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SWOT analysis of green building systems in real estate development

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Abstract

Sustainable and green facts are important for leaving a healthy environment for future generations. These facts are like sustainable development, sustainable city, green building, green economy, and so on. Green building is an innovative solution to sustainable urban planning problems. In this study, green building, sustainability, development processes are examined, and the opportunities and threats of green buildings with their strengths and weaknesses are determined by SWOT analysis. Besides, the construction cost and energy savings of a green building are compared to the traditional building. As a result of SWOT analysis, besides its significant strengths such as sustainability of green buildings, low energy consumption, and independence of energy consumption, high initial investment cost was determined as the most critical weakness. The increase in building values and the emergence of new business ventures are considered opportunities for green buildings, and the perception of green buildings as luxury is considered a threat. Ultimately, this study reveals the critical significance of transitioning towards sustainable construction practices, supported by compelling numerical evidence. Despite the initial higher investment costs, green buildings exhibit substantial long-term benefits, with the construction costs of the LEED gold-certified building calculated at 31,798,854.3 ₺ and the platinum-certified building at 32,390,841.0 ₺ in January 2024. Notably, energy savings of 47.7% and 61.6% were projected for the gold and platinum-certified buildings, respectively.

1. Introduction

The subject of real estate according to the Turkish Civil Code [1]; the land constitutes independent and permanent rights (construction, resource, and other easement rights) recorded on a separate page in the land registry and unit of the building registered in the property ownership register. In legal literature, if something cannot be transported or moved without harming its essence, it is called real estate [2].

The real estate contains both underground and above-ground extensions [3]. In the Turkish Civil Code [1], it is stated that the ownership on the land covers the air above it and the ground layers below it to the extent that it is beneficial to use. This includes plants, animals, and resources, without prejudice to legal restrictions. Real estate development is defined as the process of creating value by making concrete improvements on the property [4]. The real estate development process ranges from the construction, marketing, and management of land production and new building construction to the renovation of existing buildings. It is the process in which physical places lived and worked are conceptualized, designed, and built. The successful implementation of this process is very important as it affects our economy as well as our daily life. Real estate development projects; architects, engineers, planners, etc. It consists of a team that includes many disciplines and professions. The real estate developer is the one who oversees this process and coordinates the information generated by each project participant. The success of the real estate developer is ensured by establishing the communication between the employees in the team correctly and by creating and sharing the information efficiently. Subjects of real estate project development; It includes many businesses such as the renovation of the real estate, the lease of it, and the sale of non-parceled land by parceling. The development process to building from land is shown in Figure 1. The unimproved land is firstly divided up into plots (parceling) according to zoning plan. Then it is researched with feasibility study in order to construct buildings, which is most effective and efficient use. The building development process is completed with sale and management (Figure 1).

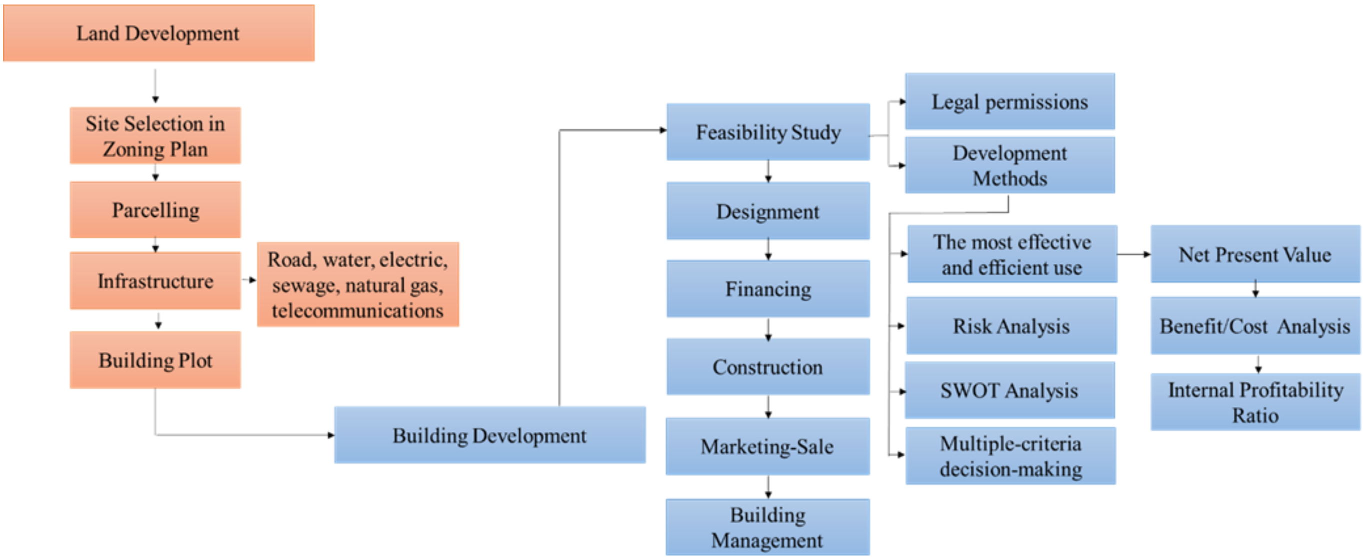

Figure 1. The development process to building from land.

Real estate development projects cover subjects such as land, residence, office, shopping center, hotel, factory. In addition to the development of some of these projects on-demand, some of them are mixed-use projects by bringing together many functions. Only new markets can be created with mixed-use projects and successful results can be obtained both economically and socially thanks to these projects. In this context, real estate development companies have a lot of work to do. Thanks to the advanced creativity of these companies, many different real estate development projects can be produced. For these projects to be realized, three important factors that can be defined as land, project idea, and capital need to be brought together. Gathering these three factors on one hand is the most practical solution for the realization of the planned project [3].

This study aim is to determine the differences between the construction of buildings consisting of 28 units of the building in Mezitli district of Mersin province as both green building and traditional building through SWOT analysis. In addition, the construction cost and energy savings of a green building, green building certification costs compare with traditional building.

Bruntland Report in 1987 with the term used today [5, 6]. According to the United Nations report in 1987, it is expressed as "developments that meet the needs of today without compromising the ability of future generations to meet their own needs" [7]. The sustainable development of contemporary cities is a highly critical task aimed at creating a beautiful, healthy, and ecological city that fully meets the needs of its inhabitants. People all over the country and city authorities must work together to ensure a better quality of life for people and the urban environment, and to balance the city with the natural environment. Concerns about climate change, clean air and water, renewable energy, and land use continue to highlight sustainability, particularly sustainable urban planning. Sustainable urban planning; includes many disciplines including architecture, engineering, biology, environmental science, materials science, law, transportation, accounting and finance, technology, economic development, and government. This type of planning also develops innovative and practical approaches to land use and its impact on natural resources.

New sustainable solutions for urban planning problems are green buildings and residences, mixed-use developments, green areas, and open spaces, alternative energy sources such as sun and wind, and transportation options. Good sustainable land use planning helps improve the well-being of people and communities by transforming urban areas and neighborhoods into healthier, more productive spaces.

Although the concept of sustainability is a new idea, sustainable cities have emerged as one of the leading issues of urbanism for more than thirty years. Sustainable cities cover a variety of sustainable urban form model topics, including eco-cities. An architect named Richard Register coined the idea of an eco-city in the late 1980s as a preferred solution to the challenges of sustainable development in sustainable development [8]. Eco-city has been defined as "an urban environmental system in which input (resources) and output (waste) are minimized" [9].

These three basic components, called social, economic, and ecological, are called "The Three Pillars of Sustainability". The ecological column is often the most noticeable. In recent years, companies operating around the world have focused on reducing their carbon footprint, packaging waste, water use, and overall environmental impact. The main reason for this is that companies have discovered that having a beneficial effect on the planet can also have a positive financial impact. For example, reducing the number of materials used in packaging generally reduces the total expenditure on these materials. The social column is another important pillar of sustainability. A sustainable business should have the support and approval of its employees, stakeholders, and the community in which it operates. The approaches to providing and maintaining this support are varied, but examples include treating employees fairly and benefiting well locally and globally. The economic pillar of sustainability is a place that most businesses consider to be on solid ground. To be sustainable, a business must be profitable. However, profit cannot overshadow the other two pillars. Profit at all costs is not the subject of the economic base. Activities that fit into the economic pillar, on the other hand, appear as compliance, appropriate management, and risk management. Sustainability will be achieved when these pillars are in harmony with each other [10].

As a result of the strategic combination of sustainability, smart cities and technology, sustainable development (energy efficiency, pollution, resources), citizen welfare (public security, education, health, social care), and economic development (investment, business, innovation) are provided [11]. Smart city and sustainable development policies and goals should be based on smart industries and services (smart energy, water, transportation, buildings, and government) and be supported by smart infrastructure (sensor networks, data analytics, smart devices, control systems, communication platforms, web). A smart city will be both a place to live and an economic space that ensures sustainable development through the systematic establishment of innovative technologies, materials, and services [12].

In the real estate development process, concepts that explain the nature of the real estate such as sustainable city, ecological city, green, environmentally friendly, and smart building have led to the creation of new concepts that enable the measurement of sustainability in structures such as advanced buildings program, business case study, LEED certification, and eco-label. Among these concepts, the concepts of ecological city and green building come to the foremost.

2. Material and method

2.1. Study area

In this study, a building located within the borders of the Mersin Province Mezitli District is considered. The district of Mezitli is located at latitude 36º.747536 and longitude 34º.518219 and has a height of 0-5 meters from the sea, fourteen floors, twenty-eight units of the building in the form of a reinforced concrete carcass II. A building in which a classroom was built is considered (Figure 2). Each unit of the building consists of 150 m^2 of living space, that is, flats. The construction cost of the building and natural gas, water, and electricity consumption were examined.

Figure 2. Study area.

2.2. Ecological city and green building

2.2.1. Ecological city

The concept of "eco-city" is one of the first organizations focusing on eco-city development, "Urban Ecology" founded by Richard Register in the USA in 1975. This organization has adopted the idea that cities and nature should be restructured in harmony [8, 13]. Founded in California, USA, this organization has made legislative proposals to encourage energy conservation and environmental policies required for the eco-city. These law proposals consist of many environmental activities, from planting trees to public transportation. Because eco-city is a phenomenon in which complex interactions between environmental, economic, political and socio-cultural factors based on healthy, human-oriented ecological principles are comprehensively addressed. In the future, living spaces such as cities, towns and villages should be designed to improve the health and quality of life of their inhabitants, and for the environment and people to live in harmony. The following items should be included in eco-city development [14, 15].

•Ecological security: disaster sheltered buildings, clean air, safe water and food

•Ecological health: ecological design and engineering to treat and recycle all waste cost effectively

•Ecological industrial metabolism: emphasizing the reuse of materials, sustainable energy use, efficient and green transport

•Eco-scape integrity: includes structures built to maximize biodiversity and maximize the city's accessibility for all citizens, open spaces such as parks and plazas, links such as streets and bridges, and natural features such as waterways

•Ecological awareness: helps people to understand their place in nature, their cultural identity, their responsibility to the environment and to increase their ability to change their consumption behavior and contribute to the preservation of high-quality urban ecosystems.

2.2.2. Green building

Green building emerges as a concept that aims to reduce the overall impact of cities on human health and the natural environment. Although this concept has been applied or defined differently in different countries, it generally covers three basic elements. These are: using energy, water, and other resources efficiently; protecting human health and the environment, to increase employee productivity; to reduce waste, pollution, and environmental degradation [15, 16].

The concept of green building, which developed at the end of the 20th century, includes concepts such as sustainable building, ecological building, and zero energy building. Green building in today's construction industry; India, Türkiye, Brazil, in the energy markets for developing countries like South Africa is of critical importance. In general terms, this concept includes parameters such as the use of the existing land, water efficiency, energy use, health and comfort conditions during the use process, selection of materials and resources used during the construction of the building, operation and maintenance activities, and innovation in this process, starting from the design process of the building.

Buildings have a certain impact on the environment during their life cycle. Harmful waste and carbon emissions arise through the use of energy, water, and other resources in the construction of buildings, their lifetime, renewal, and demolition. Sustainable building parameters, green building certificates, and rating systems have emerged to minimize these damages caused by buildings to the environment.

Green building systems developed indirectly with the concept of "Carbon Footprint" that emerged especially in the last years of the 20th century, and some certification systems in which certain common parameters are evaluated considering the differences in the geographical structures of the countries have emerged. The main goals of green buildings are as follows [17]:

• Flexible, long-lasting building designs that can adapt to changing conditions,

• Use of energy at maximum efficiency,

• Keeping the waste level to a minimum,

• Protection of water resources,

• Avoiding the use of non-environmentally friendly materials,

• Minimizing the effects that may threaten human health,

• Creating indoor air quality suitable for human health,

When the sustainability of green buildings is examined in terms of environmentally friendly design and the materials used, it is seen that they differ from other buildings. Comparing green buildings with traditional buildings, it is stated that green buildings have lower energy consumption, better indoor environmental quality, lower carbon emission emissions, and more efficient waste management, but costlier in terms of initial investment costs. Biological, ecological cement, green concrete, steel mesh, glass, etc. in the construction of green buildings materials are used, these materials are organic and mostly recyclable [18,19].

2.2.3. Green building certification systems

After the spread of the ecological, green, environmentally friendly, and sustainable building concept and the increase in its applications, there was a need for standardization in these types of buildings. It has come to the fore to establish a type of rating system that will objectively and concretely determine the effects of buildings on the environment and measure the sensitivity in the protection of natural resources. Thus, a standardization, evaluation, rating, and certification system has been established in green buildings. The certification system has enabled conceptual green buildings to become reality [20-22] (Table 1).

These systems are in chronological order in the world; BREEAM was developed in Great Britain in 1990, LEED USA in 1998, CASBEE in Japan in 2001, GREENSTAR in Australia in 2003, and DGNB in Germany in 2009.

The certificate systems designed according to the geographical characteristics of the countries spread to the developing countries with the development of the global energy economy and each country rearranged these certification systems according to their conditions [23,24].

Turkish Standards Institute in Türkiye (TSE) started to be implemented in 2013. "Safe Green Building Certificate" Environment and Urbanization prepared by the Ministry, in 2017 enacted Regulation "Green Certificates for the settlement with Buildings" will be internationally recognized national sustainable green building certification systems developed. Official institutions outside independent initiatives as Green Building Association (ÇEDBİK) in the building developed by the Ecological and Sustainable Design (B.E.S.T) manual were published in 2019 to date is the local certification system is being implemented in Türkiye and covers newly built homes.

B.E.S.T. Within the Housing Certificate System, it is planned to divide the newly built residences into 6 classes according to their square meters. For the evaluation of these houses, 9 main criteria were determined as "Integrated Green Project Management, Land Use, Water Use, Energy Use, Health and Comfort, Material and Resource Use, Living in Residence, Operation, and Maintenance, Innovation". These criteria are divided into two as construction and design, and the mandatory sections for each criterion are specified. Table 2 shows the points that the houses can receive according to B.E.S.T. Accordingly, it is evaluated as 45-64 approved, 65-79 good, 80-99 very good, 100-110 excellent [25]. Table 3 also shows the certification levels of housing evaluation systems applied in the world [21, 26].

Table 1. Green Building Certification Systems.

Criteria	BREEAM 1990 UK	LEED 1998 USA	Green Star 2003 Australia	CASBEE 2001 Japan	DGNB 2009 Germany	SB Tool 1998 Canada
Energy	✓	✓	✓	✓	✓	✓
CO_2	✓				✓	
Ecology	✓	✓	✓	✓	✓	✓
Economy					✓	
Health	✓		✓	✓	✓	
Indoor Environmental Quality	✓	✓	✓	✓	✓	✓
Innovation	✓	✓	✓			✓
Land Use	✓	✓	✓			✓
Management	✓		✓	✓		
Materials	✓		✓	✓	✓	
Environment pollution	✓	✓	✓	✓	✓	✓
Renewable technology	✓	✓	✓			✓
Transportation	✓	✓	✓		✓	✓
Waste	✓					
Water	✓	✓	✓	✓	✓	✓

Table 2. Certificate levels of green building certification systems in Türkiye [25].

B.E.S.T Criteria	Points
Integrated green project management	9
Land use	13
Water use	12
Energy use	26
Health and comfort	14
Material and resource use	14
Living in residence	14
Operation and maintenance	6
Innovation	2

Table 3. Certificate levels of green building certification systems in the world [26, 27].

Green building certification systems	Certificate levels
BREEAM	Moderate (1 Star) Good (2 Stars) Very Good (3 Stars) Excellent (4 Stars) Extraordinary (5 Stars)
LEED	Certificate (40-49 points) Silver (50-59 points) Gold (60-79 points) Platinum (80 points and above)
Green Star	4 Stars (45-59 points) 5 Stars (60-74 points) 6 Stars (75-100 points)
CASBEE	S,A,B+,B-,C
SBTool	-1 (Negative) 0 (Acceptable) 3 (Good) 5 (Best)

2.2.4. SWOT analysis

SWOT analysis was created for a detailed examination of the economy and marketing sector and is a strategic technique used to identify the strengths and weaknesses of the organization, technique, process, situation, or person involved in a project or a business venture, and to identify opportunities and threats arising from the internal and external environment. Later, it has been widely used in many research areas [28-32] including energy management [33].

A SWOT analysis consists of internal and external evaluations. Internal evaluation is done to show the strengths and weaknesses of an organization and strategic plan. External evaluation is applied to discover opportunities and threats [34]. Strengths represent available resources that can be used to improve performance. Weaknesses are flaws that can reduce competitive advantages, productivity, or financial resources. Opportunities are external changes that can contribute to further development, and threats are outside factors that can cause problems [35]. In the field of energy management, SWOT has typically been used to analyze the energy states of a single region or system. However, this study used SWOT analysis to examine sustainable green buildings [36, 37].

2.3. Ecologically sustainable real estate development

As understood in the name of ecological sustainable real estate development, it includes all of the real estate development processes and is sustainable in all of these processes. The first stage of green building projects is to determine sustainable technology and strategies after the project cost is determined within an appropriate range. The basic philosophy of green buildings aims at minimizing resource consumption and waste generation throughout the life cycle of the building. In order to achieve this goal, the stage in which many potential design alternatives are produced and evaluated during the design phase of green buildings is critical. Because the building shape and direction play an important role in the consumption of energy required for heating, cooling and lighting, it can reduce energy costs as high as 30-40% in green building construction [38]. In the green building development process, each issue should be considered separately and systematically evaluated.

Green building development projects are costlier than traditional building projects [39]. Because the various green technologies that should be used in green building development projects are in the development stage, causing them to be expensive. In order for the projects to be successful, it is necessary to make a feasibility analysis in a planned way, to make preparatory studies for project initiation and to make a detailed planning from the beginning to the end. It is critical that all stages, such as design, construction, project completion and transfer, and property management, are meticulously carried out and the plan is strictly adhered to.

The primary purpose of the concept of real estate development in green buildings is environmental sustainability, energy and water efficiency, and studies on the reduction of greenhouse gas emissions are common in the literature [13]. Technologies to be used in green building design are one of the most important parameters for green ownership [40]. It creates opportunities for property owners to minimize the environmental impacts caused by traditional buildings with various technologies identified in extensive studies [41, 42]. These technologies, such as solar energy systems [43] and waste management technologies [44], both reduce operating costs and are environmentally friendly.

There are two designs, passive and active, used in green buildings [45]. Active designs can be explained as providing electrical energy by using photovoltaic panels, wind and wave energy. Passive designs are the use of thick walls in home design, high ceilings, fans, the use of landscape elements, the use of natural and recycled materials, etc. can be listed as. In addition, it is necessary to manage natural resources, recycle waste and protect the environment for sustainability [46]. The sustainable use of underground space for infrastructure supply also has an important place [47].

2.4. Real estate development process in green buildings

During the building development process, while the design team works alone in traditional buildings, it is of great importance that the engineering and design team work together in green buildings [22]. In green buildings, it aims to create added value to the economy by combining project development, land, capital, and project thinking, and the construction of the building and the development of the land. The most effective method of creating qualified, sustainable and efficient buildings in the real estate sector are the holistic project approach. In the development process, which starts with the emergence of the project in green buildings, unlike traditional buildings, there is a holistic project approach that will start from planning and design stages to operation and demolition stages. With this operation, it will be possible to prevent the waste of labor that will occur due to both construction time and cost by predicting the problems that will occur in the design and construction process. Unlike traditional projects, it is necessary to evaluate many points in the design, construction, and operation phases of green building projects together and the design team should take more responsibility and pay attention to the certification features. The work flow chart of the real estate development process of green buildings is depicted in Figure 3. This figure adapted from Zhang et al. [48]. For example, in the design of a LEED-certified project, energy expenditures should be modeled and the design should be carried out. These LEED certification system requirements, which are not present in traditional projects, are among the criteria that must be integrated into the design and construction process [49]. Basic understanding of green building projects; contrary to the process of solving problems within the process of traditional projects, it constitutes an integrated and integrated project delivery process in which the whole system is designed from the beginning of the project. In this way, it reduces the inefficiency in the project and provides more effective work in the design, construction, and operation phases of the project [48].

According to the report of the World Green Building Council published in 2013; According to the cost evaluation of green buildings; Researches conducted by public institutions and green building organizations of various countries show that green buildings should not bring additional costs. A building should be energy and water efficient; it should be an application that should be standardized rather than an extraordinary application. Apart from this, in addition to the building construction cost, the certification process increases the initial investment cost, and when the life span and operating cost of the building are calculated, it may remain within the budget [50].

Ugur and Leblebici's study that green buildings are done on the effects of investment costs and property values, LEED-certified in Türkiye 7.43% in the gold-certified building the additional cost of green building, platinum-certified that the rate of 9.43% in the building and annual energy and, respectively, the water goes It was found that 31% and 40% savings were achieved [51].

In a study conducted for the cost of the LEED certification system in the USA, it was determined that it would bring an additional cost of over 25% for traditional buildings, while it was found that the cost of certification only increased the construction cost by 4-11% over time [52].

In another study conducted in 2010 and accepted to reach the most reliable results in terms of green building costs, it was found that the average construction cost of green buildings increased by 1.4% as a result of the calculation of building costs in an area consisting of 170 green buildings. Besides, it has been determined that the average energy saving of green buildings compared to traditional buildings is 34%. It is stated that the initial investment cost will be recovered in a short time with energy savings, considering the value of energy savings only, except for the savings to be provided from operating costs [48].

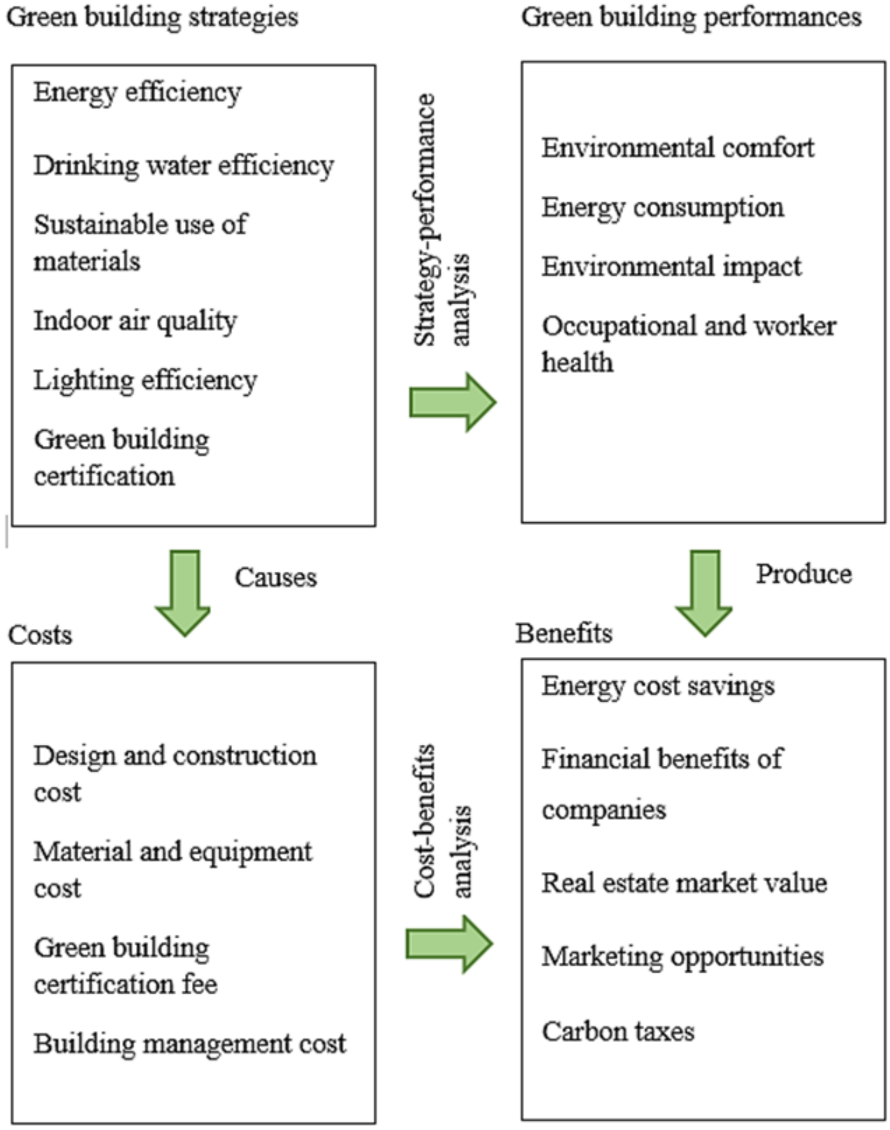

Figure 3. The work flow chart of the real estate development process of green buildings [48].

3. Results and discussion

3.1. Green Building SWOT Analysis

The SWOT analysis, in which the positive and negative aspects of green buildings are stated, are presented in Table 4 as strengths, weaknesses, opportunities, and threats. As a result of the SWOT analysis, although the initial investment cost is high and there is not enough infrastructure for some technologies in our country, the green buildings are sustainable, low energy consumption, reducing the greenhouse effect, and increasing the life quality of the society and people by living in a more environmentally friendly building, the positive aspects such as saving resources such as water and natural gas out of the monopoly of companies have been determined. Also, with the support of both states and international institutions for the construction of green buildings compared to traditional buildings, loan acquisition opportunities are facilitated to provide the necessary capital for the initial investment. In the SWOT analysis made, it is expected that green buildings will be preferred due to their advantages over traditional buildings and therefore their value will increase, the energy released in excess usage can be sold, and aesthetically, opportunities such as increasing the attractiveness of the region where green buildings are located and creating employment in different sectors are expected. As a threat, energy savings depend on consumers and misconceptions that green buildings are a luxury.

3.2. Comparison of green building cost and energy calculations with traditional buildings

In this section, the initial investment cost, annual natural gas, electricity, and water expenditures are calculated based on a 14-storey real estate with 28 units of the building with 150 m^2 flats (Table 5). The increase in the initial investment cost of the green building and the energy-saving rates were calculated by taking into account the studies of Uğur and Lebleci [51]. There is a 7.43% cost increase in the LEED gold-certified building and a 9.43% cost increase in the LEED platinum-certified building. Energy savings were calculated by assuming 31% in the gold-certified building and 40% in the platinum-certified building [51].

Construction cost and annual energy savings of traditional and green buildings are presented in Table 6. The closing time of the cost difference with energy savings is calculated as 14 years in the gold-certified building and 13 years and 10 months in the platinum-certified building. In January 2024, when it is examined the cost difference reflected in each unit of the building, it is determined as 78,544.8 ₺ in the gold-certified building and 99,687.2 ₺ in the platinum-certified building.

Table 4. SWOT analysis of green buildings.

Strengths	Weaknesses
• Sustainability • Low energy consumption • Low greenhouse effect • Utilizing solar energy • Independence of energy sources • Reduced heating and cooling costs • Availability of rainwater • Original structures • High rate of the loan	• Increase in initial investment cost • Low demand • Limited knowledge of sustainable technologies
Opportunities	**Threats**
• Increase in the value of the building • The ability to sell the excess produced energy • Providing new business ventures • Increasing sectoral employment • Increasing the attractiveness of the region where it is located	• Part of energy savings depends on the consumer • The perception that it is a luxury

Table 5. Annual energy consumption cost of the unit of the building in the real estate.

January 2024	150 m² unit of the building		28 units of the building	
	₺	$	₺	$
Natural Gas	3,510.71	112.10	98,299.88	3,138.60
Electricity	5,409.38	172.70	151,462.64	4,836.00
Water	2,801.19	89.40	78,433.32	2,504.30
Total	11,721.28	374.20	328,195.84	10,478.80

Table 6. Construction cost and annual energy savings of traditional and green building.

January 2024	Building (28 units of the building)		Gold-certified Building		Platinum-certified Building	
	₺	$	₺	$	₺	$
Construction cost	29,599,598.9	945,070.2	31,798,854.3	1,015,289.1	32,390,841.0	1,034,190.3
Annual energy savings	-		156,732.8	5004.2	202,235.9	6457.1
The traditional building cost difference	-		2,199,255.4	70218.9	2,791,242.1	89120.1
The closing time of cost difference with energy-saving			14 years 4 months		13 years 10 months	
Cost difference reflected in each unit of the building			78,544.8	2507.8	99,687.2	3182.8

4. Conclusion

One of the most important sectors that increase the consumption of natural resources is the construction sector. Traditional buildings built are the most effective factor that increases carbon emissions, which are harmful to the environment, together with fossil fuels used in cities. Therefore, it is necessary to develop the following items. To ensure that the consumption of natural resources is minimized by contributing to the sustainability of cities by those working in the field of real estate development, to make it cheaper and noticeable in order to increase use of renewable energy sources like wind, water, sun, biomass energy, etc. and developing new environmentally friendly materials and technology.

In these projects, very special solutions with reduced environmental negative effects should be produced and applications should be implemented. Also, a sustainable urbanization model should be performed by giving incentives to create adequate legislation and provide financial support for research on this subject.

In this study, by examining the concepts of ecological city and green building, housing ratings, and the processes in real estate development, a SWOT analysis was applied to green buildings and the cost calculations of green and traditional buildings were compared. As a result of the SWOT analysis, the most critical weakness of green buildings was the high initial investment cost, as well as the obvious strengths such as being sustainable, low energy consumption, and independent energy consumption. The increase in building values and the emergence of new business initiatives are considered opportunities for green buildings, and the perception of green buildings as luxury is considered a threat. The construction costs of the real estate consisting of 28 units of the building were calculated as 29,599,598.9 ₺, the construction costs of the LEED gold-certified building were 31,798,854.3 ₺, and the platinum-certified building was 32,390,841.0 ₺ in January 2024. In terms of energy savings, 47.7% less energy will be spent in the gold-certified building and 61.6% less in the platinum-certified building. Although the construction costs of platinum-certified buildings are higher, the annual energy savings are higher than the gold-certified buildings, so the cost difference will close in less time. In this study, a study has been conducted on how many years the construction costs will be closed by comparing the electricity, natural gas, and water consumption of traditional and green buildings. It turns out that green buildings are more beneficial than traditional buildings, even with energy and water savings, ignoring other benefits. Considering the benefits arising from other functional, environmental, social, and aesthetic performances, it is anticipated that the real market value of green buildings will be determined by the willingness to pay and market demand, and these predicted values may rise further.

Author contributions

Munevver Cagan: Conceptualization, methodology, design, drafting, analysis, writing-original draft preparation data collection. **Fatma Bunyan Unel:** Conceptualization, methodology, design, data curation, writing-original draft preparation, validation.

Conflicts of interest

The authors declare no conflicts of interest.

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