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THE IMPORTANCE OF WALKABILITY ON UNIVERSITY CAMPUSES IN THE CONTEXT OF SUSTAINABLE CITIES AND COMMUNITIES

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ABSTRACT

One of the biggest causes of global climate change is the rapidly growing cities in order to meet the increasing population. Due to urban sprawl and increasing automobile use in these cities; carbon footprint increases, agricultural and forest areas are destroyed, water resources, natural environment and air are polluted. This causes irreversible climate disasters. In order to learn from climate disasters and to take precautions against new disasters, studies are carried out in the context of "sustainable cities and societies" from the individual level to the national level. "Walkability" is a basic concept for ensuring sustainability in cities. Walkability is a concept that has gained importance especially with the recent Covid-19 pandemic in order to prevent the negative effects of urban sprawl, suburbanization, expanding road network and increasing vehicle ownership in cities and to provide a "pedestrian-oriented design" approach in cities. During the pandemic period, the importance of walking at every walkable distance and the necessity of designing compact cities that can be walked within 15 minutes have emerged. University campuses with the characteristics of a small compact city; ıt combines different functions such as work, accommodation, recreation, education, health and sports areas. Therefore, people of various profiles spend time in these areas during the day, participate in different actions and activities, and pedestrian mobility occurs within the campus. For this reason, it is important to investigate the walkability on campus campuses. In this study, it is aimed to explain that sustainable urban life can be achieved with walkability in university campuses, which are small compact living spaces with common areas.

Keywords: Sustainability, Walkability, University Campus, Accessibility, Climate Change.

1. INTRODUCTION

Uncontrolled growing cities, at the expense of destroying green areas, agricultural and forest areas in order to quickly solve the housing problem in increasingly crowded cities, is one of the biggest causes of global climate change. The change in consumption styles compared to the past, such as people's tendency to use individual vehicles, also increases the rate of environmental pollution in cities. These changing consumption patterns not only cause air pollution or health problems, but also cause the world community to face new problems such as global climate change due to the increase in carbon footprint. The main reason for these problems is that people think that the natural environment and resources in the world are infinite, and the way they live their lives uses these natural resources in an unsustainable way.

After many years of unconscious use of resources, societies have realized that these resources in the world are limited. As a result, the Brundtland (Our Common Future) Report (1987) and the subsequent Rio Summit and Agenda 21 (1992), the UN Conference on Human Settlements-Habitat II (1996) introduced the 'sustainable development' approach, the UN Millennium Summit (2010), Rio A sustainability approach that balances the protection of the natural environment and ensuring social development was also proposed at the +20 Summit (2012) conferences (Anonymous, 2012a).

In order to cope with the poverty, inequality, disease, hunger and climate change that people face today, the United Nations Sustainable Development Conference was held in 2012 and measures aimed at sustainable development were determined. The "Future We Want" document, signed by 193 member countries of this conference and containing 17 targets to eliminate poverty in the world, protect the world and ensure that people live in prosperity by 2030, came into force in 2016 (Figure 1). The goals included in the document called The Future We Want are; ending hunger, reducing poverty, ensuring a healthy life, eliminating economic inequality, sustainable energy use, sustainable architecture and urbanization, renewable production and consumption, and combating climate change (Anonymous, 2012a).



Figure 1. 17 Goals of sustainable development

In this study, the "Sustainable Cities and Communities" target, which is the 11th of the 17 goals of sustainable development, will be examined. Within the scope of this purpose, the points that need to be taken into consideration in urban planning to ensure sustainability in cities will be emphasized. In order to develop the understanding of sustainability in cities, the environmental, social and economic dimensions of sustainability must be addressed together and a holistic approach is required.

Environmental dimension of sustainability;

Environmental issues that need to be addressed in terms of sustainability are resource use, energy, water, waste, urban nature and environmental justice (Grove, 2009). Resource use is

the first dimension of environmental sustainability (Nijkamp and Opschoor), and the sustainability of resources depends on the sustainability of the city's production and consumption processes. In order to ensure environmental sustainability, attention will be paid to issues that will support the preservation of balance in nature, such as protecting biodiversity, using renewable resources, using environmentally friendly technologies with a zero waste and emission target, and supplying environmentally friendly products.

The basic principles of environmental sustainability can be listed as follows

Table 1. Environmental sustainability criteria (Moldan vd., 2012):

Environmental Sustainability Criteria	
Effective use of climate data	Climate data should be used in the planning and design of campuses in a way that will save energy.
Using non-renewable resources efficiently	Natural resources such as existing vegetation, streams, flora and fauna should be protected and used.
Energy and Waste Recovery	The use of renewable energy sources should be prioritized. Wastes such as paper, metal and glass should be separated on site and recycled and put into use. (Atıl, Gülgün and Yörük, 2005).
Effective Use of Topographic Data	Infrastructure and superstructure problems arising from the land should be minimized. In addition, erosion controls should be carried out, the land structure should be protected, a good planning should be made to meet the needs of all the structures to be built, pedestrians, all vehicle users and cyclists should be considered by paying attention to the adequacy of transportation routes within the land, the land habitat should be protected, a suitable environment should be created for the cultivation of natural species, and finally Control and use of water coming from rainfall should be ensured.
Use of Natural Vegetation	Expenses such as irrigation, disinfection and maintenance should be reduced by paying attention to the use of natural species of the region in the planting works to be carried out in the area.

Economic dimension of sustainability;

In order to ensure economic sustainability, it is possible to ensure that the services provided to the society are based on nature protection, that the continuity of goods and services is ensured, and that resource efficiency is within natural limits (Yazar, 2006). To put it more clearly, renewable energy should be used, recycling and recovery principles should be adopted, public transport-oriented transportation should be increased, and ecology-based production should be expanded.

An ideal and sustainable economy is one that provides the highest amount of general welfare by using the least amount of resources and ensuring the lowest level of environmental damage. To be truly economically sustainable, the overall demand for natural resources must be less than nature's supply of renewable resources (Anonymous, 2023).

Social dimension of sustainability;

Sustainability represents a social ideal as well as a concrete goal in terms of physical structure (Whitehead, 2003). Socially sustainable basically refers to projects that support the development of society by contributing to it. In this context, it can be observed that in a socially sustainable city, the quality of life is high, there are no discriminations, there is high human interaction and cultural development (Bramley and Power, 2009). In order to ensure social sustainability;

- Ensuring social integration,
- Health
- Access to public green areas and services,
- Nutrition,
- Sufficient housing stock,
- Transport,
- Education,
- Cultural services

are individual needs that must be met (Moldan et al., 2012)

It is seen that the environmental, economic and social dimensions of sustainability mentioned above are related to the subheadings of the "Sustainable Cities and Communities" target, which is the 11th goal of the "Future We Want" document. When we look at these related subheadings, we look at accommodating the increasing population, designing urban transformation in a renewable and environmentally friendly way, reducing environmental impacts in cities, reducing the negative effects of natural disasters, providing access to these areas by including more green and public areas in designs, resource efficiency and It can be seen that issues that will help develop the concept of sustainable cities by implementing policies to reduce disaster risk and protecting the world's cultural and natural heritage are discussed (Figure 2).

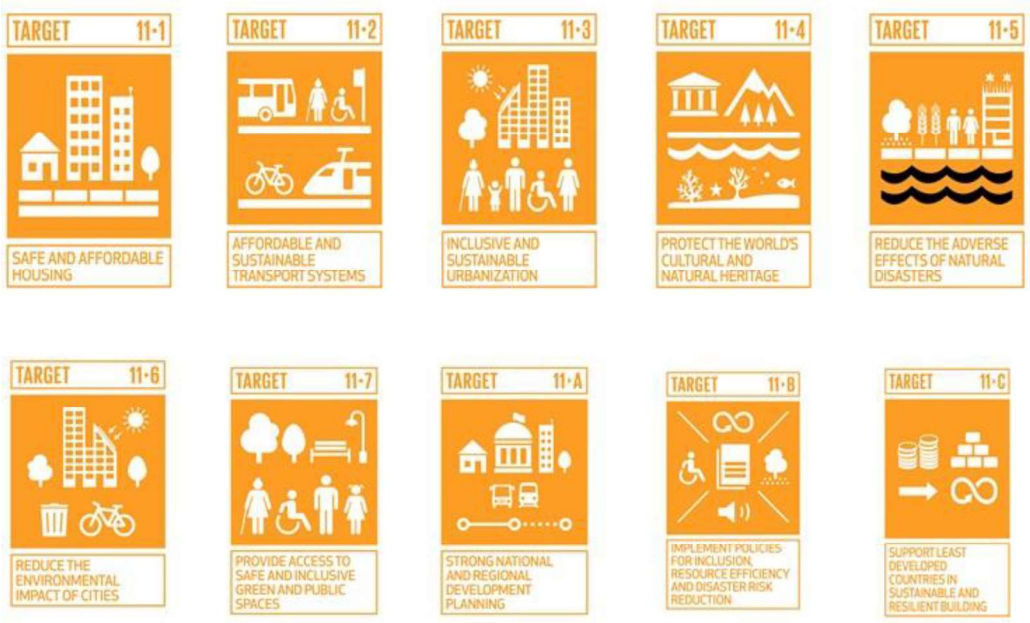


Figure 2. Goal 11 of sustainable development (Anonymous, 2012a)

The 11th goal of Sustainable Development is based on making residential areas inclusive, safe, durable and sustainable. In fact, cities and people are at the center of these goals. The biggest action that brings cities and people together is walking. Walking is a form of transportation that people use to meet their daily needs, go to work, school or parks, reach their destination or go to public transportation stops for a long-distance journey. This form of transportation is a part of our daily life, and when the physical environment allows walking, it creates walkable environments. The main purpose of walkable environments is to encourage people to walk and thus ensure sustainability in cities.

Walking and walkability are most important for the sustainability of natural and environmental resources. Walking is a clean form of transportation and helps reduce air pollution. In addition, the use of walking as a form of transportation enables cities to move away from the automobile-dependent setup (Yazıcıoğlu Halu, 2010). Thus, energy consumption, fossil fuel use, air pollution and carbon emissions in cities are reduced. Additionally, distances between destinations are close due to the compact design in a walkable environment. Having residences, workplaces, shopping, schools and entertainment areas close to each other prevents urban sprawl and sprawl; It prevents the destruction of fertile agricultural lands, wetlands and forest areas. The basis of all these environmental benefits is the increase in walkability and the resulting change in the urban development model (compact urban development model). For this reason, improving walkability is directly and indirectly beneficial in combating climate change.

Walkability also ensures economic sustainability as it creates pedestrian mobility and increases the efficiency of commercial activity. Since walking is a cheap form of transportation, it provides economic benefits for the individual. In addition, the time spent in walkable environments increases and therefore the money spent increases; Thus, the efficiency of urban commercial activities increases.

Walkability is a socially fair means of transportation that does not create class discrimination because it is open to the whole society (Forsyth & Southworth, 2008). In this respect,

walkability has public benefits such as ensuring social justice and eliminating social segregation. Walkability enables citizens to be included in urban life and at the same time provides many social benefits to the city.

Walkable environments are important for the sustainability of human health, the natural environment, the global economy and social structure. Walking is beneficial for the physical and mental health of individual people. The sustainability of walkability on human health emerges here. It has been scientifically proven that people who make walking a form of transportation and walk regularly are less exposed to chronic diseases such as obesity, hypertension, diabetes, cardiovascular disease and depression. It is also known that as walking and walkability increases, individual vehicle use and therefore air pollution decrease. Thus, the incidence of respiratory system disorders such as asthma caused by air pollution also decreases.

The issue of walkability has been brought to the agenda in terms of individual health during the Covid-19 epidemic and its importance has been re-understood. In this process, people spent time in public spaces where they could feel safe in terms of health, paying attention to both social distance and hygiene conditions. Additionally, individual modes of transportation were preferred to maintain social distance during this process. During this period, private vehicles were used for long distances as a mode of individual transportation; In close distances, transportation is possible on foot or by bicycle. For this reason, in this process, in order to increase walking and reduce carbon emissions, the concepts of "pedestrian-oriented design", "walkable cities" and "15-minute cities" have come to the fore and exemplary cities have been designed. One of these cities is Melbourne.

According to the target set for the city of Melbourne, each neighborhood will be able to reach all the units it needs within 800 meters, that is, a 20-minute walk. To achieve this goal; providing safe, accessible and well-connected spaces for pedestrians and cyclists, providing high-quality public spaces and open spaces, providing services and destinations that support local life, facilitating access to public transport connecting people to urban services, providing housing/population at appropriate densities that make local services and transport viable and strategies such as supporting developing local economies have been developed (The State of Victoria Department of Environment, Land, Water and Planning, 2019). In addition to Melbourne, many cities such as Paris and Shanghai have adopted the 15-minute city concept. In 15-minute neighborhood units, it is aimed to design many functions in people's daily lives, such as housing, education, health, work, shopping, entertainment and green areas, together and to be located within walkable distances.

At the heart of such walkable cities is a pedestrian-oriented urban design approach, and in this approach, priority is given to pedestrians and pedestrian areas. This approach includes many goals that separate pedestrians from vehicle traffic, encourage them to walk at walkable distances, and enable pedestrians to use public spaces not only to meet their essential needs but also to socialize and spend time. Another goal of the pedestrian-oriented design approach is the integration of pedestrian access networks with different transportation modes (tram, bicycle, bus, etc.). Thus, when the pedestrian wants to reach long distances, he will be able to find many modes of transportation that he can easily access and use on his own route.

In walkable cities, pedestrian spaces must meet walkable environmental criteria. Walkability is the degree to which the built environment supports and encourages walking by providing pedestrian comfort and safety, connecting people within a reasonable amount of time and effort,

and providing visual interest during the journey through the network (Southworth, 2005). As can be understood from this definition, walkability depends on the physical characteristics of the built environment. These qualities determine the walking demand for pedestrian space by affecting pedestrians' perception and walking preference. There are various definitions for these qualities by different authors. A literature review about the physical characteristics that a walkable environment should have is given below.

According to Dovey and Pafka (2020), the realization of walkability in urban space depends on DMA, that is; It depends on density, functional mix and access. Densities of buildings and people, the mix of different functions and attractions (places of interest), and the access networks we use to navigate between them are the basic tools of walkability.

In 2005, Alfonzo conducted a study in which he revealed the factors affecting walking behavior and the parameters affecting a person's decision to walk, and based on this study, he created a walking needs hierarchy model. This model suggests that there are five levels of needs that relate to urban form and are taken into account in walking decision-making. These; feasibility, accessibility, safety, comfort and pleasurability. There is no dominant need in this five-step hierarchy of needs created by Alfonzo, but each need is directly linked to the previous and next steps.

Another study to define a walkable environment was conducted by Ann Forsyth. Forsyth (2015) generally associates walkability with the physical environment and argues that a walkable environment should have four basic qualities: passable, compact, safe and physically attractive.

As mentioned above, these physical qualities can be questioned in settlements where there are campuses, neighborhoods, public spaces, pedestrian areas and mixed use of land within a 15-20 minute walking distance (within an average distance of 500-800 meters). At this point, university campuses, which are found in almost every city in our country, appear as small city models. University campuses host many different units and various social, cultural and sports activities within their large areas; ensuring integrity between buildings and open spaces; Since they have versatile functions such as allowing space use with outdoor arrangements, they form small city models in themselves. For this reason, the sustainability of university campuses through walkability will be discussed within the scope of the study.

2. DISCUSSION and SUGGESTIONS

According to the literature review, the "Sustainable Cities and Communities" target, one of the 17 Sustainable Development Goals; It includes studies that focus on humans. In this pyramid, whose cornerstone is people, individual, social and global changes can occur respectively. In other words, when individual sustainability is achieved, societies and cities develop and become sustainable. In order to increase individual sustainability, people should actually be on foot and walking in cities; It directly affects the physical, social, cultural and community life of cities. In this respect, it is important to investigate this effect in certain urban areas within cities. University campuses, which are a part of cities and contribute to the scientific development of the society, are important living spaces that need to be addressed in terms of sustainability and walkability.

Apart from the basic functions of education and research, universities also provide services as required by today's conditions; working, accommodation, eating, drinking, shopping, entertainment, sports, recreation, health, etc. They are campuses that have physical qualities to

meet many functions (Büyükşahin Sıramkaya & Çınar, 2012). In these campuses, there are planning criteria for common use spaces where staff and students from all institutions in the university can come together and exchange ideas. One of these criteria is to associate these functions mentioned above, create a systematic order and ensure that they work as a whole. At this point, the urbanism principles of walkability and sustainability need to be addressed in a holistic manner.

3. CONCLUSION and RECOMMENDATIONS

Achieving urban sustainability in university campuses is possible based on walkability and criteria. According to the literature review, for a campus to be walkable; first of all, it must be passable or walking action is possible. In other words, pedestrians should be able to reach the destinations they want to reach within the campus by walking, and the path should be suitable for walking. For this purpose, activities and units within the campus must be within walking distance of the residences or dormitories where pedestrians live, and the walking path must be allocated to pedestrians. Thus, every activity within a walkable distance encourages walking and contributes to the reduction of private vehicle use and therefore carbon emissions.

Secondly, in order for the campuses to be walkable, the campuses are compact; In other words, the functions within the campus should be intense and diverse. Since university campuses are developed within areas with certain boundaries, they are prone to the compact development model. And according to this development model, functions within campuses should generally be diverse and intense. Faculties, residences, sports complexes, health units and markets within the campuses should be designed close to each other and at walkable distances. Thus, pedestrians will be able to meet all their needs in areas close to each other and choose to walk to every destination they want to reach. Thus, urban sprawl will be prevented and the damage to nature and the damage caused to the environment due to the use of private vehicles will be reduced.

Another criterion for campuses to be walkable is physical accessibility. For this reason, human scale and pedestrians should be the priority within the campus. When pedestrians are mentioned, people walking may come to mind; However, disabled individuals and disadvantaged groups such as the elderly, children, etc. everyone should be considered on foot. For this reason, there should be special paths for every pedestrian within the campus; Pedestrian and vehicle traffic should be separated and, if possible, bicycle and public transport paths should be designed separately from private vehicle paths. In addition, all pedestrian access networks for pedestrians must be accessible to every activity and public transportation stops within the campus. Thus, there will be a mode of transportation that can be used by people from all walks of life, and people from all profiles will be able to access the function they need; The campuses will be places with high pedestrian accessibility, accessible by all segments of society and therefore preferred.

Another criterion for walkability is safety. The perception of security in campuses depends on factors such as high illumination at night, eliminating negative physical conditions related to comfort (shade, sun, rain, wind, etc.) and creating areas separated from vehicle traffic. Campuses are public spaces that are used actively throughout the day, thanks to their spatial diversity (Tutal, 2018). In order for these places to be safe, they must be alive at night as well as during the day. For this reason, pedestrians should be encouraged to use these spaces actively throughout the day. To achieve this, campuses must have good night lighting and the number

of activities suitable for night use must be high. Thus, social vitality and preferability will be ensured in the campuses.

Another criterion for walkability is comfort and, accordingly, satisfaction. Comfort refers to a person's level of comfort and satisfaction. Comfort criteria depend on many factors such as sun, shade, wind, landscape, climatic conditions, weather, urban design elements that provide protection from adverse or extreme weather conditions, and street furniture that provides convenience in urban spaces. To ensure this, according to Alfonzo (2005), the relationship between pedestrian and vehicle traffic should be balanced; The presence of traffic calming elements, speed limiters and buffers should be auditable; The status of the pedestrian crossing system should be shaped according to the urban form; pavement widths must comply with standards and pavement maintenance must be carried out regularly; Urban design elements such as canopies and passages that provide protection from adverse or extreme weather conditions and street furniture that provide convenience in urban spaces should be designed.

Finally, according to the literature review, it is important that campuses are attractive for walkability and provide visual interest to pedestrians while walking. A place that is physically attractive for this; It must provide a physical infrastructure, including wide and well-maintained sidewalks, lively street frontages, traffic calming measures, street trees and planted buffers, marked and signalized pedestrian crossings, benches, wayfinding signs and pedestrian-scale lighting. Thus, a physically attractive place is interesting, arouses curiosity and encourages people to walk. People walk because they want to see that place, not because they have to.

When the physical walkability criteria mentioned above are met, the walkability and therefore sustainability of university campuses will be ensured. Sustainability is a form of urban intervention that begins in urban areas such as universities or even at the street scale. Although sustainable development goals include upper-scale decisions, they also include decisions based on the street and human scale. In this study, walkability criteria that should be taken into consideration in university campuses, which are a small part of a city, are mentioned and suggestions are made. If university campuses are designed in line with the walkability criteria that should be taken into consideration in urban planning; It will contribute to urban sustainability with these design criteria.

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