

Exploring the Role of Vernacular Architectural Criteria in Providing Urban Resiliency: A Focus on Graduate Architecture Education

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Abstract

Architecture is a platform that embraces environmentally friendly design principles and fosters collaboration. Future architecture students and graduates require new skills to address changing environmental conditions and climate changes. Buildings play a crucial role in environmental conditions, urban development, and the well-being of users. Architects have a responsibility to design safe and resilient buildings for sustainable cities. This study discusses the importance of sustainability awareness in architectural education and shares the results of the graduate course "Sustainability and Materials in Architecture." It emphasizes the role of buildings in addressing natural and urban challenges. The course outcomes showed that sustainable development goals can be achieved by drawing insights from vernacular architecture. Through such curricula, young architects can enhance their ability to design buildings and settlements that withstand natural disasters like earthquakes, floods, and landslides.

Keywords: Architectural education, sustainable development, urban resilience, sustainable design, vernacular architecture.

Kentsel Dayanıklılığı Sağlamak için Yöresel Mimarlığı Keşfetmek: Mimarlık Eğitiminde bir Deneme

Öz

Mimarlık, sürdürülebilir tasarım ilkelerini benimseyen ve iş birliği içinde çalışabilen bir platformdur. Gelecekteki mimarlık öğrencileri ve mezunları, değişen çevresel koşullar, iklim değişiklikleriyle yüzleşerek yeni beceri ve perspektiflere ihtiyaç duyacaktır. Binalar, sadece çevresel koşullar ve kentsel gelişim açısından değil, aynı zamanda kullanıcıların sağlık, refah, güvenlik, konfor ve yaşam kalitesi üzerinde de önemli bir rol oynamaktadır. Bunlarla birlikte dayanıklı kentler yaratmaya yönelik güvenli binalar tasarlamak da mimarların sorumluluğundadır. Bu çalışmada, mimarlık eğitiminde sürdürülebilirlik farkındalığının önemi ele alınmış ve "Mimarlıkta Sürdürülebilirlik ve Malzemeler" adlı lisansüstü dersinin sonuçları paylaşılmış, binaların doğal ve kentsel zorluklarla başa çıkma sürecindeki rolü üzerinde durulmuştur. Ders kapsamında hazırlanan öğrenci çalışmalarından elde edilen sonuçlar karşılaştırılarak dersin beklenen kazanımları değerlendirilmiştir. Sonuç olarak sürdürülebilir kalkınma hedeflerine yönelik mimari katkıların yöresel mimarlık kriterlerinden çıkarımlar yapılarak elde edilebileceği belirlenmiştir. Bu tür müfredatlar sayesinde, genç mimarlar deprem, sel, toprak kayması gibi doğal afetlere dayanıklı yapılar ve yerleşimler tasarlamada yetkinliklerini geliştirebilirler.

Anahtar Kelimeler: Mimarlık eğitimi, sürdürülebilir gelişme, kentsel dayanım, sürdürülebilir tasarım, yöresel mimari.

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1. Introduction

Architecture is in a favorable position to embrace and uphold fundamental principles of environmentally friendly design while also promoting collaboration and coordination across various fields of study. Over the next decades, architecture students and graduates will encounter a transformed climate during their professional peak. The changing environmental conditions will introduce novel codes and practices, some of which are unforeseeable. As a result, these future professionals will require fresh skills and perspectives to adjust and innovate in conjunction with other subject areas and disciplines. Yet, it cannot be denied that buildings play a substantial role not only in sustainable urban development and changing environmental conditions, but also in impacting the health, well-being, comfort, and quality of life of their occupants or users. Consequently, there is a compelling case for meticulously designing curricula that prioritize tackling these critical challenges.

On the other hand, due to the constraints posed by an undergraduate architecture degree program, many undergraduates might embrace the opportunity to engage in graduate studies focused on sustainability. It is widely agreed that the current four-year undergraduate Bachelor of Architecture programs in Türkiye do not offer sufficient time for a thorough exploration of sustainability and the concepts it involves, such as resiliency, livability, inclusiveness, etc. Consequently, there is a recognized desire, both nationally and internationally, for specialized graduate programs in sustainability and graduate program curricula enriched with sustainability-themed courses which would also open up advanced research prospects for faculty members in this field (NAAB 2009; MIAK 2023; RIBA 2011; UNESCO-UIA 2017).

In a country where a significant portion of its lands are located in a high earthquake risk zone and frequently facing the impacts of the climate crisis, such as flooding caused by heavy rainfall, and especially in a country dealing with rapid and uncontrolled urbanization, the ways of building structures that harmonize with both humans and nature should be strictly taken into consideration. Emekci (2021), presented her findings regarding how sustainability can be applied in this environment-friendly building process and emphasized the significance of architectural design in this context. Considering our country's environmental conditions, the threats it faces and the necessity of taking sustainability criteria into account in the construction process, it is understood that addressing the concepts of sustainable urban development and urban resilience in architectural programs is inevitable.

Being aware of all these, within the scope of this study, the outcomes of the graduate course named "Sustainability and Materials in Architecture" will be shared and evaluated. The fundamental aim of this course is to support students in developing themselves as environmentally conscious architects via assessing the sustainability of architectural designs and their implementation, with a particular focus on the role of building materials in ensuring amid many natural and urban challenges like earthquakes, global warming, and climate change challenges. To achieve this goal, each term, students are expected to engage in discussions related to sustainability, livability, and resilience in architectural and urban terms within different scenarios. They are expected to offer some solution proposals for the given urban and environmental problems.

This study's material consists of the outputs from two different group projects conducted during the 2022-23 fall semester within the graduate course mentioned above. As a starting point, the challenges presented to the students during that specific term and the reasons for selecting them are explained. Subsequently, the conceptual tools the students were briefed, and they should employ in their quest for solutions are described. Finally, the proposed solutions developed by the groups for the selected case studies are presented, followed by a comparative analysis to evaluate the extent to which the students utilized the provided tools and the maturity of their proposed solutions.

In the results and discussion section of the study, a comparative assessment is made between the covered course and student works and a brief discussion about the outcomes are made. The conclusion of the study offers suggestions for how curricula in architecture programs can be developed to increase awareness about essential topics such as sustainable development, urban challenges, natural hazards, and urban resiliency, all of which hold significant positions on the global agenda.

2. Materials and Methods

This study uses proceedings from a graduate course mentioned above held at Bursa Uludag University, Institute of Science and Technology, Architectural Program. During the 2022-23 fall semester, the aim of the course was to develop proposals from an architectural perspective for enhancing the urban resilience capacity of a vulnerable residential area against natural disasters. The selection of the specific vulnerable residential area and the type of natural disaster was left to the students, and they were expected to explain their choices along with the reasons behind them. To guide the students in the process of developing their proposals and to support them in establishing a theoretical background, they were asked to conduct research on the topics of SDG 2030 and vernacular architecture for sustainability. The idea was for them to benefit from the information they gathered during this research to come up with suitable recommendations.

Before proceeding to examine the students' studies, it would be appropriate to briefly explain the reasons for choosing these research topics. The Sustainable Development Goals (SDGs) represent a global initiative aimed at eliminating poverty, safeguarding the environment, and fostering peaceful and prosperous lives for everyone. These goals proposed by UNDP, serve as a framework to identify challenges, and devise appropriate solutions. The objectives and stages of the process are interconnected and should be pursued collectively. The 17 Sustainable Development Goals (SDGs), which encompass ecological, economic, and social aspects of sustainability, have been implemented worldwide.

In Türkiye, these objectives, which are sought to be achieved in various theoretical and applied studies across different fields, are increasingly taken into consideration in academic research and architectural education. In this context, the content, meaning, and examples of implementations have been examined within the scope of the mentioned course. Initially, students were asked to explore the relationship between these objectives and the discipline of architecture. Furthermore, they were expected to develop proposals that were capable of realizing these objectives within the context of the built and natural environment. In this way, it is believed that young architects' awareness of both sustainable development discourse and the multidimensional nature of architecture is enhanced.

On the other hand, vernacular resources and building systems encompass a variety of accessible materials and techniques utilized in traditional buildings worldwide. Familiarizing students with these resources allow them to gain insights into the technical, cultural, and environmental aspects shaping the building practices. Latter & Oliver (1997-2004) state that, having an understanding of how space is utilized in particular cultural settings and recognizing the connection between vernacular architectural traditions and the preservation of regional identity will contribute to promoting sensitive and sustainable development amid the rise of globalization.

The instructors who share the same perspective consistently include references to the vernacular architecture literature in the course. Within the scope of this paper, the semester when the evaluated studies were conducted, the VerSus (Vernacular Heritage Sustainable Architecture) project was mentioned. It is a European research project developed from 2012 to 2014, in the framework of the Culture 2007-2013 programme. VerSus, led by ESG/Escola Superior Gallaecia in Portugal, focuses on the concept of local sustainability.

The primary objective of the project is to explore innovative ways of implementing these findings into modern sustainable architecture, drawing inspiration from fundamental principles of vernacular architecture. By aligning with the defined principles (Figure 2) of the project, various research and studies were analyzed and supplemented with relevant examples. The impact of these principles on sustainable architecture was thoroughly investigated (Versus, 2017).

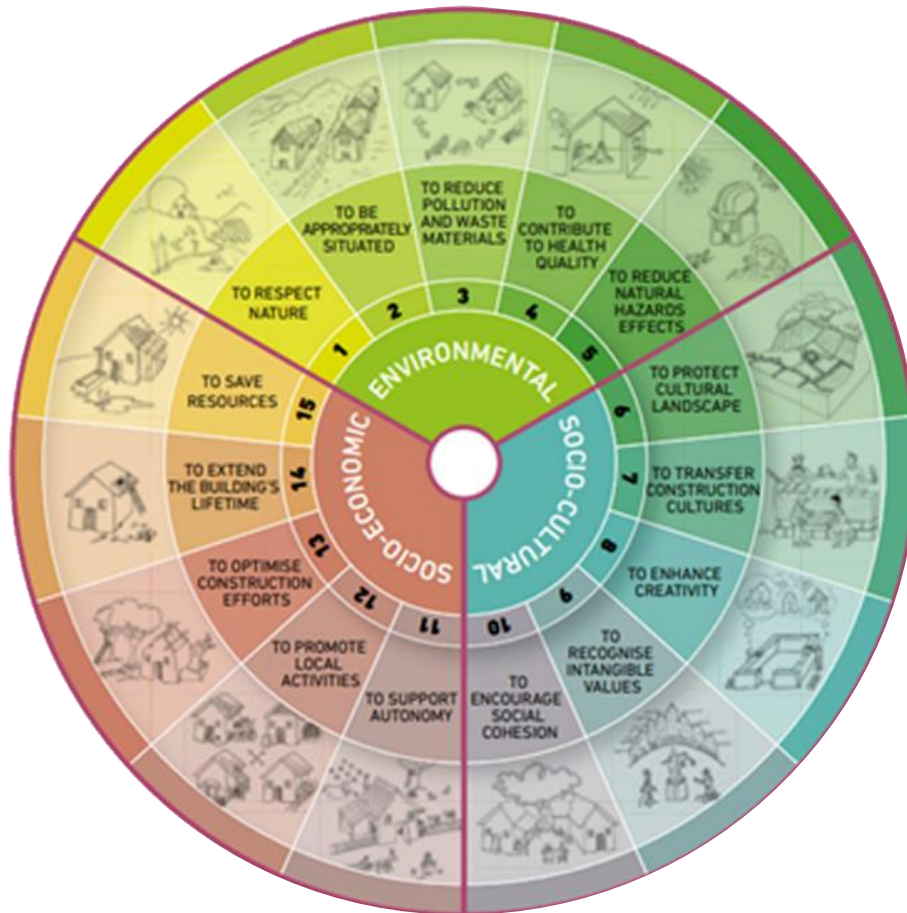


Figure 1. Environmental, socio-cultural, and socio-economic sustainable principles (Correia, Dipasquale & Mecca, 2014)

The VerSus Principles are classified as environmental, socio-cultural, and socio-economic. It consists of a total of 15 principles (Figure 1).



Environmental sustainability principles: Respect for nature, appropriate location, reducing pollution and waste materials, contributing to the quality of health, and reducing the effects of natural hazards.

Socio-cultural sustainable principles: Protecting the cultural landscape, transferring construction cultures, increasing creativity, recognizing spiritual values, and promoting social cohesion.

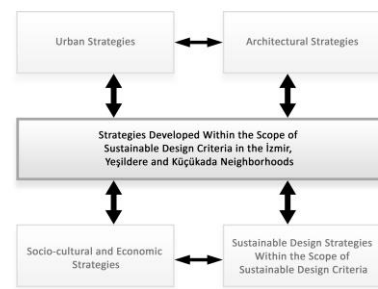
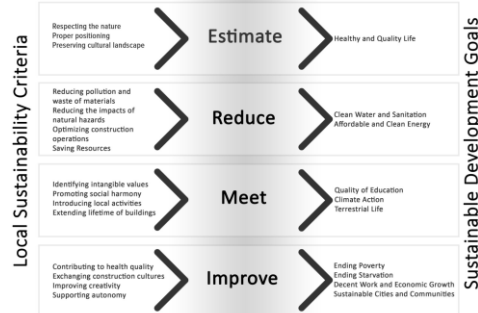
Socio-economic sustainable principles: Supporting autonomy, supporting local activities, optimizing construction work, prolonging the life of the building, and conserving resources.

Following their research on these two topics, the students identified the vulnerable residential areas in which they carried out their studies and the environmental threats faced by these areas. Both teams decided to focus their studies on informal settlements (squatter areas) located near city centers of big cities in our country. Their reasons for choosing squatter areas are as follows: Nowadays, a considerable number of people, particularly in low- and middle-income countries, reside in urban areas and mostly in informal settlements. Informal settlements refer to substandard housing constructed outside of official regulations and laws. These settlements often lack access to mains water, adequate infrastructure for sanitation, drainage, and utilities. Another characteristic of these areas is that they are located in regions of the city that are vulnerable to natural hazards, such as being close to riverbeds, on steep slopes, or in soft-soil wetlands with low earthquake resistance. Such areas are constantly at risk of natural disasters, including floods, landslides, and earthquakes. Here, we provide a comparative summary and analysis of studies conducted by two distinct groups, Team A and Team B (Table 1).

Table 1. Comparison of the main points in case studies of Team A and Team B

	TEAM A	TEAM B
Case study Area Preference and its visual presentation	Alacahırka Neighborhood in Bursa 	Yeşildere and Küçükada Neighborhoods in İzmir 
The main characteristic of the preferred city	4 th most populated city in Turkey. rapid and unplanned urbanization, migration, an industry city	3 rd most populated city in Turkey. rapid and unplanned urbanization, migration, a port city
Type of the Residential area	Squatter settlement located near the city center	Squatter settlement located near the city center
Natural Characteristics of the area	Steep terrain, around riverbeds, low earthquake resistance	Steep terrain, around riverbeds, low earthquake resistance
Socio-cultural characteristics of the area	An area experiencing internal migration	An area experiencing internal migration
Natural threads	Earthquake, flood, landslide	Earthquake, flood, landslide
Analysis techniques	Archival, literature, on-site observations	Archival, literature
Synthesis Presentation	SWOT Analysis table, layout, and section graphics of the area	SWOT Analysis table, layout, and section graphics of the area
Theoretical Framework	Estimate, Reduce, Meet, and Improve are four main headings determined through the correlation of SDGs and sustainability criteria included in the VerSus project. The proposals were developed under these headings.	Sustainability criteria included in the VerSus project are evaluated and the proposals were developed in four headings, two of which are urban scale and architectural scale, the other two of which are socio-cultural and socio-economic context, and sustainable design context

Theoretical Framework Scheme



Team A case study, Phase I: Alacahırka Neighborhood, Bursa Current Situation Analysis

Team A chose to undertake research on a squatter settlement in Bursa. Bursa, being the fourth largest city in Turkey in terms of population, has been experiencing rapid industrialization and urbanization for many years, leading to numerous unplanned settlements. Due to this aspect, Bursa, which hosts vulnerable living areas and residents, has been considered a suitable choice for the brief of the course being presented in this study.

The preferred squatter settlement in Bursa is Alacahırka Neighborhood. This settlement is established at the foothills of Uludağ and is bounded by the Cilimböz stream, which is one of the city's two natural

thresholds in the south-north direction. Over time, it has spread towards the Hisar region, which is one of the city's first settlement areas and has developed a close relationship with the city center.

Alacahırka, one of the unplanned settlements that began to surround the outskirts of the city due to the rapid growth of the textile industry and later the automotive industry and increasing migration in Bursa, forms a settlement line on the slopes of Uludağ together with other neighboring squatter neighborhoods.

While evaluating the urban and environmental problems faced by the selected area, the team conducted a comprehensive literature and archive analysis (Çalışkan & Akbulak, 2010; Kaplanoğlu, 2014), as well as held a meeting with the neighborhood headman. Interpreting the data they gathered through a SWOT analysis, the team members prioritized utilizing vernacular architecture features to improve identified weaknesses and mitigate threats, and based on this, they developed recommendations.

In their report, Team A stated that the residential properties in Alacahırka exhibit similarities to the housing construction culture of the migrant residents' places of origin. Although they didn't provide a reference directly confirming this observation, it is believed that some clues were obtained from the meeting with the neighborhood headman and the synthesis of the students' observations based on their knowledge about traditional Turkish house construction and material characteristics.

During the investigation of the natural threats faced by the study area, Team A, who utilized the works of Bursa Metropolitan Municipality and relevant literature, has determined that Alacahırka and its surroundings, like a significant part of Bursa, are at risk in terms of seismicity. Although a major earthquake has not occurred in Bursa in recent years, it is known from historical sources that the city center and its surroundings have experienced devastating earthquakes causing significant destruction and loss of life. Another threat faced by the area is flash floods caused by the increasing heavy rainfall due to climate change in recent years. The proximity of the area to Cilimboz Stream plays a significant role in these flash floods, and the most severe one occurred in October 2010. The neighborhood has faced significant economic, social, and environmental challenges because of this disaster. Unplanned and irregular settlements, the presence of excessive rainwater and surface runoff, the lack of a proper rainwater collection system, the prevalence of extensive concrete surfaces without permeable soil, and the inadequacy of existing rainwater management systems were the reasons. From the report titled "Sustainable Energy and Climate Change Adaptation" prepared by Bursa Metropolitan Municipality, the team learned that the slopes of Uludag have been experiencing severe climatic impacts. Over the past two decades, the air temperature has risen by 0.5 degrees due to factors such as uncontrolled urbanization, reduction in green spaces, expansion of industrial activities, excessive development, increased construction projects, and a growing population due to migration (BUSECAP, 2017).

Team B case study, phase i: Yesildere/ Kucukada Neighborhoods, Izmir Current Situation Analysis

Team B chose to undertake research on a squatter settlement in İzmir. İzmir, being the third largest city in Turkey in terms of population, has been experiencing rapid urbanization for many years, due to its being an important port and coastal city opening to the Aegean Sea, and offering numerous opportunities. Since the early years of the Republic, İzmir has been subjected to the second highest migration rate after Istanbul for many years, resulting in the presence of unplanned and unhealthy residential areas. Due to this aspect, İzmir, which hosts vulnerable living areas and residents, has been considered a suitable choice for the brief of the course being presented in this study.

The preferred squatter settlement in İzmir is spread across two different neighborhoods which are located on each side of Meles Stream. These neighborhoods are Yeşildere and Küçükada, which are only 2 kilometers from the city center. Due to the leather factories and other industrial establishments established around the Meles Stream, Yeşildere became a region where the workers set up their squatters (Kaya, 2020).

The team conducted a comprehensive literature and archive analysis while evaluating the urban and environmental problems faced by the selected area. They could not make interviews since they didn't

go to İzmir. Interpreting the data they gathered through a SWOT analysis, the team members prioritized utilizing vernacular architecture features to improve identified weaknesses and mitigate threats, and based on this, they developed recommendations in four different scales they determined.

In their report, Team B stated that the geographical structure of İzmir is shaped by the alluvial deposits surrounding the inner gulf, and as a result of the settlement pattern established on slopes, the city experiences natural disasters such as landslides and floods in various parts (Egetelgraf, 2021). In 2014, a considerable number of houses were destroyed in a landslide in case study areas. They used both literature and media news as sources (Versus, 2017; Aslan, 1978). On the other hand, the region, being one of the earthquake-prone areas in İzmir, is constantly under the threat of earthquakes. They also put stress on the security problems caused by vacant industrial facilities.

The students have emphasized that the settlements are located in a very steep and unplanned area, and they have also highlighted that the residences do not provide a safe and healthy living environment. However, they have not made any comments related to vernacular architecture. However, unlike Team A, they have not made any comments related to vernacular architecture. It is believed that this is due to the fact that the residential fabric in the case study areas is not characterized by local features of vernacular architecture but rather consists of hastily and inexpensively constructed, unhealthy housing structures.







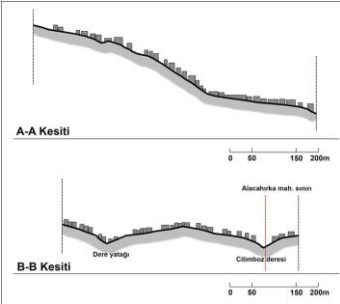
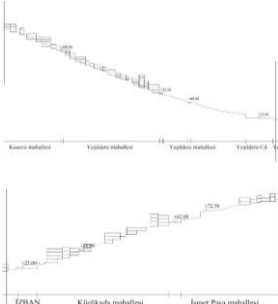

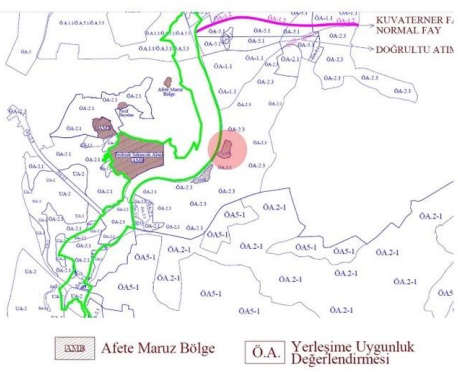
Team A and Team B have supported their findings expressed in their reports with visual representations provided in the table below (Table 2).

Both teams expressed their results with a SWOT Analysis, although it was not an obligation. They presented their proposals under some sub-headings they developed during their literature studies about the vernacular architecture and SDG2030 topics. While Team A presented a parallel evaluation with the VerSus criteria, Team B created a different set of criteria for sustainability and resilience and developed their proposals accordingly. The findings and proposals put forth by both teams are summarized below.

Team A indicated that the unplanned settlement's progress has led to numerous issues, particularly evident in areas with steep slopes. Certain zones lack vehicle access due to narrow streets and stairways, further exacerbating infrastructure shortcomings. The team thought that this lack of vehicle access could potentially hinder emergency responses during disasters such as earthquakes, fires, and floods. They also indicated that the lack of green areas is another important in terms of not only environmental but also social issues (Nevzat, 2013).

The most significant result highlighted by Team B's analyses was that the chosen area is an unhealthy and insecure region. The main reasons for these problems were identified as the major highway dividing the region, abandoned industrial structures, and the Meles Stream acting as a boundary within the area. In addition to the infrastructure inadequacy, the absence of open public spaces was considered a notable deficiency in a region dominated by a strong neighborhood culture.

Table 2. Visual representations of the findings of Team A and Team B

	TEAM A: Alacahırka, Bursa	TEAM B: Yeşildere and Küçükada, İzmir
Photos for introducing the area		
Photos for explaining the threats		
Environmental Analysis Sheets		
		
		

According to the evaluation results of team B, who work in the neighborhoods of İzmir, Yeşildere, and Küçükada, the strongest aspect of these squatter settlements is their proximity to the city center, similar to Alacahırka in Bursa. The weakest aspects are identified as the poor quality of housing and inadequate infrastructure. Additionally, the lack of efforts in rehabilitating the stream and leaving abandoned industrial structures untouched are mentioned as the most significant threats. It is stated

that the greatest opportunity that can be considered for the region is the location of the area along the İZBAN railway line and the main road that connects to Izmir Airport, providing connectivity to the city.

Team A Case study, Phase II: Proposals for Natural Hazard Resiliency of Alacahırka Neighborhood, Bursa

Team A offered their proposals for improving the resiliency of the squatter settlement they examined by using their theoretical framework (see Table 1). They integrated the sustainability criteria indicated in the VerSus Project (see Figure 1) and SDGs (SDG 2022-2023). Their proposals are grouped under four main actions that they indicated as *Estimate, Reduce, Meet, and Improve*. According to them, these are the main actions we can derive from vernacular architecture culture to meet the SDGs. Thus, they developed their proposals to improve the resiliency of their case study area against natural hazards it is threatened by, mostly earthquakes, floods, and landslides. The proposals can be summarized as follows in Table 3.

Table 3. The proposals of the Team A

ESTIMATE	REDUCE	MEET	IMPROVE
Respect nature and rehabilitate the riverside, develop a greenbelt alongside the river	Reduce pollution and waste; optimize the construction Works of the old building stock, improve the social services of the local municipality.	Meet the social needs; provide some meeting points for social activities, enable the residents to work for improving the environment, provide local support for social needs	Improve the houses; shield the buildings from the cold dry wind integrate the walls facing that direction into the slope or establishing buffer areas to obstruct the wind. Opt for a compact and clustered architectural layout, construct thick stone or earthen walls Mitigate the impact of summer heat by installing sun-shielding units on the western front. Design a green-filled patio or courtyard to counter the intensity of summer heat and drought. Incorporate a wind and snow-resistant roof. Implement systems that harness environmental resources
Respect topography and replan the urban texture of the area suitable for the landscape, offering a proper Street layout	Reduce the effects of natural hazards; design public open spaces via rehabilitating unused registered buildings. Demolish the residential buildings with landslide risk. Take control of the water resources	Meet the physical needs; develop the insufficient infrastructure and housing conditions considering local capabilities. Improve the organic texture of the settlement increasing its accessibility	Improve the Construction Culture; identify the buildings that are not resistant to earthquakes and are about to collapse, increase the use of local wooden construction systems for contributing to energy saving, ecological balance, and earthquake resistance
Respect the cultural landscape and let equal access for the residents for self-gardening	Save the resources; take control of the Cilimboz stream against floods, reinforce the buildings against earthquakes, use solar panels for heating and hot water, provide natural ventilation	Meet the economic needs; maintenance/ rehabilitation of the houses with local knowledge and local materials, improve the settlements shopping alternatives in walking distance, provide some local job opportunities	Improve the autonomy; utilize local opportunities to reduce socio-economic inequality, support local production, encourage the use of local resources, create employment in the region, establish collective production centers

Team B Case study, Phase II: Proposals for Natural Hazard Resiliency of Yesildere/ Kucukada Neighborhoods, Izmir

Team B offered their proposals for improving the resiliency of the squatter settlement they examined by using their theoretical framework (see Table 1). They used the VerSus Principles, which are classified as environmental, socio-cultural, and socio-economic (see Figure 1). They have approached the environmental context in two different scales, architectural and urban. They have considered the socio-economic and socio-cultural context together and have also developed recommendations for sustainable architectural design. They attempted to relate this final context to the SDGs. However, it can be said that Team B's conceptual framework is not fully matured at this point. Their proposals are grouped under four main sub-titles as *Urban Strategies*, *Architectural Strategies*, *Socio-cultural and Economic Strategies*, and *Sustainable Design Strategies*. Their objective is to improve the resilience of their case study area against natural hazards it is threatened by, mostly earthquakes, flood, and landslides via their strategy proposals. The proposals can be summarized as follows in Table 4.

Table 4 The proposals of the Team B

URBAN STRATEGIES	ARCHITECTURAL STRATEGIES	SOCIO-CULTURAL AND ECONOMIC STRATEGIES	SUSTAINABLE DESIGN STRATEGIES
<ul style="list-style-type: none"> - Demolish the already low-quality housing in the vicinity and relocate them away from the stream, -construct new houses in areas least affected by landslides and floods, - rehabilitate the stream and organize its surroundings as a green area by afforestation, -provide adaptive re-use of abandoned industrial structures for social and cultural activities. 	<ul style="list-style-type: none"> - construct new houses using local materials and traditional building systems, -incorporate measures for minimal resource use in their designs, - ensure high earthquake resistance in the design and construction of the houses, - provide natural ventilation and lighting, - implement climate control using local methods, - design the silhouette of the Yesildere avenue considering the strategic location of it, which passes through the settlement and connects the Airport to the city center, along with its impact on the city's image. 	<ul style="list-style-type: none"> -rehabilitate the stream and organize its surroundings as an open public space, thus, it will not only become an attraction point for this area but also for the entire city and the residents, - organize activities in this public space to bring the locals together and foster a sense of community, - Transforme the abandoned industrial facilities in the area into cultural centers to encourage the public to engage in social and cultural activities, -plan walking and cycling routes within the area to enhance its accessibility and recreational opportunities. 	<ul style="list-style-type: none"> -minimize environmental impact through the use of renewable energy sources, especially solar panels for heating and hot water - to develop various canal systems and collection ponds to utilize the slope of the terrain for rainwater storage. The collected water will be treated and planned to meet various irrigation needs in residential areas.

3. Findings and Discussion

A comparative analysis of the student work carried out within the scope of the graduate course "Sustainability and Materials in Architecture" 2022-23 Autumn Semester, which has content developed to raise awareness of sustainability, is presented in the upper section. Both evaluated studies are group work products. One of the groups (Team B) consists of students who started working immediately after four years of undergraduate architectural education and continued to work during their graduate studies. The other group (Team A) consists of students who have not started working yet. When the works of both groups are analyzed, there are two distinct differences. One of them is that Team A is more successful in creating the theoretical framework of their studies, and the second is that Team B is more successful in developing proposals.

Team A, by better analyzing the theoretical sources they examined within the scope of the course, successfully developed the theoretical framework they were expected to develop to be used in the report they prepared. In this framework, the concepts in the two main sources expected to be used were analyzed and integrated with sufficient maturity. As a result of this integration, the group identified four different analysis components, analyzed the case study area under these headings and presented their recommendations for the area to be more resilient against natural disasters by categorizing them under these headings. This success of Team A was attributed to the fact that the students started their master's degree right after their undergraduate education and that they adapted more easily to the theory-oriented structure of the master's degree while the knowledge and skills they acquired in the theoretical part of their undergraduate education were still fresh.

Although Team B did not develop a theoretical framework of sufficient maturity to be used in the analysis of their chosen case study, they conducted and presented their analyses using techniques similar to those of Team A. Although Team B examined the concepts in the two main sources they were expected to utilize in this study, they were not mature enough at this stage because they could not integrate them, synthesize them and develop a unique conceptual framework. On the other hand, the suggestions they developed for the sample area to be more resilient against natural disasters were developed by taking into consideration the location and environmental context of the sample area within the city and its unique characteristics. This careful approach of Team B in developing unique proposals was found successful. The fact that Team B members are involved in professional practice is thought to have increased their awareness of professional dynamics. Regardless of the scale, it is inevitable that studies conducted by sufficiently internalizing the site context will achieve more original and successful results.

Team A's recommendations draw a more general framework that can be evaluated in any squatter settlement. Team B's proposals offer more original solutions by taking into account the characteristics of the case study area they have chosen. However, both teams failed to demonstrate the expected maturity in their ability to use vernacular architecture criteria, which was expected of them within the scope of the study, to produce solutions to improve and make squatter settlements more resilient, which continue to show some similar characteristics today.

These outcomes highlight the need to provide students in a particular program with a variety of courses that promote sustainability awareness and can mutually enhance each other. In this way, students will have the opportunity to work on the subject for a longer period of time and evaluate different perspectives and develop their analysis and synthesis skills. One group of these courses should be related to vernacular architecture, while the other group should question the relationships between sustainable development and the discipline of architecture. As Ozorhon & Ozorhon (2020) point out, it is crucial to emphasize the significance of vernacular architecture in architectural education to foster awareness among students, as it plays a pivotal role in shaping future architectural environments. The researchers indicate that, contemporary and future architecture draws its foundation from historical origins and past knowledge. The evolution of the architectural profession, which has evolved alongside human development, is exemplified by its successful achievements. The primary challenge lies in comprehending the approaches and principles that have emerged through years of experience and integrating them into the present while aligning them with the realities of the current century (Ozorhon & Ozorhon, 2020). Correlating the principles of vernacular architecture with

the facts of the century may be possible via understanding the requirements of sustainable development. In envisioning a sustainable future, higher education plays a distinct role in fostering awareness of sustainability and simultaneously equipping future professionals for it. Sustainability encompasses matters that are central to architecture, and therefore, imparting sustainability awareness in architectural education is an extremely important necessity. Çalıkuşu (2019), in her detailed study about the sustainability awareness in architectural education, found out that sustainability should be more involved in architectural education both in undergraduate and graduate programs.

4. Conclusion and Suggestions

The need for raising sustainability awareness in architectural education is accepted by architecture schools in different parts of the world (Brogden, 2020; Salama, 2005; Stupar et al., 2018; Han & Kwon, 2019; Nyka, 2019) and by institutions evaluating and accrediting architectural education (NAAB, 2009; MIAK, 2023; RIBA, 2011; UNESCO-UIA, 2017). There are different opinions on whether the courses should be within the scope of undergraduate or graduate programs (Venkataraman, 2009; Altomonte et al., 2014; Lulo et al., 2012).

In this study, a course given within the scope of a graduate program and its outcomes are discussed. Sustainability awareness is addressed in the context of SDGs and its expansions, especially with the emphasis on "Natural hazard Resilience". Sustainable design is discussed in the context of vernacular architecture, which is at the core of architectural design and should continue to be. When the student works were evaluated, it was seen that a perspective that takes inspiration from vernacular architecture in the development of proposals to provide natural hazard resilience and associates them with sustainable development goals, which have a great place and importance in today's architectural discourse, encourages students to think critically in both subject areas and can support the development of analysis and synthesis skills.

Especially in a country like Türkiye, a large part of which is a first-degree earthquake zone, which faces risks such as landslides due to its rugged geography, and which is under the threat of disasters caused by unexpected climatic changes caused by the climate crisis as in many parts of the world, all relevant disciplines need to update and improve their education on sustainable development and its requirements. If the studies on developing resilient settlements against disasters such as earthquakes, floods, and landslides, which are discussed in this study, are addressed with sufficient weight within the discipline of architecture, more conscious architects can be trained.

In the study, inferences were made by evaluating the final products of only one course in one academic semester. In future studies, the final products of this course in different academic semesters can be evaluated, as well as the final products of different courses on the subject can be evaluated comparatively. In this way, steps can be taken to develop effective curricula to increase sustainability awareness in architectural education and to receive architectural contributions towards achieving the SDGs. With the gains to be obtained from these curricula, young architects will also improve themselves in designing structures and settlements that are resistant to earthquakes, floods, landslides, and similar natural disasters.

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