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RESEARCH ARTICLE

Evaluation of Urban Transformation Projects Through the Sustainability Indicator: The Case of Santral District in Antalya

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Abstract

Urban transformation projects are being implemented to make spatial arrangements and improvements in line with the changing needs of cities and citizens in the world and Turkey. In urban transformation projects, sustainability goals are essential in order to protect the integrity of cities and to meet the spatial, social and economic needs of the citizens in an environmentally sensitive, balanced and equitable manner. This study aims to analyze the effects of urban transformation practices on citizens, urban space and the environment by using sustainability indicators. For this purpose, the Sur Yapı Antalya Project in Santral District Urban Transformation Area of Antalya was analyzed through the items of the sustainability indicator set. The project was evaluated under eight main criteria, namely "community participation", "economy and work", "transport", "pollution", "energy", "waste and resources", "buildings and land use" and "wildlife and open spaces". As a result of the study, it was concluded that the effects of the decisions taken and the practices implemented during the planning phase of the project and the ongoing construction process on physical, economic, social and environmental sustainability vary and affect its utilization. This study is expected to contribute to the research and practice by evaluating how the urban transformation project aims to improve the region's physical conditions and offer a new urban space to the citizens.

1. Introduction

Cities are the whole of the natural and built environment in which the citizens shelter physically, exist economically and share socially. Urban transformation projects are being implemented to make spatial arrangements and improvements in line with the changing needs of cities and citizens in the world and Turkey. Urban transformation projects are defined as reorganizing unqualified and unplanned urban areas, refunctioning existing areas in the city instead of undeveloped lands in the city periphery or inside, developing physical, and social infrastructure, providing employment and revitalizing social life [1-2]. In this sense, various urban practices such as "urban renewal", "urban reconstruction", "urban development", "urban improvement", "urban renewal", "urban redevelopment", "urban regeneration", "urban conservation" are carried out in city centers, residential areas, old industrial and port areas, and cultural heritage areas [3].

In the 20th century, environmental problems emerged due to intense population growth, unplanned and rapid urbanization, unconscious

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consumption of natural resources, and the damage caused by industrial areas to the ecosystem [2]. Since the 1980s, "sustainability" studies have gained importance as being the agenda of national and international platforms to prevent these problems and protect the ecosystem and the environment. The process, which started with "Our Common Future Report" (Brundtland Report) of the World Commission on Environment and Development (WCED) in 1987, was followed by international meetings such as Habitat II and Habitat III, and decisions such as "Agenda 21" and "Leipzig Charter for Sustainable European Cities". During these international meetings and conferences, various dimensions of sustainability, the principles to be applied, and the requirements for sustainable cities were addressed [2-4]. In Turkey, the concept of sustainability became an issue for the first time in the 7th Five-Year Development Plan (1996-2000) [4]. After 2000, it has been started to be considered together with urban policies and planning with agendas such as "Turkey Habitat III National Report" and "Urban Development Strategy". However, despite these efforts, policies and legitimate regulations regarding sustainability have yet to be made [5-6], and there are deficiencies and difficulties in implementing sustainability issues [2].

Although cities give people the opportunity to be a part of their social and economic structure, they may negatively affect ecology due to the consumption of energy and natural resources, deterioration and pollution of the natural environment [3]. Concerning these negative effects, sustainable development has become an important concept, and it aims to protect the natural environment while increasing economic growth and quality of life. Transformation and renewal works in urban spaces are important opportunities for implementing sustainable development within the scope of contemporary urban planning principles and plans [7]. The concept of urban sustainability includes issues such as "climate change and pollution", "land use and urban sprawl", "transportation and motor vehicle use", "energy and resource use", and "economic inequality and poverty" [3]. In this direction, sustainable urban transformation refers to a radical change in urban development with sustainability goals about all subjects such as housing, design, construction, land use, social and economic structure, climate change, energy consumption, natural resources, transportation, education and health services [2-8].

In recent years, sustainability goals are important and principles for sustainable development come to the fore to protect the integrity of cities in urban transformation projects and to meet the spatial, social and economic needs of the citizens in an environmentally sensitive, balanced and equitable manner [2]. The negative effects of urbanization, population density in the urban area, unplanned and illegally built housing areas, environmental problems and global warming have been effective in the emergence of the concept of sustainable urban transformation [3]. The objectives of sustainable urban transformation are to improve the quality of urban life, to ensure community participation and partnership, to reduce the negative effects on the natural environment, to provide social, environmental and economic regeneration, and to prevent displacement with on-site transformation. Today, urban transformation is considered as the physical transformation of a region as well as its effect on the social, cultural and economic structure and the transformation resulting from these effects [9]. Sustainable development addresses the problems in terms of economic, social and environmental sustainability and positively affects the effects of urban transformation. In this sense, including sustainability principles in urban transformation strategies and practices contributes to sustainable urban development.

Studies on urban transformation usually aim "to explore patterns and dynamics of change linking cities and diverse socio-technical and social-ecological systems across levels and scales and to develop new forms of intervention to foster their sustainability" [10]. At the same time, the content and nature of the concept of sustainability may vary according to the unique and local characteristics of countries, cities and even districts. For this reason, one of the key components of analyzing urban

transformation areas' sustainability is to conduct research by using sustainability indicators. Especially analyzing the urban transformation practices with sustainability indicators in big cities plays a crucial role in the development of urban transformation projects. In a research in which urban sustainability is evaluated and the sustainability indicator is developed, it is emphasized that making comparisons by measuring the sustainability levels of projects, regions and cities is the essential procedure for creating a sustainable urban future [11].

From this point of view, it is an important issue to evaluate urban transformation projects in cities with sustainability indicators to ensure sustainable urban development. But the existing literature is limited in making these kinds of evaluations. This study aims to analyze the effects of urban transformation practices on citizens, urban space and the environment by using sustainability indicators. For this purpose, the Santral District in Antalya was selected as the research area and analyzed with the items of the sustainability indicator set. The Sur Yapı Antalya urban transformation project conducted in Santral District is an important urban transformation project implemented by the cooperation of the state and private sector [12]. Antalya is one of Turkey's big cities and significantly contributes to the country's economy with its tourism revenues, and the city has a rapid development potential. Urban transformation works in Santral District contribute to this development too.

When the literature on the urban transformation in Santral District are examined, the decisions taken during the planning phase of the Sur Yapı Antalya project, expectations and suggestions are included [13-14], and how the urban transformation should be discussed [15]. In a research, the urban transformation project realized in Santral District was examined through the transformation model, expectations from the project, entitlement and compromise method, social and economic values, sales value of the area and its surroundings [13]. In other research, the design and construction costs of buildings with sustainable materials in urban transformation projects were evaluated over a block in the Sur Yapı Antalya project [14]. Also, it has been emphasized that in urban transformation projects, physical transformation is focused on and social and economic dimensions are ignored, and how urban transformation should be by referring to the views of the local people in Santral District [15]. Nevertheless, these studies were limited to the evaluation of the planning phase in urban transformation applications, and the evaluation of the construction and utilization processes within the scope of sustainability was not mentioned. For this reason, the evaluation of the construction and utilization processes of the Sur Yapı Antalya project through the sustainability indicator and the examination of their effects on physical/spatial, social, economic and environmental sustainability constitutes the originality of this study. "What should be" of sustainability refers to normative sustainability, and "what it really is" refers to positive sustainability [2]. In this direction, the importance of this study and its contribution to the literature is to evaluate how the urban transformation is planned and implemented and to make suggestions for sustainable urban transformation.

2. Theoretical background

2.1. Urban transformation practices in Turkey and Antalya

Big cities in Turkey, such as İstanbul, Ankara, İzmir and Antalya, experienced a rapid urbanization process because of immigration between the years 1950-1980. In this process, there were not enough affordable housing to meet the shelter needs of people who migrated from rural to the city due to unemployment, terror incidents, natural disasters, health and education deficiencies. Therefore, low-cost, undeveloped and unhealthy physical living conditions and gecekondu (a slum type unique to Turkey) settlements have emerged in order to meet the need for shelter. Although gecekondus and unplanned settlements were tried to be prevented with the "Gecekondu Law No. 775" that came into force in 1966 [12], they were legalized with the

Improvement Development Plans in the 1980s [2]. As a result, commercial buying and selling of gecekondus and earning income by renting additional floors have come to the fore. In the period after 2000, due to the inadequacies of infrastructure, unplanned and unqualified settlements, insufficient space for construction in city centers and the need to take precautions against natural disasters, legal arrangements have been made regarding urban transformation, and renewal of gecekondu areas with state-controlled urban transformation projects has became popular. Although urban transformation projects aim to physically improve and organize unplanned settlements, the natural environment, economic, social and cultural structure should be preserved and developed in line with the genuine identity of the city and the region. In this sense, it should be ensured that different fields of expertise such as architecture, landscape architecture, engineering, urban planning, sociology and economy carry out multidisciplinary studies [16].

National and local policies are determining urban transformation policies and practices of countries. The public institution "Housing Development Administration" (Toplu Konut İdaresi Başkanlığı), central and local governments are competent in the decisions and implementations of urban transformation projects in Turkey [16]. In recent years, most urban transformation projects implemented in Turkey are carried out with "Law No. 6306 on Transformation of Areas Under Disaster Risk", which came into force in 2012 and it is aimed to take precautions against disasters and to create a healthy environment [2]. The purpose of this law is to "determine the procedures and principles for improvement, clearance and renewal in order to create healthy and safe living environments under science and art norms and standards in areas under disaster risk and on lands with risky structures outside these areas" [17]. With this law, Republic of Turkey Ministry of Environment, Urbanization and Climate Change and the municipalities authorized by the ministry have the authority to transform unhealthy and unplanned residential areas in a way that is resistant to disasters, has improved infrastructure and is arranged with a modern urbanism approach [12]. However, this law does not include principles and practices regarding sustainability and sustainable urban transformation. The concepts of sustainability and sustainable urban transformation should be included in the legal regulations, and the principles and obligations in the planning, implementation and utilization phases should be defined [4].

Large industrial areas such as Ferrochrome Factory, Weaving Factory, Kepez Hydroelectric Power Factory and the job opportunities they offered were effective in Antalya's immigration, and gecekondu settlements began to be built in areas close to these industrial areas in the 1950s [12-13]. In the 1970s, the fact that people who migrated to Antalya and worked in the agriculture, tourism and industry sectors tried to solve their housing needs with their own means effectively grew the uncontrolled housing settlement in the city. Within the scope of the reorganization of the unplanned settlement areas in Antalya, urban transformation practices were started to be implemented in Sütçüler, Gazi, Güneş, Gülveren and Döşemealtı districts with the cooperation of Antalya Metropolitan Municipality, local municipalities and Housing Development Administration [1]. Within Law No. 6306, three regions in the city center of Antalya were determined as risky areas. These risky areas are Kepez, Santral, Gülveren and Güneş districts in Kepez [12]. Urban transformation practices continue in different parts of Kepez [18], which is the largest and most populated region of the city center, due to risky areas, unplanned and unqualified constructions, social areas with low physical quality and infrastructure deficiencies.

2.2. Urban transformation project in Santral District and Sur Yapı Antalya Project

Santral District locates within the borders of Kepez in Antalya. It has an industrial site and prison in the south, a residential area and light rail transportation in the east, a zoo and forested area in the north, and a residential area and forested area in the west

(Fig.1). The distance of the area to the city center is approximately 12 kilometers. There are various transportation alternatives such as highway, ring road and tram line. In 2014, an area of 1,327,330 square meters in Santral District, where 4400 residences are located, was declared a risky area within the scope of the "Law No. 6306 on Transformation of Areas Under Disaster Risk" and transformation works were initiated [1]. This project is the first urban transformation application conducted with the law numbered 6306 in Antalya [12]. In the pre-demolition state of the region, there were generally 1 and 2-storey houses or 5-storey apartment buildings covering 13,500 people (Fig.1). In addition to houses, there were various utilizations such as green areas, commercial areas, education area, health area and religious facility area. After the urban transformation, the population is predicted to be 70,000; therefore, technical infrastructure, social and cultural facilities, religious facilities, education, health areas and green areas are planned for the inhabitants (Fig.2) [1-19].

Fig. 1. Top: The location of Santral District Urban Transformation Project (Sur Yapı Antalya) in Antalya [20]; Bottom: Google Earth image of the Santal District in 2009 [21]

Fig. 2. Left: Pre-demolition view of the gecekondus in the Santral District [14]; Right: The model of the Sur Yapı Antalya Project in the Sales Office.

During the design and implementation process of Santral District Urban Transformation Project, different experts and actors worked together in the stages of "Preliminary Preparation and Feasibility Works", "Project Management", "Information Services", "Expectations and Participant Management", "Urban Design Project", and the duties, authorities and responsibilities of each actor were defined [15]. In 2015, the Project Office was opened to organize promotional and information meetings in order to cooperate with the beneficiaries, and the meetings were held with the beneficiaries. In the Project Office, studies were carried out with experts from different professions such as survey engineers, city planners, architects, civil engineers, public relations specialists, psychologists and sociologists [1]. A survey was conducted to determine the needs of the beneficiaries and to receive their opinions and suggestions, and preliminary protocol documents were signed with the agreed beneficiaries. In 2016, contracts were completed with 3245 of 3265 beneficiaries, and the project area started to be evacuated by enabling the beneficiaries to benefit from 24-month rental assistance and relocation assistance [1]. The construction tender of the project was held in 2017 and Sur Yapı firm undertook the construction work with this tender [14]. After this stage, the state and Sur Yapı firm started to run the project in common and the project was named as "Sur Yapı Antalya". After the demolition of the buildings in the region, infrastructure works were started and the project's construction was programmed in stages. In 2018, the first stage of the construction started and work continued.

In the project of Sur Yapı Antalya, it was aimed to create a healthy and safe living space where all kinds of dynamics with potential are functionally revealed, and the new users and the beneficiaries would reside in the renewed area [13]. Within the scope of the project, it was planned to construct different types of residences ranging from 47 to 226 square meters, education and health institutions, city squares and parks, sports facilities, social areas, shopping center, market place, museum and library (Fig.3) [14-20]. Antalya Metropolitan Municipality has approved the zoning plans, the parceling arrangement has been made, and the ownership of all areas except the residential areas has been left to the Antalya Metropolitan Municipality [1]. The aim of the urban transformation project is not only to make the area physically healthier and more qualified, but also to raise the social and cultural living standards. As a result of these regulations and improvements, the increase in real estate values in and around the project area is also among the expectations [1].

On the other hand, Sur Yapı Antalya project has been determined as a pilot project for urban transformation with a smart city concept in Turkey [1].

Fig. 3. Masterplan of Sur Yapı Antalya project [20]

While the smart city approach aims to reduce the waste and the consumption of natural resources, it has an important role in creating energy efficiency data and planning in urban transformation projects, improving human life and environment, economy and governance [22-23]. In the smart city approach, the guiding principles are focusing on energy and materials to provide a holistic perspective on resource consumption, creating smart infrastructures with energy networks and mobility systems, and identifying new urban services and jobs related to sustainable urban development [22]. In parallel with the smart city approach, Sur Yapı Antalya project aims to create a smart settlement by realizing "smart housing technologies, smart health and education solutions where all data is managed from a common point with modern smart grid infrastructure, renewable energy and sustainable transportation technologies" and to implement this smart city system in other parts of the city as well [1]. In order to create mixed-functional use in the smart city, places such as private health facilities, elderly nursing home, education areas, offices, indoor and outdoor sports fields, hotel, technopark, museum, recreation area are planned together with the residences. In these places, production, storage, smart building, smart home, smart lighting, smart meter and energy monitoring infrastructures have been prepared to benefit from renewable energy with the highest efficiency, and it is aimed to create a technological and environmentally sensitive settlement with the use of electric vehicles, charging stations and light rail systems. In this way, this project won an award in the Green GOOD DESIGN design competition with its Smart City Project [20].

3. Method

In this study, case analysis method, one of the qualitative research methods, is applied. The research area is the Santral District urban transformation area in Antalya. The Sur Yapı Antalya project in this district was evaluated with statements adapted from the sustainability indicator set [24] to analyze the urban transformation in Liverpool, United Kingdom. Regarding the method of the study (Fig.4) the research has three main phases. In the first phase, a literature review on urban transformation, sustainability and sustainable urban transformation was conducted, and previous research about Sur Yapı Antalya were evaluated. In the second phase, the current situation of the Sur Yapı Antalya project was analyzed in the light of the main and sub-indicators through the sustainability indicator scale. Sustainability indicator scales have been used to evaluate the performance of urban transformation projects since the 1990s, and it is important for future projects to evaluate the sustainability of existing projects and reveal their positive and negative aspects [4]. Sustainability indicators create awareness to categorize the information within the project area, identify its positive characteristics, and better understand the problems and solve them. For this reason, various indicator and measurement sets have been created about urban transformation and sustainability, which are important issues today [11-24-25-26-27]. In the third phase, the results of the study were summarized.

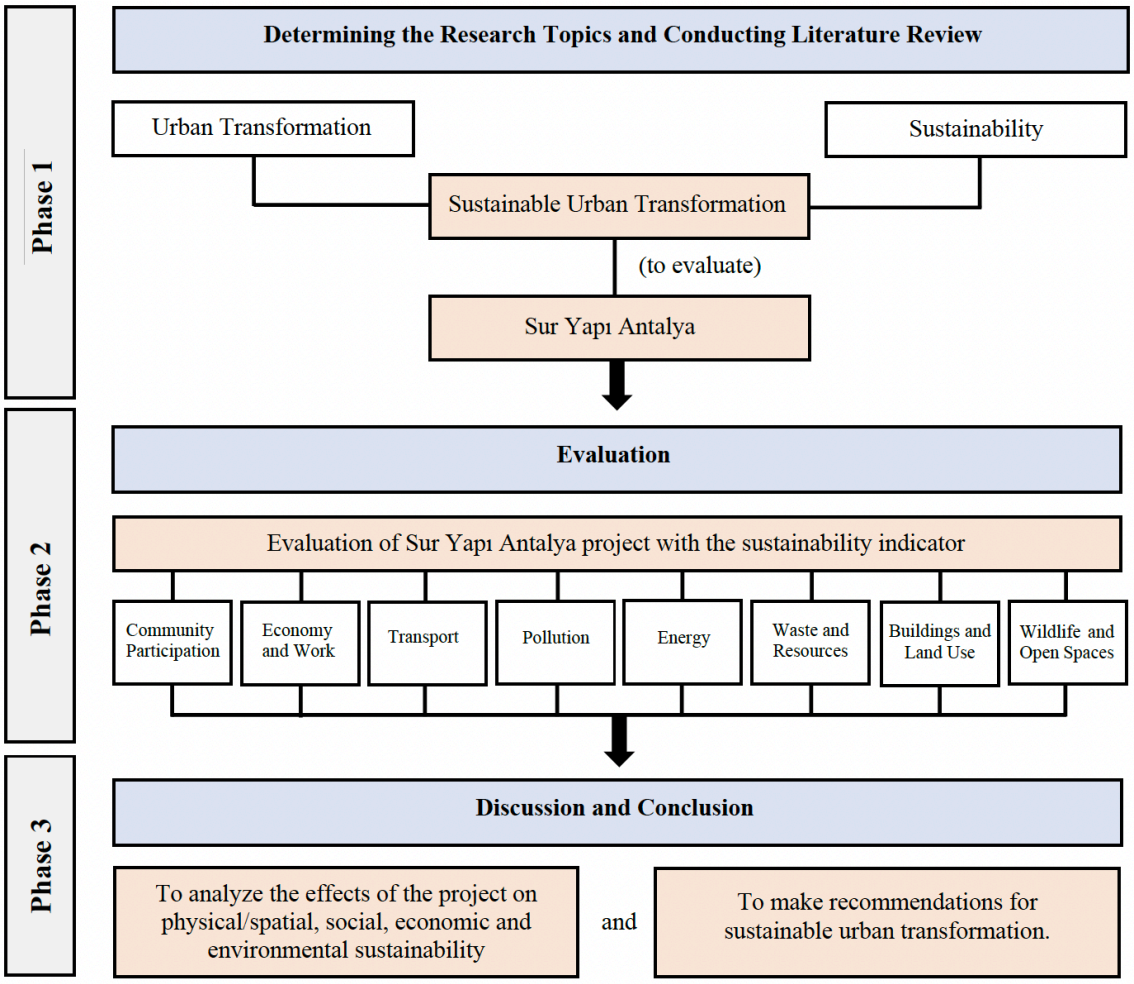

Fig. 4. Flowchart of the research method

The sustainability indicator set [24], which is the foundation of this study's research method, has also been used in different studies [3-28-29-30-31] as it provides the opportunity to evaluate different cities, regions and districts. This indicator set could be used in studies where it is difficult to collect data due to social reasons and it is difficult to obtain quantitative data, and where researchers can obtain qualitative data through their own observations and one-to-one interviews [2-3]. In the sustainability indicator set, urban transformation is examined with eight main indicators as "community participation", "economy and work", "transport", "pollution", "energy", "waste and resources", "buildings and land use", "wildlife and open spaces". Within each indicator, there are sub-indicators related to the subject and these sub-indicators are evaluated as positive, neutral and negative effects. Since it may be difficult to collect data and reach quantitative data in some cases, this method can be used to collect data in urban transformation areas in Turkey [3]. In this study, the sub-indicators within the eight main indicators in the sustainability indicator set were adapted and developed according to the subject and content of this research.

This sustainability indicator set [24] is a positive method for analyzing the current status of urban transformation projects [4]. Evaluation of urban areas reorganized within the scope of urban transformation with sustainability indicators guides the compatibility of future urban transformation projects with sustainability principles [2]. This study has attempted to make inferences for realizing the urban transformation works will be carried out in Antalya and other cities with sustainability strategies and practices by evaluating the Sur Yapı Antalya project with sustainability indicators.

4. Results

Sustainable urban transformation consists of three components that complement and interact with each other [32]. The first of these components is sustainable urban spaces and their sustainable management and use. The second is the transition of the urban development regime to culture, structure and practices aimed at sustainable urban development. The third component is ensuring urban sustainability transitions in social sectors. In this direction, within the scope of sustainable urban transformation, physical, social, economic and environmental parameters should be evaluated separately and with each other. As seen in Table 1, the physical, social, economic and environmental sustainability of Sur Yapı Antalya was analyzed with the sustainability indicator set [24].

Community Participation: To ensure the social sustainability of urban transformation projects, it is necessary to inform the residents about the planning, design and construction processes and get their opinions about their needs and expectations [2]. When the community participation in the project of Sur Yapı Antalya is examined, the establishment of the Project Office, informing the beneficiaries in this office and promoting the project, and determining the needs and expectations through survey studies are positive features in terms of encouraging local decision making and involving the community in the development of the plan. However, although it is a positive situation that the on-site transformation has been implemented by agreeing with the beneficiaries, there is also the possibility of not being able to adapt socially, culturally and economically with the upper-income group who will settle in the region in the future and to have some problems [16].

Economy and Work: In relation to the economic dimension of urban transformation and sustainability, it aims to improve the economy and employment [4]. New commercial areas such as shops on the ground floor, apartments on the upper floors that can be used as residences or offices, and a shopping center are planned on the main street called "Sur Street", which was designed as a main artery with the aim of mixed-functional urban design (Fig.5). However, since most of these buildings are under construction, there are limited spatial arrangements to ensure local production and consumption for the inhabitants of the completed buildings. No application has been found to improve environmental awareness in businesses in or around the area.

Table 1. Evaluation of Sur Yapı Antalya settlement with the sustainability indicator set

	Sustainability Indicator	Positive Impact (+)	Neutral / Mixed Impact (*)	Negative Impact (-)
1	Community Participation			
	(a) encourage local action and decision making in the planning and design process	+		
	(b) involve the community in the development of the proposal/plan in the planning and design process	+		
	(c) consider under-represented groups		*	
2	Economy and Work			
	(a) link local production in the region to local consumption			-
	(b) increase employment in the region			-
	(c) develop environmental awareness of local businesses in the region			-
3	Transport			
	(a) distance of the region to the city center		*	
	(b) access to the region from the city center	+		
	(c) (diversity of roads and transportation vehicles)			
	(d) encourage walking and cycling			-
	(e) encourage use of public transport		*	
	(f) discourage use of cars or lorries			-
4	Pollution			
	(a) reduce local pollution (noise, air, soil, etc.)			-
5	Energy			
	(a) maximize energy efficiency with the designed buildings and environment	+		
	(b) generate energy from renewable resources or waste		*	
6	Waste and Resources			
	(a) reduce waste within the neighborhood			-
	(b) encourage reuse and/or repair		*	
	(c) encourage recycling or recycled products		*	
7	Buildings and Land Use			
	(a) provide local materials and methods			-
	(b) improve access for disabled		*	
	(c) reuse/conserve buildings in the area			-
8	Wildlife and Open Spaces			
	(a) encourage use of open space for community benefit	+		
	(b) offer different possibilities like outdoor sports, cultural, social activities, etc.			-
	(c) encourage natural plant and animal life			-
	(d) protect and promote the use of the built environment and green space		*	

In addition, when the project is fully completed, the existing small-scale commercial and economic structure may be completely destroyed, and the beneficiaries may not be able to adapt economically and socially to their new living spaces and may face the problem of unemployment.

Transport: When the transportation data of Sur Yapı Antalya settlement is examined in relation to physical, economic and environmental sustainability, it can be said that the distance to the city center is approximately 12 kilometers, neither far nor close for Antalya.

Fig. 5. Left: Commercial areas and residences in the project [19];
Right: Commercial areas and residences under construction

It is possible to reach the city center and other districts by various motor vehicles such as buses, minibusses, trams, taxis and private vehicles (Fig.6). However, since there is an industrial area and a ring road around the settlement, and there are no specially designed roads for pedestrians and bicycles yet, motor vehicles are mostly preferred within the district and during transportation to the city center. Therefore, the effects of existing transport routes and vehicles on economic and environmental sustainability are negative.

Pollution: When the pollution situation is examined, noise, soil and air pollution cannot be prevented due to ongoing constructions, construction materials around, unfinished green areas, and intense use of motor vehicles. This affects physical and environmental sustainability negatively (Fig.7).

Energy: As a result of innovations and developments in science, industry, technology and communication, the need for energy and energy consumption have increased, natural resources have started to run out rapidly and energy efficiency has become an important issue at the international level [7]. For this reason, to ensure energy efficiency, energy resources should be used at the highest efficiency without harming natural resources at all stages, from production to consumption, by recycling, with clean technologies, and without loss of energy. In order to use energy effectively and to ensure environmental sustainability, in the planning, design and implementation stages, considering the data such as climate, sun, wind, temperature in the settlement, and land use, directions of buildings, distance between buildings, road widths, construction-green space balance, material selection decisions are important [7]. One of the methods of ensuring energy efficiency in buildings is to make design decisions and practices that make climatic regulations using minimum energy to reduce energy consumption for heating, cooling, ventilation and lighting [7]. In the Sur Yapı Antalya project, there is no information that climate, sun and temperature data are taken into account in the use of land and settlement of buildings to provide energy efficiency. However, the buildings have been constructed in accordance with the specifications of fire, heat, sound, waterproofing, parking, energy conservation and energy-efficient building regulations. In this context, the preparation of production, storage, smart building, smart home, smart lighting, smart meter and energy monitoring infrastructures in order to benefit from renewable energy at the highest efficiency [20], the use of motion sensor and energy saving lighting in parking lots and common areas, and utilizing solar energy systems for hot water [14] are positive features for energy efficiency.

Fig. 6. Left: The tram line is planned to pass through the area in the project [19]; Right: Buildings and roads under construction

Fig. 7. Left: Buildings under construction and their environment; Right: Buildings under construction

Waste and Resources: A vital part of sustainable urban development is preserving the ecological system while changing the urban space and the lives of the citizens [8]. In urban space, natural resources such as lands, green areas, energy and water are consumed, and waste generation occurs rapidly. Nevertheless, natural resources are limited and in case of excessive consumption of natural resources, these resources will be destroyed [7]. During demolition works in Santral District, construction and demolition wastes were separated as aggregate material on the sieve, and 223 tons of wood and 1324 tons of iron from the buildings were separated for reuse (Fig.8) [33]. In the current situation of the area, there are waste boxes placed by Kepez Municipality at the entrances of the car parks of the buildings to separate the waste and ensure their recycling (Fig.8). In these boxes, it is aimed to collect plastic, glass, metal, electronics, paper and cardboard, vegetable oil, mask and glove wastes. However, there is no information about an attempt to reduce waste or what is done as a result of recycling after collecting this waste.

Buildings and Land Use: Revitalizing old residences and out-of-use or dysfunctional areas such as old harbors and industrial areas with spatial arrangements provides an opportunity to develop public space and social life [8]. Improving and functioning structures in unplanned settlements with insufficient infrastructure and gecekondus is more challenging than in planned settlements. In transforming Santral District into Sur Yapı Antalya project with urban transformation, all structures such as residences, commercial and educational

areas were demolished, and all area is being completely rebuilt. In this context, the existing structures in the region could not be preserved, and reinforced concrete structures were built with modern construction techniques. In this case, it can be interpreted that physical, spatial and environmental sustainability cannot be achieved within the scope of the urban transformation project.

Wildlife and Open Spaces: Regarding social and environmental sustainability, the project aims to protect natural life and to ensure the use of both green and social spaces in open areas. During the demolitions, 11786 trees such as pomegranate, citrus, olive, fruit, palm and plane trees in the beneficiaries' gardens were protected in the nursery area. In addition, information such as the type of trees, the date of removal, and whom they belong to are placed on the trees [33]. However, the fact that these trees were not used during the implementation of the project caused the existing green area not to be protected. In addition, due to the increasing demand for housing with the new project, the future of the forested area in the north of the region is also in danger [16]. On the other hand, the "City Park" (Fig.9) is vertically positioned in the middle of the area and designed as a recreation area of 157 thousand square meters. In this area, it is planned to implement indoor and outdoor sports fields, children's playgrounds, walking paths, jogging and cycling tracks, entertainment, dining and resting areas, but the implementation works has not been started yet. Nevertheless, the currently open and green area is limited to the gardens of the buildings that have been constructed and the common areas between them (Fig.9).

Fig. 8. Left: Wood collected for reuse during demolition [33];
Right: Waste boxes placed by Kepez Municipality at the entrances to the car parks

Fig. 9. Left: The "City Park" in the project [19]; Right: Common areas and playground between buildings

5. Discussion

Urban transformation is a comprehensive urban management effort developed to solve urban areas' social, economic, societal and spatial problems [2]. Urban transformation projects, which primarily focus on physical space, cause direct and indirect effects on social life, economic structure and the natural environment. Sustainability indicators reveal the effects of urban transformation projects on urban space and life. It is essential to make evaluations with these indicators to improve the physical environment, protect ecology and the environment, revive the economic situation and provide an equal life to its users in all aspects. In this study, a sustainability indicator was used to evaluate the Sur Yapı Antalya project in Santral District. Table 2 summarizes the effects of the eight main criteria evaluated in the sustainability indicator on physical/spatial, social, economic and environmental sustainability of the Sur Yapı Antalya project.

The displacement of the population living in the gecekondu settlements within the scope of urban transformation practices and the region's planning for the high-income group contradicts social sustainability and the citizens' right [34]. On the contrary, in Sur Yapı Antalya settlement, on-site transformation with old and new residents, informing users and ensuring their participation in the project's planning phase positively affect the social dimension of urban transformation and sustainability.

The implementations such as mixed-use design, transportation systems, open spaces, public buildings and energy efficient buildings realized in urban transformation areas have direct and indirect effects in terms of attracting investment in the region, increasing real estate values, creating new business areas and employment, and improving the economic situation of the people living in the region [35]. In the current status of Sur Yapı Antalya settlement, commercial areas are only on Sur Street and the very limited commercial areas and job opportunities negatively affects economic sustainability. In addition, it has a negative impact on environmental sustainability as construction continues in buildings and commercial areas on Sur Street and construction materials are located on the street.

The population density in cities, rapid urbanization, consumption of energy resources, increasing waste and decreasing natural resources are the main factors that negatively affect the environment. It is crucial to take some measures to reduce these negative effects on the environment. The use of renewable energy sources is effective in reducing most emissions from the housing and construction sectors, improving air quality, protecting energy sources and reducing environmental impact [36]. It is emphasized that the implementation of sustainable transportation systems is effective in preventing air pollution, ensuring energy efficiency, reducing traffic congestion and preventing accident risks [37].

Table 2. The effects of the main criteria evaluated in the sustainability indicator

Sustainability Criteria	Physical/Spatial Sustainabilty	Social Sustainability	Economic Sustainability	Environmental Sustainability
Community Participation		+		
Economy and Work			-	-
Transport				-
Pollution	-			-
Energy				+
Waste and Resources				+
Buildings and Land Use	-			*
Wildlife and Open Spaces		-		-

In Sur Yapı Antalya settlement, the tram line and bicycle paths are planned to reduce energy consumption in the project, but these alternative transportation routes have not been implemented yet and adversely affect environmental sustainability. In addition, while people live in the completed parts of the project, the continuation of construction in other parts and the lack of work to reduce pollution in the construction areas negatively affect physical and environmental sustainability. On the other hand, the use of smart systems to reduce energy consumption in buildings and the presence of boxes for separating and collecting waste in common areas positively affect environmental sustainability.

Within the scope of the urban transformation project, the demolition of pre-existing residential, commercial and public spaces and the reconstruction of the entire area negatively affect physical/spatial sustainability. On the one hand, the reconstruction of the entire area negatively affects environmental sustainability, while the separation of construction and demolition wastes for recycling positively affects environmental sustainability. Therefore, the overall impact of building and land use on environmental sustainability is neutral.

In a study that deals with the importance of open and green spaces in sustainable neighborhoods, it is emphasized that these micro ecological areas establish outdoor interaction among the residents of the region. In addition, it was stated that to ensure the sustainability of these open spaces, their function should be determined, their management should be ensured and sustainable landscape practices should be implemented [38]. In this direction, when the Sur Yapı Antalya settlement is evaluated, the "City Park", which includes the sports fields, children's playgrounds and other social areas planned in the project, has not been implemented yet and the existing green common areas are very limited. This situation negatively affects social and environmental sustainability.

In this study, positive sustainability, which defines "what is" in the planning stage and current situation of the urban transformation area, was evaluated, not normative sustainability, which expresses what the targeted sustainability should be when the project is completed. Therefore, it is foreseen that there will be changes between the positive, neutral and negative effects of the indicators on physical/spatial, social, economic and environmental sustainability when the construction process is completed.

6. Conclusion and recommendations

Urban transformation projects are carried out with different methods and practices according to the policies, spatial needs, cultural and social characteristics and economic conditions of countries and cities. These projects affect and direct the future of cities and the lives of citizens. This study evaluated the Sur Yapı Antalya project in Turkey in terms of sustainability indicators and showed the positive, neutral/mixed and negative impacts of the project on physical/spatial, environmental, social and economic sustainability. Sur Yapı Antalya project was realized with the cooperation of the state and the private sector, and this cooperation made various contributions to the urban transformation project. In the project of 1,327,330 square meters area, infrastructure works have been carried out, different types of housing have been created according to different needs and economic situations instead of standardized houses, studies on energy efficiency have been carried out to implement the smart city concept, and qualified public, social and green spaces have been planned. It is aimed to bring the city as an autonomous region with educational areas, health services, cultural, social and commercial areas, and open to the citizens living in other districts. However, in the current state of the project, the findings of the research show that there are serious problems in terms of physical/spatial, social, economic and environmental sustainability while the construction continues and people live in the completed buildings.

As a result of the evaluation, this study recommends that sustainability should be addressed with all its dimensions, including physical/spatial, social, economic and environmental, in order to implement sustainable urban transformation

projects that will be effective in the long term for cities and citizens (Table 3). Urban transformation policies and practices based on physical, social, economic and environmental sustainability at international, national and local scales will create holistic changes in cities. For this, sustainability practices should be made a part of urban transformation policies. Sustainable urban transformation practices should be encouraged, social, economic and environmental regulations should be made together with physical development, and urban transformation projects that focus on people and the environment should be implemented. In this process, where many components will be evaluated together, information sharing and cooperation between different actors such as central government, local governments, universities, experts, private sector and the public will facilitate this process and contribute to implementing of the most efficient practices for the society.

In recent years, urban transformation and sustainability practices are among the essential urban practices worldwide and in Turkey. Sur Yapı Antalya project differs from other urban transformation projects in Turkey with its planning and construction method. The contribution of this study to the scientific field is to provide information about these practices and evaluate them through a case. The importance of this study is to evaluate this project within the scope of physical/spatial, social, economic and environmental sustainability and to make suggestions for sustainable urban transformation. Also, the study's contribution to the practice is to guide researchers, experts and local governments who will take part in planning and implementing future urban transformation projects while evaluating how urban transformation is planned and implemented in Turkey. Various urban transformation works are being implemented in Antalya, Turkey and the world with different approaches and methods. The limitation of the study is that it focuses on only one project. For future studies to make inferences and develop strategies for sustainable urban transformation, it is recommended to evaluate and compare different urban transformation projects realized in different cities and districts of Turkey only by the public or private sector or in partnership with the public and private sector, with sustainability indicators.

Table 3. Recommendations for physical/spatial, social, economic and environmental dimensions to ensure sustainable urban transformation

Sustainable Urban Transformation	
Physical / Spatial	• Determining the sustainability goals and practices in the decision-making, planning, implementation and utilization stages of urban transformation projects, • Introducing the residences with planned infrastructure, physical and social facilities, designed and built with sustainability criteria, • Supporting the design and use of open spaces and green spaces.
Social	• Analyzing the needs and expectations in urban life, • Preservation and maintenance of cultural, social values and traditions, • Ensuring that everyone benefits equally from public services and social areas.
Economic	• Realizing local development and increasing employment, • Creation of commercial areas that will enable economic mobility and social sharing.
Environmental	• Protection of natural resources and environment, • Using renewable energy sources to prevent climate change, • Reducing consumption and promoting recycling.

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Author Contributions

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