

- SUSTAINABLE FEATURES IN EDUCATION: *Ecological Retrofitting Of Existing Campuses*

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ABSTRACT

Retrofitting university campuses can be an effective strategy toward the realization of sustainability goals with maximum ecological and educational value. This paper focuses on Okan University's Tuzla Campus in Istanbul, which already has several sustainable features such as solar panels, electric vehicle charging stations, and green spaces. The paper proposes further enhancements through ecological retrofitting measures, including edible landscaping, rainwater harvesting, grey water recycling, natural ventilation, and waste management systems that will help in improving its environmental performance. These will serve to make the campus not only less environmentally intensive but also an interactive learning environment where sustainable practices are actively demonstrated and taught.

This research adopts the case study approach to study on-campus features, using site observation, document analysis, and secondary data as they are their alignment with the principles of sustainability. The proposed retrofits will discuss major weaknesses arising from such an analysis in terms of the underutilization of green spaces, inefficient systems for natural ventilation, and the lacking of a proper system for water and waste management. For instance, edible landscaping with native fruiting trees and herbs will increase biodiversity while providing hands-on learning experiences in sustainable agriculture. Retrofit the skylights with operable elements to enable improved air circulation, reducing demands for mechanical ventilation. Besides, a composting system would support compost for waste management and enrich this edible landscape.

This research underlines the fact that ecological retrofitting is not only a technical upgrade but also a transformative process in which sustainability is integrated into the ethos of educational institutions. Okan University can reduce resource inefficiencies and establish a culture of ecological awareness to become a model for sustainable campus design. Such retrofitting not only enhances environmental performance but also offers hands-on tools for sustainability education, ensuring long-term ecological benefits and preparedness by students to address global environmental challenges.

KEYWORDS:

Sustainable Educational Infrastructure, Ecological Campus Retrofitting, Strategic Interventions to Okan University to be Ecological.

I- INTRODUCTION

This article explores the role of ecological design in educational institutions, emphasizing the importance of integrating ecological design principles in existing campuses, bringing them in line with the current requirements of sustainability, with strategic interventions in the form of natural ventilation, natural lighting, edible landscape, rain water collection, grey water

recycling, and waste management, among other can be beneficial to existing and old campuses and set an example for sustainability while providing a healthier learning environment.

Educational buildings can act as vital exemplary model for sustainability, and according to the Directorate-General for Energy (2019) buildings are among the biggest contributors to carbon emissions in the world, with the entire building sector being responsible for 40% of Europe's energy demand & carbon emissions from fossil fuels. This study will demonstrate the potential of transforming these spaces to be more sustainable while serving as a model for future educational design.

The article examines Okan university in Istanbul as a case study. In campus sites, the prevailing current architectural and operational strategies will be analyzed, outlining the best practices and where further improvements are needed. Areas needing reforming will be identified for the end goal of recommending the development. This will help draw on best practices to create an actionable road map to improve the ecological performances of education buildings.

OVERVIEW AND SIGNIFICANCE

The building sector accounts for about 40% of total energy use and 36% of greenhouse gas emissions globally, hence it is of critical importance for solving environmental problems. These include educational buildings, which take up a large proportion of non-residential energy use, contributing almost 15% of the sector's total consumption (Ferdos, 2020).

As centers of learning and innovation, these institutions are uniquely positioned to lead the transition toward sustainability through both design and function. While designing new ecological campuses has gained attention, retrofitting existing educational buildings offers a more sustainable approach, since it leverages existing infrastructure and limits environmental costs of demolition and new construction. This is crucial since retrofitting not only helps reduce resource inefficiencies and energy consumption but also improves indoor environment quality, with direct benefits to students and educators, where ecological retrofitting aligns with international goals of sustainability to the specific dictates of the European Union's directives on nZEB. (Moazzen Ferdos, 2020)

Ecological features in campuses-like natural ventilation, rainwater harvesting, edible landscaping, and waste management systems-not only reduce the campus environmental footprint but also serve as visible interactive tools for sustainability education, important to environmental responsibility and to help nurture a culture of ecological awareness and stewardship, which makes retrofitting campuses stand as a testimony not only to the best practices of sustainability but also become dynamic learning environments that integrate ecological concepts into everyday experiences. (Riaz, Amina, Shahbaz, Asif, Mohsin and Irfan 2023)

This study emphasizes the transformation of existing campuses into ecological models and shows that retrofitting is not a mere technical upgrade; rather, it is an opportunity to embed sustainability into the ethos of educational institutions. Ecological retrofitting addresses the pressing environmental challenges and creates interactive learning environments, positioning educational campuses at the forefront of the global momentum into sustainability. This work shall, therefore, seek to bring to the fore the strategic value of retrofitting educational campuses to reduce environmental impact while improving resource efficiency. It also intends to suggest and evaluate ecological interventions such as rainwater harvesting, greywater recycling, edible landscaping, and waste management, considering their potential for increasing sustainability and transforming Okan University's Tuzla Campus into a model ecological campus. The study also highlights that these features serve the dual purpose of achieving sustainability goals and acting as interactive teaching tools in order to engage students and staff in the process of sustainability education. The final goal of this research is to develop actionable strategies that

can guide the transformation of existing campuses into exemplary models of ecological design and education.

PROBLEM STATEMENT

Achieving sustainable educational environments cannot rely only on designing new ecological campuses; retrofitting existing campuses is equally, if not more, important in this scop. Retrofitting considers the existing infrastructure for reduction in environmental impact, and beyond their environmental benefits, rainwater harvesting, water recycling, edible landscaping, and waste management systems are some of the very powerful teaching tools on campus that grow deeper understandings of sustainability with students and staff. Ecological retrofitting plays a dual role: enhancing campus sustainability and embedding sustainability education. In this way, ecological retrofitting represents one of the high-leverage strategies to transform campuses into inspiring examples of ecological responsibility and learning.

OBJECTIVE

The aim of this paper is to assess the current features of Okan University's Tuzla Campus in terms of ecology and sustainability and indicate further developments that should be done. These are to develop strategic ecological interventions, focusing on rainwater harvesting, edible landscaping, and grey water recycling, and waste management to then evaluate the potentials for enhancing environmental performances. Finally, the study will develop actionable strategies that meet the set sustainability goals while fostering interactive and educational learning environments.

METHODOLOGY

The research adopts a case study approach in which Okan University's Tuzla Campus is investigated. Data for the qualitative nature of analyzing the current architectural and operational strategies has been garnered through document analysis, site observation, and secondary data sources. The strengths and limitations of these features were reviewed in light of the major sustainability principles guiding resource efficiency, water conservation, waste management, and biodiversity and landscape enhancement. Best practices in ecological retrofitting have been identified to propose. Prioritizing recommendations based on feasibility, environmental impact, and educational function.

II- PRINCIPLES OF ECOLOGY AND SUSTAINABILITY IN EDUCATION

Ecological and sustainable principles integrated into educational campuses help in not only upgrading energy efficiency and resource management but also offer opportunities for practical learning among students. Main principles:

Natural Light and Ventilation: This would also reduce energy use and contribute to a healthier learning environment. For example, it has been proven that students who have adequate daytime lighting in classrooms perform better in mathematics and reading than those working in artificially lightened areas (Heschong et al., 2002). Conversely, natural ventilation enhances indoor air quality and thermal comfort, thereby contributing to an improvement in the students' concentration and overall health. Well-designed natural ventilation systems decrease the need for mechanical cooling, which results in lower energy consumption and operation costs of the buildings (Santamouris & Mumovic, 2018).

Rainwater Harvesting and Grey Water Recycling: Campus rainwater harvesting and greywater systems serve the goal of sustainability objectives through reducing the dependence on municipal water supplies, decreasing the amount of wastewater generated, and encouraging efficient resource use. Their on-campus installation also plays an educational role, enabling teaching among the students firsthand how to manage water in a sustainable manner. (Silva-Afonso & Pimentel-Rodrigues, 2023).

Edible Landscaping: Edible landscaping integrates food production into campus green spaces, thereby raising awareness about food security and creating space for sustainability education. These spaces can also improve biodiversity, reduce carbon footprints from food transport, and

teach students regarding sustainable agriculture and nutrition (Kortright & Wakefield, 2011). The campus will be a place for culture of environment and raise awareness through community engagements in food systems

Waste Management: Effective waste management systems contribute greatly to sustainability on academic campuses. Recycling, composting, and minimization of waste generated reduce the environmental impacts drastically and diminish the dependence on landfill facilities. Besides, a student gains important practical experience on resource use-related issues, stimulating them to act in a more sustainable way. (Bentil, Braimah, & Obeng, 2024).

There has also been the application of practices over sustainable transportation and energy efficiency, coupled with renewable sources of energy like solar panels and energy-efficient lighting systems, toward the reduction in carbon footprint within the academic institutions, other alternatives provide added convenience that includes sustainable transport options using bicycle-sharing schemes, provisions for charging points of electric vehicles, and improvements on public transport systems to allow environmental sustainability.

THE CONCEPT OF ECOLOGICAL RETROFITTING

Ecological retrofitting provides an upgrading of already existing buildings toward better environmental performance, such as energy efficiency, resource conservation, and occupants' wellbeing. The process generally entails the incorporation of renewable energy sources, improvement of insulation, and upgrading systems toward a low overall environmental impact.

Retrofitting is often more budget-friendly and less damaging to the environment than new construction. Retrofitting can emit 50–75% less carbon emissions than a newly constructed building. Besides, average energy performance from building reuse provides immediate impact reductions, while energy-efficient new constructions may take decades to offset the negative impacts created during the construction process. (American Institute of Architects [AIA], n.d.)

In conclusion, ecological retrofitting preserves buildings while aligning with sustainability objectives that minimize environmental footprints and provide economic benefits over new construction.

EDUCATIONAL VALUE OF SUSTAINABILITY AND ECOLOGICAL FEATURES

Incorporating sustainability and ecology into educational campuses provides students with life-operating laboratories of environmental understanding and application. Clearly, natural light and natural ventilation improve the efficiency in buildings and produce healthier and productive places of learning while exemplifying valuable design concepts for architecture. Rainwater collection and graywater reuse provide hands-on student activity with water management systems that bring theory into practical reality. Edible landscaping creates opportunities for learning about food systems, agriculture, and ecology and develops food security and care for the environment. moreover, programs involving waste management, such as recycling and composting, educate resource conservation and foster sustainable behaviors. These interventions not only support the institutional goals of sustainability but also enhance the educational experience, developing skills and insights that will be needed in solving global environmental problems.

III- CASE STUDY: OKAN UNIVERSITY

Okan University (figure 1) is one of the important campus universities, founded in 1999 in Tuzla, Istanbul, Turkey. It is a diverse academic ecosystem that contains 10 faculties, 3 institutes, 2 vocational schools, and 1 conservatory. Okan University offers a wide variety of programs to its students: 54 associate, 58 undergraduate, 82 graduate, and 19 doctoral programs. Today, it boasts an important international presence, hosting a total of 1,400 international students. With over a thousand academic staff members, the university maintains a very dynamic academic and research environment. Okan University is located in the fast-developing district of Tuzla, thus serving as a perfect subject to explore how the principles of sustainability

and ecology are incorporated into an academic setting, with extensive infrastructure to implement and analyze features of a sustainable campus. (www.okan.edu.tr)



Figure 1, Case study Okan campus, (www.okan.edu.tr)

Campus Plan and Typology

Okan University Campus (figure 2) also closely corresponds with the Town Plan Typology since the university layout includes multiple functional spaces connected by pathways and open areas. This plan typology has the incorporation of private and public spaces into its area. Its middle opens up as common spaces that would have a monument or other play areas; it provides focus points for socializing or entertainment.

In the figure below, academic buildings are colored in orange, including different faculties, while administrative buildings, student dormitories, and logistical units are colored in blue.



Figure 2. Satellite view of Okan University Campus. The campus layout showing academic buildings (shaded in orange), administrative units shaded in dark blue, and open green spaces. The light blue-shaded areas represent water bodies that can be integrated with sustainable water management practices such as and irrigation for edible landscapes. Google earth

CURRENT ECOLOGICAL FEATURES

The Tuzla campus of Okan University has a number of features related to ecology that concurrently show its commitment to sustainability and environmental responsibility. The university has obtained a carbon certificate for 64 tCO₂e during the 2023-2024 academic year. (okan.edu.tr)

Solar Panels:

Among its features that have greatly contributed to its energy efficiency is the widespread use of solar panels on the rooftops of its buildings (Figure 3). The panels can harness renewable energy from the sun in order to power parts of the university, hence reducing reliance on non-renewable energy sources and decreasing the carbon footprint from the institution.



Figure 3. Solar panel installation at Okan University. Okan university Instagram

Electric Car Charging Facilities:

Within the framework of Okan University's sustainability objectives, it has provided electric car charging facilities on campus (Figure 4). Such infrastructure supports the transition to electric vehicles among students and staff by offering them a chance to reduce the carbon footprint of their vehicles.

Green Landscapes:

This university has widespread green open spaces (Figure 5) comprising properly manicured gardens that add to the beauty of the campus and contribute much to biodiversity. They clean the air and help creating a suitable and pleasant environment for students to learn. However, these green spaces have not been utilized for edible landscaping despite the aesthetic and ecological value it provides. These could become sustainable food production areas, with the incorporation of edible plants, such as fruit trees or vegetable gardens, thereby enhancing food security and serving as a useful teaching aid for students in the application of sustainable agriculture and urban farming practices.



Figure 4. Electric vehicle charging station at Okan University. Photo taken by researcher



Figure 5. Green open spaces at Okan University.

Natural

Lighting and Natural Ventilation

There is an attempt to provide natural lighting in campus buildings (Figure 6) since features such as skylights and large atrium openings are part of the overall design. This diminishes the need for artificial lighting during the daytime, allowing energy efficiency to occur while being

a comfortable indoor climate for users. Yet, its current implementation is not very effective in gaining full advantages of natural lighting.

While allowing some daylight penetration, the design does not sufficiently light the interiors, particularly those areas that are distant from the direct sources. The result is a set of areas with very uneven conditions of lighting, which might impact energy efficiency and the overall indoor environment quality

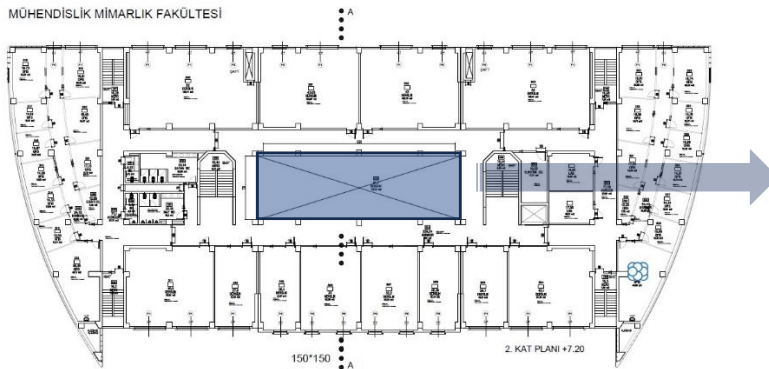


Figure 6- faculty of engineering with the skylight

Natural ventilation, as depicted in the diagram (Figure 7) -cross ventilation, chimney ventilation, and single-sided ventilation-is necessary for indoor air quality, especially in educational buildings where several people are accommodated for long periods of time. Although this skylight helps save energy through the reduction of artificial lighting, it is not enough to handle ventilation. There are no operable features in the design; hence, this skylight does not provide air movements or natural ventilation inside the building. Lack of a ventilation mechanism in this skylight reduces the ability of the building to adopt the chimney ventilation or cross ventilation technique, both of which require openings at higher elevations to vent the warm, stale air and bring in cooler, fresh air.

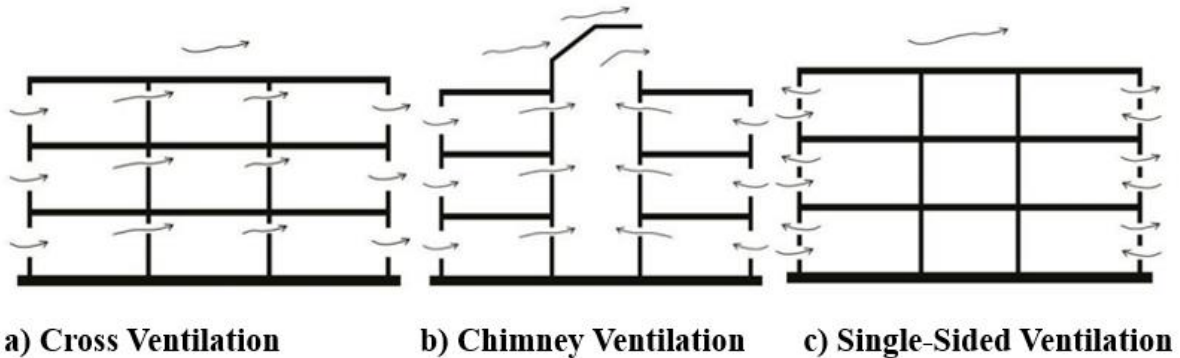


Figure 7: Types of natural ventilation mechanisms.

a) Cross ventilation, where air flows across a building due to openings on opposite sides.

b) Chimney ventilation, where warm air rises and exits through a vertical outlet, pulling in cooler air from below.

c) Single-sided ventilation, where air circulates through openings on one side of the building. (Fatma nur 2016)

Water Management

According to the university's website, there are some initiatives to sustainable water management, implementing strategies such as rainwater harvesting and greywater recycling to reduce water consumption to promote efficient water use, and although the university uses waste-water and rain collection, there is no set measurement, and despite this, current water management at campus is limited, where, for example, standard faucets are used at many locations. In a comparison with sensor-activated faucets which can prevent excessive amounts of water from being delivered through an unimpeded faucet. Unfortunately, such standard faucets lack these facets: no flow control and sensor activation, therefore allow water wastage because of unrestricted water flow (Figure 8)



Figure 8, Standard faucet in Okan University facilities.

Moreover, the toilets lack dual-flush reservoir systems that can help reduce water wastage. A dual-flush system is designed to offer low and high volumes of water for flushing; (figure 9) such a system saves up to 70% of water compared to the single-flush conventional toilet. In the absence of such mechanisms, the facility relies on inefficient flushing mechanisms that consume excess water irrespective of the requirement. (Fatma nur 2016)

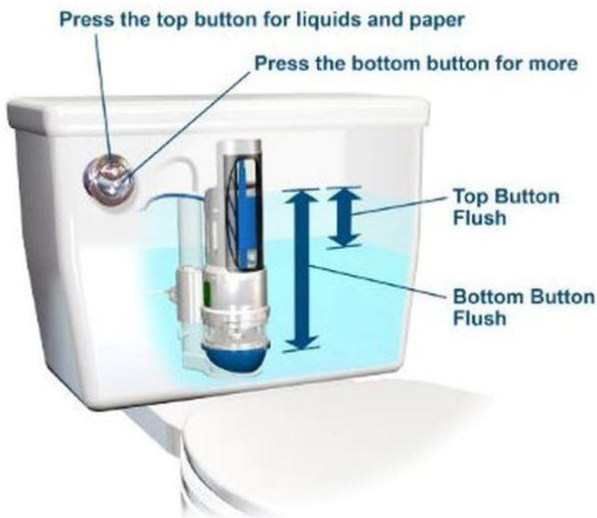


Figure 9. toilets with dual-flush reservoir systems

Although Okan University shows a promising attitude towards sustainability in almost all fields, there is not any concrete data regarding the campus's waste management practices. General trash bins are widely observed around the campus; (figure 10) these are not separated for recycling purposes. The lack of separation for waste suggests that opportunities in recycling and proper waste segregation are not being utilized fully.

Waste Management



figure 10. Waste Management Practices at Okan University.

Without a structured waste management system, the possibility that recyclable materials, like paper, plastic, and metals, are mixed with general waste reduces the resource recovery potential and increases the amount of waste sent to landfills. Setting up a system of clearly labeled, separate bins for recyclables, organics, and general waste would promote sustainability.

Moreover, there should be education and awareness campaigns regarding proper waste management among the students and staff in order to create a sustainable campus.

Figure 10 show photos taken by researcher from campus and shows how different types of waste is mixed together, hindering the ability for recycling and composting.

A complete SWOT analysis of Okan University was carried out with a critical evaluation of the ecological and sustainability performance. Such an analytical method is important in systematically establishing strengths, weaknesses to be overcome, opportunities which could be harnessed, and threats foreseen. The results obtained from this will be presented in the next section, forming a structured basis on which to develop appropriate strategies and recommendations that can be undertaken in advancing sustainability and ecological performances at the campus.

SWOT Analysis

Table 1, SWOT analysis.

S W O T ANALYSIS	
Strengths	
Sustainability Features	Implementing of solar panels on campus roofs, reducing reliance on non-renewable energy and lowering the carbon footprint. Electric car charging stations to help make transportation more sustainable. Green landscapes clean the air, enhance biodiversity, and provide a pleasant learning environment.
Natural Lighting	Skylights and Atriums reduce the dependence on artificial lighting, thus providing partial energy efficiency.
Water Management	Efforts such as rainwater harvesting and greywater recycling show commitment to sustainable water use.
Weaknesses	
Landscapes	Green spaces lack edible landscaping, which is a missed opportunity for sustainable food production and education on urban farming.
Natural Ventilation	- Skylights offer lighting without any operable elements that might provide ventilation. The indoor air quality is reduced with energy efficiency since chimney or cross ventilation is lacking.
Water Management	- Standard faucets and toilets without dual-flush systems lead to water wastage. - No measured outcomes from existing rainwater and grey water initiatives.
Opportunities	
Retrofitting	Skylights with effective natural ventilation systems are possible, through features like operable vent panels or automated openings that upgrade ventilation abilities.
Edible Landscaping	Food security awareness will be improved with the inclusion of fruit trees and vegetable gardens, and it will serve as a teaching tool in sustainable agriculture and urban farming.
Improved Water Systems	Sensor-activated faucets and dual-flush toilets can lessen water consumption by up to 70% and further reinforce sustainability goals.

S W O T ANALYSIS	
Enhanced Awareness	Special activities and educational campaigns on proper water use, waste management, and energy efficiency will further instill environmental responsibility among students and staff.
Threats	
Maintenance Costs	- Upgrading infrastructure (e.g., skylights, water systems, edible landscaping) requires financial investment and long-term maintenance.

DISCUSSION OF SWOT ANALYSIS

SWOT analysis (table 1) points out Okan University's effort and potential for an ecological, sustainable and functional campus environment but at the same time outlines some of its key weaknesses. Among its strong points, the University's layout follows the well-planned layout according to the Town Plan Typology with integrations of several functional spaces through open spaces and main cores, thus helping in social interaction and building up community spirit. This typology balances effectively between private and public, creating an inclusive and lively campus environment. Besides, ecological features like solar panels, electric car charging facilities, and green landscapes are the expression of the university's concern for sustainability and environmental responsibility.

On the other hand, weaknesses represent a serious shortage in fully realizing the potential of campus ecological status and sustainability. For example, the green landscapes add to biodiversity and aesthetic value, but the underutilization of these for edible landscaping is a missed opportunity to integrate sustainable food production and hands-on educational experiences for students in urban agriculture and sustainable farming. Similarly, while the features are available, they do not adequately optimize indoor light distribution; where operable skylights are lacking, effective natural ventilation can hardly be achieved. All these deficiencies diminish energy efficiency and indoor air quality to a large extent, which is highly undesirable, particularly in those spaces shared for extended periods by big groups, such as classrooms.

The identified opportunities outline very clearly the way forward in achieving improvement. Retrofitting skylights with operable features, such as vent panels or automated openings, can enable natural ventilation, leveraging the chimney effect to improve airflow and reduce reliance on mechanical ventilation systems. This will help to turn green spaces into sustainable food production areas while raising the ecological bar on campus, thereby serving as an exemplary tool for the learning experience among students. Retrofitting's of water systems to include sensor-activated faucets and dual-flush toilets will make reasonable water consumption a guarantee. This way, the campus will be closer to reaching its sustainability goals. This helps in conserving not only the environment but also in the learning process on sustainable practices among students and staff through experiences.

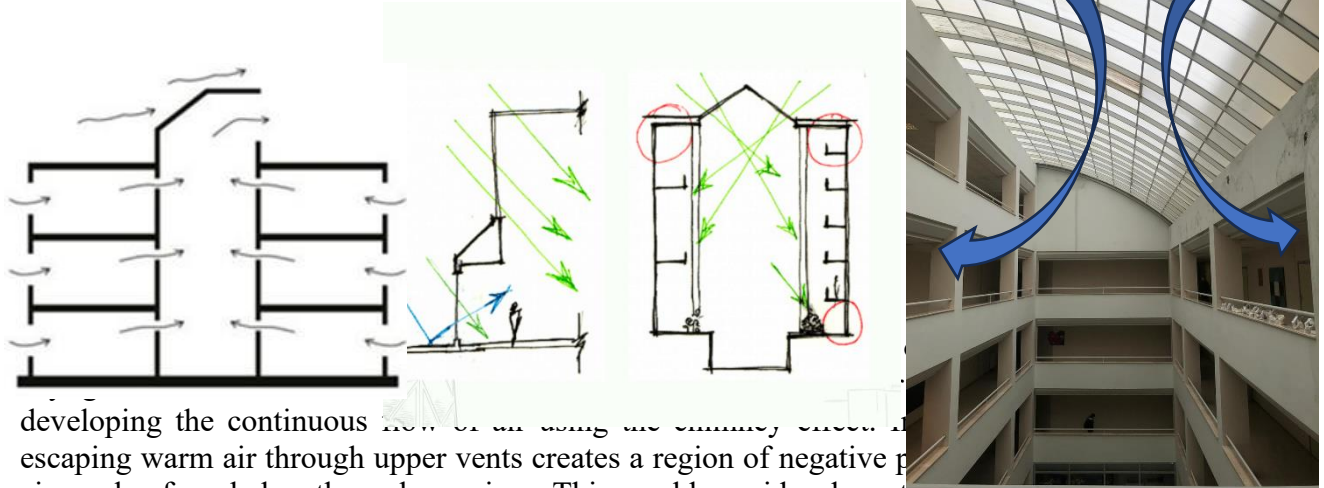
Against all these strengths and opportunities exist a few threats that would have to be taken up. There will be economic costs to retrofit the infrastructure, install new systems, and sustain such initiatives. Furthermore, behavioral change among the campus users will also need nurturing. A key part of it would relate to creating awareness and educating on issues related to sustainability for better use and maintenance of upgraded systems, whether waste segregation, water-saving processes, or energy efficiency.

While Okan University did a good job in building a sustainable campus, a lot of things are underdeveloped. By addressing these weaknesses and seizing the opportunities, the university can also improve its ecological features and position itself as a model of sustainability and environmental education for others to follow.

PROPOSED RETROFITTING

Natural lighting and ventilation

In the current state, natural lighting and ventilation have some limitations within the existing atrium structure; hence, several retrofitting techniques are proposed to enhance both energy efficiency and occupant comfort (Figure 11).



developing the continuous flow of air using the chimney effect. As escaping warm air through upper vents creates a region of negative pressure, cooler air flows in from below through openings. This would provide adequate circulation of air within the atrium.

Figure 11 proposing adding operable openings at the top of the skylight

In order to enhance the sustainability and comfort of the building, retrofitting the skylight with operable elements such as vent panels or automated openings can provide effective natural ventilation. This will enable the structure to take advantage of the chimney effect, improving airflow and minimizing the need for mechanical ventilation systems. Eliminating this shortcoming will also help in improving air quality inside the building and will keep the design of the building in tune with sustainability concerns.

An example of such an operable skylight system suitable for such applications is the Model HL-FF. (figure 12) This skylight is fabricated with a corrosion-resistant aluminum curb frame 6063-T5 alloy, has heliarc-welded corners for added strength, and incorporates sealed double or triple acrylic domes in various color choices of clear, white, or bronze, for improved thermal insulation. This series features an extruded vinyl thermal break that minimizes heat transfer between the interior and exterior. Fully operable up to 70 degrees, gas springs enable smooth, controlled opening and closing; a handle and latch bolt system assures secure manual operation. An 8-degree sloped condensation gutter is integrated into the skylight for effective drainage that reduces moisture buildup while preserving energy efficiency through airtight seals. Series include those for low-slope roofs, curb mounting with flashing, and greatly enhance natural lighting and ventilation in retrofitted educational buildings. Custom options include a number of different sizes and dome colors to accommodate a wide range of structural and aesthetic needs.

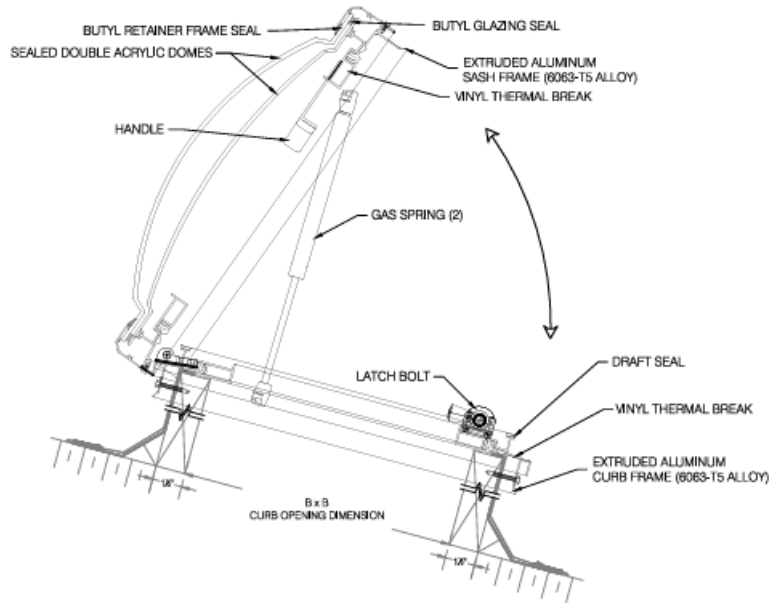


figure 12. Design Details of an Operable Skylight System. www.arcad.com.

Proposed Edible Landscaping And Water Management

The green shaded zones in Figure 13, are suggested to be designated for edible landscaping at Okan University, by integrating fruit-bearing trees, vegetable gardens, and herb beds into the landscape. This will enhance the ecological value of the campus and contribute to food security and serve as a practical learning environment for students in sustainable agriculture and urban farming.

These areas being close to the body of water (shaded blue in figure 13) makes it useful for irrigation purposes. Collected rainwater or greywater can be used for these edible landscapes, lowering the demand for external water supplies aligning with sustainable water management principles. Integrating this system with efficient irrigation techniques such as drip irrigation would further optimize water use.



Figure 13, satellite view of okan campus with water and plantation areas shaded

Improving ecological and educational value using native fruiting tree and herb in edible landscaping. The plants to be introduced to support biodiversity and sustainability include Common Fig, (*Ficus carica*), pomegranate (*Punica granatum*), olive (*Olea europaea*), cherry (*Prunus avium*), and grapevine (*Vitis vinifera*). These species are appropriate to the temperate climate of Tuzla and can be planted in strategic relation to pathways, courtyards, and seating areas, providing shade spaces and edible produce. Herb plantings such as thyme (*Thymus vulgaris*), oregano (*Origanum vulgare*), mint (*Mentha* spp.), and sage (*Salvia officinalis*) can be added to the groundcover and herb gardens for additional culinary and aromatic values. This edible landscape will minimize water and maintenance, enhance biodiversity, and function as a living laboratory for sustainability education, reflecting the agricultural heritage of Turkey. (figure 14) (PictureThisAI, 2024).



Figure 14, fruiting plants native to tuzla

Proposed Composting system for Waste Management and Edible Landscaping

Establishing a composting system on campus, one that can be seen by students, can serve three major purposes, first, improving the waste management on campus, and second, providing support to the edible landscapes. Organic waste, such as food and green waste from gardens, may be composted into nutrient-rich organic fertilizer, which can be applied back to nourish the edible plants in a full circle that will benefit both in waste reduction and soil health.

Thirdly, composting will be serving many purposes: it will help reduce the volume of wastes, enhance soil for plantations including edible landscapes, serve as a practical learning environment for students concerning waste management and sustainable agriculture, and can also cut costs on chemical fertilizers.

The proposed composting method presented here consists of three bins (figure 13) one for effectively handling each one of the three critical stages in active composting, curing, and storage of the finished compost. The ruggedness and weather-resistant materials like recycled plastic and treated wood make them suitable for outdoor uses. (www.compostingcouncil.org)



figure 15. Three-Bin Composting System. www.compostingcouncil.org

The basic operational requirement would be clear guidelines on waste segregation, educating with signage on what to put in-compostable materials like food scraps and garden clippings- and what not to put in. The operation would require regular monitoring by trained personnel or volunteer students in terms of moisture, aeration, and temperature. The finished compost would enhance the fertility of the edible landscapes, completing a cycle of use of resources in a sustainable manner.

Additionally, education will be integrated through hands-on student involvement in environmental science curricula in best practices for waste management.

These suggestions for retrofitting, apart from bringing an improved environmental performance of the campus, all these measures also act as very practical, educative tools for students in understanding key concepts about sustainability. This shall also enable the university to reduce its footprints on the environment and enhance biodiversity, therefore having a healthier and more interesting campus that follows international objectives of sustainability.

CONCLUSION

Okan University Campus reflects a very high degree of sustainability, given its existing ecology with solar panels, Electric vehicle-charging stations, and green landscapes. However, some of its features are in need of retrofit to increase environmental performance. Retrofitting is one very valid, effective strategy to meet some of the challenges being faced today, especially those relating to the optimization of natural lighting and ventilation, better management of water systems, waste, and the conversion of green spaces into edible landscapes.

Retrofitting will improve functionality and enhance sustainability for the existing structure with minimum environmental and financial costs associated with new construction. For example, the retrofitting of skylights with operable elements would provide natural ventilation and increase indoor air quality while reducing the energy use of mechanical systems. Similarly, sensor-operated faucets, dual-flush toilets, and expanded rainwater collection would align water management with the sustainability goals. Green spaces would become much more effective in providing biodiversity, enhancing food security, and affording hands-on learning opportunities for students if they were changed into productive edible landscapes.

REFERENCES:

1. Eryıldız, D., & Eryıldız, S. (forthcoming, 2025). *ETURE - Ecological Design & Planning Almanac 2*. Istanbul Okan University.

2. Directorate-General for Energy. (2019). *New rules for greener and smarter buildings will increase quality of life for all Europeans*. Retrieved from https://commission.europa.eu/news/new-rules-greener-and-smarter-buildings-will-increase-quality-life-all-europeans-2019-04-15_en
3. Ferdos, M. (2020). *Architectural retrofit of educational buildings towards nearly zero energy and cost optimal levels considering the life cycle and occupant comfort* (Ph.D. thesis).
4. Alboueishi, F. A. A. (2026). Efficacy of Curcumin on Inflammatory Biomarkers in Type 2 Diabetes: A Meta-Analysis of Clinical Trials and Animal Studies Systematic Review & Meta-Analysis (PRISMA 2020) Field: Botany & Complementary Medicine. *Al-Farooq Journal of Sciences*, 2(2), 15-35.
5. Riaz, H., Amina, N., Shahbaz, I., Asif, R., Mohsin, H., & Ifran, A. (2023). Green retrofitting of educational buildings for enhancing the building's performance.
6. Hescong, L., Wright, R. L., & Okura, S. (2013). Daylighting impacts on human performance in schools. *Journal of the Illuminating Engineering Society*, 31(2), 101–114.
7. Santamouris, M., & Mumovic, D. (Eds.). (2018). *A handbook of sustainable building design and engineering: An integrated approach to energy, health, and operational performance*. Routledge. <https://doi.org/10.1201/9781315172026>
8. Silva-Afonso, A., & Pimentel-Rodrigues, C. (2023). Rainwater harvesting in university buildings: Feasibility analyses in Mediterranean climate. In *Sustainable Development and Renovation in Architecture, Urbanism and Engineering* (pp. 3–15). Springer. https://doi.org/10.1007/978-3-031-44006-9_1
9. Kortright, R., & Wakefield, S. (2011). Edible backyards: A qualitative study of household food growing and its contributions to food security. *Agriculture and Human Values*, 28(1), 39–53.
10. Shaltami, O. R., & Hkoma, M. A. B. (2026). THE LINK BETWEEN DINOSAUR GEOCHEMISTRY AND SUSTAINABLE DEVELOPMENT IN LIBYA. *Al-Farooq Journal of Sciences*, 2(2), 229-238.
11. Bentil, J. N., Braimah, I., & Obeng, P. A. (2024). Solid waste management in higher educational institutions: An investigation using the SWOT analysis and the circular economy principle perspective. *Discover Sustainability*, 5(1), 1–15. <https://doi.org/10.1007/s43615-024-00349-7>
12. American Institute of Architects (AIA). (n.d.). The assertion that retrofitting can result in 50–75% less carbon emissions compared to constructing a new building. *TIME*. Retrieved from <https://time.com/7177539/cannondesign-net-zero-emissions-buildings/>
13. İstanbul Okan Üniversitesi. (n.d.). Retrieved from <https://www.okan.edu.tr>
14. Weasley, C. (2024). How retrofitting can turn old buildings into green powerhouses. *Science Times*. Retrieved from <https://www.sciencetimes.com/articles/51571/20241108/retrofitting-turn-old-buildings-green-powerhouses.htm>
15. Küçük, F. N. (2016). Sürdürülebilir eğitim binalarının incelenmesi ve bu bağlamda İskenderun'da mevcut bir lise binası için iyileştirme çalışması. [Examination of sustainable educational buildings and improvement work for an existing high school building in İskenderun].
16. ARCAT. (n.d.). Roof windows and skylights - 086000. Retrieved from <https://www.arcat.com/content-type/cad/openings-08/roof-windows-and-skylights-086000>
17. U.S. Composting Council. (n.d.). Home page. Retrieved from <https://www.compostingcouncil.org/>