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Investigation of Methods and Studies for Determining the Material Selection Criteria with Low Environmental Impact in Hotel Buildings

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Abstract

Today, with the development of environmental sustainability awareness, measures have been taken in the construction sector to protect nature and human health. Building production with low environmental impact is possible with the use of building materials selected through various data and criteria. Studies have shown that many, and different building materials are used in hotels because hotels are trying to attract the attention of users. Materials taken from nature in their natural state and used by processed cause many environmental problems. In this study, the steps to be followed for the selection of finishing materials with low environmental impact to be used in hotel buildings are explained and evaluated within the scope of environmental sustainability through a literature review, and interviews with hotels. At the end of the study, it was determined that a systematic way should be followed especially in material selection during the design process.

Keywords: *Environmental sustainability, environmental effect, hotel building materials, material selection.*

Otel Yapılarında Çevresel Etkisi Düşük Malzeme Seçim Kriterlerinin Belirlenmesine Yönelik Yöntem ve Çalışmaların İncelenmesi

Öz

Günümüzde çevresel sürdürülebilirlik bilincinin gelişmesiyle birlikte, doğanın ve insan sağlığının korunması adına yapı sektöründe önlemler alınmaya başlanmıştır. Çevresel etkisi düşük yapı üretimi, çeşitli veri ve ölçütler yoluyla seçilen yapı malzemelerinin kullanılması ile mümkündür. Yapılan araştırmalar, otellerin kullanıcıların ilgisini çekmek adına farklı ve çok sayıda yapı malzemesi kullandığını göstermiştir. Doğadan alındıktan sonra işlenerek kullanılan malzemeler birçok çevresel probleme sebep olmaktadır. Bu çalışmada otel yapılarında kullanılacak olan çevresel etkisi düşük bitirme malzemelerinin seçimine yönelik izlenmesi gereken adımlar aktarılmış, kriterler; literatür taraması ve oteller ile yapılan görüşmeler aracılığı ile çevresel sürdürülebilirlik kapsamında değerlendirilmiştir. Çalışma sonunda otellerde malzeme seçimi konusunda sistematik bir yol izlenmesi gerektiği belirlenmiştir.

Anahtar Kelimeler: *Çevresel sürdürülebilirlik, çevresel etki, otel yapı malzemeleri, malzeme seçimi.*

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1. Introduction

In recent years, rapid urbanization and developments in the building industry have brought about a wide variety of building materials. The materials obtained naturally in the past and used in construction without much processing have become multifunctional, but of poor quality, with the increase in the performance criteria expected from the material today. This situation has brought with it the issue of mentioning the relationship with the environment in addition to the physical, chemical, mechanical, technological, economic, and availability properties of the material during the selection. In this sense, emerging environmental impact assessment approaches, decision-making and comparison methods, material databases and approaches to material selection, laws, regulations, and standards are very important (Khoshnava, Rostami, Mohamad Zin, Štreimikienė, Mardani and İsmail, 2020; Güner, 2017; Güleryüz, 2014). Solving the problems arising from material selection requires the people involved in the selection to act with awareness from the design stage. The environmental effects that will occur throughout the material's life cycle are preventable at this stage. The selection of materials with optimum properties for the building is defined as a complex process involving many different data and factors. For this process to be managed properly, a systematic method should be followed for the performance criteria expected from the material (Rahim, Musa, Ramesh, and Lim, 2020).

The most used area in hotels is known as the bedrooms. For this reason, the people involved in the design process try to use so many different finishing materials to attract the attention of the users, and to keep up with the times, they make renovations from time to time before the material service life expires. The bedrooms' wall, floor, and ceiling finishing materials are chosen by their price, availability, color, and texture properties without considering the environmental effects. There are many decision-making methods to reduce the environmental effects in the selection of these finishing materials (Gültekin, 2006; Alptekin, 2014; Koyaz, 2016; Bayır, 2020). However, the decision-making process becomes difficult as there are many different criteria, data, and impact classes. The inadequacy of the methods for the selection of materials used in hotel buildings and the difficulties experienced in the decision-making process necessitates the creation of an environmental impact assessment model that compares different material alternatives. In this study, the problems with the environmental effects and the importance of the material selection of hotel buildings are discussed. Then, the most used materials in hotel bedrooms in Türkiye were determined. Renovation behaviors and performance requirements of the finishing materials are examined. Important regulations, notifications, standards, certificates, and award programs are defined.

2. Material and Method

Within the scope of the study, first of all, a literature review was carried out for the environmental effects of hotel buildings and the importance of material selection in the hotel buildings' life cycle process. Secondly, hotels are classified according to national and international sources by literature review and selected by the classification of Regulation on the Qualifications of Tourism Facilities for the study. According to the selection, the most used finishing materials have been analyzed. Due to the low number of 1, 2, and 3-star chain hotels, a total of 31 hotels, including only 15 5-star chain hotels and 16 4-star chain hotels, were included in the study. The hotels are selected by the geographical prevalence with the help of TS 825 Degree Day Regions by Province. (TS 825, 2013). In terms of suitability for data collection, the lowest-priced double bedroom was selected in each hotel. Furnitures and the bathrooms are not included in the study. Later on, renovation behaviors were analyzed by interviewing the hotels, and the findings are shown in the section 'Renovation Behaviours of the Materials'. Performance requirements of the materials have been defined according to International Organization for Standardization, (2016). Important standards, regulations, awards, and programs were found according to the literature review. Within the scope of this study, national regulations, notifications, national and international standards regarding tourism structures were investigated through; the Turkish Presidency Regulatory Information System, Turkish Standards Institution (TSE), International Organization for Standardization (ISO), European Standard (EN), British Standards Institution (BSI), American Society for Testing and Materials (ASTM), The American National Standards Institute (ANSI).

3. Findings and Discussion

Although studies are carried out at the national and international levels for the impact of building materials, it is seen that hotels in Türkiye have a passive role and fail to preserve their values in their geographical location by not giving importance to the use of renewable resources and energy, raw material, and water, destroying natural areas for large-scale projects, not paying attention to the recycling of wastes, changing migration routes of animals, reducing the biodiversity of wastes dumped into the sea. The lack of necessary legal regulations is one of the biggest reasons for all these problems. Considering that sustainable architecture requires a holistic and strategic approach to the building, it is imperative that people take precautions during the design phase of the building. According to the studies, the most important environmental effects of the materials in Türkiye are; global warming, depletion of the ozone layer, acidification, eutrophication, photochemical smog formation, indoor air quality, fossil fuel consumption, mineral resource consumption, water consumption, waste, and land use (Karaman Öztaş, 2014). It has been found that the subject has not been adequately addressed and hotels have to take precautions as a result of the research. It has been determined that the material selection is made regardless of the location of the hotels, there is no general method for the renewal of the materials, and the performance criteria are not taken into account, there is no standard or regulation for the selection of sustainable materials in the hotels, the certificate and award programs preferred by the hotels are based on environmental sustainability.

3.1. Environmental Effects of Hotel Buildings

Building materials play one of the biggest roles in lowering the environmental impact of hotel buildings (Vatan & Poyraz, 2016). Increase in waste production, consumption of raw materials, energy, and water, air pollution, decrease in biodiversity, occupation of agricultural land, seawater pollution, depletion of the ozone layer, and global warming are just a few of these impacts (Kuo & Chen, 2009; Chen & Hsieh, 2011). When the environmental policies of the hotels are examined, it is seen that lowering the effects of building materials has not been adequately addressed. Hotels attach importance to the concept of eco-label to reduce the environmental impact of the materials used and to provide other sustainability criteria. Green Flag Award, Biohotels, Sustainable Tourism Eco-Certification Program, Energy Star, and Enviro-Mark are some of the environmental management system certificates that hotels receive. In Türkiye, the hotels use environmental management system certificates such as GTBS (Green Tourism Business Scheme), Blue Flag, GreenGlobe, Green Key, White Star, Greening Hotels, Green Star and LEED, ISO 14000, Travelife (Nakhla & Mossad, 2022; Ertaş, Can, Yeşilyurt & Koçak, 2018). In addition, the "Environmentally Friendly Accommodation Facility Certificate" was given to the hotels that attach importance to environmental issues by the Ministry of Culture and Tourism; it has been observed that non-governmental organizations and environmental organizations also carry out studies on the subject. Reducing the environmental impact of the materials used in hotel buildings is not possible only with the use of environmental management system certificates and environmental labels. It is necessary to use Life Cycle Impact Assessment models such as BEES, BEPAS, and BELES, which evaluate the environmental effects of products, notification services such as GreenFormat, GreenSpec, EPD, product labels such as EC Eco-labelling scheme, Blue Angel, Eco mark, which discuss materials in detail and specify the system limit in the life cycle process (Karaman Oztas, Tanacan & Oğuz, 2017). Life cycle impact assessment models should also be compatible with Turkish conditions. In this sense, although there are studies (Tuna Taygun, 2005; Karaman Öztaş, 2014; Gültekin, 2006; Türkmen Bayraktar, 2010; Alptekin, 2014) that have been carried out, a general method has not been accepted. Reducing the environmental effects of the materials used in hotels is only possible if they are traceable and measurable. For this reason, it is necessary to establish a systematic method that facilitates material selection during the design process.

3.2. The Importance of Material Selection in the Hotel Buildings Design Process

The first building materials consisted of stone, wood, and earth which people found without getting too far from their location. Over time, the increase in population, the increase in human knowledge, and the advancement in technology caused a wide variety of material alternatives with higher

performance requirements (Gökçe, Aytekin, Kuşan & Zorluer, 2017; Tufan & Özel, 2018). Accordingly, selecting the best materials at the design stage became hard, which showed the necessity of following a systematic way. One of the biggest reasons for this is the increase in environmental effects caused by building materials (Çizmecioğlu, 2020). The materials used in the buildings cause global warming, depletion of raw materials, water, and energy resources, and great damage to human health (Kaya, 2013; Çiftçi, 2021). At this point, selecting materials by evaluating their life cycle and environmental impact performance is important. When the environmental effects of building materials in touristic buildings are examined, it is seen that hotels are in the first place (EkoYapı, 2013). Especially after the 1960s, the increasing number of hotel buildings started to use different kinds of building materials to keep the attention of the masses alive (Horne, 2009). As a result, hotels' "environmental sustainability" awareness has started to develop with the emergence of environmental effects. With this awareness, building materials with low environmental impact have become a feature; preferred by the building industry, and designers.

3.3. The Most Used Materials in Hotel Bedrooms

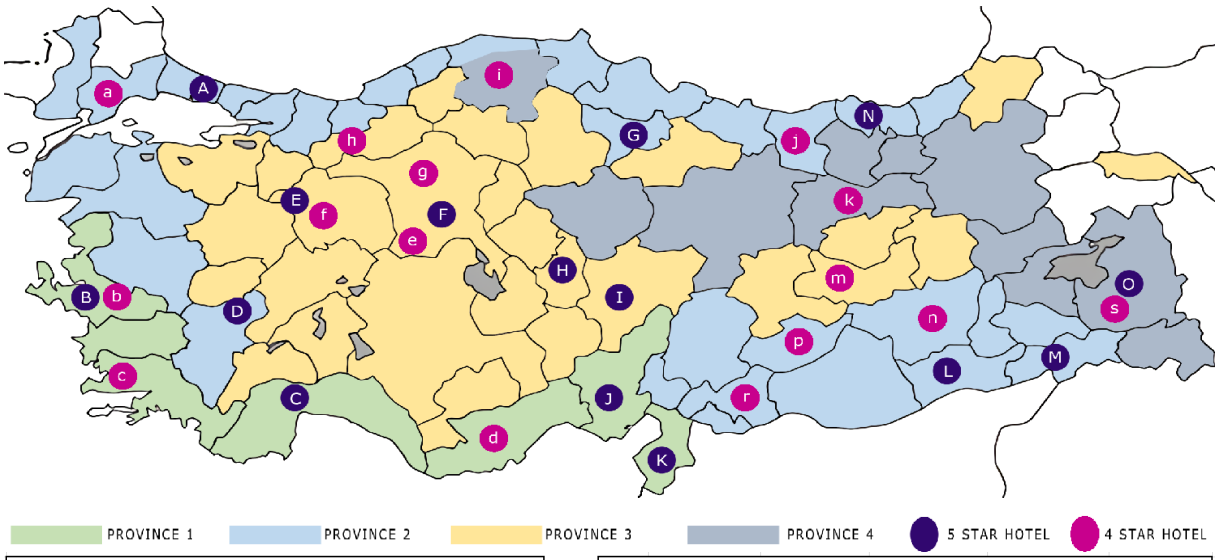
According to national sources; hotels are classified according to the purpose of accommodation, duration of the activity, legal characteristics, and size. The purpose of accommodation hotels is classified as; central hotels (city hotels), coastal hotels, mountain and sports hotels, spa-cure hotels, and congress hotels. In terms of the duration of the activity, hotels are classified as; permanent hotels and seasonal hotels. In terms of legal characteristics, hotels are classified as; municipality licensed hotel businesses and hotel managements with tourism operation certificates. In terms of size, hotels are classified as; very small hotels with 25 rooms or less, small hotels with 25 - 100 rooms, medium-sized hotels with 100 - 299 rooms, and large hotel complexes of 300 or more rooms (Mevzuat Bilgi Sistemi, 2005; Elmas, 2008). According to international sources, hotels are classified by; the star classification system, American Automobile Association Classification System, Forbes (Mobile) Classification System, and Michelin Classification System (Minazzi, 2010; World Tourism Organization, 2015).

In this study, in terms of accommodation purpose; city hotels, in terms of activity period; permanent hotels, in terms of legal features; hotels with tourism operation certificate, in terms of property; private hotel businesses, in terms of size; hotels with 25- 100 and 100- 299 rooms, in terms of star classification; 5-star and 4-star hotels were selected (Figure 1) (Aydoğdu, 2017).

Bedrooms are the most used spaces in hotels that need regular renewal. Many building products used in hotels are discarded before the end of their service life as a result of renewal. It is seen that as the number of stars in hotels increases, their ecological footprint also increases. To analyze the most used finishing materials in hotel bedrooms, 5 chain hotels (2 national, 3 international) which are among the top 10 hotels in Türkiye have been selected (Table 1).

Table 1. Selected chain hotels for the study (T.C. Kültür ve Turizm Bakanlığı Belgeli Konaklama Tesisleri, 2021)

No	National	Hotel number	Web page
1	Anemon	21	https://www.anemonhotels.com/
2	Dedeman	18	https://www.dedeman.com.tr/
3	Divan	17	https://www.divan.com.tr/
No	**International**	**Hotel number**	**Web page**
4	Wyndham	8900	https://www.wyndhamhotels.com/tr-tr
5	Hilton	3897	https://www.hilton.com.tr/



5 STAR CHAIN HOTEL					
	HILTON	WYNDHAM	ANEMON	DEDEMAN	DIVAN
P1	Antalya (C)	İzmir (B)	Hatay (K)		Adana (J)
P2	Trabzon (N)	Mardin (L)	Denizli (D)	İstanbul (A)	Şırnak (M)
P3	Ankara (F)	Nevşehir (H)	Eskişehir (E)	Tokat (G)	
P4	Van (O)	Kayseri (I)			

4 STAR CHAIN HOTEL					
	HILTON	WYNDHAM	ANEMON	DEDEMAN	DIVAN
P1	Bodrum (c)	Mersin (d)	İzmir (b)		
P2	Adıyaman (p)	Giresun (j)	Diyarbakır (n)	Gaziantep (r)	Tekirdağ (a)
P3	Bolu (h)	Eskişehir (f)	Ankara (e)	Elazığ (m)	Ankara (g)
P4	Erzincan (k)	Van (s)		Kastamonu (i)	

Figure 1. Geographical prevalence of selected hotels (T.C. Kültür ve Turizm Bakanlığı Belgeli Konaklama Tesisleri, n.d.)

To carry out the analysis, the wall-floor-ceiling finishing materials used in the selected chain hotels' selected rooms were examined through a literature review and field studies. First, a legend is created for the determination of the materials as a result of the examination (Toydemir, Gürdal & Tanaçan, 2000). According to this legend, the most used finishing materials in bedrooms are shown in Figure 2.

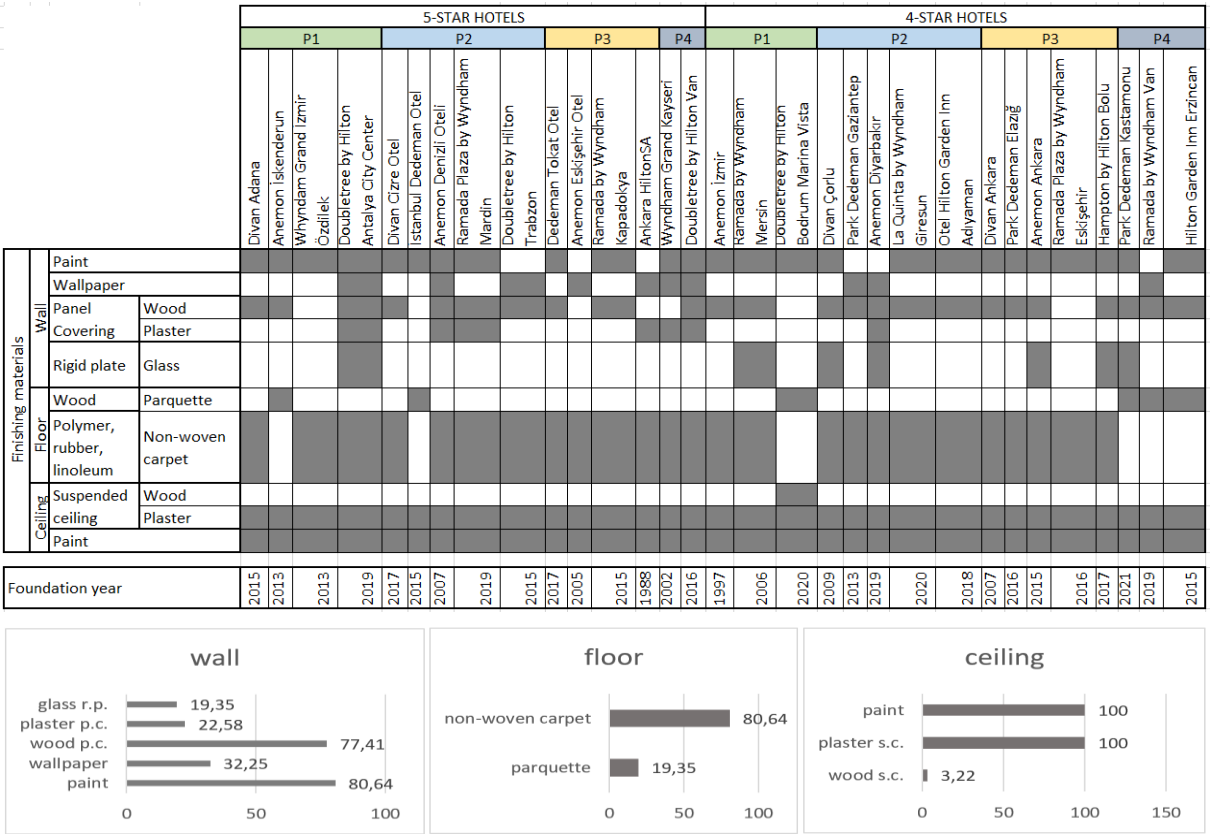


Figure 2. The most used finishing materials in bedrooms (Divan, 2022; Anemon Hotels, 2022, Wyndham Hotels and Resorts, 2022, Dedeman Hotels and Resorts, 2022; Hotels by Hilton, 2022)

As shown in the analyses, the most used wall finishing materials in the chain hotel bedrooms are; paint, wood panel covering, wallpaper, plaster panel covering, and glass rigid plate, the most used floor finishing materials in the chain hotel bedrooms are; non-woven carpet and wood parquette, the most used ceiling finishing materials in the chain hotel bedrooms are plaster suspended ceiling, paint and wood suspended ceiling from most to least. It is seen that the bedroom finishing material selection criteria of chain hotels do not differ geographically, and the same type of materials are used in the building without changing to maintain the chain hotel perception. Considering that each geographical region has different climatic characteristics, local materials, and site properties, the materials used in these regions should also change as they will have different performance requirements. It is known that during the design of chain hotels, pre-prepared design sheets are used to maintain the user's perception of trust and to ensure continuity. Unfortunately, these design sheets do not differ by region, they only help the designer during material selection. Today, the biggest problems such as global warming, deterioration of human health, regional air pollution, and climate change occur due to mistakes made in material selection during the design phase (Mahmoudkelaye, Taghizade Azari, Pourvaziri & Asadian, 2018). Materials should be chosen not only considering their physical, chemical, mechanical, technological, aesthetic, and economic properties, but also their environmental impact which will lower the high ecological footprint of chain hotels.

3.4. Renovation Behaviours of the Materials

The renovation behavior of hotels has a great contribution to the environmental problems caused by the materials. Interviews have been made with each selected hotel about the subject. The resulting information is as follows:

- There are two approaches to hotel renovation. In the first approach, the hotel is completely closed and renovated. A complete renovation is possible if the hotel is very old or has changed hands.

- In the second approach, the hotel is kept under regular surveillance. If, for example, there is a problem with the parquet in the bedroom, the parquet can be repaired/replaced. It is not possible to change every material at the same time. At this point, depreciation is taken into account. This increases as a result of the sales and use of the rooms. For example, curtains change on smoking floors may be more frequent than on non-smoking floors. Since the hotel changes frequently and in different regions, the hotel renewal date cannot be given.

- Hotels generally carry out renovation work during the winter months (October-November). However, if there is a very urgent problem, the room can be closed and intervened. In these months, wall-floor-ceiling finishing materials are renewed sequentially, not at the same time.

- Because it is not needed, there are no serious renovations for the first 5 years after the hotels are opened.

- It also has been stated that after the hotels change/renew the materials, the old materials end their life as a waste.

Interviews with hotels have shown that the biggest problem in the renovation behavior of hotels is the disposal of materials as waste before their end of life which is an important issue in creating environmental problems. Materials salvaged and reused as a result of construction practices can be overhauled and reused, or if they are not suitable for reuse, they can be recycled. It can also be used as a raw material in the production of other products. These recycled building materials not only add ecological value to the building they are used in but also provide economic benefits and affect environmental and structural sustainability (İpekçi, Coşkun & Karadayı, 2017).

3.5. Performance Requirements of the Materials

The performance requirements of finishing materials in hotels can be determined by using International Organization for Standardization, (2016). In this standard, 4 levels are proposed to determine the performance of a building or a part of a building (Figure 3).

A detailed explanation of specifying performance is given below:

Figure 2. Proposed levels for the performance (ISO 19208, 2016)

- Objectives: It includes the expectations regarding the properties expected from the material. Some commonly expected objective categories described in the standard are; stability, fire safety, safety in use, tightness, air purity, durability, accessibility, contributions to sustainable development.

- Performance descriptions: It defines the agents, factors affecting human behavior, and changes in performance over time. Agents are classified as; mechanical, electromagnetic, thermal, and chemical agents; factors affecting human behavior are classified as; physical abilities, sensory abilities, and mental abilities. Changes over time describe the characteristics, reason, and variation over time of the performance requirement expected from the material.

- Performance parameters: These sets the qualitative requirements for the behavior of the material. It may vary depending on the type and nature of the performance. For example, the performance of the material affecting society can be determined through simulated CO_2 emissions.

- Evaluation of the solution: It constitutes the stage of evaluating the results of the performance statements and bringing solution proposals. For example, evaluation of a whole building can be obtained through; a) experiments on a full-scale building, b) integration of performance of elements through calculation, etc. (Experimental results of elements), and c) logical reasoning of performance from materials or products, through elements to a whole building (ISO 19208, 2016)

Considering the environmental problems of today's world, examining all the materials in the design and production processes with the realization of the act of architecture; it is important to select performance-oriented materials. The performance requirements expected from the finishing materials used in the wall, floor, and ceiling in hotel bedrooms differ from each other. Research conducted in selected hotels has shown that the biggest factor in material selection is visual appearance and economy. The performance properties of the material such as fire, safety, durability, and acoustic properties have been ignored and the user has been left vulnerable to various agents. After selecting the materials suitable for all these criteria in hotels, the long-term performance of the materials should be analyzed. However, no such practice has been found in the selected hotels. It is important for everyone involved in the design of the building to act knowing this, and to reduce the contribution of the material to the environmental impact by working with the best performance and the best life.

3.6. Standards, Regulations, Awards and Programs

Within the scope of this study, national regulations and notifications (Table 2), national and international standards regarding tourism structures (Table 3) were investigated. There are several certificate and award programs to reduce the role of hotels in environmental destruction. There are many eco-friendly hotel labels around the world today. These differ in areas such as geographical scale, sub-sectors of tourism, and certification methods. The most well-known national and international certificate and award programs are summarized in Table 4.

When the regulations, notifications, and standards related to hotel buildings are examined, it is seen that there is information about the design strategies such as the usage of the textiles or lighting of the building or the places, but the selection of the materials, specifications, performance requirements and environmental solutions is missing. Although there isn’t a detailed explanation about this subject, the marked areas in Table 2 and Table 3 can contribute information about both material properties and environmental effects but they are not in detail. The number of hotels that receive certificates and award programs for their environmentally friendly practices is increasing day by day as can be seen in Table 4.

Table 2. National regulations and notifications of hotel buildings (Mevzuat Bilgi Sistemi, 2022)

Regulations	Regulation on the Qualifications of Tourism Facilities
	Fire Protection Code of Buildings
	Regulation on Planning and Implementation In Culture and Tourism Conservation, Development Zones, and Tourism Centers
	Planned Areas Zoning Regulation
	Istanbul Zoning Regulation
	Bursa Metropolitan Municipality Zoning Regulation
	Ankara Metropolitan Municipality Zoning Regulation
	Gaziantep Metropolitan Municipality Zoning Regulation
	Regulation on the Protection of Buildings Against Noise
	Regulation on Evaluation and Management of Environmental Noise
	Regulation on Facilities to be Built and Opened Near Highways
Notification	Communiqué on the Implementation of the Regulation on the Qualifications of Tourism Facilities
	Communiqué on Preparation and Application of Evaluation Forms Regarding Classification Studies
	Communiqué on Issuing an Environmentally Friendly Accommodation Facility Certificate
	Communiqué on Giving Bicycle Friendly Accommodation Facility Certificates to Accommodation Facilities with Tourism Operation Certificate

Table 3. National and international standards for hotel buildings (Türk Standartları Enstitüsü, 2022; International Organization for Standardization, 2022; European Standard, 2022; British Standards Institution, 2022; American Society for Testing and Materials, 2022; American National Standards Institute, 2022)

Standards	TS 10082 Workplaces- Accommodation Facilities- Hotels Of Tourism Certificated- Classification- General And Private Rules
	TS EN ISO 18513 Tourism Services — Hotels And Other Types Of Tourism Accommodation — Vocabulary
	TS ISO 8100-32 Lifts For The Transportation Of Persons And Goods — Part 32: Planning And Selection Of Passenger Lifts To Be Installed In Office, Hotel And Residential Buildings
	TS ISO 22483 Tourism And Related Services — Hotels — Service Requirements
	TS ISO 21401 Tourism And Related Services — Sustainability Management System For Accommodation Establishments — Requirements
	ISO/TS 13811 Tourism And Related Services — Guidelines On Developing Environmental Specifications For Accommodation Establishments
	TS 6915 Workplaces- Accommodation Facilities- General Rules
	ISO 9000 Quality Management System
	ISO 14001 Environmental Management
	ISO/DIS 23405 Tourism and Related Services — Sustainable Tourism — Principles, Terminology, and Model
	ISO 21902:2021 Tourism and Related Services — Accessible Tourism For All — Requirements and Recommendations
	ISO 21621 Tourism And Related Services — Traditional Restaurants — Visual Aspects, Decoration, And Services
	ISO/DIS 21620: Tourism And Related Services — Heritage Hotels — Equipment And Service Requirements
	BS ISO 17679:2016 Tourism And Related Services — Wellness Spa — Service Requirements
	BS ISO 17680:2015 Tourism And Related Services— Thalassotherapy — Service Requirements
	BS ISO 21426:2018 Tourism And Related Services — Medical Spas — Service Requirements
	ISO/PAS 5643 Tourism And Related Services — Requirements And Guidelines To Reduce The Spread Of Covid-19 In The Tourism Industry
	IES DG-25-12 Design Guide for Hotel Lighting
	GB/T 14308-2010 Classification And Accreditation For Star-Rated Tourist Hotels
	GB/T 21084-2007 Green Hotels
	GB/T 22800-2009 Textiles For Star-Tourist Hotels
	GB/T 24453-2009 Plastic Products Used In Guestroom Of Hotel
	GB/T 26357-2010 Construction Standards Of Management Information System For Tourist Hotel
	GB/T 39634-2020 Management Specification For Water-Saving Of Hotels

Table 4. The most well-known national and international certificate and award programs (Ovalı, Çakır, & Atık, 2020; Ertaş et.al., 2018)

Certificate and award programs	Green Star	Green Key	TUI Umwelt Champion&Eco Resort
	White Star	Viabono	Green Globe
	Blue Flag	EU Ecolabel	Green Seal
	Greening Hotels	Nordic Swan Ecolabel	Green Leaf
	Green Key	EU Flower	Ecotel
	Environmental Impact Assessment Report	EHC	Green Tourism Business Scheme (GTBS)
	Eco-Management and Audit Scheme (EMAS)	Blaue Schwalbe	Travelife
	Leadership in Energy and Environmental Design (LEED)	Bio Hotels	Naturidyll Hotels
	Building Research Establishment Environmental Assessment Method (BREEAM)	Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB)	Japan Environmentally Sustainable Accommodations International Standard (ESAIS)

While awards and certificates are the most frequently mentioned environmental factors on the websites of environmentally friendly accommodation establishments, the most emphasized issues are environmental policy, waste evaluation, personnel and guest training, and energy saving. In addition to political and legal pressures, these businesses give importance to environmentally friendly practices due to reasons such as the increase in tourists' interest in environmental issues, the increase in environmental regulations, the desire to provide more consumer satisfaction and to solve problems related to physical appearance (Auzair, 2011). When the websites of the selected chain hotels (Table 1) are examined, it has been observed that the international hotels clearly share their environmental policies compared to national hotels. Especially in city hotels where users spend a short time, the scarcity of awards and programs mentioned in the table above draws attention. It will be an important step in terms of environmental awareness that environmentally sensitive accommodation establishments discuss this issue in detail and share it with the public. In addition, it is seen in this study that the features expected from the material differ according to the certificate and award program. Establishing a common certification system and award program for a more effective result is important for the joint development of environmental awareness.

4. Conclusion and Suggestions

Hotel buildings are structures with high environmental impact due to the materials used. Considering environmental factors in the selection of finishing materials in hotels may cause additional costs for businesses in the short run, but in the long run, it will be effective in reducing the costs of the businesses and increasing their profits. This will contribute to the economy and help increase social welfare. In addition, it will increase the prestige of hotel businesses if they show the environmental effects of the materials in a clear, and accessible way through sustainability reports. Finishing materials in hotel buildings are selected by the features such as functionality, durability, ease of maintenance, cost, and aesthetics. Reducing the environmental impact of hotel buildings is only possible with the use of sustainable building materials (Başyiğit, Hanifi Alkayış & Kartlı, 2021). Even though most of the studies on hotel designs have defined the concept of a sustainable hotel and mostly focused on the social, economic, and environmental impacts of the operation process superficially, it is seen with this study that hotels should consider many factors for environmental impact evaluation. In this sense, it is important to prefer materials that are renewable or reusable, cause the least damage to the environment and human health, require less maintenance, energy, raw materials, and water throughout their life cycle by everyone involved in the design process of the building (Gamal Sahlol, Elbeltagi, Elzoughiby and Abd Elrahman, 2021). The awareness of hotel designers and decision-makers in this field, especially architectural design teams, and material preferences and incentives with low environmental impact will also encourage material manufacturers to publish environmental product declarations for their products and make improvements in their usage processes. This study is important in terms of thinking about the quality

of life of future generations and acting on this issue. It is emphasized that the choice of sustainable materials in the building is not in line with human desires, but is necessary for the realization of human needs. For the selection of materials used in hotels, it is necessary to establish common and detailed laws, regulations, and standards, to determine the performance requirements expected from the material, to give importance to recycling during the material renewal behavior, to select the materials specific to the geographical region and to establish a common method for material selection. In this sense, both the state and designers must work together. Thus, a better environment can be left for future generations by ensuring the use of sustainable materials in the building.

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The article complies with national and international research and publication ethics. Ethics committee permission was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

References

Alptekin, O. (2014). *Research Method In Construction Material Selection And A Model Proposal* (Ph.D. thesis). Gazi University, Ankara, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (11.01.2022) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jspANSI

American National Standards Institute, (2022). *ANSI Webstore*. Access Address (13.02.2021) https://webstore.ansi.org/?_ga=2.224823135.418440850.1678537386-27751546.1678537386

Anemon Hotels. (2022). *Hotels.* Access Address (13.02.2021) https://www.anemonhotels.com/oteller.aspx

American Society for Testing and Materials, (2022). *Search Designation, Keyword(s), Title.* Access Address (13.02.2021) https://compass.astm.org/

Auzair, S. (2011). The effect of business strategy and external environment on management control systems: a study of Malaysian hotels. *International Journal of Business and Social Science*, 2(13), 236-244. Access Address (12.12.2021) https://ijbssnet.com/journals/Vol._2_No._13_Special_Issue_July_2011/28.pdf

Aydoğdu, A. (2017). Efforts for classification-standardization in international hospitality management & ISO 18513:2003 terminology standard. *International Journal of Social Humanities Sciences Research (JSHSR)*, *4*(10), 281–294. Access Address (13.02.2021) https://doi.org/10.26450/jshsr.56

Başyiğit, C., Hanifi Alkayıs, M. & Kartli, M. I. (2021). Environmental effects of utilization of sustainable building materials. *Heritage and Sustainable Development, 3*(1), 64-70. Access Address (19.07.2021) https://doi.org/10.37868/hsd.v3i1.57

Bayır, E. (2020). Sağlık Yapılarında İç Mekân Bitirme Malzemesi Seçim Kriterleri. In M. Dal (Eds.) *Geçmişten Geleceğe Mimarlıkta Malzeme ve Yapı Fiziği,* Gece Kitaplığı. Access Address (26.05.2021) https://www.kobo.com/tr/tr/ebook/gecmsten-gelecege-mmarlkta-malzeme-ve-yap-fzg

British Standards Institution, (2022). *Advanced Search*. Access Address (13.02.2021) https://www.bsigroup.com/tr-TR/

Chen, H.-S. & Hsieh, T. (2011). An environmental performance assessment of the hotel industry using an ecological footprint. *Journal of Hospitality Management and Tourism*, *2*(1), 1–11. Access Address (20.05.2021) https://academicjournals.org/article/article1379503548_Chen%20and%20Hsieh%20pdf.pdf

Çiftçi, S. Y. (2021). *Material Selection Within The Scope of Ecological Architecture Place In Local Architecture; Traditional Urfa Houses.* (Master's thesis) İstanbul Kültür University, İstanbul,

Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (02.06.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Çizmecioğlu, Z. (2020). Çevreci yapıların tasarımında malzeme seçiminin önemi. In M. Talas, G. Aras (Eds.) 4. *International Congress on Architecture and Design* (pp. 46-53) Access Address (11.11.2021) https://www.researchgate.net/publication/357702410_4_ULUSLARARASI_MIMARLIK_VE_TASARIM_KONGRESI

Dedeman Hotels and Resorts. (2022). *Hotels*. Access Address (13.02.2021) https://www.dedeman.com/en/hotels

Divan. (2022). *Hotels.* Access Address (13.02.2021) https://www.divan.com.tr/otel

EkoYapı. (2013). *Turizm ve Sürdürülebilirlik*, Ekoyapı Ekolojik Yapı ve Yerleşimler Dergisi. Access Address (18.03.2021) https://www.ekoyapidergisi.org/269-turizm-ve-surdurulebilirlik.html

Elmas, B. (2008). *Analyzing The Factors That Affect Room Design In Chain Hotels (Instance Of Hilton).* (Master's thesis). Yıldız Technical University, İstanbul, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (05.05.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Ertaş, M., Can, B. K., Yeşilyurt, H., & Koçak, N. (2018). Evaluation of environmental sensitivity of hospitality industry within the scope of green star applications. *Journal of Travel and Hospitality Management,* 15(1), 102–119. Access Address (28.11.2021) https://doi.org/10.24010/soid.415349

European Standard. (2022). *Search Standards*. Access Address (13.02.2021) https://www.en-standard.eu/

Gamal Sahlol, D., Elbeltagi, E., Elzoughiby, M. & Abd Elrahman, M. (2021). Sustainable building materials assessment and selection using system dynamics, *Journal of Building Engineering, 35*. Access Address (28.11.2021) https://doi.org/10.1016/j.jobe.2020.101978.

Gökçe, Ş., Aytekin, O., Kuşan, H. & Zorluer, İ. (2017). Reflections of International Standards on the Turkish Standards of Sustainable Building Assessment Systems. In TMMOB (Eds.) *Uluslararası Katılımlı 7. İnşaat Yönetimi Kongresi*, (pp. 327–338). Erol Ofset. Access Address (11.11.2021) https://eski.imo.org.tr/resimler/ekutuphane/pdf/18201_15_01.pdf

Güleryüz, P. (2014). *Structure Biology In Terms Of Healty Building Spatial Qualities And Material Selection*. (Master's thesis) Mimar Sinan Fine Arts University, İstanbul, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (17.08.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Gültekin, A. B. (2006). *Proposal Of A Model For Assessment Of The Environmental Impacts Of Construction Products Within The Context Of Life Cycle Assessment Methodology.* (Ph.D. thesis) Gazi University, Ankara, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (23.04.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Güner, C. (2017). *A Research On Ecological And Sustainable Material Selection In Energy Efficient Design* (Master's thesis) Çukurova University, Adana, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (23.04.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Horne, R. (2009). Life cycle assessment: origins, principles, and context. In R. Horne, T. Grant, Karli Verghese (Eds.)*, Life Cycle Assessment- Principles, Practice, and Prospects* (pp. 1–8). CSIRO Publishing. Access Address (11.11.2021) https://doi.org/10.1111/j.1442-9993.2009.02049.

Hotels by Hilton. (2022). *Locations*. Access Address (13.02.2021) https://www.hilton.com/en/locations/?cid=OH,WW,EntNavLocations,MULTIPR,Tile,Home,SingleLink,i83120

ISO 19208. (2016). *Framework For Specifying Performance in Buildings.* ISO, I. Edition, Switzerland.

International Organization for Standardization. (2022). *Browse or search our catalogue*. Access Address (13.02.2021) https://www.iso.org/home.html

İpekçi, C. A., Coşkun, N. & Karadayı, T. T. (2017). The importance of recovered materials usage in terms of sustainability in construction sector *Journal of Tubav Science,* 10(2), 43-50. Access Address (28.11.2021). https://docplayer.biz.tr/139566807-Insaat-sektorunde-geri-kazanilmis-malzeme-kullaniminin-surdurulebilirlik-acisindan-onemi.html

Karaman Öztaş, S. (2014). *A Model Proposal For Life Cycle Impact Assessment For The Turkish Building Materials Sector* (Ph.D. thesis) İstanbul Technical University, İstanbul, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (23.04.2021) https://tez.yok.gov.tr/UlusalTez Merkezi/tezSorguSonucYeni.jsp

Karaman Oztas, S., Tanacan, L. & Oğuz, Z. (2017). A Comparative Analysis of Life Cycle Impact Assessment Methods for Building Materials. In A. Passer, K. Höfler, P. Maydl (Eds.) S*ustainable Building Conference (pp. 722-729).* Access Address (11.11.2021) https://openlib.tugraz.at/download.php?id=5624d3f3f2999&location=browse

Kaya, F. B. (2013). Sürdürülebilir Sağlıklı İç Mekân Tasarımı ve Sürdürülebilir Malzeme Seçimi. In C. Kurtay, İ. Ayçam, A. Sarıoğlugil (Eds.) *Akıllı ve Yeşil Binalar Kongresi ve Sergisi* (pp. 78–85). Ahmet Tayyar Vako Reklam Ajansı. Access Address (11.11.2021) https://doi.org/10.13140/RG.2.2.23946.82886

Khoshnava, S. M., Rostami, R., Mohamad Zin, R., Štreimikienė, D., Mardani, A. & Ismail, M. (2020). The role of green building materials in reducing environmental and human health impacts, *International Journal of Environmental Research and Public Health*, 17(7), 2589. Access Address (28.11.2021) https://doi: 10.3390/ijerph17072589

Koyaz, M. (2016). *Material Selection Tool In Building Element Design*. (Master's thesis) İstanbul Technical University, İstanbul, Türkiye. Accessed from Council of Higher Education Thesis Center. Access Address (23.04.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Kuo, N. W. & Chen, P. H. (2009). Quantifying energy use, carbon dioxide emission, and other environmental loads from island tourism based on a life cycle assessment approach. *Journal of Cleaner Production*. 17(15), 1324–1330. Access Address (27.01.2021) https://doi.org/10.1016/j.jclepro.2009.04.012

Mahmoudkelaye, S., Taghizade Azari, K., Pourvaziri, M. & Asadian, E. (2018). Sustainable material selection for building enclosure through ANP method, *Case Studies in Construction Materials, 9*. Access Address (23.12.2021) https://doi.org/10.1016/j.cscm.2018.e00200

Mevzuat Bilgi Sistemi. (2005). *Regulation on Certification and Qualifications of Tourism Facilities.* TC Cumhurbaşkanlığı Mevzuat Bilgi Sistemi. Access Address (13.02.2021) https://www.mevzuat.gov.tr/MevzuatMetin/3.5.20058948.pdf

Mevzuat Bilgi Sistemi. (2022). *Aranacak ifade, sayıyı yazınız*. Access Address (13.02.2021) https://www.mevzuat.gov.tr/

Minazzi, R. (2010). Hotel classification systems: a comparison of international case studies. *Acta Universitatis Danubius: Oeconomica. 6*(4), 64 – 86. Access Address (23.12.2021) https://www.academia.edu/1922797/Hotel_Classification_Systems_A_Comparison_of_International_Case_Studies

Nakhla, R. A. B. & Mossad, R. (2022). Sustainability standards and their impact on the interior design of green hotels. *Journal of Heritage and Design*, *2*(10), 396-416. Access Address (23.12.2021) https://jsos.journals.ekb.eg/article_214187_f953bf58cac2d775cd77c56f3f65b931.pdf

Ovalı, P. K., Çakır, H. K. & Atık, D. (2020). Evaluation Of Hotel Buildings By Users Within The Scope Of Environmental Sustainability (Edirne). In M. Özyavuz (Eds.) *Theory and Practice in Sustainable*

Planning and Design Planning, Design, Applications, Peter Lang. Access Address https://www.researchgate.net/publication/343655370_Evaluation_of_Hotel_Buildings_by_Users_within_the_Scope_of_Environmental_Sustainability_Edirne

Rahim A. A., Musa, S. N., Ramesh, S. & Lim, M. K. (2020). A systematic review on material selection methods. *Journal of Materials: Design and Applications*. *234*(7), 1032-1059. Access Address (23.12.2021) https://doi.org/10.1177/1464420720916765

T.C. Kültür ve Turizm Bakanlığı Belgeli Konaklama Tesisleri. (2021). Access Address (13.02.2021) https://ktb.gov.tr/genel/searchhotel.aspx?lang=tr&certificateType=4

Toydemir, N., Gürdal, E. & Tanaçan L. (Eds.) (2000). *Yapı elemanı tasarımında malzeme*, İstanbul: Literatür Yayıncılık.

Türk Standartları Enstitüsü. (2022). *Size nasıl yardımcı olabiliriz?* Access Address (24.02.2021) https://www.tse.org.tr/

Tufan, M. Z. & Özel, C. (2018). Sustainability concept and sustainability criteria for construction materials. *International Journal of Sustainable Engineering and Technology*. 2(1), 9–13. Access Address (23.12.2021) https://dergipark.org.tr/tr/download/article-file/526933

Tuna Taygun, G. (2005). *A Model For Life Cycle Assessment Of Building Materials* (Ph.D. thesis) Yıldız Technical University, İstanbul, Türkiye. Accessed from Council of Higher Education Thesis Center. Access adress (23.04.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

TS 825. (2013). *Binalarda Isı Yalıtım Kuralları*, TSE, I. Edition, Ankara.

Türkmen Bayraktar, F. (2010). *A Proposal Of Building Material Life Cycle Assessment System For Turkey.* (Master's thesis) İstanbul Technical University, İstanbul, Türkiye. Accessed from Council of Higher Education Thesis Center. Access adress (22.05.2021) https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Vatan, A. & Poyraz, M. (2016). How to create a sustainable hotel? *Çatalhöyük International Journal of Tourism and Social Research*, *1*, 15–30. Access Address (23.12.2021) https://dergipark.org.tr/tr/download/article-file/1673221

World Tourism Organization. (2015). *Hotel Classification Systems: Recurrence Of Criteria In 4 and 5 Stars Hotels*, UNWTO. Access adress (20.01.2021) https://www.e-unwto.org/doi/pdf/10.18111/9789284416646

Wyndham Hotels and Resorts. (2022). *Book.* Access adress (22.05.2021) https://www.wyndhamhotels.com/