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Derleme

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Enerji Etkin Binalarda Finansal ve Vergisel Teşvikler: Türkiye ve Dünyadan Karşılaştırmalı Bir Bakış

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Öne Çıkanlar:

- Enerji-etkin binalar için finansal ve vergisel teşvikleri, Türkiye özelinde incelenip gelişmiş ülkeler ile karşılaştırıldı.
- Türkiye için finansal ve vergisel teşvik önerileri sunuldu.
- 2025 yılında binalarda yenilenebilir enerji kullanımına yönelik belirlenen %10'luk asgari gereklilik, en son düzenlemelere göre kademeli olarak artırılmalıdır.
- Vergi teşviklerinin önemli bir noktası, bu teşviklerin sürdürülebilir olması ve uzun vadede uygulanabilir olmaları gerektiğidir.

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Amaç:
Bu çalışma, Türkiye'deki enerji-etkin bina vergi teşviklerini incelemekte ve uluslararası örneklerle karşılaştırarak en iyi uygulamaları ve yenilikçi politikaları vurgulamaktadır.

Metot:
Çalışmada, ilk adım olarak, enerji-etkin binaların sistematik bir incelemesinin yapılmıştır. ScienceDirect, Google Scholar gibi veritabanları kullanılarak kapsamlı bir arama gerçekleştirilmiştir. Çalışmaya dâhil edilmek üzere seçilen çalışmalar, tamamen veya kısmen enerji-etkin bina teşviklerine odaklanmaktadır. "Enerji-etkin bina teşvikleri", "sürdürülebilirlik ve finansal teşvikler", "sürdürülebilir bina teşvikleri" ve "enerji-etkin bina için vergi indirimi" gibi anahtar kelimelerle yapılan aramalar sonucunda toplamda 251 yayın elde edilmiştir. Ayrıca, Türkiye'deki enerji-etkin binalara yönelik tüm finansal ve vergisel teşvik kanunları incelenmiştir.

Sonuçlar:
Türkiye'de doğrudan enerji-etkin binalara yönelik yeterli düzeyde finansal ve vergisel teşvikler mevcut değildir. Türkiye'de, binalarda enerji kayıplarını azaltmak ve enerji verimliliği sağlamak amacıyla Enerji Verimliliği Kanunu gibi bir dizi yasal düzenleme hayata geçirilmiştir. Bu tip düzenlemeler, enerji verimliliği ve sürdürülebilirlik hedeflerine ulaşılmasında önemli adımlar atmaktadır. Mevcut olarak, ihtiyaç fazlası elektrik enerjisinin satışında esnaf muafiyeti, damga vergisi kanunu gibi düzenlemeler olduğu tespit edilmiştir. Ancak, seçilen gelişmiş ülkeler özelinde yapılan karşılaştırma sonucu, Türkiye'de bu yönde atılacak somut adımların olduğunu göstermektedir. Bu adımlara örnek olarak, 2025 yılında binalarda yenilenebilir enerji kullanımına yönelik belirlenen %10'luk asgari gereklilik, en son düzenlemelere göre kademeli olarak artırılması verilebilir.

Anahtar kelimeler:
Enerji-etkin bina teşvikleri, Vergi teşvik programları, Türkiye vergi kanunları, Vergi karşılaştırması, Çevre dostu binalar

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Review

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Financial and Tax Incentives in Energy-Efficient Buildings: A Comparative View of Türkiye and the World

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Highlights:

- Financial and tax incentives for energy-efficient buildings were analyzed in the context of Turkey and compared with developed countries.
- Financial and tax incentive recommendations were presented for Turkey.
- The 10% minimum requirement for the use of renewable energy in buildings, set for 2025, should be gradually increased according to the latest regulations.
- An important aspect of tax incentives is that they must be sustainable and applicable in the long term.

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Abstract: As global concerns about climate change and environmental sustainability intensify, the energy-efficient building construction sector has emerged as a key focus for reducing greenhouse gas emissions and resource energy consumption. On the other hand, tax incentives have proven to be effective tools in promoting energy-efficient building practices, while encouraging developers, investors, and property owners to adopt sustainable construction techniques incorporating with energy-efficient technologies. To this aim, this paper reviews tax incentives for energy-efficient buildings in Türkiye and compares with international examples, highlighting best practices and innovative policies. This study also explores the scope and implementation of tax incentives programs, including property tax reductions, investment tax credits, accelerated depreciation schemes, and VAT exemptions, which aim to lower the financial barriers for energy-efficient building adoption.

The findings of this paper suggest that integrating well-structured tax incentives with broader sustainability goals can significantly accelerate the transition to eco-friendly construction practices.

Keywords: Energy-efficient Building Incentives; Tax Incentives Programs; Turkish Tax Relief; Tax Comparison; Environmental Friendly

1. Introduction

Energy-efficient buildings (EEBs) are essential for the sustainable development of nations. On the other hand, global warming, driven by the rise in greenhouse gas emissions, remains a significant challenge for governments, worldwide [1]. Hence, the design and construction of energy-efficient buildings aim to reduce the building sector's share of energy consumption. Nowadays, buildings are a major contributor, accounting for almost 30% of total green gas emissions [2]. In developing countries like Türkiye, the ratio of energy consumption in buildings is increasing compared to developed countries [3]. Therefore, to guide and encourage the building sector toward adopting green buildings, sectors should be driven by laws and legislation.

The EEB concept is defined as "*a structure designed, constructed, and operated in a way that minimizes its environmental impact and promotes sustainability*" [4]. The characteristics of "an EEB" include energy efficiency, water conservation, eco-friendly construction materials, improved indoor air quality, optimal thermal comfort, health and wellbeing, efficient land-use and biodiversity protection and resilience to global warming [5]. The LEED (Leadership in Energy and Environmental Design) certification system is an internationally recognized framework that assesses the environmental performance of buildings, encouraging sustainable construction practices by focusing on factors like energy efficiency, water conservation, and the use of renewable materials, thus serving as a crucial tool for advancing the EEB initiatives. As of 2024, there are over 195,000 LEED-certified buildings across 186 countries worldwide [6]. Figure 1 illustrates the number of LEED-certified buildings across different countries. As of recent data, Türkiye ranks among the top countries for the number of LEED-certified buildings. It is typically positioned within the top 20, with approximately 1,500 LEED-certified buildings.

The US Green Building Council reports that new EEBs typically experience a 10.5% reduction in operating costs during their first year [7]. Moreover, EEBs experience an average reduction in operating costs of 16.9% over a five-year period. While EEBs offer numerous benefits, the economic dimension is a critical aspect that warrants particular attention. Constructing an EEB involves various costs that can differ based on factors such as location, building type, and the level of sustainability desired. For instance, according to the Hu and Skibniewski [8], EEBs often incur an initial construction cost premium up to 10% compared to traditional buildings. Figure 2 depicts the share of the cost of constructing EEBs in terms of items. The installation of energy-efficient HVAC systems, renewable energy sources (e.g., solar panels), and advanced insulation techniques typically account for a significant share of the additional costs.

Energy consumption of Türkiye has been rising steadily each year. For example, in 2020, the country's primary energy consumption reached 147.2 million tons of oil equivalent (Mtoe), positioning Türkiye

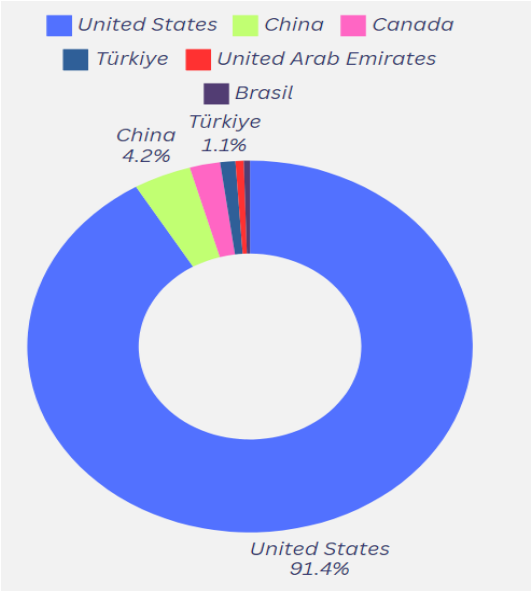

Figure 1. The share of countries according to LEED-certified buildings (adopted from US Green Building Council)

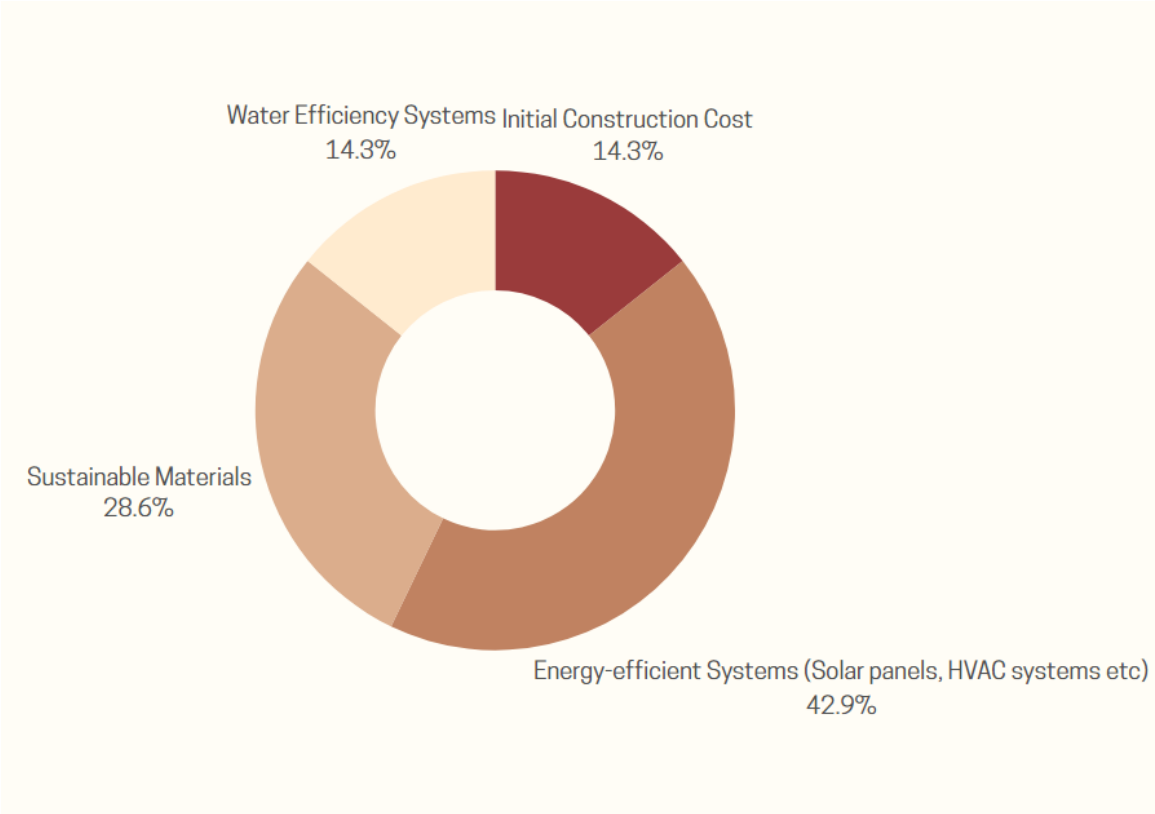

Figure 2. The share of costs for constructing EEBs [9]

among the leading countries in global energy consumption. Furthermore, energy consumption in Türkiye grew by 9% in 2021 compared to the previous year. These statistics reflect an ongoing increase in energy consumption in the country [10]. Therefore, EEBs concept may be one of the solution to decrease total energy consumption of the country. On the other hand, there are several ways to convert a

building to EEB, such as adding trombe wall and integrating renewable energy like photo-voltaic panels [12] (Figure 3a) and wind turbines [13] (Figure 3b), utilizing from energy-efficient roof and walls [14] (Figure 3c) and insulating the walls [12] with changing lighting systems with more efficient ones. However, all modifications incur costs for investors, which makes effectively leveraging incentives and tax reductions essential, as this can minimize the waste of limited national resources while maximizing energy efficiency for the country.

In Türkiye, Erbıyık et al. [15] reviewed the LEED Certification system embedded in to green building certification as a case study. The authors stated that the defined tax for green buildings was kept fairly lower than the conventional buildings. In another study, Bahadıroğlu et al. [16] adopted the SBTool for the first time to an educational facility in Marmara/Türkiye climate for evaluation of sustainable building. The authors found that the relative performance score was assigned to "B" which means an acceptable standard for a sustainable building. On the other hand, Efe et al. [17] indicated that there was no official green or sustainable built environment evaluation system in Türkiye. The authors discussed he importance of establishing a local certification system for Türkiye.

Incentives and tax reductions are crucial not only for all sectors but for EEB sector. For example, these financial incentives foster sustainable and energy-efficient development by encouraging practices like the production of renewable energy for buildings. Additionally, they serve as an effective tool for governments to achieve their long-term energy, environmental, and climate policy goals [18]. However, incentives and tax reductions are closely related to the energy policies of countries. Therefore, the review of financial incentives is typically country-specific. For instance, Rana et al. [19] assessed the financial incentives for EEBs in Canada. The authors found significant regional variations in the availability of financial incentives for both residential and commercial buildings, even within the same country. Sebi et al. [20] compared the policy strategies of Germany, France, and the US regarding retrofitting approaches for EEBs. Liu et al. [21] reviewed policies in China for EEBs while Trencher and van der Heijden [22] followed the results of retrofit policies in existing buildings of New York, Sydney and Tokyo. Most of the review papers have focused on incentives and tax reductions in developed countries, such as those in European nations and the U.S. On the other hand, it is proven that a systematic review of existing retrofit policies on EEBs is the basis of improving the policy effectiveness [23]. Therefore, a systematic review examining the financial incentives of developing countries, with a particular focus on Türkiye, and comparing these incentives to those of developed countries, is essential. To this aim his paper reviews the EEB retrofit policies and financial incentives in Türkiye, a developing country, and compares them with those of developed countries. The importance of this paper is to explore the crucial link

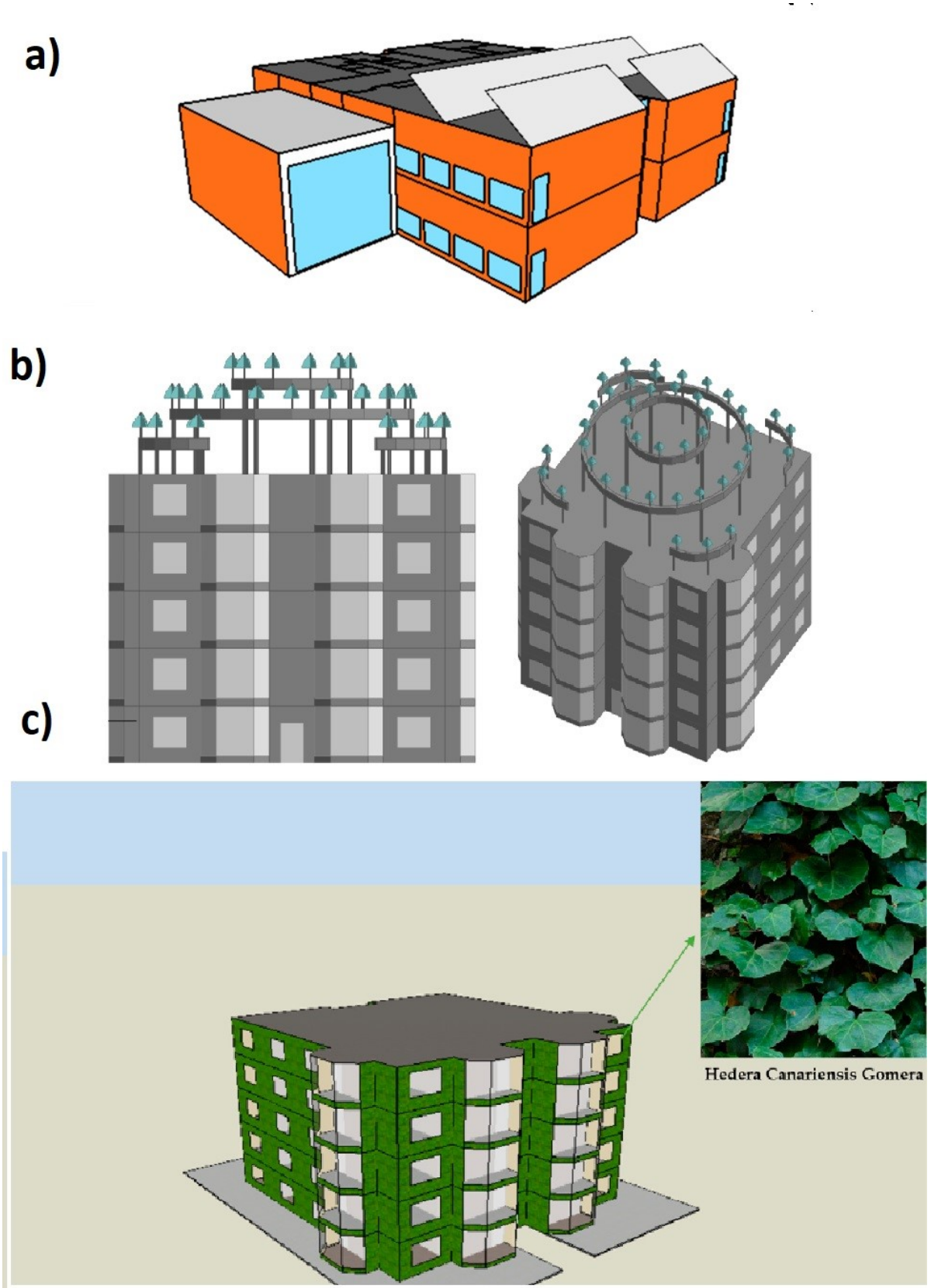

Figure 3. The simulations for EEB applications in Turkiye

between climate change, energy efficiency, and sustainable construction, offering key insights into how tax incentives can promote the adoption of energy-efficient building practices. By focusing on Türkiye, this paper provides a localized analysis while drawing comparisons to international best practices, which can help inform policy improvements and facilitate a wider shift toward sustainable construction. The study highlights the role of financial incentives—such as property tax reductions, investment credits, and VAT exemptions—in overcoming the financial challenges associated with the EEB adoption. The remainder of the paper is structured as follows: The first section examines financial incentives for EEB in Türkiye. Next, the paper compares the financial EEB incentives in Türkiye with those of developed countries. Finally, the authors propose recommendations for improving these incentives.

2. Methodology

Figure 4 presents the flowchart of the study. The first step involves conducting a systematic review of the EEB. A comprehensive search is performed using databases such as ScienceDirect, Google Scholar, and others. The studies selected for inclusion focus either fully or partially on EBB incentives. Using keyword searches, such as "EBB incentives" "sustainability and financial incentives" and "sustainable building incentives" and “tax reduction for EBB”, a total of 251 publications were retrieved for the study.

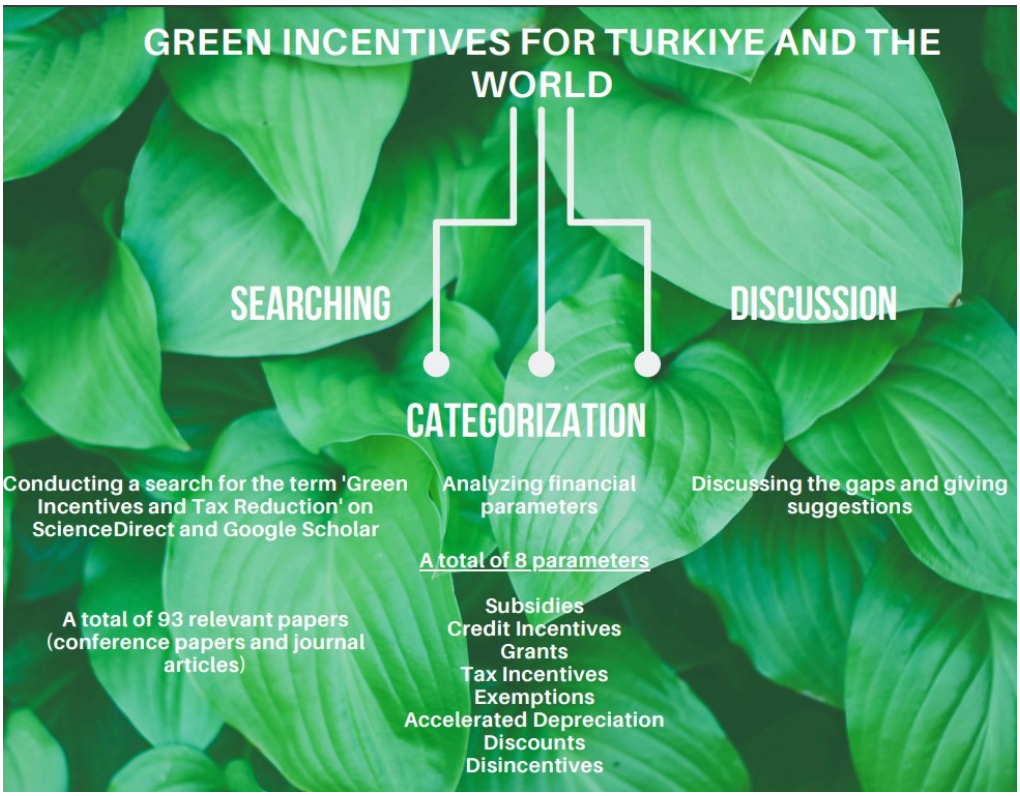

Figure 4. Flow chart of the research

However, only 93 publications are selected for this study according to 8 different financial criteria.

These financial incentive parameters for the EBBs are;

- Subsides
- Credit Incentives
- Grants
- Tax Incentives
- Exemptions
- Accelerated Depreciation
- Discounts
- Disincentives

Subsequently, these parameters are published for Türkiye and then compared with those of selected developed countries.

3. Financial Incentives for EEB in Türkiye

The concept of the EBBs, which first emerged in Türkiye in the early 2000s, has made significant progress over the years through important steps taken. During this 25-years period, Türkiye has implemented various legal regulations to support sustainability goals in the globally important fields of "Energy-efficient Buildings" and "Sustainable Structures." Government incentives, tax reductions, and financial support have played a crucial role in promoting the widespread adoption of energy-efficient building practices. In Türkiye, several legal regulations have been implemented to reduce energy losses and obtaining energy-efficiency in buildings. For instance; the "Energy Efficiency Law No. 5627 [24]", the "Thermal Insulation Regulation for Buildings [25]", the "Energy Performance in Buildings Regulation [26] ", the "Regulation on Efficient Use of Energy Resources and Energy [27]", the "Energy Efficiency Strategy Document and Buildings [28]" and the "Energy-efficient Certification Regulation for Settlements [29]".

The "National Energy-efficient Certification System (YeS-TR)," which was the first national implementation prepared for the certification of energy-efficient buildings, was implemented under the "Regulation on Energy-efficient Certification for Buildings and Settlements" published in the Official Gazette of Türkiye in June 2022. While this regulation is the only one specifically addressing EEBs, various other institutions, independent entrepreneurs, and universities in Türkiye have conducted various efforts in addition to the legal regulations. These efforts have led to the development of drafts for EEB certification systems.

On the other hand, starting from January 1, 2025, this practice will be expanded to all buildings over 2,000 square meters, and it will be mandatory for at least 10% of the energy used to be sourced from renewable energy in Türkiye. For large buildings, it has been made mandatory to construct in accordance with the nearly zero-energy building (nZEB) concept. The energy performance of buildings is required to be at least Class B.

In Türkiye, there is no direct tax incentive for EEBs. Although there is no specific regulation in Turkish tax legislation

regarding EEBs, there are some regulations that cover buildings related to energy efficiency and renewable energy, which affects energy-efficient building investments.

3.1. Exemption for Tradesmen in the Sale of Excess Electricity

Under the Article 193 of the Income Tax Law (GVK), regulations are in place for the production of electricity from renewable energy sources, in line with the "Electricity Market Law" No. 6446. With the enactment of Law No. 7103, an additional subparagraph (9) was added to the first paragraph of the Article 9, which regulates the tradesmen exemption of Article 193.

The new provision states the followings:

"In accordance with the Electricity Market Law No. 6446, activities that can be carried out without a license for the purpose of generating electricity from renewable energy sources, individuals who sell excess electricity produced from a single facility with a maximum installed capacity of up to 10 kW (including 10 kW), installed on the roofs and/or facades of residential buildings they own or rent (including those installed for the common electricity needs of the main property by the co-owners) to the last-resort supply company. (The provision of the third paragraph shall not be considered in the application of this subparagraph.)".

The relevant provision is explained in the 303rd Series of the Income Tax General Communiqué, published in the Official Gazette No. 30448 on June 11, 2018.

With the Law No. 7420, published in the Official Gazette No. 32008 on November 9, 2022, which amends the Income Tax Law and certain other laws and decrees, the expression "25 kW" in paragraph (9) of the first paragraph of Article 9 of the Income Tax Law No. 193, dated December 31, 1960, was changed to "50 kW."

Moreover, those who produce excess electricity with an installed capacity of up to 50 kW (including 50 kW) on the roofs of properties they own or rent, from sources within the scope of unlicensed activities, and sell the excess electricity to the last-resort supply company are exempt from taxes.

Additionally, under the Article 17/4-a of the VAT Law, the deliveries and services made by tradesmen who are exempt from taxes according to the Income Tax Law are also exempt from the VAT.

3.2. Regulations Introduced in the Stamp Duty Law and the Fees Law Regarding Procedures for Thermal Insulation and Energy Savings in Buildings

The procedures related to thermal insulation and energy savings in buildings, outlined in the Stamp Duty Law No. 488 and the Fees Law No. 492, have been exempted from taxes on documents related to these matters.

3.3. Deduction of Thermal Insulation and Energy Saving Expenses as Business Expenses for Determining Commercial Income

In the Article 40, paragraph 1, subparagraph 7 of the Income Tax Law No. 193 titled "Deductible Expenses", following statement is valid:

"*7. (Amended: 24/12/1980-2361/29) Depreciation amounts allocated according to the provisions of the Tax Procedure Law, (Added: 24/6/1994-4008/24) (...)38 (Additional provision: 15/7/2016-6728/14) (Expenses related to thermal insulation and energy-saving measures that increase the economic value of the property included in the business can be directly deducted in the year they are incurred.)*"

The principles of this regulation were outlined in the Income Tax General Communiqué No. 295 published in the Official Gazette No. 29927 on December 23, 2016.

With this legal amendment, the phrase "*Expenses related to thermal insulation and energy-saving measures that increase the economic value of the property included in the business can be directly deducted in the year they are incurred*" was added to the article on deductible expenses in the Income Tax Law. This change allows these expenses, which were previously added to the property cost and depreciated over time, to now be directly deducted as an expense in the year they are made.

3.4. Deduction of Expenses Related to Thermal Insulation and Energy Saving Measures in Determining the Net Amount of Real Estate Income

In the Income Tax Law No. 193, under Article 74 - Expenses:

"Expenses: Article 74 – (Amended first paragraph: 24/12/1980-2361/51) In order to determine the net income, expenses listed below are deducted from gross income, excluding those related to exempt gross income according to Article 21:

6. Depreciation of leased property and rights (The depreciable value, if known, is the cost price; if unknown, for buildings and land, it is the tax value, and for other assets, it is the market value determined according to the third item of Article 267 of the Tax Procedure Law), and expenses made by the lessor that are aimed at increasing the economic value of the real estate, such as thermal insulation and energy-saving measures (If these expenses exceed the limit set in Article 313 of the Tax Procedure Law within a calendar year, they may be considered as part of the cost)."

When the real expense method is selected for the declaration of real estate income, thermal insulation and energy-saving expenses, which enhance the economic value of the property, can be added to the property's cost and depreciated over time.

With the amendments introduced by the Law No. 6745, the change in Article 74 of the Income Tax Law allows for these expenses, provided they do not exceed the depreciation limit specified in Article 313 of the Tax Procedure Law. In this case, the entire amount of the expenses, excluding those related to exempt gross income, may be directly deducted as an expense in determining the net income.

However, if the expenses exceed the depreciation limit specified in Article 313 of the Tax Procedure Law, the entire amount of the expenses, excluding those related to exempt gross income, may either be directly written off as expenses or added to the property's cost and depreciated.

4. Comparison of Financial Incentives with the Developed Countries

This section summarizes financial incentives in developed countries and compares these incentives with the Türkiye.

4.1 United States of America

Looking at the global scene, it is evident that the United States offers the most incentives for energy-efficient buildings. Different states in the U.S. have various incentive programs.

For example, New York and Maryland have legal provisions that include tax deductions for energy-efficient buildings. In Maryland, energy-efficient building owners receive an 8% income tax deduction. In New York, both public and private sector buildings are incentivized through a "energy-efficient building grant" program, aimed at making buildings more energy-efficient and environmentally friendly. Additionally, building owners and tenants who meet specific energy-efficient building criteria enjoy advantages such as corporate tax, income tax, and insurance tax deductions. One of the key criteria is that energy consumption in new buildings should not exceed 65% of the permitted level, while for renovated buildings, it should not exceed 75% [30].

In Oregon, energy-efficient building incentives are offered in the form of exemptions from property taxes. The support is provided through a credit fund to help cover the building costs in the region.

In Cincinnati, Ohio, newly constructed buildings certified at the LEED Silver level are exempt from property taxes for 15 years. Renovations also enjoy up to $500,000 in exemptions for 10 years. For LEED Platinum-certified buildings, there is no upper limit on the tax exemption.

4.2. United Kingdom

The United Kingdom, a country with heavy rainfall, aimed to turn this situation into an advantage by enacting the "BS-8515" standard in 2009. This law covers the design, installation, and maintenance of rainwater harvesting systems, which allow rainwater to be added to household water supplies. In the first year, a 100% tax deduction is applied to this system. Additionally, a 5% tax deduction is offered for solar panels. There are also benefits for individuals who generate electricity. Those with solar panels on their roofs can sell the excess energy they produce to companies.

From the beginning of 2022 until March 31, 2027, the UK aims to provide approximately £280 million in tax incentives to improve residential energy efficiency. To achieve these goals, the government plans to apply a reduced Value Added Tax (VAT) rate for materials that improve energy efficiency in residential buildings. Specifically, energy-saving materials such as insulation, heat pumps, and solar panels will be subject to a 0% VAT rate until March 31, 2027. Additionally, the stamp duty paid for a home will be adjusted based on its energy efficiency performance. As a result, homes with better energy performance will have lower stamp duty [31].

4.3. Australia

In Australia, there is an organization called GBCA (Energy-efficient Building Council of Australia) that examines and certifies energy-efficient buildings. One of its

primary roles in the energy-efficient building process is setting standards for energy-efficient buildings using various rating tools. To establish these standards, the GBCA developed the Energy-efficient Star rating system in 2002. Today, the Energy-efficient Star rating system continues to maintain its popularity and is becoming increasingly widespread in the construction industry.

Currently, there is no systematic approach for tax exemptions specifically for energy-efficient buildings in Australia. However, federal tax systems provide tax exemptions for activities related to environmental protection [32].

4.4. France

In France, various measures have been implemented to encourage households to carry out energy efficiency renovations. These measures include tax reductions, subsidies, and zero-interest bank loans. The tax credit system allows taxpayers to deduct part of the renovation costs from their income taxes. The discount rate varies depending on the equipment used; for example, it is 15% for double glazing, 25% for roof and wall insulation, 25% for heating system modernization, 40% for renewable energy use, and can vary based on the number of individuals in the household [30].

The French government introduced the sustainable development tax credit in 2005 to enhance energy efficiency in private residences. This tax advantage was later restructured as a tax credit for energy transition. The program allows private homeowners in France to benefit from this tax credit, offering up to 30% reimbursement of their expenses if they opt for energy efficiency renovations or heating system modernization. In practice, the tax authorities apply these credits based on documentation of the expenses incurred. However, this tax advantage cannot be used for a second home and is limited to 30% of the total expenses for energy renovation works. This amount should not exceed 8,000 euros per person in the household, and 16,000 euros for couples. Additionally, an extra 400 euros can be reimbursed for each child in the household. This tax credit can also be applied to investments in new buildings and can be used for improvements to insulation and/or heating systems.

4.5. Spain

Since 1990, Spain has implemented various normative and financial measures aimed at improving energy efficiency in all types of housing, including single-family homes. In some municipalities, when solar energy systems are installed in homes (except new ones), property tax rates are reduced by up to 50%. Additionally, buildings or facilities that include solar energy-based heating or electrical systems benefit from up to 95% tax reductions on building, infrastructure, and installation taxes, with these tax reductions being applied by local governments. Local authorities also offer property tax reductions for buildings that include solar energy or photovoltaic systems.

The Spanish government also provides personal income tax credits for residential energy efficiency renovations. This tax credit mechanism contributes financially to

housing energy efficiency initiatives under the existing national regulations. The contribution is available for homeowners, with this advantage applied to no more than 30% of the total expenses for energy efficiency renovations. The maximum amount for each person in the household is set at 8,000 euros, and for couples, it is 16,000 euros. Additionally, an extra 400 euros can be reimbursed for each child in the household. Furthermore, in addition to energy renovation works, Spain offers a 20% additional tax reduction for improvements to insulation and heating-cooling systems in buildings.

4.6. Germany

Hamburg, Germany's second-largest city, became the first to develop a comprehensive energy-efficient roof strategy to mitigate the effects of climate change. A budget of 3 million euros was allocated for the development and implementation of this strategy. The program, launched in 2015, was originally set to end in 2019 but has been extended until 2024. It aims to increase the surface area of energy-efficient roofs using various tools. The program covers up to 40% or more of the construction costs for energy-efficient roofs between 20 and 100 square meters. For non-residential buildings, a maximum of 50,000 euros per roof is provided. Hamburg also plans to provide up to 100,000 euros in support for energy-efficient roofs on school buildings. In 2019, Hamburg allocated 7.5 million euros for the construction of energy-efficient roofs on schools.

To increase energy efficiency in buildings, the German government has offered tax advantages to homeowners, which can be recognized as tax deductions on income tax returns. This regulation, which came into effect in 2020, targets homeowners of properties older than 10 years. The deductions are reflected in income tax returns. However, in order to benefit from this deduction, the homeowner must reside in the property. Additionally, the efficiency improvements must be completed by January 1, 2030, at the latest.

Under this incentive, homeowners can benefit from tax deductions when they replace or renovate windows, doors, heating systems, update ventilation equipment, insulate walls, roofs, floors, and ceilings, or install a digital system to optimize energy performance. The tax deduction is limited to 20% of the total expenses for these activities. The right to the deduction is spread over three years, with 7% applied in the first year, 7% in the second year, and 6% in the following year. Additionally, there is a cap of 40,000 euros for the maximum deduction amount. If the property is rented out or assigned to someone else for free, the tax deduction cannot be claimed. The German government expects these tax incentives to save 3.4 million tons of carbon by 2030 [30].

4.7. Canada

In Canada, various energy-efficient building incentives are provided by the Canada Mortgage and Housing Corporation (CMHC), banks, public utilities (such as the Power Smart Home Loan provided by FortisBC), and municipalities, with most of the incentives being 5-year loan programs. These loans

are available for the construction of new homes, renovations of commercial buildings, and upgrading of individual systems. For example, in Manitoba, there is a Residential Earth Power Loan for cold climate air-source heat pumps.

Tax incentives in Canada are generally based on exemption models rather than discounts. For instance, British Columbia (BC) offers a 100% property tax exemption for certain devices and energy upgrades. Quebec (QC) offers the RenoVert tax credit for energy renovations in homes. Among the various financial incentives, tax incentives have been found to be the most effective method in terms of both environmental and economic impact.

In Canada, there are numerous grants available at both the provincial and municipal levels. Most of these grants are provided through public utility companies in different provinces. In the residential sector, discounts offered by municipalities in Alberta (AB) are common. In provinces such as BC, QC, ON, and Newfoundland and Labrador, public utilities more widely provide discounts [19].

4.8. Norway

Norway is another country that has developed a energy-efficient building certification system. In the early 2000s, Norway used the EcoProfile certification system, but it has since been replaced by BREEAM-NOR, which was developed in 2011. BREEAM-NOR is the national adaptation of the BREEAM rating system that originated in the United Kingdom.

In addition to being a safe and livable country, Norway stands out for its ambitious renewable energy goals and efforts to achieve these targets. Some of the key renewable energy incentives implemented in Norway include indirect taxes, energy funds, carbon dioxide taxes, and premiums for energy-efficient certification schemes, tariff guarantees, and other exemptions.

Norway offers various incentives aimed at energy conservation. The Norwegian Investment Support combines investment subsidies and financial incentives to promote renewable energy sources for electricity generation. Wind and biomass (heat production) investments can benefit from subsidies, which can reduce total investment costs by up to 25% and 100%, respectively. Wind energy promotion projects can receive subsidies covering up to 100% of the investment costs. Additionally, wind energy investments are exempt from both investment taxes and energy production taxes [32].

Table 1 summarizes financial incentives for energy-efficient buildings in selected developed countries and Türkiye.

5. Suggestions

Energy efficiency and renewable energy regulations related to buildings in Türkiye are currently limited, highlighting the need for new policies that provide financial advantages for energy-efficient buildings, in alignment with global best practices. Therefore, this section presents several suggestions for Türkiye.

- Energy-efficient-certified or LEED-certified buildings or complexes could be granted the right to receive free advertising through public channels.

Table 1. Financial Incentives for Energy-efficient Buildings in Selected Developed Countries and Türkiye

	Subsides	Credit Incentives	Grants	Tax Incentives	Exemptions	Accelerated Depreciation	Discounts	Disincentives
Türkiye	✓	NC	✓	✓	NC	NA	✓	NA
US	✓	✓	✓	✓	✓	✓	✓	✓
UK	✓	✓	✓	✓	✓	✓	✓	✓
Australia	✓	✓	✓	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	NC	NC	✓	✓
Spain	✓	✓	✓	✓	✓	NA	✓	NC
Germany	✓	✓	✓	✓	✓	✓	✓	NC
Canada	✓	✓	✓	✓	✓	✓	✓	✓
Norway	✓	✓	✓	✓	✓	✓	✓	✓
NA: Not available and NC: Not common								

- There is a need for regulations that will provide directly financial advantages for energy-efficient buildings, taking into account practices from other countries.
- The requirement for the use of renewable energy in buildings, currently set at a minimum of 10% in 2025, could be gradually increased in accordance with the latest regulations.
- The exemption for buildings rented out as residential under Article 21 of the Income Tax Law could be extended and amended to include energy-efficient buildings by expanding its scope and limits.
- Similar to the LEED certification system, VAT reductions could be applied for the use of regional materials in construction, and insurance discounts could be provided for employing local workers.
- Individuals undertaking or owning the construction of energy-efficient buildings can benefit from exemptions provided for buildings constructed under Investment Incentive Certificates.
- Under the Real Estate Tax Law No. 1319, tax reductions, exemptions, and tax credits for energy-efficient buildings could be introduced by considering the practices of other countries.

- To encourage compliance with energy efficiency improvements, disincentives such as carbon taxes could be applied to those who do not meet established standards. Additionally, higher rates of environmental and cleanliness taxes could be applied to non-compliant parties.
- The exemptions provided for buildings constructed under the Investment Incentive Certificate could be extended to individuals involved in the construction of energy-efficient buildings.
- In technology development zones, the incentives for the exemption of income from software and R&D activities could also be applied to energy-efficient building construction to promote sustainable buildings.
- Under the Value Added Tax Law, VAT exemptions could be granted on new machinery and equipment used for R&D, innovation, and design activities related to energy-efficient building construction, which would further encourage energy-efficient building investments.
- Other potential incentives include providing tax relief on energy, water, and renewable resources for projects that use them efficiently, reducing environmental and cleanliness taxes for projects that recycle waste materials, VAT exemptions on energy sources and equipment used in construction, applying low or no tax on imported building materials, income and corporate tax reductions for investors, and providing workforce support for construction projects.
- A key point in tax incentives is that these incentives must be sustainable and applicable in the long term.

6. Conclusion

This paper presents an in-depth comparative analysis of the financial and tax incentives available for energy-efficient buildings in Türkiye and across the globe. It emphasizes the growing significance of adopting energy-efficient building practices as a means of addressing climate change and supporting sustainable development goals. While numerous developed countries provide a wide range of incentives, such as subsidies, tax exemptions, low-interest loans, and grants, Türkiye has made commendable progress in promoting energy-efficient building practices through similar measures, though some challenges remain.

Developed countries like Germany, Spain, and Canada have implemented extensive financial mechanisms to advance energy-efficient buildings, aligning these efforts with broader climate policies. In contrast, Türkiye is gradually increasing its support in this area. The results indicate that the success of these incentives is not only influenced by their diversity and accessibility but also by the degree of awareness and active participation from both governmental and private sectors.

For Türkiye to further promote sustainable construction, it could benefit from expanding its financial incentives, introducing more robust tax incentives, and ensuring better synchronization between public policy and industry requirements. As energy-efficient building practices

continue to develop, it is crucial for policymakers worldwide to collaborate and exchange knowledge in order to establish a conducive environment for sustainable construction.

In conclusion, this paper highlights the importance of sustained investment in financial and tax incentives as key drivers for energy-efficient building adoption. By improving the accessibility and breadth of these incentives, countries can accelerate their transition to a more sustainable and environmentally-friendly built environment.

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