

Evaluation of the Green Campus Approach on the Campuses in Turkey

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ABSTRACT

The universities resemble to small cities with the area they occupy, their population and their activities. Therefore they have direct or indirect negative effects on the environment. It is important for universities to minimize these effects by taking necessary precautions. The purpose of the green campus implementation is to minimize the negative effects on the environment.

“Green Campus” expresses the education, application and communication environment that focuses on “sustainability”. In related literature green campus criteria are defined generally in the context of headlines as: sustainability of environment and infrastructure, sustainability of adaptation to energy and climate changes, sustainability of waste and water management and sustainability of transportation.

This paper starts with giving information about green campus criteria, then the some university campuses were evaluated within the context of these criteria in Turkey.

Keywords: Green campus, sustainability, Turkey.

BACKGROUND OF GREEN CAMPUS

Sustainability issues and discussions do not have a long history but have become part of our lives during the last several decades. Sustainability as a term became widely used after the The Brundtland Report in 1987. The Brundtland Commission's report defined sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (Ongan, 2014). Also, sustainability means "...a dynamic balance among three mutually interdependent elements: (a) protection and enhancement of natural ecosystems and resources; (b) economic productivity; and (c) provision of social infrastructure such as jobs, housing, education, medical care and cultural opportunities" (Bell and Morse, 1999).

The discussion of sustainability in higher education dates back to 1970s with a primary focus on environmental education (Sauvé *et al.*, 2007). The Stockholm Declaration of 1972 was the first to make reference to sustainability in higher education and has recognized the interdependency between the humanity and the environment and suggests several ways of achieving environmental sustainability (UNESCO, 1972; Alshuwaikhat and Abubakar, 2008) and the specific importance of universities in promoting sustainable development has been highlighted in a number of significant declarations. In 1990, over 300 university administrators in 40 countries have signed the Talloires Declaration, a commitment made by university presidents toward sustainability, which states, “Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation, and

ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature. Universities have a major role in the education, research, policy formation, and information exchange necessary to make these goals possible.” (UNESCO, 1990; Parker, 2007; Alshuwaikhat and Abubakar, 2008) One year later (in 1991), at Halifax (Canada), university administrators again added their voice on the continuing widespread degradation of the earth’s environment, and the pervasive influence of poverty on the process (UNESCO, 1991). During the Swansea Declaration of 1993, participants drawn from over 400 universities in 47 different countries focused on finding ways by which the universities of the Association of Commonwealth Universities, their leaders, scholars and students might engage and deploy their resources to respond appropriately to the challenge of finding the balance between human quest for economic and technological development and environmental preservation (UNESCO, 1993). In 1993 Kyoto Declaration increased campus sustainability interest and activity by obligating higher education institutions to promote sustainability by reviewing their operations to reflect sustainable development best practices (IAU, 1993).

European universities have come together to support sustainable development in education by signing the COPERNICUS University Charter for Sustainable Development in 1993 and establishing the network called “Copernicus Campus”. By the announcement of the Guidelines, 320 universities from 38 countries including universities from Turkey have signed the Charter since 1993; thus, the Guidelines can support them for curricula development, institutional management, establishing services for local or regional societies, and for having a responsible balance between economic, ecological and social/cultural aspects (COPERNICUS CAMPUS, 2007). Also in recent years the ‘Greening’ of the campus (or Do What You Preach) was emphasized in the United Nations Conference on Sustainable Development (UNCSD) 2012 (Rio plus 20). In this conference, the role of higher education in sustainability besides teaching sustainable development concepts is also covered, encouraging research on sustainable development issues, supporting sustainability efforts, and fostering and engaging in international collaboration has been emphasize in UNCSD (2012). (Sustainable development, 2017).

SUSTAINABLE CAMPUS/GREEN CAMPUS

University campuses are small and sometimes medium sized villages having direct and indirect effects on their environments, in terms of waste generation, water and materials intake, as well as electricity and hydrocarbon fuels consumption in operating machineries, heating and lighting, transportation etc. each with implications. A university should be a model for sustainability (Alshuwaikhat and Abubakar, 2008; Ongan, 2014) Campus sustainability has become an issue of global concern for university policy makers and planners [Alshuwaikhat and Abubakar, 2008-5]. A sustainable campus is defined as “A higher educational institution, as a whole or as a part, that addresses, involves and promotes, on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles”(Velazquez *et al.*, 2006). Components of a sustainable campus could be generalized to develop a holistic approach such as: environmental management (energy consumption, on-site renewable, energy efficiency, waste and recycling, sustainable campus development of housing and buildings, water management, transportation, procurement, landscape, food); research; education and outreach (curriculum, programs, community engagements); development and

implementations of sustainable campus policies and efforts in the campus; social sustainability and economic sustainability (Ongan, 2014).

Current situation as that “Green” campuses or “Sustainable” campuses are two terms which people tend to use interchangeably. Furthermore, the focus of the “Green Campus” tends to be primarily on environmental sustainability, not social or economic sustainability “Green campus” is even more strongly environmental in focus (Ongan, 2014). “Green Campuses” are designed to reduce overall impact of the built environment on human health and the natural environment by

- Efficiently using energy, water, and other resources.
- Protecting occupant health and improving employee productivity.
- Reducing waste, pollution and environmental degradation (Alshuwaikhat and Abubakar, 2008).

GREEN CAMPUS DESIGN MEASURES

The need for environmental sustainability in university campuses has been stressed in many articles (Barnes and Jerman, 2002; Corcoran *et al.*, 2002; Viebahn, 2002; Bernheim, 2003; Cortese, 2005; Alshuwaikhat and Abubakar, 2008; Lukman *et al.*, 2010; Grindsted and Hol, 2012). In the world, green campus design strategies and applications are developed according to some measures. Most important measures are Leadership In Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Program (BREEAM), European Eco- Management and Audit Scheme (EMAS), and Campus Sustainability Assessment Framework (CSAF), Green League, Environmental and Social Responsibility (ESR), Index 2009, GreenMetric.

LEED is a point base system that is created in 1998 encourages sustainable green building and new development practices. Projects earn Leed points according to their environmental and health performances. Leed evaluate the performances according to five categories which are; Sustainable Site Development, Water Savings, Energy Efficiency, Materials Selection and Indoor Environmental Quality. United States Green Building Council (USGBC) offers several programs that can be applied within a university or college campuses. Leed has nine rating systems and three out of nine is proper for campus development projects. These are Leed for New Construction (LEED-NC), Leed for Existing Buildings (LEED-EB), Portfolio Programs with volume certification and Leed for Neighborhood Development (LEED-ND). LEED-NC rating system is a certification system for new building construction on college and university campuses. It challenges the environmental considerations in designing and constructing a building. LEED-EB provides a method for existing buildings to implement sustainable operations and maintenances. LEED-ND USGBC’s newest rating system integrate principles of environmental sustainability into new, largescale developments such as campus expansion projects through a holistic approach to neighborhood planning. This rating system is arranged according to some categories and each category has sub-categories. The points are evaluated according to these categories. Green infrastructure and the building is one of the categories in this system. This category evaluate the Building Water Efficiency, Water-Efficient Landscaping, Stormwater Management and Wastewater Management sub-categories. These sub-categories are water related subjects. Green infrastructure and the building category also has another sub-categories (Ulusoy, 2011; USGBC, 2017)

BREEAM is a Building Research Establishment Environmental Assessment Program that is most widely used for buildings created in 1990. It sets the standard for best practice in

sustainable design and has become the de facto measure used to describe a building's environmental performance. Breeam provides people low environmental impact buildings with innovative solutions. Breeam developed assessments in nine categories for sustainable building. These categories are; Energy and Carbon dioxide Emission, Water, Materials, Surface Water Run-Off, Waste, Pollution, Health and Wellbeing and Management and Ecology. According to the categories, there is a rating system. The projects get Pass, Good, Very Good, Excellent or Outstanding Degrees and has Breeam Certificate (BREEAM, 2017).

EMAS is an European Eco-Management and Audit Scheme that brings changes in environmental performance (Alshuwaikhat and Abubakar, 2007). This is a voluntary environmental system which companies and other public organizations evaluate, manage and improve their environmental performances. EMAS has been operated since 1995. The scheme has environmental indicators and the companies and organizations order their applications according to indicators (EMAS; 2017).

CSAF is a Campus Sustainability Assessment Framework that is an environmental measurement system used in Canadian Universities. This Framework divided into two main sections. People Section and Ecosystem Section. People Section considers the social and economic aspects of sustainability, Ecosystem Section considers environmental aspects of sustainability. These two sections are divided into five sub-sections which include indicators. The CSAF is the largest scale tool of its kind, containing over 170 indicators, but many campuses will not be able to find information on all of the indicators contained in CSAF (Stewart, 2005).

The Green League tables have shown the environmental performance of British universities based on eight different environmental criteria, both in terms of policy and performance related measures. It incorporates data never before published in the public domain and was obtained under the Freedom of Information Act; including the percentage of energy purchased from renewable sources, percentage of waste recycled, and CO₂ emissions for each institution (Green League, 2007).

The ESR index covered five keys of corporate strategy; integration of environmental concerns; environmental management; environmental performance and impact and assurance that the data gathered for the index was accurate (De Montfort University, 2009).

Green metric aimed to offer the portrait of the current conditions and policies related to Green Campus and Sustainability in the universities all over the world. It has developed an online "green" ranking for world universities from Universitas Indonesia in 2010. Instead of using research and educational indicators, it mostly embraced the environmental ones. With respect to this specific issue in sustainability and green campus, GreenMetric has played a different role among other sustainability surveys, scorecards, and rating systems. Each year participating universities are evaluated, graded and ranked in areas such as infrastructure, energy and climate change, waste, water resources, transportation and education (Hazelkorn, 2011; Greenmetric, 2017).

Energy Efficiency in Campus Sustainability

Preserving nonrenewable energy resources for future generations is a primary goal of Energy efficiency In Campus Sustainability, as is avoiding the undesirable impacts of exploration, production, and use of fossil fuels (EESI,2017). Improving energy efficiency in the campus is a supply side approach that provides several benefits including cost savings

through lower energy bills, cost-effective investment, mitigation of growing energy needs, decreases in environmental degradation, and the fostering of economic development. Improving energy efficiency in the campus is the most abundant and cheapest way to reduce greenhouse gas emissions (McLean, 2009).

Energy efficiency improves as building spaces are used efficiently with intelligent control systems. Exploiting efficient technologies through means such as replacing inefficient incandescent light fixtures with fluorescent fixtures improves sustainability by providing the same level of service (e.g. lumens) with less energy. In contrast, modifying the behavior of facility users to conserve improves sustainability by reducing the amount of energy required. Energy efficiency and conservation could be achieved through the following ways.

- Use more efficient HVAC systems with improved building control systems using the wide range of viable passive energy technologies and integrating them into overall design for maximum effect.
- Use of wind, solar and geothermal sources for heat and power, low-flow faucets, showerheads, and toilets and day lighting to illuminate classrooms which offers dramatic reductions in buildings operations and maintenance costs.
- Reduce energy costs by installing centralized control systems to control off-hour heating, cooling, and lighting across the campus.
- Reduce lighting loads and improve comfort by incorporating energy-efficient lighting such as T-8, compact fluorescents, and metal halide fixtures (Vahid *et al.*, 2015).

Water Management in Campus Sustainability

Environmental problems such as climate change, pollution growth and uncontrolled developments cause water scarcity and degrade water quality. Increasing water scarcity requires efficient water management to meet the future demands. Providing efficient water management which includes stormwater management techniques, greywater systems and protection of the clean water (potable water) are the important issues (Ulusoy, 2011). Water management in campus sustainability means managing available water resources to meet university needs while preserving ecological systems and maintaining this vital non-renewable resource for future generations (Stanford University, 2017).

Storm or surface runoff is a stormwater that moves on the ground by gravity and flows into streams, rivers, ponds, lakes and oceans. Urbanization effects the drainage systems. Because of urbanization, the amount of the impervious surfaces such as; roofs, streets, parking lots and sidewalks increase. Engineered solutions aren't proper for the sustainable environment and not cost effective, so natural drainage systems should be developed. Urban landscape should be redesigned according to the stormwater runoff. Integrated stormwater infrastructure needs more public green spaces (SPUR, 2017)

Stormwater management strategies are for the prevention of stormwater runoff and hold and reuse it. In the world, most of the countries develop strategies and apply techniques to prevent the stormwater runoff. Some techniques are used for the proper stormwater management. Permeable pavement, rooftop rainwater collection system, bioretention areas, green roofs, open road sections with vegetated swales are the techniques that are used to protect streams, wildlife habitat, wetlands and other natural resources, groundwater and drinking water supplies (Tilley, 2003). In addition water harvesting is essential for an effective water management because the main aim is protecting the water quantity and quality of water resources. There are various resources to capture water. Rainwater, stormwater, greywater, airconditioner condensate, treated wastewater and desalinated water

are important resources. Rainwater is collected from rooftop surfaces, it is not proper for potable uses but can be used for toilet flushing, irrigation and cooling equipment but it can be potable if treated (Environmental Building News, 2017).

Waste And Recycling in Campus Sustainability

Recycling the solid waste helps to reduce the negative effects on environment. In the construction of buildings, the kind of material and its effects to the environment should be evaluated for sustainability. Energy efficient and recycled materials should be used. Also, local production plays an important role so local products should be preferred as possible as (Alshuwaikhat and Abubakar, 2007).

Waste water management is also important issue in campus sustainability. Stormwater is getting from impervious surfaces like roads, pathways, plazas, car parks like that. It has the same using areas with rainwater. Greywater collected in buildings from the showers, bathtubs, clothes washers and lavatory faucets, is proper for non-potable uses and can be used for irrigation. Another one is airconditioner condensate. It is an important source for hot and humid regions. Condensate is moisture removed from indoor air. Condensate captured from the evaporator coils of air-conditioning equipment and proper for non-potable uses and can be used for toilet flushing, irrigation and cooling equipment. Treated waste water is also used as a resource that can be used for irrigation, toilet flushing and cooling equipment and lastly desalinated water is a freshwater produced by removing salts from sea water and it is proper for potable uses (Environmental Building News, 2017).

Waste and Recycling differs from medical waste, lab waste, infirmary waste, home waste, plastic, aluminium, glass, paper, and steel on a campus. Following the waste hierarchy of the three Rs, “Reduce, Reuse and Recycle”, some universities have more programs on recycling, but mostly ignore other two Rs: Reduce and Reuse. With increasing environmental regulations, developed countries and developing countries as well have put regulations on waste management into effect (Ongan, 2014).

Landscaping in Campus Sustainability

Landscape design is important for sustainability and it does not have only an aesthetic function for urban design but also, it has functions of especially supporting stormwater management. The type of the plants and trees, pest management approaches, irrigation techniques play an important role (Mat *et al.*, 2009).

Sustainable landscaping is a way of designing and maintaining yards, gardens and landscapes in a way that reduces harm to the environment, provides healthier places to work, live, and play, and saves time and money by offering reduced maintenance (Ongan, 2014). Integrating the landscape design with stormwater management reduces the quantity of runoff and provides maximum treatment on-site contaminants (Ulusoy, 2011). High performance Landscape or Infrastructure Landscape concept is used to maximize the performance of green infrastructure systems. For example “Xeriscaping” approach is the best way of conserving water and protecting the environment. They are adaptable to local conditions and drought tolerant. The principles of Xeriscape are, appropriate choice of plants, soil analysis which may include the use of solid waste compost, efficient irrigation, practical use of turf, appropriate use of mulches and proper maintenance. They provide benefits of reduction of pollutant load and reduction of water consumption. Also, Native Planting is an approach to landscaping that uses naturally grown plants. If native plants grow under local conditions, they don’ t need support. On the other hand, irrigation of the

plants is very important to protect the quantity of water. Use of efficient irrigation systems such as drip irrigation or sprinkler reduce the water consumption (Tuna, 2006).

Sustainable landscaping services are a combination of activities related to ecology, personal health and enhancement of educational value. Some examples of these activities are integrated pest management, habitat restoration projects, campus gardens, organic landscaping programs, applying natural design principles, yard waste composting, irrigation systems, campus as a botanical garden, and outdoor classrooms (Ongan, 2014).

Transportation in Campus Sustainability

Transportation modes used at campus should affect the sustainability of campus. Because Transportation means burning fossil fuels, causing green gas emissions and increasing dependence on energy from fossil fuels. A sustainable transportation system as one in which fuel consumption; vehicle emissions, safety, congestion, and social and economic access are of such levels that they can be sustained into an indefinite future without causing great or irreparable harm to future generations throughout the World [Richardson, 2007-40]. For more environmental-friendly transportation, the car use should be reduced and public transportation should be encouraged. Bike roads, biking parks, quality and safe walking roads should be design. the major factors in transportation planning is land use and distance. University campuses should develop sustainable transportation strategies as promoting walking, bicycling, using mass transport vehicles, ridesharing, discouraging the use of single-occupancy cars, and linking transportation planning to land-use planning (Balsas, 2003; Parker and Fields, 2012). High accessibility affects the sustainability, the distance between the buildings should be short to improve the walking and cost effective infrastructure (Alshuwaikhat and Abubakar, 2007).

EXAMPLES FROM “GREEN CAMPUS” IN TURKEY

Today, there are two important missions of the universities in solving the increasing environmental problems. These include firstly reducing environmental pressures (such as energy consumption, waste generation, food consumption, transport and waste). The other is to train leaders, build a quality corporate model and become a living laboratory. In this context, "sustainable/green campus" practices, which can contribute to sustainable development by creating environmental awareness, are rapidly spreading in the world and in Turkey (Çetiner, 2011; Sustainable campus applications, 2017). Boğaziçi, Özyeğin, Nişantaşı, Piri Reis and Bülent Ecevit universities are continuing their efforts to create a green campus in Turkey. The following information will be given about the studies carried out within the scope of the green campus in the institutions.

Boğaziçi University/İstanbul

Among the strategic goals of Boğaziçi University, being green campus is the priority. In this context, in 2010, efforts were made to use and expand sustainable energy sources and make the university carbon-neutral to become a green campus (Boğaziçi University,2017a). In 2014, "Sustainable Green Campus Practices Commission" has been established to plan sustainable and green campus formation, improve energy and natural resource management to prevent environmental pollution, to develop strategies to reduce the ecological footprint of the campus (reducing emissions and waste, increasing recycling, protecting green tissue etc.) to increase the environmental sensitivity. Also the purpose of establishing this commission that the institution is referred to as a university with exemplary and successful

sustainable campus implementations on national and international platforms (Boğaziçi University, 2017b).

In the university, the participation of college staff and students for a sustainable and green campus is helping to prevent environmental pollution and improve energy and natural resource management. In addition to these, studies are being carried out also on sustainable and green campus life concepts through energy saving applications, renewable energy applications, water recycling reuse applications, integrated solid waste management activities

in all campuses of the university (Boğaziçi University , 2017c) Another target of this strategy is the establishment of the Boğaziçi University Wind Energy Plant, which was established at Kilyos Saritepe Campus as of December 2014. With this project, Boğaziçi University became the first university campus in the world to obtain electricity from its own wind power plant (Çetiner, 2011). Furthermore, in the Saritepe Campus, academic studies are being carried out in the direction of the use of renewable energy resources such as solar, wave, biogas and geothermal and the storage of the energy (Green building, 2017). Another important example in this respect on campus is Hamlin Hall (Male Dormitory). Hamlin Hall, which was founded in 1868 and used as a dormitory since then, is the first green university building and green public building of Turkey with Leed "GOLD" Certificate (Çetiner, 2011). In addition, the Tsunami Monitoring and Evaluation Center-within Bogazici University Kandilli Observatory and Earthquake Research Institute National Earthquake Monitoring Institute (UDIM)-is the second building of Bosphorus University with LEED Gold certificate (Green building, 2017). In these buildings heating and cooling is done by electricity, no gas or a different energy source is used. An important part of the electricity is obtained from the solar panels on the roof. Rain water is filtered and used. Thanks to the air-source heat pump, the heat inside the air is utilized and less energy is consumed in heating and cooling. In South Campus, the environmental performances of buildings using water, energy, carbon footprint and waste data are determined by special software and necessary improvements are made by grading the buildings. The University's two student's residence in each gray water systems are reclaiming 16 m³ of water per day. The rainwater collected from roof areas in Kandilli and North campuses is collected in 46 m³ of depot and used in garden irrigation, cleaning and reservoirs. The works have been started to implement the same system at Hisar Campus. Hazardous, medical, radioactive and electronically recoverable wastes are stored with the support of firms and municipalities and collected without environmental damage (Green campus,2017).

Özyeğin University/İstanbul

Özyeğin University, which was awarded the LEED Gold certificate with two buildings on Çekmeköy Campus, was established in 2008 as an accessible and entrepreneurial research university. One of the issues that the university attaches great importance is to integrate the concepts of sustainable life and environment into its own teaching and campus life. The use of natural materials is at the forefront. Çekmeköy Campus buildings of Özyeğin University are characterized by light and transparency. Campus built with a flexible and modular approach is also an important example of sustainability through the economic use of resource and operating costs (Green university, 2017).

Özyeğin University has many facilities to become a green campus. For example; While 50 percent of the land is planted, rainwater is collected and reused. Roofs are planted, private parking spaces are built for hybrid and low emissions vehicles. Gray waters are purified and re-evaluated. Intelligent building automation systems are applied. The buildings benefit

from daylight at the highest level. Construction excavation falls into the campus area. Solar panels are used and an energy distribution center is established (Nişantaşı University, 2017).

Nişantaşı University/İstanbul

The Sadabad Campus, located at Nişantaşı University and entering service on October 13, 2014, is the first organic campus in Turkey. Environmental sensitivity and sustainability dimensions have been carefully considered in all phases and operations, from design to construction, from material selection to campus operation (Nişantaşı University, 2017). Among the primary goals of the university are the preservation of the historical, cultural and green texture of Sadabad. The most important feature of the 'Green Campus' project, which is planned to be completed in 2017, is environmentally friendly, student-committed protection. Sadabad Campus respects the natural resources of the region and gives importance to energy that can be recycled. It is aimed to create a sustainable energy policy awareness with new applications for energy production and energy saving on campus. Activities on the campus-such as emissions and waste generation reduction, recycling and reuse-are carried out in accordance with sustainable life (Green campus, 2017).

Piri Reis University/İstanbul

Piri Reis University, which provides higher education and applied education on shipping, is Turkey's first international "BREEAM-Very Good Certified" on green campus. It was founded in 2013 in Tuzla. The principle of "sustainable living and energy saving", which is one of the most basic principles of existence in maritime transport, has been decided to be applied as the basic principle in the main campus of Piri Reis University and all subsequent structures of the campus. The definition of "green campus" has been adopted from the very beginning by the employer and architectural team. For these purposes, the "sustainable building" principles and design criteria have been determined along with the engineering teams that have been involved since the first stage of the project.

Priority features of the campus in the context of sustainability;

- The establishment of a system that will make natural resources available again,
- Utilization of solar energy as energy use,
- Using of solar and electric batteries
- Using of landscape design studies as minimum water requirement
- Using of special materials that can be recycled during construction
- Using of a tri-generation power plant as an innovation
- Absorption cooling
- Using sea water heat pump on heating / cooling
- Treatment of greywater and using on garden irrigation (Piri Reis University, 2017).

Also, lighting, heating-cooling and electricity expenses can also be kept at minimum levels with the automation of the building being constructed (İtez, 2014). Although the initial investment cost for this campaign is 10-15% higher, which includes the design in which emissions of carbon dioxide, carbon monoxide and sulfur oxide are kept to a minimum, an order for investment will be established within 3-4 years (Piri Reis University, 2017).

Bülent Ecevit University/Zonguldak

Bülent Ecevit University has been the first in Turkey and it was 239th and 217th in the world order in 2014 and 2015 on GreenMetric World University Ranking assessments. The most important goal of Bülent Ecevit University is to be an example to all the universities of Turkey and the world with its environmental friendly practices and environmental structure (Bülent Ecevit University, 2017).

CONCLUSIONS

One of the most important goals of sustainable life is the planning and design of space within ecological and economic principles. In this context, a variety of strategies have been developed for spatial design. “Green campus” is one of this spatial strategy. Green campus has been designed as place where information on sustainable living has produced and transmitted to life. This includes designs and practices that prevent and / or reduce problems (water and energy use, waste, transportation, food consumption, etc.) that may create pressure on the environment.

Practices related to green campuses are particularly pointy (eg green buildings, wind turbines, etc.). However, green campuses should be planned and designed as a whole from the space.

It should also be part of spatial planning. The plan scale should be able to descend from the upper scale to the campus scale. This means that green campuses are designed in the correct areas. For this purpose, ecological analyzes should be carried out in which natural and cultural landscapes are evaluated holistically. The campus should be assessed holistically with the development plans of the city or settlement it is located in, not by itself. For this reason, it will need to be planned in the context of sustainability in the city. Otherwise, green campuses will be exposed to the pressure of the city and will struggle for life.

Another important issue for the green campus is the integration of open green space systems and structures (green buildings) with other system details such as roof garden and vertical garden. Thus, the system will provide continuity both vertically and horizontally.

At this point the green links inside the campus should have an integrity and be designed as a continuation and part of the open and green space system outside the campus. With this system, many environmental contributions can be achieved such as transmission of surface water to groundwater, supporting biodiversity, prevention of heat islands, provision of microclimatic comfort, improvement of air quality. Existing green campuses have inadequate designs in this regard.

As a result, integration of the green campuses-created to ensure the integration of people with nature in the most efficient manner, to protect the health of the people living there, to increase the productivity of the employees, to use water, energy and other resources more efficiently, to reduce the most negative environmental impacts-with the open and green space system of the city is very important. At this point, cooperation and sensitivity of the university administration and local government is necessary. Most of the developed universities around the world have made them green campus missions. Green campus examples are also increasing rapidly in Turkey. For all universities to reach this consensus, state promotion is important. Green campuses should also be subject to national assessments other than international assessments.

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