ESTABLISHING A CULTURE OF ENVIRONMENTAL SUSTAINABILITY IN A UNIVERSITY: A CASE STUDY OF BOĞAZİÇİ UNIVERSITY

by

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ABSTRACT

ESTABLISHING A CULTURE OF ENVIRONMENTAL SUSTAINABILITY IN A UNIVERSITY: A CASE STUDY OF BOĞAZİÇİ UNIVERSITY

Higher education is a key area in the sustainable development debate today. More and more universities and colleges around the world are implementing plans and policies to become both environmentally more sustainable on campus level and adapting their education programs to address the rising need for a sustainability-minded generation. Boğaziçi University's recent efforts in this area are notable and promising. With its alumni network and highly capable students, successful application of a higher education for sustainable development program in all its aspects at the university will have a region spanning impact on sustainable development, as well as providing an example for other universities to follow. Looking at how the university has thus far managed its campus environment and what the current level of education for sustainable development is at the university, within the framework of the campus sustainability scheme UI GreenMetric, and comparing and contrasting them with the results of an awareness and willingness-to-act assessment questionnaire study of the students and alumni would provide key recommendations that could impact the university's performance significantly. Organization of results into strength, weakness, opportunity and threat areas would map out and guide the university's efforts towards becoming a leading institute of higer education for sustainable development.

ÖZET

BİR ÜNİVERSİTEDE ÇEVRESEL SÜRDÜRÜLEBİLİRLİĞİ KÜLTÜR HALİNE GETİRMEK: BOĞAZİÇİ ÜNİVERSİTESİ ÜZERİNDEN BİR DURUM ÇALIŞMASI

Sürdürülebilir kalkınma tartışmasında yükseköğrenimin yeri bugün çok konuşulan bir tartışma konusu. Her geçen gün daha fazla üniversite hem kampüs bazında çevresel sürüdürülebilirlik adına çevre etkilerini kontrol altına almakta hem de sürdürülebilirlik düşünce yapısına sahip bir nesil ihtiyacını karşılamak adına eğitim programlarını gözden geçirmektedir. Boğaziçi Üniversitesi'nin bu alandaki çalışmaları kayda değer ve gelecek vaat etmektedir. Mezun ağı ve üstün kabiliyetli öğrencş nüfusuyla burada gerçekleştirilecek tüm yönleriyle başarılı bir yükseköğrenimde sürdürülebilirlik uygulamasının bölge genelinde hem sürdürülebilir kalkınma adına, hem de diğer üniversitelerin izleyeceği bir örnek oluşturmak adaına olumlu etkileri olacaktır. Üniversitenin bugüne kadarki kampüs sürdürülebilirliği ve sürdürülebilirlik için öğrenim adına yürüttüğü çalışmaların UI GreenMetric yükseköğrenimde sürdürülebilirlik değerlendirme çerçevesi içinde gözden geçirilerek, öğrenci ve mezunlarla yapılmış bir farkındalık ve harekete geçmek için gönüllülük esaslı anketlerin sonuçlarıyla karşılaştırılmasının yapılması üniversitenin bu alandakini performansını önemli bir şekilde yönlendirici anahtar tavsiyeler üretecektir. Sonuçların güçlü, zayıf, fırsat ve tehlike alanlarında sınıflandırılmaları üniversitenin yükseköğrenimde sürdürülebilirlik ve sürdürülebilir kalkınma için öğrenim alanında lider bir kurum olmak yönündeki çalışmaları için bir yol haritası çizecektir.

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LIST OF SYMBOLS/ABBREVIATIONS

Abbreviation	Explanation
AASHE	Association for the Advancement of Sustainability in Higher Education
CEE	Civil and Environmental Engineering
CSAF	Campus Sustainability Assessment Framework
CSRC	College Sustainability Report Card
DESD	Decade of Education for Sustainable Development
EAATSD	Ecocentric and Anthropocentric Attitudes Towards Sustainable Development
EC	Energy and Climate Change
ED	Education
EMS	Environmental Management System
ESD	Education for Sustainable Development
GASU	Graphical Assessment of Sustainability in Universities
GHG	Greenhouse Gasses
GS	Global Seminar
HESD	Higher Education for Sustainable Development
IDE	Industrial Design Engineering
ISAC	Integrating Sustainability Across the Curriculum
LO	Learning Outcomes
MDG	Millennium Development Goal
OL	Organizational Learning
PBL	Problem-Based Learning
PPBL	Project and Problem Based-learning
PSE	Post-Secondary Education
SAQ	Self-Assessment Questionnaire
SD	Sustainable Development
SDG	Sustainable Development Goal
SDSN	Sustainable Development Solutions Network
SDSN-Y	Sustainable Development Solutions Network – Youth
SI	Setting and Infrastructure
STARS	Sustainability Tracking Assessment and Rating System

STEM	Sustainability Transdisciplinary Education Model
TM	Transition Management
TR	Transportation
UN	United Nations
WR	Waste
WS	Water
UNESCO	United Nations Educational, Scientific and Cultral Organizaton

1. INTRODUCTION

1.1. The Millennium Development Goals

The United Nations Millennium Declaration was adopted in September 2000 at the fifty-fifth session of the United Nations General assembly in the United Nations Headquarters, New York. This moment was the culmination of a decade of summits, debate and conferences to determine a set of goals that aimed to reduce extreme poverty and were time-bound to 2015. This marked the first time that the United Nations agreed to strive for improvement in measurable targets within a pre-set time period. These were called the Millennium Development Goals (MDGs).

In terms of content, the MDGs were composed of eight goals in total. The main objective of the eight goals was to reduce extreme poverty all around the world. However, each of the eight goals had specific targets from different areas of social life that were to set the measure of its success, and the success of the MDGs in general.

Table 1.1. The millennium development goals.

Goal No.	Goal
1	Eradicate Extreme Poverty and Hunger
2	Achieve Universal Primary Education
3	Promote Gender Equality and Empower Women
4	Reduce Child Mortality
5	Improve Maternal Health
6	Combat HIV/AIDS, Malaria and Other Diseases
7	Ensure Environmental Sustainability
8	Develop a Global Partnership for Development

Progress towards the achievement of the Millennium Development goals was monitored and periodically reviewed in documents called Millennium Development Goals Reports and MDG Gap Task Force Reports. Millennium Development Goals Reports reported on the progress of the 8 MDGs in general. But the MDG Gap Task Force was created by the General Secretariat of the United Nations in order to improve the specific monitoring of MDG number 8 “Develop a Global Partnership for Development” through promoting cooperation between agencies. Agencies represented in the task force included the World Bank, the Organization for Economic Cooperation

and Development, the World Trade Organization and the International Monetary Fund. The last reports in 2015 provides a clear outline of the outlook as the MDG agenda came to its close.

The 2015 Millennium Development Goals Report's findings were that even though there were significant improvements in the conditions that the MDGs sought to better, the global distribution of these improvements was uneven, and some gaps were severe. Discrimination against women in the workplace and women's general disadvantages in labor markets meant that gender inequality was still a big issue. The ratio of women against men in the poorest households had increased from 108 women for 100 men to 117 women for 100 men and women were earning 24% less than men while being 1.5 times less likely to find employment (UNDESA, 2015). The gap between the richest and the poorest and the urban and the rural was another area of concern. Children born into families of the poorest 20% of the population were twice as likely to become stunted in their growth and twice as likely to die before the age of five when compared to children born into the richest 20% (UNDESA, 2015). Climate change and environmental deterioration could not have been effectively managed and the world's poorest were the ones most affected by it. Overexploitation of fisheries, massive loss of forest land and water scarcity in 40% of the world were some of the more visible observations mentioned in the report and all three factors primarily affected the most deprived people on earth since they were the ones more relying on natural resources and ecosystems for a living (UNDESA, 2015) Conflicts still exists in all corners of the world and has caused the largest wave of displaced persons since World War 2. This number was increased by 42,000 people being forced away from their homes and children often were those affected the worst by this, they made up almost half of the total number of refugees and the ratio of children out of school in countries with conflict had also increased (UNDESA, 2015). In the meantime, conflict was also driving poverty levels in affected regions and even outside conflict zones approximately 800 million people were living in extreme poverty; half of the world's workforce still lacked the basic labor rights and almost a billion people lived in slum neighborhoods, and many more had limited access to clean water and sanitation. (UNDESA, 2015)

The MDG Gap Task Force's final report was not very optimistic either. It reported that the official development assistance from developed countries to developing and least developed countries had increased since 2000, but the UN target of 0.7% of GNI was missed by a wide margin (MDG Gap Task Force, 2015). While the developing countries reached greater market access, still around 35% of all their exports were debt service (MDG Gap Task Force, 2015). Access to affordable medicine did not increase to the desired levels and access to mobile and fixed broadband in developing countries was developing at a far lower rate (MDG Gap Task Force, 2015).

1.2. The Sustainable Development Goals

Between September 25th and 27th of 2015, the heads of state and government and representatives of the member states of the United Nations, during the 70th year celebrations of the organization, came together at the U.N. Headquarters Building at New York. They decided on a new agenda, the 2030 agenda, and seventeen new global sustainable development goals.

Table 1.2. The sustainable development goals.

Goal No.	Sustainable Development Goal
1	End poverty in all its forms everywhere.
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
3	Ensure healthy lives and promote well-being for all at all ages.
4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5	Achieve gender equality and empower all women and girls.
6	Ensure availability and sustainable management of water and sanitation for all.
7	Ensure access to affordable, reliable, sustainable and modern energy for all.
8	Promote sustained, inclusive and sustainable economic growth, full and productive. Employment and decent work for all.
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
10	Reduce inequality within and among countries.
11	Make cities and human settlements inclusive, safe, resilient and sustainable.
12	Ensure sustainable consumption and production patterns.
13	Take urgent action to combat climate change and its impacts.
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
17	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

In resolution A/RES/70/1, member countries have committed to the full implementation of all these goals by 2030 and highlighted the greatest challenge as eradicating poverty in any sense of the word, but especially with regards to extreme poverty. The same document states that the U.N.'s approach to the sustainability issue will be shaped by the three dimensions of economic, social and environmental aspects of sustainability (General Assembly Resolution 70/1, 2015). Specific mentions of how an agreement of this size had never been achieved previously in the history of the organization and pledges that no one will be left behind set out the global scope of the goals.

With such a wide scope, and the number of goals having more than doubled in number, how the agenda would be implemented if it were to have any chance of being achieved by 2030 was also addressed in the resolution. Here, the focus is on a movement of global solidarity, implying that the cooperation and assistance between U.N. members was going to provide the principal means of implementation. This "Global Partnership" is defined by the implementation targets of Goal 17 alongside the other SDGs and the resolution references the final document of the International Conference on Financing for Development held in July 13th-16th of 2015 in Addis Ababa as a guideline for appropriate policies and actions that can assure that the sustainable development goals are met in time (General Assembly Resolution 70/1, 2015). However, the partnership is not limited to financing. It will also include capacity-building and transfer of technologies and the importance of both public and private sectors are highlighted (General Assembly Resolution 70/1, 2015).

As for how progress was going to be measured, each of the seventeen sustainable development goals had underlying target that specified criteria that its success will be measured against. In turn, these individual targets would later be determined by a subset of indicators; each being a statistic expressed as a numeric value which can be quantitatively analyzed. It is stressed multiple times in the document that each U.N. member country will be individually responsible for its own socioeconomic development, therefore placing high importance on national policies and strategies. As an institution, the U.N. is committed to respect each country's policy space and because of this, the focus of its enabling action is constructed around providing a supportive economic environment via the global partnership mentioned earlier. In addition to the Addis Ababa conference, references

to the Istanbul Declaration and Programme of Action, the SIDS Accelerated Modalities of Action (SAMOA) Pathway and the Vienna Programme of Action for Landlocked Developing Counties for the Decade 2014-2024, as well as the African Union's Agenda 2063 and the New Partnership for Africa's Development are made for this purpose (General Assembly Resolution 70/1, 2015).

1.3. The United Nations Decade of Education for Sustainable Development

In December 2002, the United Nations Assembly passed resolution 57/254 that marked the beginning of the Decade of Education for Sustainable Development (DESD), which would take place between the years 2005 and 2014. UNESCO was the designated lead agency for the DESD and prepared an implementation scheme. Purpose of the DESD was to enable citizens and leaders alike to face the challenges of the present and the future to gather the necessary skills to take an active part in their societies, to be respectful of the Earth and life, and to be dedicated to upholding democracy in peaceful societies without exclusion. (UNESCO, 2005).

The methods to reach this purpose were collected under three titles; incorporating education into sustainable development plans, promoting awareness on sustainable development, and achieving widespread media coverage of sustainable development related issues (UNESCO, 2005). Main challenges for these methods were given as reaching beyond environmental education and providing education for sustainable development, comiling an inventory of practices already in place around the world, using media, and establishing partnerships and harmony between different programs and initiatives (UNESCO, 2005).

In its final report dated 2014, UNESCO evaluates the DESD. It has been found that education systems are increasingly encouraging discussion of sustainable development related issues, and the programs for sustainable development are increasingly incorporating sustainable development education plans (UNESCO, 2014). The report finds education for sustainable development has reached a wider audience in terms of engagement and partnerships with politicians and different stakeholders, while at the same time local commitments have gained strength (UNESCO, 2014). In the field of education, embedding sustainable development in curricula and into mainstream learning environment has taken up speed, especially with higher education institutions taking whole-institution approaches increasingly (UNESCO, 2014). Educating for sustainable development has been found to support and promote learning-based pedagogical approaches, all the while it is being incorporated into both formal, non-formal or informal education including applications in technical and vocational education and training (UNESCO, 2014). Despite the

DESD having co-existed with the MDGs and have not been followed up by a similar global initiative, its implications for the way forward with sustainability education has important ramifications for higher education institutions even today. Challenges pertaining to alignment of sustainable development and education stakeholders, the need for increasing institutionalization and more research and innovation to prove the benefits of education for sustainable development still persist (UNESCO, 2014).

1.4. Boğaziçi University

Boğaziçi University is a leading, prestigious university in Turkey that is often considered to be among the best universities in the region. Its history begins in 1863 when the American educator, inventor, technician and architect Dr. Cyrus Hamlin partnered with New York philanthropist and merchant Mr. Christopher Rheinlander Robert to establish the first American college outside of the United States (Boğaziçi Universitesi, 2018a). The result of their efforts was the opening of Robert College. When the college suffered economic hardships beginning in the 1930s, throughout the Second World War and into the 1960s, the college board decided to grant the Hisar campus of the college to the Turkish government under the condition that a higher education institution be formed in its place (Boğaziçi Universitesi, 2018a). While Robert College moved its high school education entirely to its Arnavutkoy campus, Boğaziçi University was established in 1971.

The university's mission is comprehensive in its purpose. It seeks to educate individuals who will adopt its institutional values, who are capable of creative and critical thought, who are independent and egalitarian, with ethical values, who respect nature and environmentally aware, who are rooted in the local and open to the global and who can assume leadership roles wherever with confidence and their scholarly foundations (Boğaziçi Universitesi, 2018b). With this mission, Boğaziçi University's strive for excellence is well-founded in its culture. The values it seeks to instill in its graduates align with the requirements from global citizens in order to achieve global sustainable development. It is therefore no coincidence that SDSN has chosen Boğaziçi University to host its Turkey network. In this sense, Boğaziçi University's influence and impact on the implementation and success of the 2030 agenda on a global and regional level is highly important.

1.4.1. The SDSN and SDSN-Y

Launched in 2012, the Sustainable Development Solutions Network is a platform established by the office of the General Secretariat of the United Nations. Its purpose is to provide an

international network that will facilitate the movement and transfer of scientific and technological methods and practices that will act as problem solvers for the achievement of the SDGs and the Paris Climate Agreement (SDSN, 2018). SDSN Turkey is based in Boğaziçi University and its priority SDGs are 9, 11 and 13 (SDSN, 2018).

SDSN also incorporates a Youth Network, called the SDSN Youth (SDSN-Y). SDSN-Y aims to raise awareness for the SDGs and educate young people about the barriers that face sustainable development.

The SDG Academy is the education portal run by the SDSN and it is widely used as a tool to spread awareness on the 2030 agenda either as a stand-alone project of its own or alongside other projects that are concerned with sustainability education. It is also actively seeking to improve how its courses can be merged with existing curricula.

1.5. UI GreenMetric

In 2009, Universitas Indonesia hosted a conference on world university rankings. In the discussion, an agreement was reached that the current method of how universities were ranked around the world did not reflect university efforts to reduce their carbon footprint and help combat global climate change. Some of the leading universities in the world, including Harvard, Chicago and Copenhagen, were already taking steps to reduce their carbon footprints (UI Greenmetric, 2018). Also, there were other co-operations between other universities working on the same subject. A system was already being implemented in the United States, called the United States Green Report Card with 300 participant universities, but they weren't ranked only graded (UI Greenmetric, 2018). Therefore, the need for a globally applicable, uniform, numeric ranking system was established, and the foundations of UI GreenMetric were formed.

UI GreenMetric aims to provide the outcome of an online survey regarding the current status and policies concerning green campus and sustainability in the universities all across the earth (UI Greenmetric, 2018). It is expected that drawing the attention of university leaders and stake holders will provide awareness about combating global climate change, energy and water conservation, waste recycling, and green transportation. Such activities will require change in behaviour as they provide more attention to sustainability of the environment, as well as economic and social problems related to the sustainability. Creators of UI Greenmetric believe that the leading universities in this approach need to be identifiable and they have decided to make a start in

realising this project. (UI Greenmetric, 2018) Initially, numeric data from thousands of universities world –wide is collected and the data provided is processed to reach a single score that reflects the efforts being made by the institution to implement environmentally friendly and sustainable policies and programs. Universities are ranked according to this score. It is expected that the rankings will be useful to university leaders in their efforts to put in place eco-friendly policies and manage change in behaviour among the academic community at their respective institutions. (UI Greenmetric, 2018)

The criteria and methodology used have been carefully looked into to make it simple and easy enough to fill in without an inordinate amount of effort, while providing information on key indicators. Critical examination of the data collection instrument will provide feedback for improvement. With that in mind, the questionnaire has been given to an independent review board and will welcome comments from participants in order to improve and refine it in subsequent versions. (UI Greenmetric, 2018)

Thousands of universities around the world are invited to participate include those which already have a presence in other World Universities Rankings, such as THES-QS, Webometrics, and Shanghai Jiao Tong ranking. (UI Greenmetric, 2018) Universities that wish to participate are asked to provide numeric data on a number of criteria that can give a picture of their commitment to the greening of their campus and integrating environmentally friendly policies that support sustainability. The criteria include such baseline information as the size of the university, both spatially and in terms of population, the location of the campus and the amount of green space it has as well as information on energy use, means of transport, water use and recycling and waste treatment. Moreover, efforts being made by the institution towards establishing green policies and management will also be evaluated.

1.6. Thesis Purpose

Purpose of this thesis is to outline the current education program, campus initiatives and student activities at Boğaziçi University from a sustainable development point of view. The outline will be set against the UI GreenMetric criteria and analyzed accordingly, since the university has submitted its data to participate in the ranking in 2016. One note is that since the total score of the result of the 2016 application and points totals per section are known but points scored on individual questions level is unknown, the exact points contributions of suggested actions cannot be calculated.

While conducing the analyses for this thesis, the focus will be entirely on students and how their participation, awareness and willingness to act determines the key strengths and weaknesses of the university with regards to its sustainability performance as an institution of higher education. Focus of the students will be extended to former students within the context of the alumni questionnaire and the complete look at the past, present and future of the university will provide a clear view of how its culture is being shaped alongside its sustainability efforts.

Any references or recommendations pertaining to activities and actions that would require significant financial investments have been purposefully omitted from the scope of this thesis on the grounds that these investments would be made from a constrained budget of a public university and therefore might not be practically implemented even if they have sustainability merit, and that since a university's culture is embodied in the actions and minds of its students and alumni, these investments would fall out of scope for a culture investigating thesis both.

2. LITERATURE REVIEW

2.1. Importance of Higher Education to Sustainable Development

Following the Johannesburg Summit on Sustainable Development of 2002, the role of education in ushering an era of sustainability had been underscored. UNESCO was mandated to collaborate with educators worldwide to "foster the development, testing, sharing and adaptation of educational materials within the framework of the Decade of Education for Sustainable Development that was officially launched in January 2005," which continued until December 2014 (Garcia et al, 2006). To that end, educators worldwide committed to efforts to engage institutions, students, governments, and communities to "travel together on the sustainability journey" (Garcia et al., 2006).

Interdisciplinary approaches range from regional applications of sustainability to developing methods and tools to teach sustainable development, and to implement faculty-specific approaches to education for sustainable development. Teaching sustainable development requires not only establishing methods to reach students but encompasses many other approaches that bring in educator education within the mix. To that end, developing competence and promoting increasing consciousness are a must. Universities are central in this context and their roles in promoting effective approaches and strategies within academic institutions should also be emphasized.

In the process of implementation of these concepts, there are potential barriers a higher education institution must overcome. While these barriers are easily generalizable, one must be aware that these change from institution to institution, and more importantly vary to a high degree between regions and countries. Perhaps the most salient of these barriers is the freedom of individual faculty members. For a number of universities, individual faculty members have the last word on forming the research and education goals set for their students. Sometimes, the administration may run into issues in proposing changes that might affect the freedom of faculty members and perhaps risk academic integrity in the implementation of these changes (Scott and Gough, 2006). The authors also state that this level of freedom may be beneficial in fostering change if the individual faculty members champion sustainability efforts in their curricula and drive the change the university sets for themselves.

Combating pressure from society and the lack of desire to change are external barriers a university might face in transforming into sustainable universities. Unless society demands major changes, the universities may be reluctant to make transformations and continue with the status quo. Even if there is an external pressure for change, establishing new and sustainable facilities requires time and investment, which are long-term commitments for a lot of these institutions. A major transformation may be difficult to achieve in a short timeframe, especially if there is internal pressure against change (Ferrer-Balas, 2008).

Sibbel identifies key challenges towards meeting the challenge of global sustainability and their consequences in higher education learning. She juxtaposes these barriers against the resources, responsibilities and potential of higher education in order to establish a framework for an effective approach towards the higher education sector.

The barriers to achieving sustainability are broadly defined as; limitations of technological solutions, traditional regulatory and economic approaches, consumer-based approaches, lack of accessibility of information for decision-making, limits to reliability of this information and human information processing capabilities, and balancing individual and universal rights (Sibbel, 2009). After having described each of these barriers, the paper underscores the role of higher education as a resource for sustainability. As the training of "professionals who manage the resources, educate the public or design the options from which choices are made," are realized at these institutions, the "higher education sector bears a significant responsibility for sustainability by virtue of its influence on society an academic freedom to explore ideas" (Sibbel, 2009).

Cortese also highlights the need for a change in the mindset to achieve a vision of sustainability and sustainable development for all in higher education. Cortese claims that graduates of the best colleges and universities are the ones who are agents that lead us down a unhealthy, inequitable, and unsustainable path (Cortese, 2003). To drive his point further, Cortese quotes McIntosh et al.'s 2001 paper that despite the efforts of many to incorporate sustainability into the education system, "education for a just and sustainable world is not a high priority" (Cortese, 2003).

To fully transform higher education institutions, Cortese claims that education, research, university operations, and the external communities around universities should form a "complex web of experience and learning," which requires a fully integrated community "that models social and biological sustainability itself and in its interdependence with the local, regional, and global communities." (Cortese, 2003). The author stresses that these four areas are in dire need of change;

even when there is myriad examples, more needs to be done to assure that this change stays permanent. To that end, the key highlights are environmental and sustainability literacy, curricula incorporating environmentally sustainable design on campuses, curricula involving improvement in local communities, and expanding and improving architectural education.

Meeting this challenge is not an issue of ability for institutions but the willingness and the time frame according to Cortese. He underscores the importance of acting soon, within the next one or two decades, and gives the example of a kindergartener at the time of writing the paper who will graduate from college in 2020. After almost two decades, we are at the point of fully integrating sustainability into higher education and Cortese's vision seems to have been fulfilled to a certain extent.

In another review (Dale and Newman, 2005), focus on sustainability literacy despite the criticisms that sustainable development is too normative, ambiguous, and ineffective as a focal point for developing curricula for higher education. The authors claim that criticisms are unfounded and unjustified on the grounds that the role of sustainability in education is misrepresented by the critics.

Interdisciplinarity is another key point that is underlined in this paper; social-ecological reactions have a complex structure that sustainable development literacy, epistemology, and research requires a strong interdisciplinary structure in the curriculum. Such approaches need to incorporate fact-based skills such as systems theory and governance, and process-based skills such as systems thinking, inter- and transdisciplinary research methods and multi-stakeholder processes in order to flourish and attain sustainable development literacy (Dale and Newman, 2005).

Stephens et al. is a conceptual paper that explores "opportunities and challenges for institutes of higher education as agents for change in advancing more sustainable practices in different cultures and contexts" (Stephens et al, 2008). The authors identify five critical issues to tackle in assessing challenges and opportunities facing communities. They classify these challenges under three categories of environmental, societal, and technical changes (Stephens et al., 2008).

In the transition to sustainability, higher education speaks to these three categories of changes, in terms of providing the agency needed for change, especially for societal and technical transition. To that end, Stephens et al.. define five key questions to review challenges and opportunities in higher education: (a) dominant sustainability challenges of the region; (b) financing structure and

independence; (c) institutional organization; (d) the extent of democratic processes; and (e) communication and interaction with society (Stephens et al., 2008). All of these areas may be explored in the context of any higher education institution around the world and would provide a thorough assessment of higher education as an agent of change.

Wu and Shen's aim was to introduce an academic research into higher education for sustainable development (HESD). Their study reviewed scientific literature databases to determine research topics during the UN's Decade of Education for Sustainable Development (DESD).

Wu and Shen when comparing research trends and United Nations Educational, Scientific and Cultural Organization's (UNESCO's) strategic perspectives, worldwide topics and the number of studies they came to the conclusion that the research trends and UNESCO's perspectives did not go well and because of the researchers' concentration on popular events every year different number of articles came out (Wu and Shen, 2015). In conclusion, the results show that most researchers worked on environmental topics, and HESD should be integrated as research trends suggest. This study systematically reviews higher education for academic research into sustainability, and it shows researchers and educators the gaps between the research and the UN's policies during the DESD (Wu and Shen, 2015).

Kopnina and Meijers looked into ESD perspectives and methodological approaches and variations in ESD. the discussion of The Ecocentric and Anthropocentric Attitudes Toward the Sustainable Development (EAATSD) scale suggested outlines for forming principles of ESD which considers environmental ethics.

The paper presents an overview and an assessment of quality of EAATSD scale with students of higher professional education. Findings show that there are wide and inconclusive debates about the objectives of ESD which lead nowhere (Kopnina and Meijers, 2014). The assessment suggests EAATSD scale can be used for testing anthropocentric and Ecocentric Attitudes Towards Sustainable Development in students of higher education. Results show that being useful for testing anthropocentric and ecocentric attitudes in students of higher education this scale reveals paradoxes and challenges that are natural and basic part of aims of sustainable development (Kopnina and Meijers, 2014).

2.2. Application of Education for Sustainable Development: Case Studies and Best Practices

2.2.1. Becoming a Higher Education Institution for Sustainable Development

The literature on how sustainability development can be integrated in higher education institutions is rich. Case studies and best practices from all over the world have been examined, interpreted and analyzed for implementation by academics, especially during the 10 years since the United Nations Decade of Education for Sustainable Development.

Filho et al. describes the achievements of the UN Decade of Education for Sustainable Development (2005-2014) concentrating on higher education, and it defines some of the main aspects, which will be guidelines of sustainable development in the future. The paper starts with an analysis of past events assessing sustainable progress by the International Journal of Sustainability in Higher Education.

There is a lot of international interest in sustainability for the last 20 years. Although there has been a lot of achievement, there are still many areas to improve in the coming two decades. Besides, reaching its objectives, it needs to realize the promises made in The Future We Want by involving the higher education community that may start a chain reaction to improve ESD provision in formal and informal situations (Filho et al., 2014).

Ferrer-Balas et al. identify five core concepts that define sustainable universities. The first and foremost concept is to usher in transformative education that addresses complex sustainability challenges for a multi-way process in learning. The authors claim that rather than following a transmissive process, learning should be more interactive and learner-focused with strong emphasis on critical thinking ability (Ferrer-Balas et al., 2008). Incorporating trans and interdisciplinary research into the mix and forming networks that bring in various fields of expertise from around the campus are the next two concepts to efficiently share mindshare and resources. Dealing with the complexities created by issues related to sustainability and how these might transform in the future is another concept to be mindful of: “societal problem-solving orientation in education and research through an interaction through multiple interfaces to be pertinent to societal goals” are central to dealing with these complexities that might arise (Ferrer-Balas et al., 2008). Finally, the leadership and vision that is required from the institutions are central to achieving a truly sustainable university. The needed changes should be handled through a proper assignment of responsibilities

that would allow the long-term transformation of the university and the society through these mechanisms (Ferrer-Balas et al, 2008).

Moore makes suggestions that will help universities form sustainability education programs. What is suggested is not limited to curricula or programs, on the contrary they make academic institutions consider moving to sustainability education broadly (Moore, 2005b). In workshops where they used a "value focused thinking" framework, a group of researchers discussed with numerous stakeholders about sustainability education at the University of British Columbia, Vancouver, Canada. They made recommendations using data from workshop and from 30 interviews with participants engaged in decision-making and sustainability at the University of British Columbia.

One of the recommendations was to include sustainability in all university decisions. To do this collaboration and trans-disciplinarity and focus on personal and social sustainability should be practiced (Moore, 2005b). Combining University plans, decision-making structures and evaluative measures and the combination of the research, service and teaching components of the university were also recommended. Members of the university should include reflection and pedagogical transformation.

Amaral et al. review methods used to follow the concept of a sustainable university, Research papers, books, conference proceedings, technical reports and Internet Web sites were included in the Internet based research. The review was in two parts: sustainability implementation methods and evaluation and report instruments. Traditional environmental sustainability initiatives and more updated sustainable management systems are used for implementation at universities.

This paper defines two sustainability management systems used at universities. They both emphasize the benefit of a management system; the need for including environmental issues and special attention to using resources, such as energy, on campus buildings, the social responsibility of the institution, and educational and research sustainability activities at universities (Amaral et al., 2015). Sustainability can be managed in a university if the implementation procedure sustainability is in the same line with the instrument that evaluates its performance.

Krizek et al. describes four stages of universities' sustainability agenda and using the example of the University of Colorado Boulder shows how and where campus experiences, have been met with success and other challenges. The authors offer general ideas to perform university-wide

sustainability process with the aim of explaining obstacles against, and incentives for, a coordinated and integrated approach to campus sustainability. Four stages used, and a description of the University of Colorado Boulder are based on experiences from learning, teaching, and administering within universities (Krizek et al., 2012).

Sustainability process on campus goes through stages called: grassroots; executive acceptance of the business case for sustainability; the visionary campus leader; and fully self-actualized and integrated campus community (Krizek et al., 2012). Despite being a leader in many areas of sustainability such as research, student activities, facilities management, the University of Colorado Boulder has experienced serious difficulties in coordination.

Lozano et al. studies the texts of eleven declarations, charters, and partnerships for higher education institutions, which represent university leaders' willingness to contribute to the effectiveness of Education for Sustainable Development (ESD). In the analysis two criteria were used: (a) the university system, including curricula, research, physical plant operations, outreach and meeting stakeholders, and assessment and reporting; and (b) complexity of the texts', number of points, and number of words.

Universities are still highly traditional (Lozano et al., 2013). This means that many of them are behind corporations and governments in term of making societies more sustainable. This paper suggests universities should understand the needs of present and future generations better and contribute to the transition to 'sustainable societal patterns. Universities should include SD in all courses and curricula and all other elements of university and college activities, so show that SD is the 'Golden Thread' of the university system (Lozano et al., 2013).

Stewart offers a plan to integrate sustainability education into almost any college or university. The strategies such as green orientation, first year education, graduation requirements, interdisciplinary perspectives, sustainable campuses, and sustainability-focused academic programs—are being implemented at different colleges and universities, in all sizes (Stewart, 2010)

In sustainability education students are part of an academic environment where there are relations between disciplines and work to find interdisciplinary solutions to real-world problems. It is challenging to have this kind of institution, but it is possible individuals have specific programs and work together to coordinate sustainability initiatives. Although there is quite a lot of faculty and staff time involved, the cost of some of these programs can be quite low (e.g., the Chesapeake

Project, graduation requirements, and sustainability-focused academic programs), some can be free (e.g., sustainability integration in first year education), and some may even save money in short-term (e.g., green orientation and energy conservation efforts) or long-term (e.g., a sustainable campus).

Stephens and Graham contributes to the development of sustainability in higher education by looking into the theoretical outlines of transition management (TM), which is a multi-scale, multi-actor, process-oriented approach and analytical outlines to understand and promote change in social systems (Stephens and Graham, 2010). The TM framework guided future experience-based research in this important new field.

When applying TM framework to empirical research on higher education and sustainability some problems arise in individual institutions because internal subcultures often have competing incentives and time scales; i.e. students are temporary while faculty and staff are often on campus for many years. There is also a basic conflict in higher education organizations: they are designed to teach, but not to teach themselves. That is the reason why change is slow and gradual. The research on sustainability in higher education should analyze the factors and interactions between networks, scales, and levels across higher education and among multiple organizations.

Clark and Button describes the parts of a sustainability transdisciplinary education model (STEM), a modern approach combining art, science, and community, that provides learning opportunities for university and K-12 students, and society. The STEM combines the sciences, arts and aesthetics, and the university with the greater New Britain community (Clark and Button, 2010). Academic areas included geography, environmental science, communication, art history, aesthetics, and teacher education. The transdisciplinary methodology is part of a learner-centered design.

Because of the mutual learning in the STEM, all participants improved each other's understandings of sustainability (Clark and Button, 2010). Everybody was learning from each other: students from instructors, instructors from students, students from students, instructors from instructors, and all were sharing knowledge in a bigger group. So, all participants had a deeper and broader understanding about human-environment relationships and how humans affect natural resources (Clark and Button, 2010).

2.2.2. Mechanics of Integration

While the general principles for integration of sustainable development to higher education are well covered in the wide literature, papers on the specialist subjects of integration provide insight into less-thought aspects. These include the methodology, techniques, non-tuition university services and the student mindset and learning capacity.

Academic programs and research about sustainability have increased since AASHE's 2010 call to action (Jankowska et al., 2013). Studies identified how much academic libraries were engaged and how much information science schools contributed to scholarly sustainability activities and curricular plans. Jankowska et al. provides the results of one such study which shows library professional's involvement in sustainability, such as increasing direct access to research, building sustainability-related collections and research guides, and incorporating sustainability content into information literacy. It used an online survey as the main method, together with library, library sciences program, and university homepage searches and a literature review.

This study presents a picture of library employee and library sciences program faculty and student views on the level of academic libraries and library sciences programs' involvement in educating and teaching for sustainability across the curriculum in Unites States academic institutions. The study showed a gap between willingness to be actively involved in sustainability activities and a lack of specific sustainability documents such as a statement, commitment or action plan in academic libraries (Jankowska et al., 2013). Mulder et al. aims to determine factors that could motivate students in sustainable development (SD) education. The paper shows that SD education is not always as popular with students and lecturers as intended. The paper gives a brief review about behavioral change for long-term benefits. It determines four factors that motivate people to have longer-term objectives. It tries to reveal if these motivating factors existed in five cases of successful SD education.

It was observed in successful SD education that there were four aspects motivating students at different level: a sense of autonomy, a challenge of reflection on the future role, contact with others, self-fulfillment, focus on the individual learning need (Mulder et al., 2015). Individual autonomy did not exist in learning while group autonomy was present in all cases. The case studies were all electives.

Velazquez et al. investigated factors that made it difficult to implement the sustainability initiatives in higher education institutions help others to make their potential or current sustainability initiatives more effective. It was performed with a literature review of published and unpublished articles, conference proceedings, university reports, books, and website documents.

There aren't suitable conditions to implement sustainability programs successfully. All around the world on campuses there are many factors that prevent sustainability initiatives from being successful (Velazquez et al., 2005). Despite obstacles, however, sustainability initiatives on campuses are improving. Still there are problems such as university's conservative organizational structure and university community's not being aware (Velazquez et al., 2005). People responsible for sustainability should solve these problems until the problems of absence of sustainability policies or the existence of policies with zero enforcement on many campuses are over, one of the best solutions to implement sustainability initiatives is cultural awareness (Velazquez et al., 2005).

Warburton looks into factors that affect deep learning and discusses some ways where environmental educators encourage students to use deep learning strategies. These strategies seem to be necessary to get the most benefits from environmental courses and to possibly improve creative interdisciplinary approaches to sustainability beyond the institution (Warburton, 2003).

To be successful, students should benefit from sustainability education to have a unique way of learning that balances operation and comprehension learning – so it would lessen the possibility that some students (e.g. from science) cannot describe the meaning of what they know, while others (e.g. from arts) are not able to deduct reasoning. Educational institutions should not only teach facts about the environment but to create an active, transformative process of learning atmosphere where values are discussed, and a unification of theory and practice are included. Busy timetables or large class sizes are not suitable for these activities.

2.2.3. Case Studies and Global Examples of Integration

Vagnoni and Cavicchi review Italian universities utilizing the Deming Cycle (Plan-Do-Check-Act model). The Deming Cycle "defines the key aspects for a correct implementation of the sustainability system in universities" based on the following four steps: (a) Policy (Plan), (b) Actions (Do), (c) Assessment (Check), and (d) Optimization (Act) (Vagnoni and Cavicchi, 2014). The authors claim that the literature shows evidence that most sustainability efforts in universities

succeed or fail during the actions stage. As a quality management tool, the Deming Cycle is a robust guide in the analysis of specific organizations' approaches (Vagnoni and Cavicchi, 2014).

With this approach in mind, it's a good idea to review the Deming Cycle and the several items the authors have defined for each stage of the cycle. The Plan stage deals with identifying policies, strategies, and objectives in terms of sustainability, Do refers to the implementation of these practices, Check stage is the monitoring of the implementation of the practices, and finally, Act is the ongoing improvement stage that involves processes of development of these plans. Using these as a grading rubric Vagnoni and Cavicchi answers questions about Italian public universities for each of these stages. The authors find that although sustainability is entering the Italian university system as an idea and is within agendas, the institutional context is characterized by budget constraints and reform implementations (Vagnoni and Cavicchi, 2014).

Castro and Jabbour have conducted a study on assessing the sustainability performance of an Indian university. In order to do that, they have looked at the university's environmental management system, green campus activities, public participation, community service, social justice, conferences, courses and curriculum and research and development. They performed document checks and conducted interviews with university officials and scholars.

The university has adopted some techniques for energy efficiency according to each season. Since temperatures in summer go above 40°C, there is no need for water heating, for example. Water is reused to some degree and use of bicycles on campus lowers carbon footprint from transportation. Campus organic waste is transformed into fertilizer and waste separation bins are placed. The university offers public services including psychological therapy and a polyclinic and has other community projects. It strives to be inclusive to students from all walks of life with lower than average tuition fees and offers job opportunities to its handicapped students. There are indirect references to sustainability in lectures and there were no specific courses in environmental management (Castro and Jabbour, 2013). Research projects touch upon sustainability-related areas, again indirectly.

Analysis of the university's performance according to the framework put forward previously by Alshuwaikhat and Abubakar yields that the university is partially, inadequately, in compliance with it. Authors recommend that the same university be subject to other frameworks set out by other studies as well as more established ones like STARS. Research shows clearly that indirect

references and disorganized events cannot help a university conform with sustainability frameworks for institutions of higher education (Alshuwaikhat and Abubakar, 2008).

Moore describes a research project which was action-oriented for the involvement of the University of British Columbia with sustainability. Using data from interviews, Moore reveals that the obstacles that prevent the implementation of sustainability education are disciplinary problems, the competition at the university, misdirected assessment criteria, and multiple priority-setting by the administration (Moore, 2005a). Moore recommends sustainability education stressing transdisciplinary research and teaching, collaborative and transformative learning, and structures with participatory evaluation.

While faculty members believed it was administrators who have more power to change things administrators suggested that faculty members have more power to change in their departments and classrooms. As the goals of the administration were sometimes different from those of the faculty members they did not coordinate initiatives. It would help greatly to encourage decision-makers to become more accountable to their policies (Moore, 2005a).

Karatzoglou describes a literature review and critique of articles about University experiences, published between the years 2003-2011, after the declaration of the U.N. Decade of Education for Sustainable Development (DESD).

In short, it has been found that Universities cope effectively and continuously with sustainability by moving barriers, changing teaching models, improving social and communication skills, and community relations, and getting more involved in local and regional activities (Karatzoglou, 2013). However, when they publish their findings there is a difference of concerns. If the aim is to address the internal contextual relevance and approval, it is enough to describe past efforts and institutional practices in an introspective way. But, if the purpose is to share these experiences to contribute to the improvement of institutional practices, transferring and abstraction become important, and this choice would have implications for how the case-study research was conducted, documented and shared (Karatzoglou, 2013).

Sammalisto et al. published a case study presenting data from an open-ended survey how faculty and staff define their role in sustainability work in a Swedish university. A model was designed to show development of sustainability skills and its institutionalization.

It may be elucidated from results that sustainability is perceived differently from waste separation to a complex understanding and integration of issues into education (Sammalisto et al., 2015). It is difficult to make sustainability part of university skills for a whole university to reach. Opportunities for discussing the sustainability concept in diverse academic traditions in different disciplines are possible with interpretational flexibility. It is essential for top management to encourage integration at different university levels and continuous training and routines are needed for institutionalization of sustainability activities and following up the process in universities (Sammalisto et al., 2015).

2.3. Extracurricular Activities for Sustainability in Higher Education

Campus sustainability and student involvement and ownership of the sustainability agenda is a critically important component of sustainable development integration in institutions of higher education. A wide variety of different sustainability schemes and projects on campuses all around the world have been implemented. There are many sources reporting on the success or failures of such extracurricular activities. Often, these projects are on the subjects of resource efficiency and have wider implications on the organization of the institution rather than staying limited to environmental consciousness.

Albrecht et al. inquires ways through which universities can adapt in order to become more sustainable, based on the paradigm of organizational learning over two projects: preparation of a sustainability report by the university and a large-scale energy saving program. The authors define organizational learning (OL) as a derivative benefit from problem-based approach to questions that necessitate organizational change (Albrecht et al., 2007).

The sustainability report is a trigger with the objective of adding new information to the existing knowledge base and the energy saving campaign is considered a separate trigger for OL in the sense that it confirms correct information by adding new details to it. With regards to actors, the paper references “vicarious learning” as learning form what others around you have experienced. From that point on, the paper links organizational and group learning and so it identifies main actors as groups within the university, the university’s sustainability coordinator and its stakeholder forum. The study then seeks to identify if the projects have somehow altered the language that the university uses to communicate its information. This has happened since both projects have highlighted and contributed to the notion of a sustainable university and in part emphasize transparency and accountability to that end. Both projects have also contributed to the storage and

retrieval of data available for further research. Together with their shared area of concern and the resulting production of "shared meaning", the projects have achieved another dimension of OL. In conclusion, the study finds both projects to have successfully contributed to the culture of the university via OL.

John Maiorano and Beth Savan's 2013 paper identifies several barriers to energy efficiency in university campuses. It also seeks to understand the priority for directing energy efficiency projects in the established operational processes while examining the methods that can be utilized to overcome the identified barriers in Canadian universities.

Barriers begin with access to capital. Simply put, no energy efficiency project can be implemented if the funds for it are inhibited by internal budgeting practices, investment appraisal or due to different management priorities. Bounded rationality, either the limited cognitive capacity, constraints on time and attention or pursuit of satisfactory rather than optimal solutions by the management is another barrier. Expectation of high hidden costs associated with such projects is also considered another potential barrier. Management can also be afflicted by imperfect information that provide inadequate information for making a decision. If the management is risk-averse, this can also make them decide unfavorably towards energy efficiency projects that may entail regulatory, financial or other risks. The final barrier identified by the authors is difference in incentives. For example, if individual departments within a university are not responsible to cover their energy expenses, they would be less interested and therefore less motivated to invest in energy efficiency.

The study views revolving funds as a key area that needs to be addressed when looking at energy efficiency projects. Respondents to the study were given a set of questions to evaluate their views on revolving funds. On average, universities agreed that multi-constituency of committees, tracking costs and savings, administrative responsibilities are barriers to implement revolving funds. They do, however, agree that revolving funds can be an effective tool to use for implementation of energy conservation projects.

In conclusion, universities see access to capital as the principal barrier. Only 33% of universities use savings from energy efficiency to invest in new projects. Small and medium sized universities are less likely to successfully implement revolving funds and will face less organizational resistance when compared to well established, larger universities. The authors recommend that universities should develop formal commitments to reach energy targets and to

establish committees composed of many different stakeholders in order to implement and improve an official energy policy in order to eliminate the barriers for energy efficiency and establish functioning revolving funds.

The study by Soares et al. investigates university buildings to suggest an energy efficiency plan at an example Portuguese higher education building. The study was conducted in scope of a green campus challenge. Researchers identified three barriers to energy efficiency, as put forward by the International Energy Agency in 2006. These are: information and behavioral barriers, market organization barriers and technological barriers (Soares et al., 2015). Analysis started in campus scale and then to the scale of the specific building chosen for this study, followed by an analysis of the lighting system inside the building and then a web-based survey to understand user behavior.

Results of the study yielded an energy efficiency plan composed of short term technical and behavioral improvement. The building's insulation, heating and lighting systems were inspected together with electricity, water and natural gas consumption. Specific to the lighting system, replacing fluorescent lightbulbs with energy efficient bulbs, replacing ferromagnetic ballasts with electronic alternatives and installation of motion sensors for toilets were proposed (Soares et al., 2015). Within a payback period of 3.7 years, these improvements are expected to save 26,123 kWh/year and the corresponding 3,704 kgCO2/year in emissions. Of the 394 participants to the survey, the majority stated that they could not see the inefficiencies in energy use at the building but most of the participants expressed concern for sustainability practices. This is a prime example of another case where inefficiencies and unsustainable practices are existing, but the users are failing to take notice or action even if they are expressing concern.

Duram and Williams' 2013 study on a student-run organic garden as part of a university sustainability agenda examines the progress of an organic garden at a state university as a reflection of both university campus sustainability and student-focused sustainability education. The study was conducted over three years and the authors observed why and how the garden was formed, its key stages of evolution and the long-term issues that need to be resolved for it to continue.

The garden was established because of a group of interested students. They were geography students and the existence of a high level undergraduate geography course on local food and organic farming brought more together. This was further strengthened when the students of the geography field methods class successfully launched a professional project for the garden and won a sustainability prize. Research assistants, graduate assistants were getting interested in the project

and it received continuous funding from several campus bodies. For the long-term; issues with long-term funding, training a workforce for a productive garden, expanding visibility on and off campus, getting as many students as possible to get engaged and the development of a sustainable farming center were identified. Results of the study support that motivated, concerned students can play a key role in on campus initiatives and make change happen.

Tim Lang's paper dated 2015 tests whether campus sustainability initiatives and environmental performance has any correlation, in light of resource consumption and waste generation data taken from AASHE STARS database.

The principal observation from the study supports STARS-rated universities having improved environmental activity. This can imply that once STARS rating is obtained by a university, improvement in its environmental performance is more likely to happen than not. Looking at specific metrics, the study confirms that there is a correlation between campus characteristics and university sustainability performance. Characteristics as defined by this metric refer to energy, GHG, waste and water intensity and the diversion rate figures. The study also reports that institutions who adopt best practices can be expected to have higher division rates, but this does not strictly imply that they will improve performance with time. As for curricula, co-curricular education and research, the study results find no correlation with environmental performance.

Limitations of the study, however, need to be clarified to understand the wider implications of its findings. Firstly, the analysis was based on institutions participating in the STARS scheme. The sample may very well be representative of the population. Next, all conclusions are strictly derived from how STARS define them. All best practices are weighed equally in the STARS scheme, but it is very unlikely that all best practices have equal value to every campus and institution. Then there is how STARS defines campus characteristics via normalized data weighed with a specific formula that they have developed. The weighing can affect applicability for differences between part-time and full-time campus residents. STARS also requires one baseline year from participants and the participants select this baseline year with the only restriction being it has to be within three years of evaluation date. Participants can abuse this by selecting particularly good performance years that may have been anomalies.

Lipscombe et al. explores the scope and composition of extra-curricular education for sustainable development activities in UK universities and comments on their value. The author points out that higher education institutions can benefit sustainable development through education,

operations and research, but so far, the educational contributions have been viewed as the weakest. Using a questionnaire that was sent to the heads of the 140 institutions of higher education throughout the UK, the study collected information on the types of activities and the strengths, weaknesses, opportunities and barriers associated with education for sustainable development.

Results show that 99% of the respondents have told that they utilize one or more, 86% 5 types or more and 50% 10 or more types of sustainability related activities in their campuses (Lipscombe et al., 2008). Awareness campaigns were most common, and among them recycling campaigns were the most observed. On-campus events were second most common and occasional lectures were the most popular activity there. Third was training and personal development types, with dedicated internet/intranet pages being most common. Three quarters of the respondent institutions reported sustainable development concerned groups, most noticeable type being environmental groups (Lipscombe et al., 2008).

Extra-curricular activities are mainly regarded as being beneficial to education for sustainable development in higher education institutions. They have the potential to address a lot of the main limitations and barriers regarding educational contribution to sustainable development (Lipscombe et al., 2008). However, if badly managed, they can create only an illusion of action. Key opportunities lie with connecting these activities with real-life concerns or attracting resources from organizations and individuals aiming to promote sustainability education (Lipscombe et al., 2008). Voluntary nature of extra-curricular activities is both an opportunity in the sense that they help reach a much wider audience, and a weakness due to their optional nature.

The aim of Kaplan’s study was to show the level of sustainable transportation, mainly walking and bicycling, on a large campus in the US Midwest and then it analyzed some of the opportunities and impediments. It used three types of analysis. First, level of walking and bicycling around the campus was measured during mornings and afternoons selected. Secondly, a survey questionnaire completed by 668 students was reported. Thirdly, on and around the campus aspects of infrastructure which either facilitated or blocked walking or cycling were reported.

This paper concerned low levels of sustainable transportation among students around a campus. There was a particularly low level of bicycling activity. One of the reasons was time and convenience (especially among students who work), and another was that many students did not enjoy bicycle access. Finally, it was found from student attitudes and campus inventory that existing infrastructure discouraged sustainable transportation activity around campus (Kaplan,

2015). Although this may be limited to specific circumstances in one institution several crucial factors improving, or impeding walking and bicycling can be found on other campuses. Being aware of the impediments to walking and bicycling universities can design better and more useful facilities. This can improve the social environment and health conditions on campus (Kaplan, 2015).

White described and analyzed the use of integrated campus sustainability plans at US higher education institutions. The paper also provided a framework to assess these plans. The paper examined 27 campus sustainability plans. It identified the types and characteristics of the institutions that use these plans. The study then analyzes the contents of the plans and what they emphasize. Finally, the paper related literature to sustainability plans and plan evaluation to determine a tool for assess campus sustainability planning efforts.

Campus sustainability plans in the USA are extremely diverse. The most important are environmental aspects whereas social equity aspects are least prominent. More attention is paid to campus operations than to academic or administrative aspects. To develop their sustainability plans most campuses have adopted an inclusive, campus-wide approach (White, 2014). When assessing these plans their process and their substance and circumstances unique to higher education should be taken into account. Although the research is focused on US colleges and universities leaving others it is a fairly comprehensive analysis of campus sustainability planning in the USA. These constitute a valuable tool for integration. If the details are understood and these plans are assessed thoroughly there can be broader adoption and implementation (White, 2014).

Brinkhurst et al. examined organizational change related to environmental sustainability on university campuses. Case studies of campus sustainability efforts usually classify leadership as either “top-down” or “bottom-up”, however, they fail to consider roles of the “middle” – who are the faculty and staff (Brinkhurst et al., 2011). The authors utilize the results of the study on sustainability initiatives from the University of Guelph with an analysis of initiatives under faculty and staff leadership at universities from Canada and the USA, in addition to material regarding best practices on campus sustainability. Using business concepts and leadership literature, the authors say that faculty and staff are universities’ equivalent to social “intrapreneurs”, who work for social and environmental good in large organizations (Brinkhurst et al., 2011).

Faculty and staff members are critical leaders to achieve lasting progress towards campus sustainability, however, the way campus sustainability schemes are often marketed often puts them

in the shade. It is necessary to pay greater attention to the potential of faculty and staff leadership and how to support their efforts. In the paper, there is a case emphasizing faculty and staff leadership in campus sustainability efforts and presenting successful strategies for overcoming problems.

Williamson in his research emphasized the need for methods to consider greenhouse gas (GHG) mitigation policies at a system-level. The research focused on connecting GHG mitigation objectives such as decrease single occupancy vehicle travel) with wider institutional objectives such as growth in student population aiming to show how policies at different scales individually and collectively affect GHG reductions (Williamson, 2012). First, the author developed a framework to define different types of policy and associated GHG impacts. Secondly using data from a higher education institution, he designed a quantitative model for the effects of testing policy. Finally, by adjusting the model's policy levers, GHG emission trajectories are compared according to their type of policy.

It has been found that policies connected with housing stock and student growth can influence GHG emissions more than traditional mitigation policies such as investing in alternative transportation services (Williamson, 2012). Furthermore, based on the difference between immobile and mobile emission and related energy sources the incentive for managing GHG emissions cost-effectively in the short term is to reduce investments in housing and raise the number of students commuting (Williamson, 2012). Tradeoffs are involved in GHG efforts to reduce harmful effects and in wider higher education planning. However, institutions don't have the methods and tools to assess these tradeoffs, neither in GHG mitigation efforts nor in institutional priorities (Williamson, 2012). This research provides a method and case study to understand tradeoffs using a systems approach.

Emanuel and Adams investigates the matter whether or not there are differences between college students in Alabama and Hawaii asking three questions: are students concerned about the present and the future. What do students know about sustainability? Who is responsible for sustainability? First, sustainability efforts at universities in Alabama and Hawaii are summarized. Second, 406 undergraduate students were picked at random at two universities in Alabama (258) and at a community college in Hawaii (148) and they were surveyed.

The data show that sustainable programs and practices are being implemented on some campuses in Alabama and in Hawaii. Students surveyed in both states have the same worries:

wasteful consumption and pollution (Emmanuel and Adams, 2011). What respondents knew about sustainability was similar. They also thought similarly when they identified who is responsible for sustainability. However, more respondents from Hawaii showed concern for and enthusiasm to take part in sustainable practices. So, in campus sustainability there is almost no "knowledge gap", but when it comes to commitment the gap widens." Possible reasons for this are questioned (Emmanuel and Adams, 2011).

Horhota et al. evaluates the behavioral obstacles to sustainable action in a campus community. Using focus groups and surveys he assesses campus members' opinions about the barriers that restrict sustainable behaviors on campus. After determining general barriers, with the help of behavioral assessment he identified specific barriers to energy conservation in a target location on campus to intervene to reduce energy use for that location.

Across methodologies, four key behavioral barriers reported to sustainable actions were communication/awareness, inconvenience, financial concerns and absence of engagement (Horhota et al., 2014). The result of adopting a multi-method approach was continuous feedback loops which guide various efforts to encourage more sustainable behaviors on campus, create responsive approach to sustainability in all divisions and departments on campus (Horhota et al., 2014). The barriers of communication issues and lack of awareness were intervened which as a result reduced energy use for a target campus location.

Disterheft et al. investigates environmental management system (EMS) development and implementation in universities in Europe and provided an overview about European higher education institutions that implemented EMS at their campuses, comparing top-down and participatory implementation approaches. Besides regional differences, it discusses aspects that make an EMS at the campus go beyond operational aspects to deal with campus sustainability. Moreover, it suggests implications for the professional practice.

For the implementation of an EMS at the campus, the most effective approach could be a participatory or a mix of top-down and participatory to achieve two aspects: (a) To decrease the effect of the institutional environmental and (b) to do research and teaching, increasing awareness for (coherences and developing competencies that lead to) more sustainable practices (Disterheft et al., 2012). If only a top-down process is used to implement an EMS it is likely to make environmental improvements in the universities' operations, however, it would not contribute to the educational aspect of campus sustainability (Disterheft et al., 2012). The EMS can only help

operational environmental performance improve if it is in combination with participation, however, it creates the suitable conditions for a paradigm shift to sustainability activities encompassing the entirety of the university system (Disterheft et al., 2012).

Vaughter et al. looks into the empirical research conducted on sustainability in post-secondary education (PSE) in eight important international journals that publish on sustainability and education. Three noticeable themes of research on the topic recognized in the review were researches that compared sustainability curricula between institutions (specifically regarding disciplines of study and across disciplines); researches that compared campus operations policies and practices among several institutions; and researches around how best measure or audit approaches and outputs in sustainability in PSE (Vaughter et al., 2013). This review of the research literature supports the disagreement in the literature on sustainability in PSE that research concentrates more on case studies than comparison of various institutions (Vaughter et al., 2013). The comparative research from the field focuses on evaluating measurable outputs for environmental externalities in institutional operations, without examining understanding of sustainability and outcomes in other institutional policies and practices.

Savelyeva and McKenna looked into the Global Seminar (GS) curricula model and its on-the-ground participatory practices in America, Europe, Africa, Asia, and Australia. The authors interviewed 20 faculty members from the USA, Mexico, Costa Rica, Italy, Australia, Sweden, Honduras, South Africa, Germany, Austria, and Denmark. They observed 11 class sessions; and analyzed available course documents.

The GS model offers a broader way of teaching and learning for sustainability including greening and education for sustainability in curricula (Sayalyeva and McKenna, 2011). Although this new system provides a shift towards a unique model of teaching and learning for sustainability in academia there is a major problem with the structure which would give a lot of autonomy to faculty but follow direction of a particular institution (Savelyeva and McKenna, 2011). The other problem, minor though, is that it needs enthusiasm for academic growth, a time and effort investment that can often not pay back, and access to educational technology.

Ifegbesan et al. aims to look into common waste management practices and characteristics of undergraduate students in a Nigerian University. Data was collected using a questionnaire, focusing on group discussion and observing participatively. 840 students from four academic faculties of the

university took part in this process. Descriptive and inferential statistics were used when dealing with the research questions to lead the investigation.

The major environmental challenges observed include careless littering, open dumping of waste, weedy and overgrown lawns, huge increase in power generating sets, uncollected refuse sites and damaged walls with postings (Ifegbesan, 2017). Open burning of refuse was the most common way of destroying large volumes of waste on the university campus. Despite the problems being prevalent, only 40.5 per cent of the students concerned seriously for the solid waste practices. Also, while the students had a positive approach to new ways of dealing with the challenge of waste management in the university, students' awareness and tendency differed significantly according to sex, age, academic level and faculties (Ifegbesan, 2017).

Trahan et al. aimed to look into the development and usage of environmental sustainability tours at universities focusing on Western Kentucky University Green Tour. To find out how they were developed and used. He conducted questionnaires and interviews with sustainability leaders in tours at their university

There was not enough data on sustainability tours which made it difficult to design new tours and prove them as the main instrument. In the university, it was confirmed data was essential because some practices considered effective came ineffective. Suggestions were made to improve tours. The information on tours shows that with more help and extra supplemental materials, tours can become perfect places where teachers teach and create useful tools not only providing knowledge to students but also creating interest in sustainability (Trahan et al, 2017).

Shelest et al. considers the environmental awareness raising as the most essential element of education for sustainable development. The paper describes Youth Environmental Volunteers Movement in the area of coastal oil response operations in St. Petersburg as a successful movement in environmental awareness through cooperation between universities and city authorities. The main aim is to investigate ways to raise environmental awareness through universities and city authorities' cooperation (Shelest et al., 2017). It is a system prepared by environmental volunteers for oil recovery operations on the Baltic Sea coast.

Environmental volunteers' tuition program was created because of cooperation between universities and state authorities. The aim is to give necessary knowledge and skills that experts and

young people require on how to run rescue and oil spill response operations. Practical field trainings with simulated oil accidents took place on the coast of the Gulf of Finland.

Cruz et al. explores how integrated traffic and parking management strategies contribute to use existing parking spaces effectively and to reduce commuters' fuel consumption and greenhouse gas emissions when traveling to the University of Coimbra main campus. They used an integrated modelling approach that included the features of supply and demand for parking and public transport, creating a survey and applying it to campus users and a life-cycle approach to evaluate six transportation and parking strategy scenarios.

This study has studied if integrated parking management policies have contributed to use the available parking spaces more sensibly; and to reduce GHG emissions, fossil fuel consumption and commuters' energy requirement on the University of Coimbra Campus. It shows how important integrated management measures are to greening commuters' transportation and parking within a University campus, by determining opportunities to make the transitions successfully toward a more sustainable future, which is increasing well-being and reducing environmental effect (Cruz et al., 2017).

Lambert and Cushing describes how an ecological footprint reduction campaign affects the pro-environmental behavior of university students, faculty and staff. The focus of the campaign was to educate participants to reduce resource use and have an environmental benefit of each action. At the beginning of an academic year, the baseline EF of participants was measured, and they participated in a footprint reduction campaign. At the end of the campaign, their EF was measured again to see if they were able to decrease it by 10 per cent (Lambert and Cushing, 2017).

Students participating in the footprint reduction campaign reduced their footprints by 10 per cent. The factor that changed their behaviors was goods and services, with a 16 per cent decrease in footprint corresponding to this category (Lambert and Cushing, 2017). The most impressive behavior change for faculty and staff was in the housing category with decreases of 12 and 11 per cent, respectively. For students the biggest behavioral changes students low- and no-cost options (Lambert and Cushing, 2017).

Wright examined some major national and international declarations and institutional policies about environmental sustainability in universities. And reviewed definitions and frameworks for sustainability in higher education. No matter what the approach of the university to sustainability

is., there are foundational themes in both macro and micro approaches to sustainability such as sustainable physical operations, sustainable academic research, environmental literacy, ethical and moral responsibility, cooperation amongst universities and countries, the development of interdisciplinary curriculum, and partnerships with government, non-governmental organizations and industry (Wright, 2002).

It is not known exactly how much implementation of national and international declarations within specific institutions has been done so far and what difficulties and opportunities universities have had during implementation. To promote sustainability in higher education it is important to understand how declarations can be implemented effectively at institutions, rather than only reporting on 'best practice' cases. Finally, if a university creates a specifically environmental institution policy, what are the measures to make sure that it is implemented? Issues of accountability and efficacy of the various declarations are not discussed here but they have been neglected in the literature and need further attention.

2.4. Curriculum for Sustainability Education

From a curriculum perspective, there has been an increase in the number of higher education institutions that have incorporated sustainable development into their curricula throughout the ten-year period (Aktas, 2015). In the USA, the number of interdisciplinary environmental and sustainability degree programs have increased by 57% between 2008-2012, and that 21% of four-year institutions offered sustainability academic programs in 2012 (Vincent et al., 2013). Aktas also cites Clark et al. that there are more than 1000 environmental studies programs within higher education institutions in North America (Aktas, 2015). However, the increasing numbers do not necessarily mean that these institutions are committed towards unified and clearly defined goals. It should also be mentioned that the competence of faculty members with disciplinary expertise are also up for question. From a research side, however, sustainability and sustainable development have been getting increasing interest from academia, demonstrated by the number of articles within this time frame.

De Lange develops a theoretical model to examine stakeholder-related mechanisms that pertain to incorporating sustainability into academic curricula for institutions of higher education. By doing so, the author tries to find an answer to the question "what stakeholder-related mechanisms and how do these mechanisms affect adoption of sustainability into university curricula" (De Lange, 2011).

The author chooses university setting for its unique and strong cultural characteristic of hierarchy and universities' acceptance of new thought such as sustainability.

De Lange then examines three cluster regions of universities that rank within the top 100 MBA programs according to Financial Times. According to the analysis, she arrives at three propositions: [1] the more embedded a university, the more limited its ability to choose its stakeholders, thus resulting in narrower, reactive sustainability adoption, [2] the higher extrinsic motivation stakeholders have, the broader and proactive sustainability adoption becomes, and [3] intrinsic motivations of stakeholders and broad and proactive sustainability adoption requires mediation by university attention to the widest set of stakeholders (DeLange, 2011).

In their paper, Coops et al. present a description of the development, and newly introduced implementation of an entry-level, interdisciplinary sustainability course. For this, they describe the development of a university-wide plan. The plan was designed to connect units on campus working and teaching in sustainability areas, and to promote and support sustainability curriculum.

Especially three activities of the learning communities developed excited the teaching team in their development and performance; (a) an interactive team activity for holistic systems thinking; (b) the requirement for each student to develop their own personal sustainability plan as a mechanism of examining their own individual course of learning; and (c) the requirement that each student develop their own personal sustainability portfolio, to follow the students' development through the course focusing on their learning and reflecting the process of their own sustainability thinking during the semester (Coops et al., 2015). This type of course offers new understanding into problems for implementing first-year sustainability curriculum.

Zeegers and Clark try to find the answer to the question if the graduates of a balanced course on raising students' awareness of sustainability, that is one considering equally the social and economic and also the environmental aspects, would have the necessary knowledge and commitment to take the sustainability agenda forward. The aim of the paper is to discuss these issues. They analyzed students' final information in their reflective journal to see whether their views on sustainability reflected a balanced view.

This research confirmed previous studies showing that students are enviro-centric biased (Zeegers and Clark, 2014). It also showed that although a pedagogical approach which provided a

balanced view of sustainability by encouraging discussion, debate, and reflection many students have an environmental perspective of sustainability.

Brundiers and Wiek presents a system for PPBL courses in sustainability and reviews PPBL practice in six programs around the world (Europe, North America, Australia). Data collection was realized through semi-structured qualitative interviews with course instructors and program officers, and document analysis.

The study shows that the quality of the PPBL courses reviewed is high and they are carefully designed. Each PPBL course has innovative suggestions for partnerships between the university and private entities, in-depth peer-review, and the function of knowledge brokers (Brundiers and Wiek, 2013). However, there are also weaknesses such as lack of critical learning objectives, solution-oriented research methodology, and follow-up research on implementation. Through the comparative design, the study shows improvement in strategies for the problems and presents guidance for design and redesign of PPBL courses (Brundiers and Wiek, 2013).

Dmochowski et al. describes the strategy used at the University of Pennsylvania (Penn) and assesses its success and how it led others to create similar programs. This article is a summary of Penn's Integrating Sustainability Across the Curriculum (ISAC) program. ISAC puts Penn undergraduate research assistants together with instructors in a common effort to introduce sustainability into courses.

Besides other Penn activities (a course inventory, faculty discussion groups and a research network), ISAC increases Penn's sustainability-related courses and creates dialogue about contribution of disciplines to sustainability (Dmochowski et al., 2015). The program described in this article is used in other institutions. The authors suggest that future programs should be done where academics are the primary group. They also recommend using past faculty as part of the faculty workshop and employing new faculty applicants. The authors show that the logistics of recruiting students and setting the program are clear (Dmochowski et al., 2015). Undergraduate students are on campus; they have reasonable pay requirements; and they are enthusiastic about research experiences.

Kurlan et al. investigates the campus's sustainability network. Stressing the curricular efforts, and using an interdisciplinary course team-taught by seven faculty from different disciplines, the authors describe how California State University Northridge has improved its sustainability network

and overcome structural gaps, to create systemic organizational change (Kurlan et al., 2010). The authors finish with implications for management pedagogy.

This interdisciplinary course both educated students about sustainability, and through developing shared learning objectives made shared mental models part of the system around sustainability among areas extending faculty. What was the role, of management faculty and pedagogy in meeting these needs? Authors expected at least two possibilities: building and bridging. A building approach, as intended in the present case, can present a base course for a sustainability minor. In a bridging approach, the management professor is an important connection with other faculty, and through management pedagogy students experience the sustainability implications for management of various disciplines.

Bonney and Duram investigates the place and role of geography for sustainability studies in higher education. The authors highlight that geography is not considered to be a main field of study for sustainability when compared with other fields like economics, environmental science or sociology, the perceived "pillars" of sustainability (Bonney and Duram, 2016). Through the Sustainability Tracking, Assessment and Rating System (STARS) of the Association for the Advancement of Sustainability in Higher Education (AASHE), their study focuses on universities who have self-identified themselves as leaders in sustainability for higher education.

Results show that among the highest-ranked universities according to STARS, few universities indeed have curricula dedicated to sustainability studies. Gold, Silver and Bronze-rated universities were offering 4%, 2% and 1% of their classes respectively as focused classes on sustainability (Bonney and Duram, 2016). The study's proposition of the field of geography acting as a binding agent for environmental problem solving was backed up by geography departments in the 79 sample universities having 14% of their curricula dedicated to sustainability focused courses, ahead of environmental sciences at 10%, on average (Bonney and Duram, 2016). The inherently interdisciplinary nature of geography and its focus on human-environment relations, the authors argue, makes geography education suitable for leading sustainability in higher education.

2.4.1. Sustainability Education in Business Programs

Sustainable development has often been described as having three pillars: environmental, economic and social. With that in mind, specific applications of sustainable development education in faculties and institutes of business and economics is a subject that any university with a business

school should study. Boğaziçi University is one of the leading schools in Turkey and the region for business studies in all levels of higher education. For this reason, case studies of business school applications is important to cover within the context of this study.

A study by Eagle et al. sought to understand the attitude of students towards sustainability related issues within the context of a business studies program at a university. The study was conducted simultaneously on two campuses. Nine indicators were used to determine the level of familiarity with the basic concepts and terms related to sustainability. Although there were differences, the concepts most featured in media outlets were the ones that the students displayed more familiarity with. However, a following set of open-ended questions, students were instructed to ask questions regarding these concepts. The answers were so few in number that it showed support for familiarity not necessarily leading to environment friendly behavior. The following section of the study asked questions regarding how the students view the impacts of their everyday actions upon the environment and knowledge on that link was shown to be weak. Correspondingly, actions that the students elect in terms of minimal effort for improving their environmental impact such as switching lights off were financially rather than environmentally concerned. However, despite these findings, the students yet claimed that they were interested in sustainability and their environmental impact. This inconsistency suggests a non-rational element (Eagle et al., 2015). This inconsistency is further elevated with the high levels of optimism and risk denial observed from the students regarding the future. Level of feeling alarmed regarding the various “tipping points” of environmental conditions as portrayed in the media are moderately low but the students do agree with the potential consequences if such changes occur.

The attitude-behavior gap as put forward by Owens and Driffill in 2008 resurges in this study. Purely informative stimulus is not enough for the students in the sample to overcome the myriad barriers (economic, psychological, social, etc.) for meaningful behavioral change.

In their 2007 research, Christensen et al. looked into how the directors of the MBA programs of the 2006 Top 50 MBA rankings by the Financial Times have responded to their questions regarding the offering of courses related to corporate responsibility, business ethics, inclusion and sustainability at their institutions.

Limiting the scope of their study to the top 50 business schools for MBA, the authors were able to communicate directly with the deans and other senior administrators in these schools. They have discovered that almost a third of these schools require courses related to the three topics in their

programs. There is also institutional support for these topics to be taught. The study was also able to highlight the innovations primarily in Europe regarding integration of these topics. Teaching techniques and immersion were brought up, all the while student involvement was also investigated as a driving factor. Overall, the study reports that while there is no firm direction in where the tuition of these topics is going across their sample, it is impossible to deny that the integration of all three topics is taking root. The fact that similar studies in this field overlap with their findings suggests that a trend may be forming.

Barber et al. study on sustainability in business school education seeks to display how to overcome the barriers for successful integration of sustainability into curricula over a case study. The authors recognize that while both businesses and universities are embracing sustainability at an increased pace, business schools so far have been slower to join in (Barber et al., 2013). A very few number of business schools offer core courses in sustainability, and business schools are accused of not producing leaders knowledgeable on sustainability.

In the case studied by the authors, the answers came from several sources. First of all, innovative new programs like the Dual Major in EcoGastronomy show the case university integrating sustainability into its wider campus and community. One step further, the study suggests young academicians and scholars should be incentivized by their universities to move towards sustainability research and tuition. For lasting institutional change, the importance of funded, interdisciplinary research in creating interest and meeting the expectations of stakeholders is highlighted (Barber et al., 2013). To facilitate this change, the key role is placed on strong institution-wide support and university management's strategic commitment.

Gitsham and Clark's study explores the relevance of sustainability in management education. The criteria used are the expectation and requirements of an important type of stakeholder in management: corporate senior executives. Their methodology includes a survey that was sent to executives of the companies participating in the UN Global Compact. Results indicate that surveyed executives firmly support the notion that obtaining the skillset and knowledge required to address emerging challenges put forward by sustainability related phenomena is crucially important for all employees across their organizations (Gitsham and Clark, 2012). This skillset also includes capability and competence to understand and evaluate the business risks and opportunities from environmental and social trends, ability to establish and expand partnerships both internally and externally, as well as the existence of an ethical principle to guide business decision-making (Gitsham and Clark, 2012). The expectations are high and implicate that equipping students with

these qualifications is a complex task that universities can't solve entirely with awareness campaigns and guest lectures.

The 2007 article by Stubbs and Cocklin puts forward the details of a framework for educating MBA students with sustainability as a focus point used at the Monash University in Australia. The system challenges student perspectives and provokes critical thinking of their assumptions on the relationship between business, the society and the environment. The article points out that this framework encourages a lot of class discussion due to how it brings out the differences among various views on sustainability and the neoclassical views on business-as-usual. However, it is important to note that the framework does not seek to strictly change the students' points of view, instead it tries to deepen their perspectives on the issues and increase their awareness regarding arguments in the both sides of the debate. The three "pillars" are not static in how the framework works, its nature is portrayed realistically as not static. Reasoning of why this program is not a stand-alone department is given as that maybe the basics and the principal theory could be transferred to students better that way, but integration with core programs is important. This integration allows students to view sustainability not as a separate field entirely different to what they are studying at an MBA program.

Perera and Hewege applied the present knowledge of curriculum developments in international business and marketing curricula. The issue of involving sustainability in business and marketing curricula of the universities has been discussed previously. Using a method with two stages consisting of complementary data collection techniques they got the findings. First, they used an online survey among 111 undergraduates from an International Marketing course. They used the findings of the survey to analyze essays written by 60 undergraduates assessing sustainable marketing practices of international firms.

The study suggests that curriculum development projects in integrating sustainability into an existing curriculum in universities should cover gaps in undergraduates' learning in sustainability education (Perera and Hewege, 2015). The study shows that the biggest learning gaps are that it is difficult for undergraduates to see the social function of international business firms from a holistic perspective their evaluation of sustainable marketing practices is critical; and their views on sustainable marketing practices are futuristic (Perera and Hewege, 2015). Moreover, the content analysis identified three main thematic categories: sustainability from reductionists' point of view, the outcome of sustainable marketing practices is "but good for businesses", indecisive about the future success of sustainable marketing practices (Perera and Hewege, 2015). These learning gaps, thematic categories and the theoretical underpinnings of Rusinko's matrix for integrating

sustainability in education helped the study to provide practical pedagogical framework for incorporate sustainability education into curricula (Perera and Hewege, 2015).

2.4.2. Sustainability Education in Engineering Programs

Similarly, with business education, engineering is another important field for sustainability studies and contributes to both the environmental and economic pillars of sustainable development. With the concerns around climate change and the advent of the sustainability agenda for the near future, cleaner production and eco-friendly products are becoming areas of interest. To that end, engineering education too will have to meet the demand to train environmentally conscious graduates.

The paper by Shields, Verga and Blengini seeks to explain the shift towards sustainable engineering and how this shift has affected the way engineering students are taught. The challenge, as the authors say, is how to prepare engineering students to work efficiently within the context of the new realities that require sustainable business practices. Authors describe three points of resistance from faculty members when asked to teach sustainability in their courses. Firstly, it is argued that teaching of sustainability should not take away from students the grasping of engineering mechanics. Secondly; teaching sustainability should not take away time or credits from the course itself. Lastly, faculty tend to argue that they have perfected their course content over many years and do not need to learn about sustainability themselves to teach it in the time where they can talk about new technological developments on the field. These constitute barriers to incorporate sustainability into already existing course content.

Authors describe common approaches that universities utilize to overcome these barriers. Universities can add courses linking engineering, ecology, environmental sciences, etc. Universities can create entirely new courses that are interdisciplinary and encourage systems-based thinking (Verga and Blengini, 2013). Another approach is deep-rooted institutional commitment to revise many courses to incorporate sustainability and expect students to have a degree of knowledge on sustainability and to produce projects on sustainability (Verga and Blengini, 2013). A fourth approach is to form a sustainability working group which establishes classes where non-engineering aspects of sustainability are taught in tandem. An alternative to this working group is to form a separate degree in multidisciplinary sustainable engineering, as an alternative to a traditional engineering degree (Verga and Blengini, 2013).

Of the four approaches, the authors agree that the first one is impractical while there are many cases of the other three found among various universities. They recommend working with professional societies and chambers of commerce to establish the value of a systems-based multidisciplinary point of view for engineering students (Verga and Blengini, 2013). There is no need for engineering students to become sociologists or economists per se, but an ability to communicate with those professions is a clear need for them.

Quist et al. reviews the TU Delft university practice of teaching participatory backcasting to engineering students. Courses are planned with attention to backcasting, systems orientation, a vision for sustainable development, stakeholder engagement and multidisciplinary projects. Backcasting is the practice where the desired outcome is imagined first and then traced back to the present in order to identify the pathways that lead to it. Students are found to be appreciative of these courses, especially with regards to backcasting and the project method (Quist et al., 2005). At the outcome of the course, students are introduced first-hand to the challenges of public acceptance and obtaining stakeholder support for their projects. This entails the understanding that different fields have different viewpoints and also that different stakeholders can prioritize in different ways (Quist et al., 2005). Upon completion of their projects students experience the cultural and structural barriers which might be more difficult to overcome than technical barriers as well as the need for long-term paradigm shift and social change for sustainable development (Quist et al., 2005).

Azapagic et al. tries to answer these questions: (a) How much do engineering students know about sustainable development? (2) What are the gaps in knowledge? (3) What could be the best approach to educate engineering students for sustainable development? A world-wide survey was conducted and part of tried to see how much engineering students know about sustainability and what is their understanding of sustainable development.

Overall, it was seen that the level of knowledge and understanding of sustainable development is not sufficient and much more work is required to educate engineering students in this area (Azapagic, 2005). In general students are relatively knowledgeable about environmental issues, however, it is clear that there are important gaps of knowledge in connection with the other two (social and economic) parts of sustainable development (Azapagic, 2005). More knowledge is required in the area of environmental legislation, policy and standards, because students do not know much about these issues under this general heading.

Chau expresses the reason why sustainability concepts are integrated into an undergraduate civil engineering curriculum in Hong Kong. The study refers to incentives and barriers for implementation of the curriculum. The project was designed by a team that had a problem-based learning approach

It is seen that civil engineering students have to be provided with a wider perspective on concepts of environmental, economic and social issues to make decision making sensitive to sustainability (Chau, 2007). The assessment results show that multidisciplinary skills developed when learning might contribute to relevant knowledge on sustainability. It can be said that the use of PBL is not enough to totally depend on capstone design activities to change students' views and to implant an understanding and practice of sustainability throughout their career (Chau, 2007). Therefore, additional curriculum changes are necessary to attain this important change to the traditional engineering problem-solving process.

Watson et al. study how interested students are in and how much they know of, and what experiences they have in sustainability in civil and environmental engineering (CEE) at the Georgia Institute of Technology (Georgia Tech). A survey was conducted and administered to 153 students from CEE capstone courses.

Most CEE students showed interest in sustainable development. Students' rating on how capable they are to understand and apply sustainability were impressively lower than how they rated the importance for engineers to have these abilities, which implies potential for improvements in student learning (Watson et al., 2013). Although students were not very confident to discuss the three sustainability dimensions, they regarded environmental dimension as the most important and social dimension as the least important for engineers. Students learned about sustainability more in CEE courses than in other curricular and extracurricular activities, and this underlines the importance of curricular quality (Watson et al., 2013). Students were generally satisfied with CEE sustainability education; however, they supported several strategies that may improve the curriculum, providing more guidance on applying sustainability during design.

Boks and Diehl refers to the issue of how to make sustainability part of a course, focusing on one specific course in Delft University of Technology's Industrial Design Engineering (IDE) Bachelor curriculum. The course has 6 stages: (a) Pitch (b) Internal and External Analysis (c) Product Development Assignment (d) Conceptual design (e) Sketch design and (f) Business Plan.

The study shows that students prefer more case-specific input and discussion on sustainability issues, and in specific cases they have difficulty in applying generic understanding in sustainable product development (Boks and Diehl, 2006). If students are not specifically asked to integrate sustainability issues, they do not tend to do that. This is not only because most staff members (clients and coaches) do not have enough experience to do so, but also because it is true that sustainability usually plays a small, but increasing, role in most industries (Boks and Diehl, 2006). Including sustainability as example topics regarding consumer safety has helped to make staff members accept sustainability as a source for creativity and assessment more easily. In that respect, more about trans-disciplinarity is becoming clear in Design 5; sustainability certainly includes elements in product development that traditional subjects did not (Boks and Diehl, 2006).

Segalas et al. offers the results of a 5-year research project that analyzed how sustainable development skills were introduced into technological universities. To assess which pedagogical approach is the best to make sustainable development learning easier, he analyzed ten courses on sustainability from five European technological universities using conceptual maps as the assessment method (Segalas et al., 2010).

Experts stress the sociological role of sustainability in terms of how issues connected to sustainability influence human beings and how problems related to unsustainability can be solved (Segalat et al., 2010). After taking a course on SD most students concentrate on the technological side of sustainability, thinking that technology offers solutions to environmental problems. Sustainable development courses at technological universities should: (a) Have a content focused on the social and institutional aspects of SD and (b) Use a constructive and community-oriented pedagogical approach. Available pedagogical tools for sustainability education of engineering students are: (a) Lecturing, (b) Project-based Learning, (c) Case studies, (d) Problem-based learning, (e) Backcasting and (f) Role play.

2.5. Competencies for Evaluation of Sustainability in Higher Education

In the final section of this literature review, the focus will be on the studies presented for measuring, benchmarking, assessing, and revising the sustainability performance of higher education institutions. A number of tools have evolved over the last decade that provide frameworks for evaluation and yet the literature also includes specifically designed frameworks for universities alongside the well-recognized common tools. Without performance evaluation, any attempt at educating for sustainable development at higher education institutions cannot be

themselves sustainable. Therefore, in order to provide the foundation to the current agenda on competencies and draw conclusions for Boğaziçi University, the literature on sustainability reporting and evaluation frameworks will be reviewed.

Barth et al. in their 2007 paper discuss the possibilities that formal and informal learning can have on competence formation in higher education institutions. Their results implicate that developing competencies in both sustainability education programs as well as student volunteer work should be encouraged. Interdisciplinary cooperation, motivation and planning and execution skills are closely related to this. In order to establish these competencies, the concept of multi-faceted contexts is key. Informal learning is argued to provide this requirement at universities, but whether informal learning is supported or allowed by universities is the determinant factor.

As far as controlling any competencies is concerned, the study finds this is only possible up to a certain level. The greater the sense of responsibility is instilled in individuals, the greater the possibility for learning and reaching competencies will be. Again, availability of informal learning spaces plays a crucial role in achieving this. Finally, interdisciplinarity is found important with regards to providing a medium for reflection. It is important for forming competencies for interdisciplinary collaboration and establishing motivation schemes. Formal learning should therefore allow interdisciplinary collaboration while informal learning probably already provides that setting since it does not differentiate between subjects.

Both formal and informal learning at university level are important for formation of competencies for sustainable development. The study concludes that a culture of learning should be followed by a culture of teaching in a university that combines academic formal and informal settings for learning, all the while drawing from competencies formed in extra-curricular or volunteer work of the students. Establishment of such a learning culture would better equip learners to handle complex problems, to act and decide reflectively, to be more responsible, to make ethical judgements before they act and to be able to foresee consequences of their actions.

Wu and Shen aims to provide a complete understanding of academic research into higher education for sustainable development (HESD). Their study utilizes a systematic review of four scientific literature databases to outline topics of research during the UN’s Decade of Education for Sustainable Development (DESD) (Wu and Shen, 2015).

Shephard relates aspects of education for sustainability to educational theories of the emotional part (values, attitudes and behaviors) and proposed how the education for sustainability could benefit if these theories and related experience are used in other educational areas. Analysis is based on a review of related educational attempts in emotional learning.

This paper reveals that most teaching and evaluating in higher education is mainly based on cogitative skills of knowledge and understanding rather than emotional results of values, attitudes and behaviors (Shephard, 2008). Some areas of higher education, however, have followed emotional results and to do so they use particular learning and teaching activities. Main matters are evaluating results and courses, presenting academic credit for emotional results, main roles for role models and designing realistic and acceptable learning results in the area (Shephard, 2008).

Shi and Lai discuss the elements of developing a working university sustainability ranking framework. Their proposed framework addresses the main aspects of sustainability and is found upon quantifiable criteria for general applicability in all universities around the world (Shi and Lai, 2013). Work of Velazquez et al. on a sustainable university model influenced their proposed framework. Its purpose was to provide an alternative framework with a neatly structured criteria tree that would allow aggregating the criteria to a benchmarkable single sustainability score without the risk of double counting. Double counting is observed when the criteria are redundant at least partially and key criteria are omitted. This risk is evident in most sustainability grading tools, owing to the interdisciplinarity of the field of sustainable development. Saaty's remarks in 1994 that it happens when the weighted criteria are used or found multiple times in the weighting of its alternative partially explains this for the authors.

Shriberg analyzes the way by which sustainability in higher education has been recently measured by institutions. Key focus areas in these measurements were the identification of important areas, the need for comparability and computability, moving beyond simple ecological efficiency, measurement of process and motivations, and finally the importance of being understood. Shriberg analyzed 11 campus sustainability assessment tools with very different scopes, uses and aims. The results of the study show that there are certain common strengths and weaknesses shared across these tools (Shriberg, 2002). First is decreased throughput. This refers to all tools imposing the need to use resources (electricity, water, etc) less. Next is incremental and systemic progress; as sustainability is a long-term goal, tools commonly suggest a dual approach. Incremental steps should be taken to address concerns regarding ecological performance, however, weaker tools usually suggest this and leave out the second approach of systemic changes and

sustainability education becoming a priority (Shriberg, 2002). Final common point is cross-functional reach. This refers to measurement of progress for teaching, research, ecological building design, etc, and inter-institutional co-operation. Stronger assessment tools usually incorporate measurement of these over weaker ones (Shriberg, 2002).

Suwartha and Sari introduces the changes in UI Greenmetric framework and analyze the meaning and results of its 2011 annual ranking. The analysis is performed descriptively and qualitatively, meanwhile the Berlin Principles were used to analyze the compliance and quality of UI Greenmetric.

The 2011 version, as analyzed in the paper, had increased its number of indicators by 21 while the weighting of each category remained the same percentage (Suwartha and Sari, 2012). Answer options for some questions were extended to capture more accurate responses, while authentic data collection was improved with each institution receiving a password to enter the website of the framework (Suwartha and Sari, 2012). Collected data was verified over e-mails and also by site visits and using online tools especially with regards to setting and infrastructure questions. Some criteria and their weightings are under revision and the questionnaire is prepared in a way to provide the most feedback from users.

Results of the study indicate that participant institutions have scored the most amount of points in the energy and climate change section (Suwartha and Sari, 2012). With regards to the Berlin Principles, which are a set of best practice and quality standards for higher education institutions, most of the indicators are conforming.

Svanstrom et al. discusses the common aspects of learning outcomes (LOs) for education of sustainable development in the context of the Tbilisi and Barcelona declarations. These aspects are; systemic or holistic thinking, the integration of different perspectives, skills such as critical thinking, change agent abilities and communication, and finally different attitudes and values (Svantstrom et al., 2008). LOs that are proposed in the Tbilisi and Barcelona declarations are analyzed. The analysis presents some specific issues for the common aspects. Examples of LOs from Instituto Tecnolo´gico y de Estudios Superiores de Monterrey (ITESM) in Mexico, and from other associations from the USA are given. There is a short discussion about the means to achieve these LOs and learning assessment.

In the example of LOs, the institutions proposed the commonalities (shared interest and experiences) presented in the paper's first section. As it is known and perceived, sustainability is properly shown in the examples. Besides obtaining the knowledge about ecosystems and the human condition, the learning results all have systemic thinking, interpersonal and intrapersonal skills development and a strong emphasis on change agent skills (Svanstrom et al., 2008).

The study Tierney et al. that looked into how education for sustainable development was assessed in the taught curriculum at the University of Bristol, compared it to other methods of measurement and used measurements to get academics to consider using sustainable development in their teaching. The University of Bristol decided to use Unit and Program Catalogue, which was a list of units taught as an in-house method of assessment. Initially this showed that some information relating to ESD was not clearly explained. A school ESD review refined the data after key information set data, which was a nationally published data set which identifying mandatory, typical and optional diets taken by students on programs, was revealed.

Although text-based methods that evaluate ESD penetration into programs of study have limited use as direct measures of sustainability visibility in programs, they can be improved by using interpretative methodologies (Tierney et al., 2015). Quantitative and qualitative methodologies are combined to produce data, which is a prime stimulant for academic reflection. Perhaps more importantly, it contributes a tool for engagement while also permitting the goal of obtaining resources and support. The University of Bristol has avoided the likely mistakes of manipulatable text count methods and shown that when academics and students get involved comparative methods can be combined effectively for a measurement method (Tierney et al., 2015). Now the monitoring of ESD is part of the institutional quality assurance process, annual program review, and the ESD baseline review supports this monitoring. The mapping process's "bottom up" approach works well with the "top down" goals that the University management's different extensive and connected strategies and policies (Tierney et al, 2015).

Wright examined some major national and international declarations and institutional policies about environmental sustainability in universities. and reviewed definitions and frameworks for sustainability in higher education. No matter what the approach of the university to sustainability is., there are foundational themes in both macro and micro approaches to sustainability, such as sustainable physical operations, sustainable academic research, environmental literacy, ethical and moral responsibility, cooperation amongst universities and countries, the development of

interdisciplinary curriculum, and partnerships with government, non-governmental organizations and industry (Wright, 2002).

It is not known exactly how much implementation of National and international declarations within specific institutions has been done so far and what difficulties and opportunities universities have had during implementation. To promote sustainability in higher education it is important to understand how declarations can be implemented effectively at institutions, rather than only reporting on 'best practice' cases (Wright, 2002). Finally, if a university creates a specifically environmental institution policy, what are the measures to make sure that it is implemented? Issues of accountability and efficacy of the various declarations are not discussed by Wright, but they have been neglected in the literature and need further attention (Wright, 2002).

Kamal et al. discusses a study trying to find an effective sustainability-benchmarking tool for the University of Saskatchewan that needed to track and evaluate the university's sustainability performance in education, research, operations, governance, and community engagement. Two of the tools reviewed were academic-focused, namely SAQ and CSAF and the other two, the CSRC and STARS, had a more general scope. 27 questions directly related to sustainability in the five areas of campus life were used to rate the tools.

The study has shown that CSRC is the best tool for governance and operations, although it is not effective for sustainability in education and research (Kamal et al., 2013). The academic tools – SAQ and CSAF – are not effective enough for sustainability in campus operations. Therefore, STARS. was regarded as the most effective to assess sustainability in all areas of campus life at the UofS.

Lozano aimed to evaluate the state of sustainability reporting in universities. It used the Graphical Assessment of Sustainability in Universities tool to analyze 12 universities sustainability reports. The results indicate that sustainability reporting in universities is still in its early stages (both in terms of numbers and level) when compared to that of corporations (Lozano, 2011). The results from GASU help to see where the university excels and those that could be improved.

The research is limited to universities that publish sustainability reports. Reports show that universities could learn from the experiences of corporate sustainability efforts, and as learning organizations use them to support their systems with sustainability. Therefore, University leaders and champions should publish more information on the social and educational aspects.

Alghamdi et al. (explores 12 evaluation tools of sustainability in universities and develops the structure and the contents of these tools to be more understandable. The pattern of the tools examined shows that indicators communicate only the essential information. This paper looks into how the theoretical concept of a sustainable university is changed into more measurable variables to support practitioners and academics in evaluating sustainability in universities.

In this paper, the main method was a desk study approach, which included reviewing research papers, graduate theses, academic books, network platforms, and websites. The tools reviewed have similar characteristic in terms of criteria, sub-criteria and indicators. Five factors are essential for a holistic framework: management; academia; environment; engagement and innovation (Alhamdi et al., 2017). This research can be used to improve existing assessment methods and also to develop new methods specially made for universities that encounter various challenges and are not able to measure their sustainability policies (Alghamdi et al., 2017).

Adams et al.'s study offers conceptual guidelines to design involvements and measuring and monitoring progress in building and fixing a university sustainability culture. They applied data from an initial staff and student survey from a UK university to the framework and studied their interpretation and implications. They defined approaches to the challenge in the university context as: technological solutions to sustainability challenges, making sustainability subject matters of the curriculum, integrating sustainability as the center strategic principle across the campus (Adams et al., 2018).

It is argued in this article that an organizational culture of sustainability develops over time because actions are applied in the 'visible' layer and is likely to appear in different forms within subcultures. It is also suggested that to understand an organizational culture thoroughly it is necessary to have a mixed-methods research approach that combines quantitative elements to reach its visible artefacts and a qualitative approach to find and track change in the supporting basic ideas and values (Adams et al., 2018).

Arroyo explores various roles of campus sustainability valuation in organizational change and determines the change agents behind the development of this management control system, using micro/internal processes in two universities. He conducted a field study about the change process between 1998 and 2011 at two Quebec universities. He selected these particular universities

because they have extensive sustainability activities implemented in the last 15 years (Arroyo, 2017).

The findings show that sustainability campus assessment is a social structure coming from the interaction of different stakeholders that requires change agents to create groups with internal and external stakeholders to get institutional support and to start the organizational change process (Arroyo, 2017). Furthermore, the social structure characteristic is useful to understand the existence of various roles of campus sustainability assessments in these institutions. The most important contribution of the study is that it offers a new organization system to study the role of campus sustainability assessment in organizational change. These roles are called reflecting, monitoring and planning, comparing and legitimizing (Arroyo, 2017).

Another review of sustainability capabilities that are developed through higher education is presented by Thomas and Depasquale. The authors point to a series of capability identification exercises to guide higher education institutions such as the work of the United Nations Economic Commission for Europe Steering Committee on Education for Sustainable Development, Student Employability Profiles project in the UK, European Qualification Framework, the North American Association for Environmental Education framework in North America, and Australian Qualifications Framework. These guides provide a framework in which sustainability-related capabilities can be defined in.

Using the five key competencies of (a) Systems thinking, (b) Anticipatory, (c) Normative, (d) Strategic, and (e) Interpersonal skillsets (Wiek et al., 2011) as a baseline for their survey, the authors surveyed 26 respondents from a total pool of 72 potential respondents whom participated in the Vietnam Project, a cross-disciplinary program encompassing students from Social Science (Environment), Environmental Science and Environmental Engineering.

The results, although marred by the small response rate, are consistent with other studies “when considering the capabilities important in the work of environment and sustainability professionals. Specifically, the respondents indicated that all five capabilities proposed by Wiek et al. are important, to various degrees” (Thomas and Depasquale, 2016). The authors conclude that interpersonal capabilities are by far the most important among the ones described and that higher education programs that offer a high degree of interdisciplinarity such as the design of the Vietnam Project may be effective in delivering the five capabilities.

2.6. Green Campus Activities Review

Boğaziçi University already has a Green Campus program in place that has been active for the majority of this decade in either official or unofficial capacity. Using annual reports, activities of the green campus program and their effects on campus life will be listed and reviewed in this section. This list contributes to establishing the areas where the university has taken action so far with regards to campus sustainability. Since prior action can help determine the university's strong and weak areas, the results of this study will contribute directly into the final SWOT analysis.

In this context, the program's activities since 2011 are tracked according to the green campus activity reports, interim reports and project reports conducted by the Boğaziçi University Sustainable Development and Cleaner Production Center.

Boğaziçi University's green campus efforts officially began in 2014. According to the collection of activity reports from 2011 to 2016, and one presentation made by Prof. Dr. Nilgun Cılız, who is the coordinator of the Univeristy's Sustainable and Green Campus Program, in October of 2017, the following activities were undertaken by the program since its founding.

2.6.1. Environmental Applications

2.6.1.1. Energy saving and renewable energy. In 2012, Natuk Birkan Building and South Campus square had their lighting replaced with LED lamps (Cılız et al, 2012b). LEED Green Building Gold Certification application for South Campus Men's Dorm was completed in 27.01.2012 (Cılız et al, 2012a) and received its certificate in September 2012 (BU-SDCPC, 2016). A comprehensive study on energy efficiency of campus buildings was carried out in 2012 (Cılız et al, 2012a). Faculty of Economics and Administrative Sciences building's LED lamps and Kandilli Campus UDIM Tsunami Tracking building's night lighting were fully provided by photovoltaic panels in 2013 (Cılız et al, 2013). Photovoltaic panels installed on the South Campus Economic and Administrative Sciences Building roof had 0,480 kWp installed power, while the panels on the Superdorm roof also had the same installed power (Cılız et al, 2014a). Also, roads of the North Campus had LED lighting installed that year (BU-SDCPC, 2016). LEED Green Building Gold Certificate application for Kandilli Campus UDIM building was submitten in 2014 (Cılız et al, 2014b). The wind turbines in Saritepe-Kilyos Campus were installed in 2014 and started providing 40% of the campus

electricity use with 1000 kWp installed power and providing 1.034.550 kwh per year (Cılız et al, 2014b). Solar water heating panels installed at the Men's Dormitory in South Campus had the capacity to provide 14,584 kcal/h for heating water (Cılız et al, 2014a). Another success story came from the Tarsus Campus when the building there produced all its power from photovoltaic panels (Cılız et al, 2014b). Kandilli Campus UDIM building received gold-level LEED certification as a green building in February 2015 (Cılız et al, 2015).

2.6.1.2. Water recovery and reuse. Kandilli Campus UDIM building was installed with a rainwater collection system in 2013, which provided 5% of the building's water use at 46m^3/h capacity and the collected water is used in irrigation, reservoirs and cleaning (Cılız et al, 2013). Grey water recovery began in 2014 at 4th North Campus dormitory which reduced water consumption of the building by 60% (Cılız et al, 2014a). Grey water is also being recycled in the 1st Men's Dorm with the capacity to recover 1m^3/h water (BU-SDCPC, 2016). Also, rainwater collection in Turgut Noyan building provided 3% of the building's water use and the rainwater collected from the roof of the North Campus ETA Building started being stored and used for garden irrigation in 2014, capacity is listed at 20m^3/h (Cılız et al, 2014b).

2.6.1.3. Integrated waste management. An inventory of the hazardous wastes originating from university campuses was established in 2012 (Cılız et al, 2012b). Also in 2012, blue recycling bins were placed in campus to promote recycling (Cılız et al, 2012a). An agreement between the university and Hewlett-Packard company resulted in 430 waste printer cartridges being removed from the university (Cılız et al, 2013). Hazardous wastes from the Chemistry, Chemical Engineering, Physics, Molecular Biology and Genetics departments of the university were appropriately disposed of in 2013 (Cılız et al, 2013). Electronic waste containers, one for each campus, were donated to the university by the Turkish Association of Informatics Industrialists in 2015. Medical Waste from the university's infirmary and the departments of Genetics and Molecular Biology was disposed of in accordance with the concerned law starting from 2014 (Cılız et al, 2014b).

2.6.2. Trainings and Seminars

Sustainable and Green Campus Survey was launched in 2011 and remained fillable for one year (Cılız et al, 2011), another such survey targeting the students was made in 2013 (Cılız et al, 2013). Staff trainings on hazardous waste management and recycling practices were given in 2012 (Cılız et al, 2012a) and repeated in 2013 (Cılız et al, 2013). The SMART Start-up Green

Entrepreneurship program was carried out the same year (Cılız et al, 2012b). The RENA Climate Action Policy seminars were held in 2012 (Cilz et al, 2012b). Prof. Donald Huisingh was invited for a seminar on sustainable and green campuses (Cılız et al, 2012b). The University hosted the fourth EMSU (Environmental Management for Sustainable Universities) conference in 2013 (Cılız et al, 2013). Also in 2013, a survey of personal hygiene products consumption was carried out with students living in university dormitories (Cılız et al, 2014a). Training regarding carbon footprint management and use of the SoFi software was given to building managers of university campuses in 2014 (Cılız et al, 2014a). A collaboration with TEMA, an NGO concerned with deforestation in Turkey, in 2015 entailed planting of 60,000 trees of various species and the establishment of a "Forest School" which would serve as an awareness training location.

2.6.3. Student Activities

First iteration of the now annual Greenfest campus event was organized by the Environment Club and the Boğaziçi University Sustainable Development and Cleaner Production Center (BU-SDCPC) in 2011 (Cılız et al. 2012b). Boğaziçi University Environment Club placed the recycling bins and printer toner collection bags in 2012 (Cılız et al, 2012a). The university's BOUNtoGreen team, supported by the structure club and the BU-SDCPC, won the Students Go Green competition with an electronic waste collection project and application of this project in 2014 resulted in removal of 1.65 tons of electronic waste from the campus in 3 months (Cılız et al, 2014b). Establishment of a youth component of the SDSN network managed by Boğaziçi University students took place in 2014 (Cılız et al, 2014b). Also in 2014, 21 scholarship students were given green campus student assistant roles by the scholarship office of the university (Cılız et al, 2014b), in 2015 there were 19 such students (Cılız et al, 2015). The environment club has established three sub committees in 2015: the Bicycle Society, the Animal Rights Society and Tarla Taban, a permaculture society (Cılız et al, 2015).

Boğaziçi University also has an extensive list of student clubs and organizations. These range from career oriented Department clubs to the sports committee, from fine arts to gastronomy and mountaineering. Some of these clubs have organized events that can be correlated to sustainability activities on campus. Chief among which is the Environment Club. Greenfest is a successful annual event organized by the Environment Club. Annual iterations of Greenfest are the single largest environment and sustainability related event on the campus calendar. This is supplemented by the Sustainability Panel event, which brings together industry professionals, NGO representatives and academics to discuss conemporary events in sustainable development. More recently, the Boğaziçi

University Sustainability Festival was organized by SDSN-Y and hosted by the BU-SDCPC on South Campus in May 2018. Another club that has activities applicable to the expectations from a sustainable development perspective is the Boğaziçi Mensuplari Tuketim Kooperatifi (BUKOOP). This is a club with the main purpose of connecting Boğaziçi University students, staff and faculty with producers of agricultural goods directly in order to both eliminate the middlemen that drive up the price of produce and provide access to organic farming produce. The cooperative is active throughout the year and has a sales area in North Campus. Departmental clubs such as the Management Club and the Structure Club at Boğaziçi University are some of the longest running clubs on campus and have organized numerous activities that touch on the subject of sustainability. While they are not exclusively environment or sustainability-minded, their contacts and audience are potential partners in increasing awareness on sustainability or organizing student events or projects on sustainability within a certain context.

2.6.4. Management Activities

Meters were installed in the Rectorate Building, Sciences and Literature Building, 1st Men's Dorm, Natuk Birkan Building, Psychology-Sociology Building, Student Activities Building, South Campus Foreign Languages Building, Albert Long Hall, General Management Building, Faculty of Engineering and the 1st Women's Dorm to better track their environmental impacts (Cılız et al, 2012b). In February 2014, the Sustainable and Green Campus Applications Comission was found by the Boğaziçi University rectorate (Cılız et al, 2014b). UNSDSN's Turkey organization was established within Boğaziçi University in 2014 (Cılız et al, 2014b). The university also began to share green campus information online from its webpage in 2014 (Cılız et al, 2014). The university's 2015-2019 strategic plan was established in 2014 with one of its 5 main topics being commitment to a green campus (Cılız et al, 2015). Application for membership for the International Sustainable Campus Network (ISCD) was submitted in 2015 for membership in 2016. Also, decision to participate in UI Greenmetric for 2016 was taken in 2015.

2.7. Academic

2.7.1. UE4SD Project and Student Theses

The University Education for Sustainable Development (UE4SD) project began in 2013 with the intention of forming an academy for sustainability education open for all higher education educators (Cılız et al, 2013)

“Life Cycle Impact Assessment of an Anaerobic Digestion Plant for Organic Wastes Generated from a University Campus in Istanbul”, a thesis by master’s student Merve Tunali, was prepared and presented in the Scientific Basis of Biomass Sustainability in EU Energy Policy conference. In 2015, “Ecological Health Comparison for Different Personal Care Products and Detergents in Selected AccomModation Sector: A Case Study for Student Dormitory” thesis of master’s student Rana Okur calculated the water footprint of the 4th North Domitory (Cılız et al, 2014a).

2.7.2. Carbon and Water Footprint Mapping

The BAP Project had calculated campus carbon footprint in cooperation with Escarus in 2012 (Cılız et al, 2012b). Carbon footprint calculations of campus buildings were furthered in 2013 with the purchase of the Sofi software by the university, and a training was given that year to the responsible staff regarding green campus and software use (Cılız et al, 2013). Tracking and measurements began in 2014 and carbon and water footprints of the 1st Men’s Dorm, 1st WOmen’s Dorm, Faculty of Sciences and Arts, Faculty of Economic and Administrative Sciences, Rectorate Building, Natuk Birkan Building, BTS Building, Student Activities Building and Kennedy Lodge have been mapped (Cılız et al, 2014b). A survey was conducted with university students in 2015 regarding carbon emissions from university transportation (BU-SDCPC, 2016) and the SoFi reports on carbon and water footprint mappings were shared on the university website (Cılız et al, 2015).

2.7.3. Courses

The ESC351: Sustainable Development undergraduate course was launched in 2015 with 77 students taking the course in the autumn semester (Cılız et al, 2015). Boğaziçi University does not have an environmental engineering or similar undergraduate program. Previously, any environment or sustainability related courses were offered to graduate students only at the university’s Institute of Environmental Sciences. Since ESC351, the university has offered an increasing number of undergraduate environment and sustainability courses.

2.7.4. IMBIYOTAB Project

The Istanbul Microalgae Biotechnology Research and Development Unit project was started in 2015 at the Kilyos-Saritepe campus with the goal of using microalgae to increase carbon capture on campus, to introduce microalgae to the streams on campus to treat domestic pollutants in the water,

to separate high calorific value algae from biotechnological products for use in biogas production, and conduct life cycle assessment on the food, environment and energy products and technologies research efforts of the unit.

2.7.5. BURET Project

The Boğaziçi University Renewable Energy Resarch Group project was formed in 2015 with the focus of using low temperature heat sources for energy production with applications in heat recovery, solar photovoltaic, geothermal and biomass energy production.

2.8. Overview of the 2016 UI GreenMetric Application

Here, a simple overview of the data found inside Boğaziçi University's 2016 UI Greenmetric application supporting documents will be provided. Data obtained from the application report and its supporting documents will be useful for determining the courses of action that will carry the university's sustainability performance further. The entire application form can be seen in Appendix E.

2.8.1. Setting and Infrastructure

Boğaziçi University lists 8 campuses in its UI Greenmetric report: South Campus, Hisar Campus, Iznik Campus, Kandilli Campus, North Campus, Saritepe-Kilyos Campus, Ucaksavar Campus and Tarsus Ginning Factory with a total area of 1,679,082 m^2. Area-wise, Saritepe-Kilyos Campus is the largest, followed by Kandilli Campus and South Campus. 80.5% of the total area is covered by forests, 4.4% with planted vegetation and 0.5% used for other forms of water absorption.

The university had 16,517 students in the 2015/2016 spring semester when the application was submitted. This figure is currently 17,124 students according to the university website (Boğaziçi Universitesi, 2017), with 12,082 undergraduate and 5,042 graduate students. Correspondingly, there were 1745 academic and administrative staff employed by the university, this number is 1,787 today. Finally, the university has dedicated 6.4% of its budget to sustainability efforts in its campuses.

2.8.2. Energy and Climate Change

- Energy efficient appliances are utilized at a less-than 20% level, the documents reference efforts to replace fluorescent lamps with LED lamps. Natuk Birkan building and South Campus road lighting have been completely replaced with LED lamps in 2012, while efforts to replace North Campus lamps was being studied for efficiency.

- Smart building implementation is reportedly under 30%.

- Renewable energy sources available to the university are solar power and wind power. The wind power turbine in Saritepe-Kilyos Campus had saved 1,034,550 kWh/year and prevented an estimated amount of 900,000 kg CO_2/year in emissions.

- Hot water sun collecting systems (solar heating panels) at the First Male Dormitory in South Campus and at the Tarsus History and Culture Center in Tarsus Ginning Factory had saved in excess of 62,560 kWh/year with over 14,640 kg CO_2/year emission prevention.

- Photovoltaic panel installations at the 3rd North Dormitory, Faculty of Economics and Administrative Sciences, 4th North Dormitory, Kandilli Campus UDIM building, Turgut Noyan Building and the Tarsus History and Culture Center have collectively saved the university 105,363 kWh/year in electricity use and reduced an estimated 63,685 kg CO_2/year in emissions.
- University's reported electricity consumption was 18,673,116 kWh in 2015 and the rate of renewable energy production towards that use remains less than 20%.

- There are two gold-level LEED green building certified buildings at the university, one is the 1st Male Dormitory (Hamlin Hall) and the other is the UDIM building at Kandilli Campus.

- The university's greenhouse gas emission reduction program was in preparation in 2016 and the total carbon footprint of the university was estimated to be 16,505 cubic tons.

2.8.3. Waste

The university had no program to reduce use of paper and plastic in campus and the recycling rate was reported as Partial (25%-50%).

Electronic wastes of the university were being collected once every 5 months. All toxic waste was collected, stored and disposed appropriately. Types of toxic waste included were toner waste from printers, hazardous wastes from laboratory chemicals, medical wastes from the infirmary and the molecular biology and genetics departments, radioactive wastes from molecular biology and genetics department

There were no activities concerned with organic waste, inorganic waste was sent to landfills and all sewerage were disposed to the infrastructure untreated. These options for organic and inorganic waste and the sewerage all yield low points on the Greenmetric scheme.

2.8.4. Water

With regards to water, the conservation plan was in its initial implementation and included rainwater harvesting. The recycling program was also in initial implementation and recycled water was intended for use in toilets and garden sprinklers. Water efficient appliances were used at a rate less than 25%.

References are made to a grey water recycling system, at the 1st Male Dormitory in South Campus and 4th Dormitory in North Campus. Grey water is argued to make up 75% of all waste water from the university. As for rainwater harvesting, the UDIM building in Kandilli Campus collects rainwater in its roof and the collected water is used for irrigation, cleaning and in toilets. The ETA building in North Campus also has a similar system. Hisar Campus is noted to be the most suitable site for rainwater collection and feasibility studies are conducted. Finally, for water saving measures, cartridges installed in taps of all dormitory buildings are reported to have reduced water use by 35%.

2.8.5. Transportation

There are 26 vehicles owned by the university and the daily number of cars entering the campuses being estimated at 1500. Also, there are 20 motorcycles entering the campus each day. The number of shuttles operated in Boğaziçi University is given as 17, which complete 289 trips daily. There are 50 bicycles on average on campus every day.

With regards to parking space, the types of parking in campus are a mix of buildings and open space. Parking capacity did not decrease between 2013-2015.

As for initiatives to discourage private vehicle use, the university references the quick access to the metro station and bus stops. Campus shuttles are available free of charge and there are designated bicycle and pedestrian roads. Each shuttle travels approximately 10km inside the campus each day.

2.8.6. Education

Boğaziçi University had only 7 courses related to environment or sustainability at the time this report was prepared. This number was out of 2325 courses offered in total. $2,936,705 was made available for sustainability and environment research, out of $31,912,942 total research funds. Number of scholarly publications and number of scholarly events were left empty. There were 5 student organizations related to the environment or sustainability. The university's green campus initiative runs and maintains a website containing sustainability information on the university.

3. METHODOLOGY

To evaluate the current status of Boğaziçi University's performance in terms of sustainability in higher education, a set of analyses will be conducted in this thesis. These begin with an extensive research on the policies and practices that the university has already put in place to increase its performances in campus sustainability as well its sustainability education. This step will also include a look at the history of the university's engagement with campus sustainability.

Because the university uses UI Greenmetric to assess its performance, the most recent application of the year 2016 will be reviewed together with the implications of the university's current standing both domestically in Turkey and globally. This analysis will be contrasted with the university's mission statement in order to highlight what the university's standing implies for improvement.

Importance of improvement will be highlighted, but specific areas for improvement will be collectively determined by the review of the university's activities, UI Greenmetric performance and how the students feel about the university's performance. Views of the students are crucial not only because they are the principal users of university's campuses but also because assessing their levels of awareness and identifying the areas where their willingness to act is more focused on will help reach improvement recommendations that can be feasibly and easily applied. For this purpose, two student questionnaires are prepared and distributed to university students.

What makes a university's contribution to sustainable development different from, and perhaps more important than, most other institutions is a university's ability to graduate students with a sustainability conscious. For this reason, specific attention will be given to the university's education program with regards to how sustainability education is being conducted and what can be improved in light of recent literature and student expectations. A survey of the university's course catalog will be in order to establish a baseline.

Results of all these assessments and research will be finally compiled into an organizational SWOT (Strength-Weakness-Opportunity-Threat) analysis. This analysis will produce a clear outline of what areas are the university is performing well or badly and what areas can be problematic or advantageous for the future.

3.1. UI GreenMetric

How the UI Greenmetric criteria translates into its ranking will be analyzed in this section. From these weightings, an idea of how the university can improve its standing will be established.

According to the UI Greenmetric's "Guideline of UI GreenMetric World University Ranking 2016 – From Policy to Action" document not every section has equal weighting. There are 6 sections in total, and each section has a subsequent set of indicators and criteria that correspond to questions on the UI Greenmetric Questionnaire. These sections are: Setting and Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR) and Education (ED) (GreenMetric UI, 2016). Weights of the sections are given in the table below.

Table 3.1. Greenmetric sections.

Section	Weight
Setting and Infrastructure	15%
Energy and Climate Change	21%
Waste	18%
Water	10%
Transportation	18%
Education	18%

Internally within each section, questions also have different point values. Depending on the answer, these points have multipliers that decrease points awarded if the provided answer does not completely satisfy the question's requirements, or, if the question is a multiple choice, each answer given yields a portion of the points available from that question. Exact details of how each answer rewards points can be found on the Appendix 1 of the UI Greenmetric guideline provided in Appendix A.

3.2. Student and Alumni Questionnaires

For the purposes of this thesis, two questionnaires were prepared. Both were designed to provide feedback on the current levels of awareness of their target segments as well as to assess their willingness to participate in sustainability events and programs at the university.

3.2.1. The Student Questionnaire

3.2.1.1. Content. The student questionnaire is composed of a total of 61 questions. These questions are divided into several sections. The first section contains the introduction questions that provides some details on the participant. Details such as their field of study, number of semesters at the university, gender, whether or not they are living or have lived in university accommodation, etc.

This is followed by a section on sustainability in social and academic life at Boğaziçi University and has a total of 13 questions. Students' answers will show the level of ownership that the students feel towards increasing their knowledge on sustainability, as well as which campus events and activities are most popular and how can sustainability related activities and programs can reach a better audience.

The next section tests the students' knowledge and awareness regarding energy sustainability both in theory and in terms of campus activities. Answers from this section will provide a review of both the visibility of campus sustainability programs with regards to energy and if the theoretical background of the students is sufficient to analyze and assess the energy performance of their university campus. This section has 5 questions.

Carbon footprint awareness was kept separate from energy related questions in this questionnaire because it was intended for the students to disassociate methods and practices from the current conditions at the university in terms of their carbon footprint. By answering the 13 questions in this section, students will provide an insight into their awareness on carbon footprint, as these results will be validated against carbon footprint measurements of campus buildings and reducing the carbon footprint originating from campus transportation.

Waste is another important environmental aspect to an institution of higher education. There are 11 questions in this section, most of which are ranking questions that ask the respondent students to rank their preferred waste management methods for solid, hazardous and special wastes. Questions pertaining to students' views on organic waste and cultivation are also included in this section.

The Water section contains 6 questions. Since water use is not an aspect that greatly concerns an education institution and since it is a low-weight area in UI Greenmetric, this section was kept

short. In the 6 questions, students are asked questions regarding water efficiency methods and sources of waste water in their campus. These are mainly awareness-related questions.

Lastly, the Sustainability in Your Private Life section asks 3 questions regarding how the students apply sustainability practices that they observe in campus in their homes and dormitories. Purpose of this section is to determine if campus initiatives can have partnership opportunities to affect the wider community.

3.2.1.2. Scope. The target segment of the student questionnaire is chosen as Boğaziçi University undergraduate students that are taking courses in sustainability. This segment is selected because the questionnaire seeks answers pertaining to the current practices at the university, and some level of prior knowledge would provide a better set of results in terms of both awareness levels and how that awareness translates into willingness to act among students that are familiar with sustainability. Whereas non-initiated students would have likely resulted in answers to the questions being guessed at best, familiar students are expected to provide at least some level of insight. This makes the data obtained from this questionnaire biased, since certain questions related to awareness and student participation will provide skewed results due to the nature that this sample was chosen.

3.3.1.3. Distribution. The questionnaires are presented to the students in two ways: via an online survey, the link to which was shared via mass e-mails or social media posts, and via handouts distributed to the students before their midterm examinations in two undergraduate-level courses related to sustainability. With the cooperation of professors from the Boğaziçi University Institute of Environmental Sciences, the first midterm examinations of the Spring 2018 semester of the following classes are picked to conduct the survey: ESC351: Sustainable Development and ESC305: Global Climate Change. Three classes of ESC305 and one class of ESC351 students participated in the survey. Overall, this sample represents 2.57% of Boğaziçi University's undergraduate students.

Full text of the questionnaire can be found in Appenix B.

3.2.2. The Alumni Questionnaire

A second questionnaire for Boğaziçi University alumni is conducted in order to collect data on how professional experiences have affected the alumni view on sustainability education and campus sustainability. A total of 34 questions is available to the respondents, with answers to specific

questions leading to different sections according to the answer given. This method seeks to customize the student experience of each respondent and ask relatable questions.

3.2.2.1. Content. The questionnaire starts with an introduction section to gather data on the respondent including year of graduation, department, etc. This is followed by a section on university accommodation information if the respondent had stayed in one. The next four questions assess the respondent's familiarity with some basic sustainability concepts like the pillars of sustainability and the SDGs. Once this is established, the questionnaire then asks questions about sustainability education at Boğaziçi Univesity, mainly establishing if the respondent had taken sustainability courses or not, with reasons. This is followed with questions on campus sustainability events and efforts and views of the respondent on what makes them more efficient and appealing to student participation. The final section asks questions on how the alumni see the role of Boğaziçi University in the sustainability agenda and the benefits of a sustainability education in professional life.

3.2.2.2. Scope. This questionnaire is intended for all Boğaziçi University graduates from all departments and all levels of education.

3.2.2.3. Distribution. The Alumni questionnaire was made available online only in order to reach as many respondents as possible. The link of the online questionnaire was shared on social media channels and via mass-emails. Replies were collected between March and May of 2018.

Full text of the questionnaire can be found in Appendix C.

3.3. Course Catalog

Boğaziçi University has a diverse range of departments and institutes that offer a wide selection of courses to its students. Since education for sustainability is a key role for an institution like Boğaziçi University with regards to sustainable development, a review of its course catalog will be performed to ascertain what portion of its available courses from a sample year are related to sustainability-concerning subjects. Course catalog of the 2017-2018 academic year will be the sample year for the purposes of this study since the most current conditions present at the university will provide the most up-to-date view and therefore more viable, apt recommendations for improvement.

3.4. SWOT Analysis and Recommendations

Once the reviews and analyses from the previous steps are gathered, this study will seek to compile these results into areas of strengths, weaknesses, opportunities and threats concerning the university's performance as an institute of higher education for sustainability. The steps to be followed in this analysis are as below:

(A) All results from previous research will be evaluated according to what they imply for the university in terms of awareness and action.

(B) Action will determine if the university has acted to address that area of concern, i.e. if there are existing practices related to the subject, or if there is high willingness to act on behalf of the students.

(C) Awareness will determine if the students are aware of any existing practices or have theoretical awareness on the subject.

(D) Once categorization is complete, significant implications from the obtained results will be organized into axes of awareness and action.

(E) Implications with high action and high awareness will be viewed as the strengths of the university.

(F) Implications with high awareness but low action will be viewed as areas of opportunity.

(G) Implications with high action but low awareness will be viewed as the weaknesses of the university.

(H) Implications with both low action and low awareness will be viewed as threats to the university's efforts.

The SWOT analysis will be student-centric, and therefore place the separation line between positive and negative implications along the awareness axis. This is because, as an education institution, the wider impact of the university's sustainability performance is seen as the alumni it graduates and their roles as decision-makers and change-bringers of the future. For this reason, the importance is placed on establishing a culture of sustainability rather than providing an empiric analysis of the university's campus sustainability.

Once the SWOT analysis is complete, a series of recommendations will be provided to address the opportunities, weaknesses and threats. Focus will be given to education or awareness related solutions rather than technical applications to reduce the net environmental impact. While the UI Greenmetric scope will remain as the guiding framework, this choice represents the view of this thesis that a higher education institution's principal interaction with sustainable development is

through what it equips its alumni with. Therefore, recommendations will focus on the students, while also seeking to maximize the university's score on the UI Greenmetric framework.

4. RESULTS AND DISCUSSION

4.1. Results of the Student Questionnaire

The student questionnaire's answers were gathered between the months of March and April 2018. Participants were asked to fill the form online via a Google Forms document. However, the largest portion of participants came from co-operating members of faculty at the Boğaziçi University Institute of Environmental Sciences who distributed the survey to their students prior to taking their midterm examinations. The results of the latter answers were collected from the printed copies of the questionnaire. In total, there were 299 students from the midterms and 11 students on the online form for a total of 310 responses.

Answers obtained from the student questionnaire will be analyzed according to several criteria as defined in the methodology section. In this section, they will be grouped together for results reporting according to their corresponding areas of concern for the university. These areas will be: Management and Awareness, Standards, Studies, Technical Applications and Transportation.

4.1.1. Students Information

Of the 310 total students, the overwhelming majority were undergraduate students with only 1.6% of the participants being masters students and 0.3% doctoral students. In terms of department representation, the students represent almost all departments of Boğaziçi University. Similarly, the career aspirations of the students are also diverse and range from academia to business administration. The majority of the students are in their 8th or higher semester.

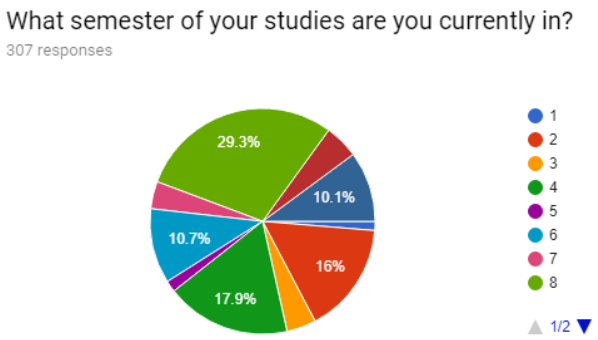

Figure 4.1. Semesters.

Most spend more time in North and South campuses. Gender distribution is 52.5% male to 46.9% female and 0.6% agender. 3rd North, 1st North and Superdorm dormitories are the most selected by those students who use university accommodation.

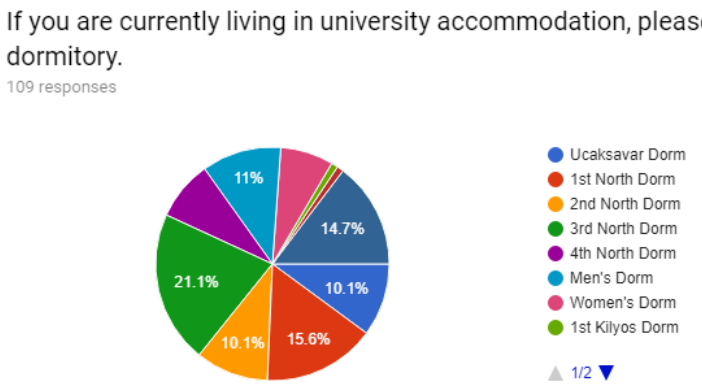

Figure 4.2. Accommodation.

4.1.2. Sustainability in Social and Academic Life at Boğaziçi University

Students regard Environmental sustainability as the most important branch of sustainability, followed by social and cultural effects and barriers.

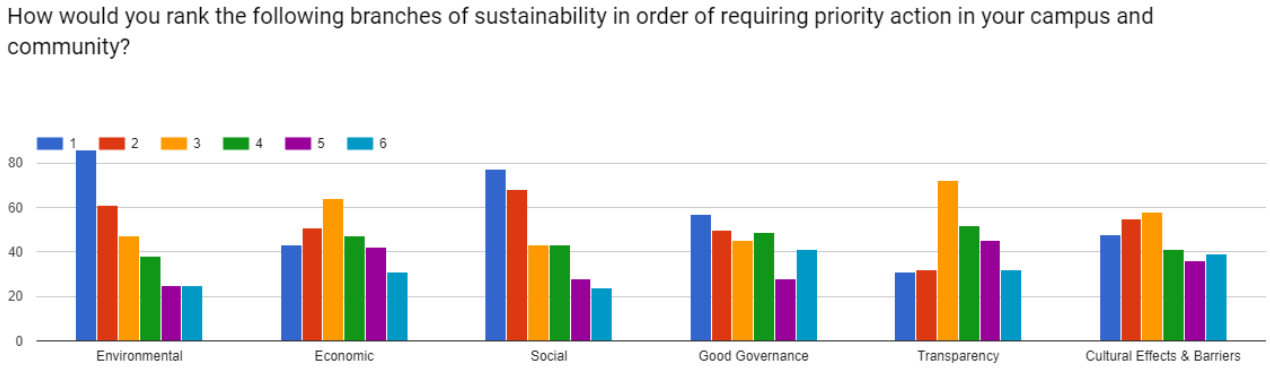

Figure 4.3. Branches of sustainability.

They believe that students' knowledge and awareness of sustainability is most important, followed by that of administrative staff and faculty.

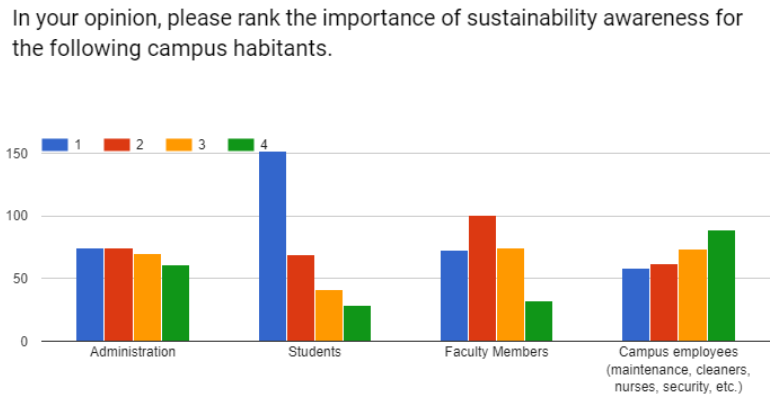

Figure 4.4. Awareness importance.

Respondents are more interested in sustainability events to raise their awareness and learn applicability and practical information.

73.6% of students who answered the question know that there are one or more green buildings on campus. Many of the answers indicate that the students know about Hamlin Hall (Men's Dorm) being one, but few, if any, know about Kandilli. 16% erroneously believe that university sustainability is measured by AASHE STARS scheme while only 11.3% percent are aware of UI Greenmetric being employed at the university.

Management and Economics Club (BUIK) is the most popular student club of the students, followed by Radio Boğaziçi, Sports Committee and Cinema Club. Environment Club (BUCEK) was chosen by only 3.3% of the students. Only 1.5% are aware of the activities of the Green Campus Commission and the SDSN-Y Turkey Network. On the other hand, Taşoda Music festival is by far the most popular campus event for the correspondent students, followed by the Boğaziçi Brands Summit and Children's Festival. 5.2% are expressing interest in Greenfest and 3.9% are interested in the Sustainability Panel activities of the Environment Club.

The majority of students place high importance on availability of campus sustainability information on a website when asked what channels would be best for raising sustainability awareness at the university. The other popular options are the use of sustainability themed art exhibitions and film screenings, organizing sustainability related seminars or discussion groups and support of sustainability related student clubs and societies.

67.7% of the answers indicated that student interest is the leading barrier for more sustainability research and projects at the university, followed behind by availability of funds at 48.4%.

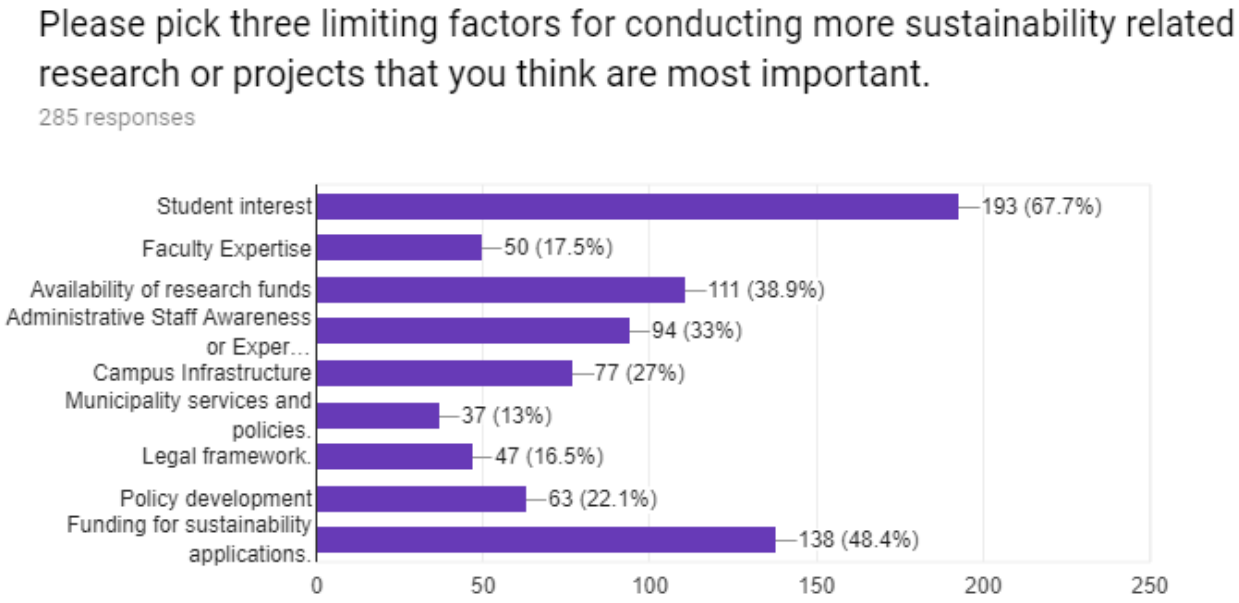

Figure 4.5. Limiting factors for sustainability research.

Most participants think that sustainability information should be shared over the social media, followed by e-mail newsletters and website updates.

In terms of sustainability education, students have taken at least one undergraduate course offered by the university's Institute of Environmental Sciences with ESC305: Global Climate Change leading. More importantly, however, students have expressed equal levels of interest in taking the other available courses while 26.6% expressed they do not intend to take any other course. When asked about what would be a better way to integrate sustainability education into their curricula, the majority of participants prefer multidisciplinary courses organized around their fields of study. This is followed by addition of comprehensive, large-scale multidisciplinary courses and specialized sustainability courses centered around the SDGs. The clearly least favorite option was sustainability content integrated to mandatory courses.

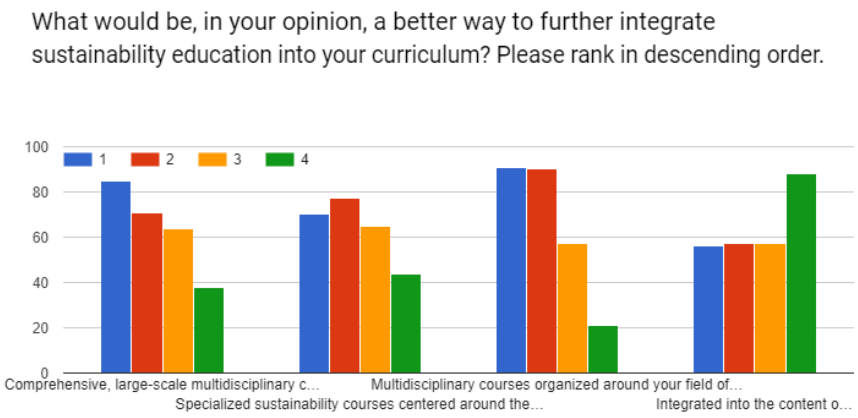

Figure 4.6. Further sustainabiulity education integration.

4.1.3. Sustainable Energy Practices at Boğaziçi University

With regards to renewable energy, students are aware of the use of wind power at the university and some have also claimed knowledge on solar heating panels. Students are in the opinion that solar heating panels, wind power and solar photovoltaic panels are the most likely renewable energy sources to be used in their campuses.

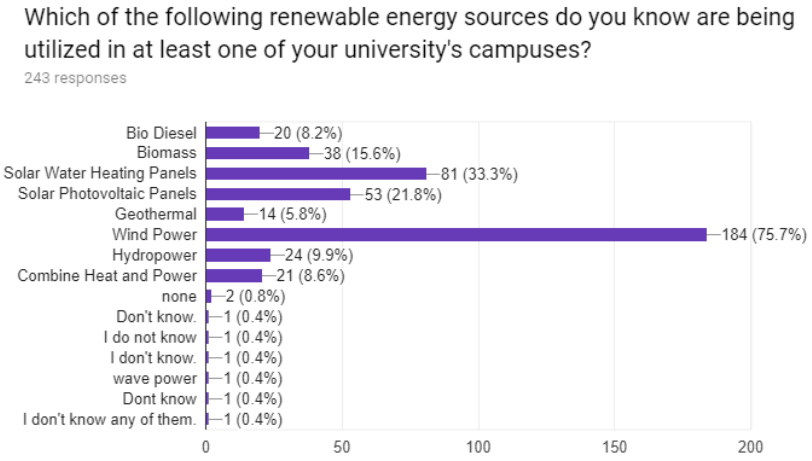

Figure 4.7. Renewable energy practices.

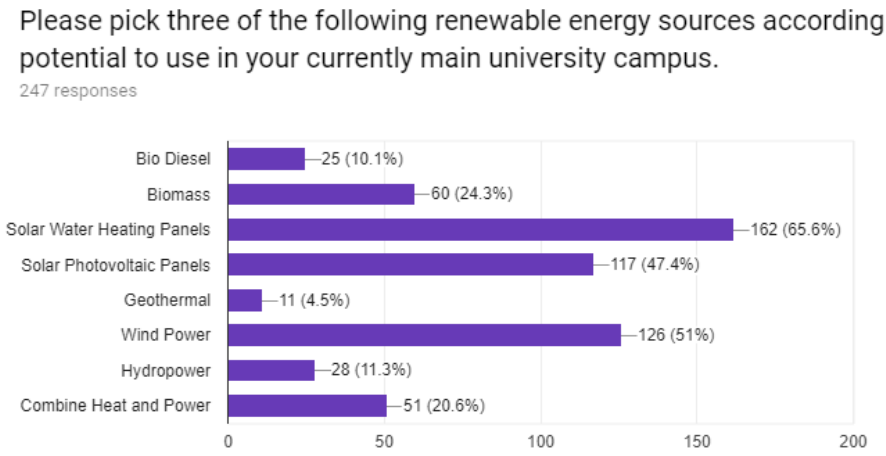

Figure 4.8. Renewable energy potential.

Almost none of the students could identify the differences between a smart and a green building.

Students believe use of energy-efficient appliances, motion-sensor lighting and heat insulation of buildings are the most important energy saving measures. They also express that these measures are best applied to dormitories and lecture halls.

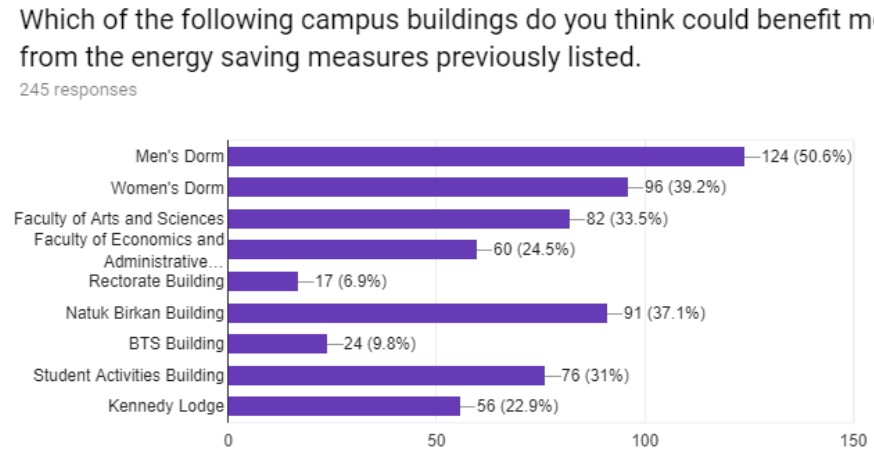

Figure 4.9. Energy saving areas.

4.1.4. Carbon Footprint of Boğaziçi University

In this section, students were asked to pick three of several types of campus buildings according to their guess of how high their carbon footprints are. For dormitories, Superdorm, 1st and

3rd North Dormitories were the most picked answers with the top reasons being that these are older buildings and that they house a lot of students. For administrative buildings, Construction Works Building, Teknopark and the Student Activities Building were the top three picks with the most popular reasons being given as their perceived high energy use. For departmental buildings, Faculty of Engineering was the top pick with the Computer Engineering Building following later. The main reasons for selecting them was perceived as both high energy use and the number of people that use them. For Lecture Halls, New Building, Sciences and Engineering Building and the North Park Building were the most popular picks because the students think they are crowded buildings and they are thought to use a lot of energy. Finally, for the campus facilities, the students picked the Aptullah Kuran library, Hisar Sports Complex and Civil Engineering Laboratory and Polymer Research Center for their high energy use. When asked to pick between different building types, the top picks were Men's and Women's Dormitories followed by the Student Activities Building.

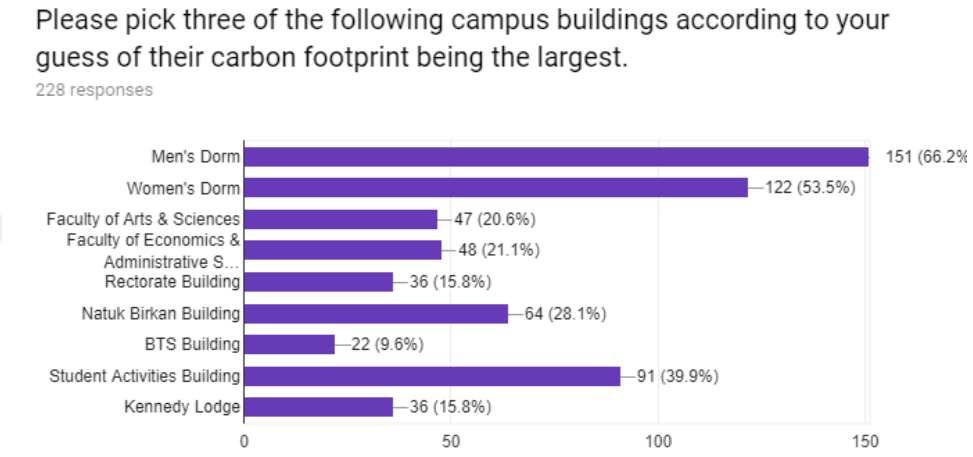

Figure 4.10. Carbon footprint building ranking.

According to the Boğaziçi University's Green Campus project report on Carbon Footprint, the Scope 1 emissions of both the Men's and Women's dormitories are indeed among the highest three, but the Student Activities Building's emissions are relatively low. With regards to Scope 2 emissions, the same report shows that while the Men's Dorm is still in the top three, Women's Dorm and Student Activities Building are some of the lowest sources of emissions on campus.

For transportation, the students believe the major areas of focus should be a centrally managed bicycle program at the university, the efficiency of campus shuttle routes and the use of hybrid or electric vehicles.

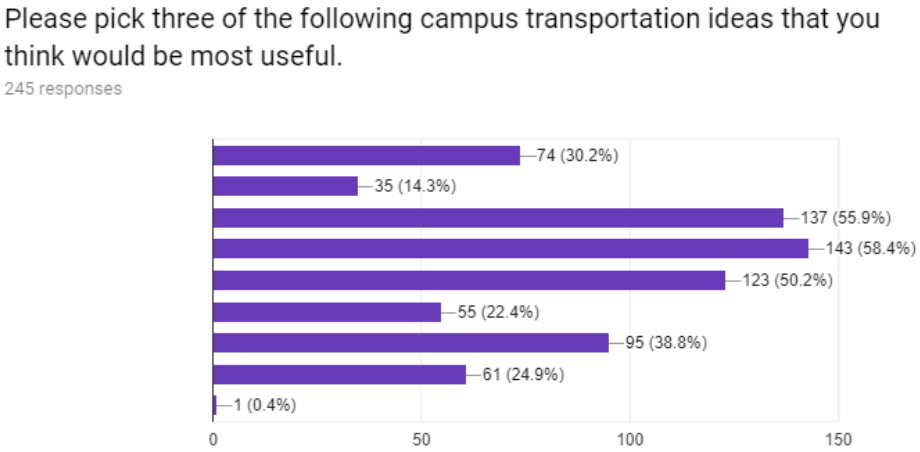

Figure 4.11. Transportation preferences.

4.1.5. Waste Management in Boğaziçi University

Students place most importance in raising awareness about recycling, followed by the availability of recycling points and the university's recycling policy about increasing the rate of recycling on campus.

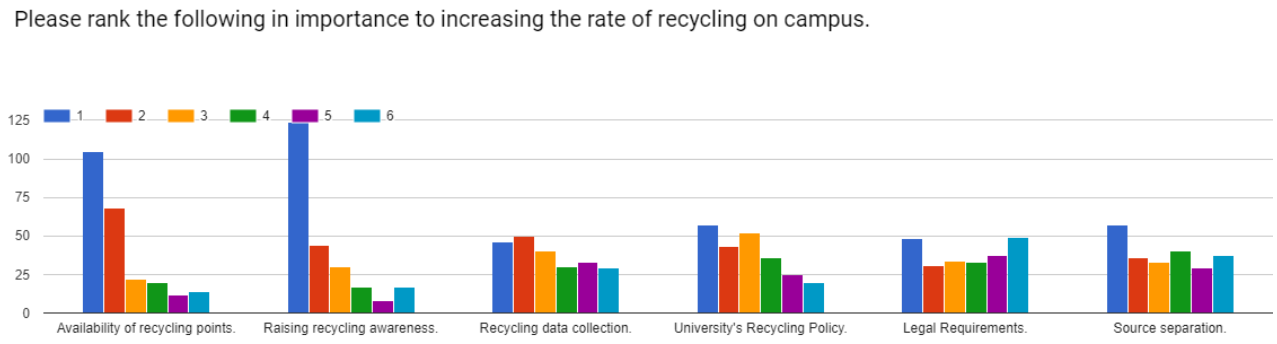

Figure 4.12. Recycling rate increase methods.

Students also responded that they recycle paper and cardboard products the most, followed by plastic (PET) bottles and glass. Students also take care to use double-sided printing and printing documents only when necessary.

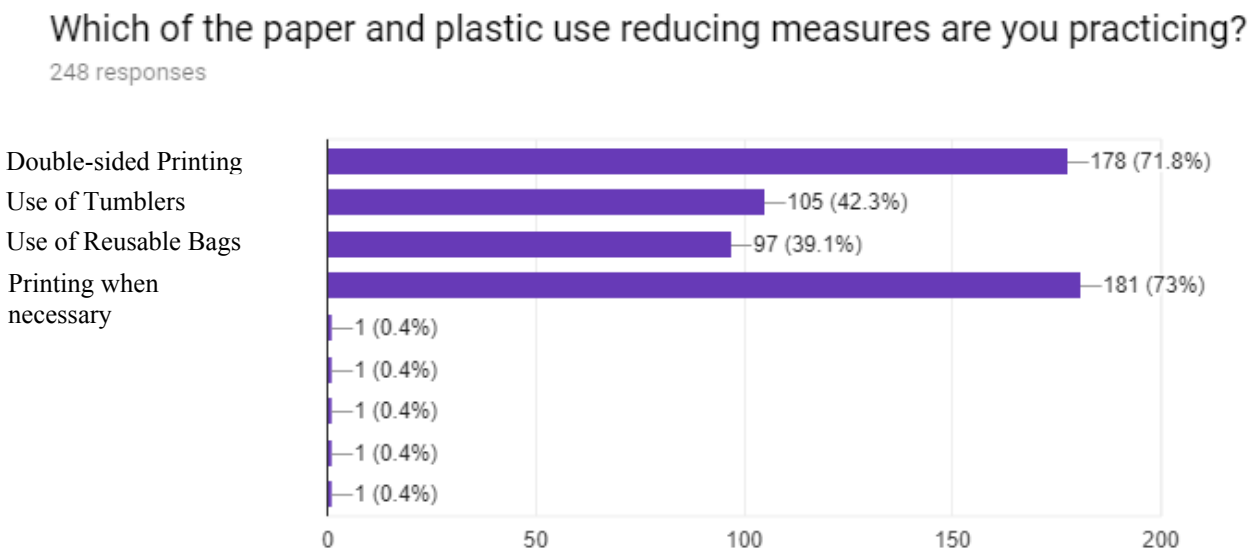

Figure 4.13. Paper and plastic use reduction methods.

They express that special wastes such as batteries, electronics and printer cartridges and toners should be recycled from the campus. With regards to printer cartridges and toners waste management, students support their refilling and reusing the most, followed by sending to recycling facility and returning to office supplier.

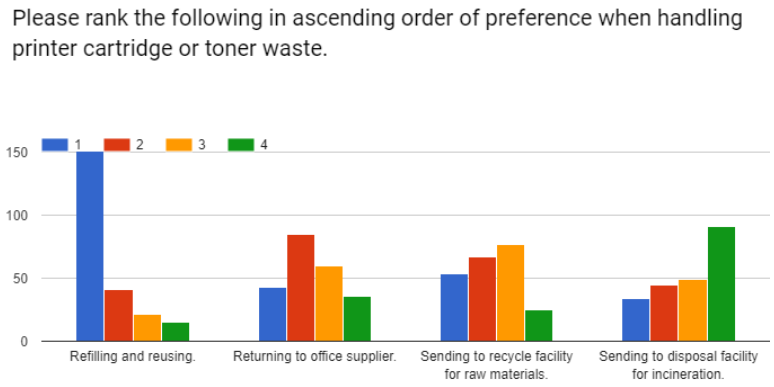

Figure 4.14. Handling printer cartridges and toners.

When asked about how to process electronic waste, students prefer a reuse scheme where old electronics can find new users, followed by recycling of electronic waste and repair workshops to extend the lifetime of electronics. After extending the list of special wastes and asking again, students have selected electronics waste, batteries and food waste as the top three wastes that the university should manage.

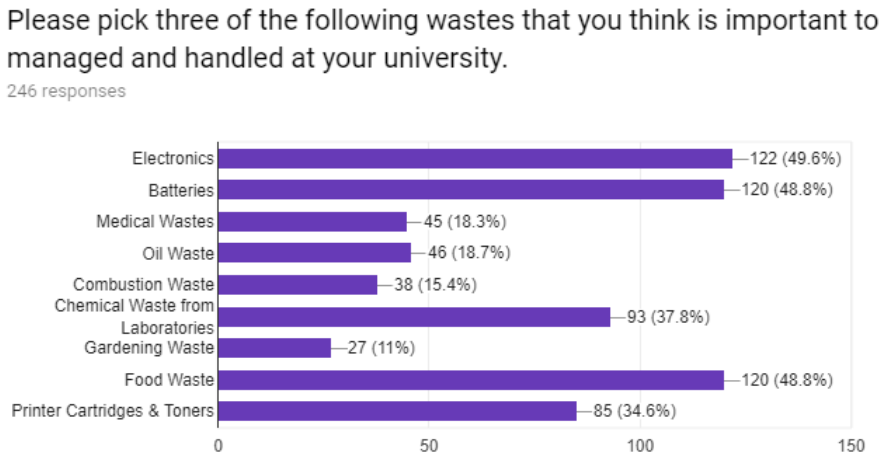

Figure 4.15. Waste handling prorities.

Students placed most importance on safe transport of hazardous waste, followed by disposal by authorized facility and leak-proof temporary containment for hazardous waste management priorities.

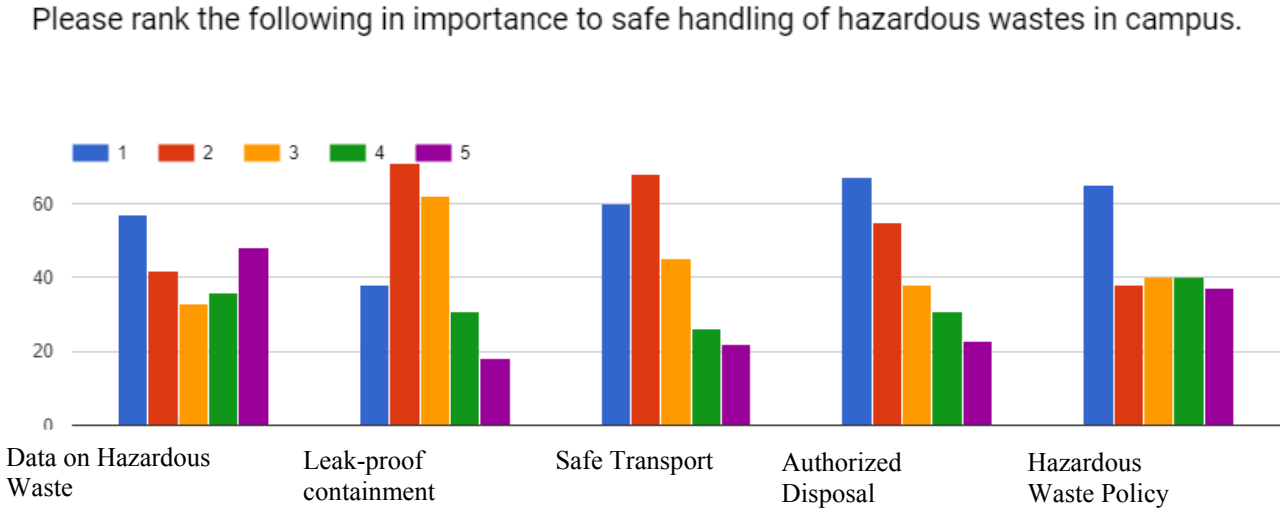

Figure 4.16. Hazardous waste handling priorities.

All these options are already covered by the concerned regulations, the answer options related to data collection and establishing a policy for hazardous waste were the least selected. Regarding reducing hazardous waste from laboratory experiments, students expressed that payment of hazardous waste disposal fees by concerned department or institute would be the best practice to control the amount of waste. This was followed by establishing innovation criteria before approving

research with heavy chemical use that can produce a lot of hazardous waste and departments and institutions being held responsible for temporary storage of the hazardous waste they produce.

The question regarding agricultural and ecological actions that can be taken on campus to increase campus sustainability showed that the students favor creating green walls and roofs at campus buildings, followed by organic composting and planting more trees for carbon sequestration on campus.

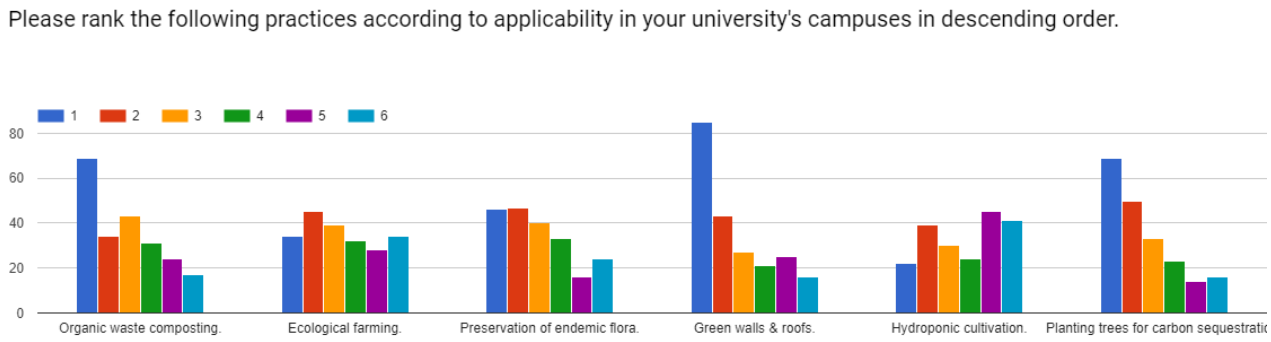

Figure 4.17. Soil and ecosystem management.

4.1.6. Water Conservation in Boğaziçi University

A great majority of the students were not able to provide a description for what grey water is; with that in mind, the answers for sources of grey water listed dormitories as the largest source, followed by laboratories and cafeterias. Not being able to define grey water probably placed laboratories as second, whereas both dormitories and cafeterias are indeed common sources of grey water.

Most students are unaware of any water conservation measures that are being undertaken on campus, but recycling of water is seen as the most important measure. This is followed by use of water-efficient appliances and rainwater collection. Students overwhelmingly believe that dormitories are the main areas on campus that should be targeted for water conservation, this is much later followed by kitchens and cafeterias alongside teaching halls.

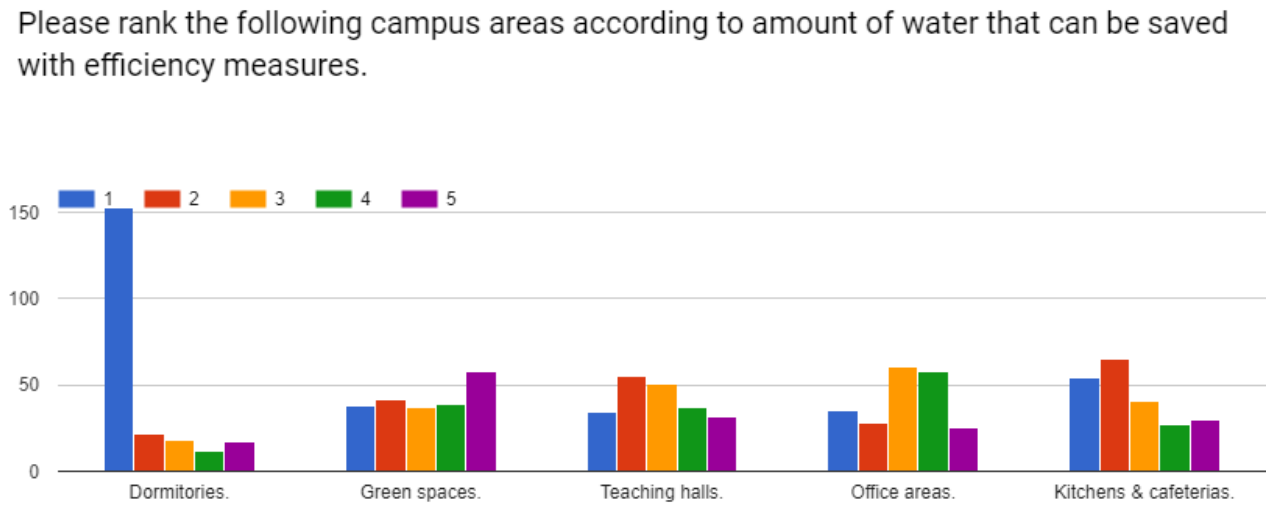

Figure 4.18. Water saving areas.

4.1.7. Sustainability in Students' Private Lives

Most students report they recycle paper, plastics and waste in their lives off-campus. When asked about if they would be willing to bring hazardous waste from their homes for disposal at the university, majority of students expressed interest in bringing their batteries and electronic waste.

Finally, on the question of what aspect of sustainability they have learned about in Boğaziçi University that they incorporate into their lives, the top picks by the students were energy and water saving measures, followed by waste management and elements of social sustainability.

4.2. Results of the Alumni Questionnaire

The alumni survey was also conducted in the months of March and April 2018. The questionnaire was made available to respondents only online. A total of 43 responses were accumulated. The results will be collected under several topics below.

4.2.1. Alumni Profile

Responses came from a diverse pool of Boğaziçi alumni that have graduated from the university any time between 1972 and 2017, with the majority being within the span of 2009-2012.

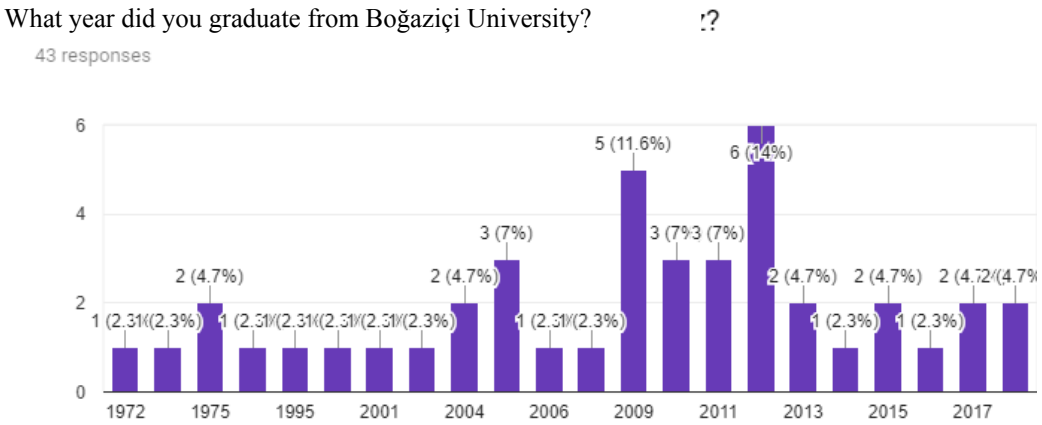

Figure 4.19. Graduation dates.

Participating alumni had graduated from a variety of departments and institutes, most common being political science and economics. The sector that they are currently working in were asked to provide context for their answers to the rest of the questionnaire. Most commonly, participants were found to be academics or researchers with the rest working in a wide array of sectors. 88.4% of participants have undergraduate diplomas from Boğaziçi University, while 20.9% have master's degrees, with 9.3% having both undergraduate and master's degrees. 44.2% of participants had never stayed in university accommodation, the majority of the remaining 55.8% had stayed in university accommodation for 10+ terms. Most common dormitories were Men's and Women's Dormitories in South Campus and the 2nd North Dormitory.

4.2.2. Sustainability Awareness

When asked about what first comes to their minds about sustainability, alumni had overwhelmingly mentioned the environment, with the economy and the society following. Other options like human rights, governance and innovation were picked much less. Regarding what they think the top three most important SDGs were, the alumni picked SDG 2: Zero Hunger the most. Second most common pick was SDG 5: Gender Equality, with SDG 13: Climate Action in third. Also, most alumni view the governments of the world as the primary actors in realizing the SDGs with NGOs following and research institutions being the third most common pick.

4.2.3. Sustainability Education

90.7% of the participating alumni had never taken a course related to sustainability during their studies. Those who had taken any rated the diversity of the available courses as medium while claiming that the impact of those courses having somewhat affected their career choices after graduation.

Figure 4.20. Sustainability course participation.

When asked about what would have motivated them to take more sustainability courses, large-scale comprehensive multidisciplinary courses and focused multidisciplinary courses centered around the principles of sustainable development were the most picked options.

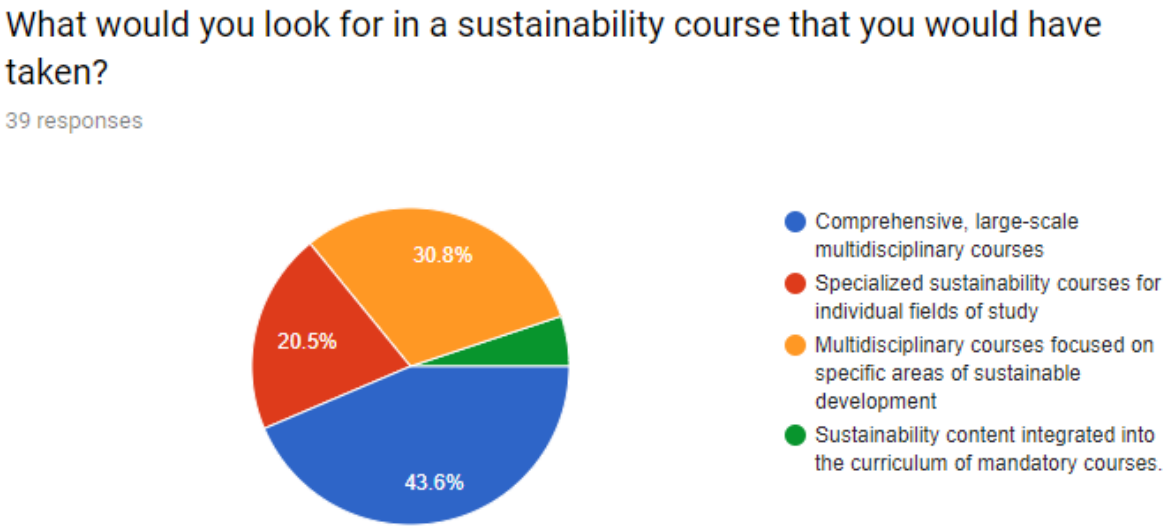

Figure 4.21. Sustainability course expectations.

For those that had not taken any courses, almost half stated they definitely would, with a quarter stating they most likely would. When asked the same question about motivation, the responses were similar to those who had taken sustainability courses; large-scale multidisciplinary courses and focused multidisciplinary courses centered around sustainability principles.

4.2.4. Campus Sustainability

79.1% of alumni had not participated in any campus sustainability event or program during their studies at Boğaziçi University. Those who did had participated in various activities ranging from permaculture to climate change projects. When asked about which environmental activities at Boğaziçi University campuses would provide most benefit to the students and the society, results obtained from alumni align on waste management, water efficiency and energy efficiency. Those alumni that have participated in sustainability events remark that certification or grading of sustainability application on campus is important for the university. Those who did not participate were asked if they would do so if they were students again, and around 67.7% reported that they would.

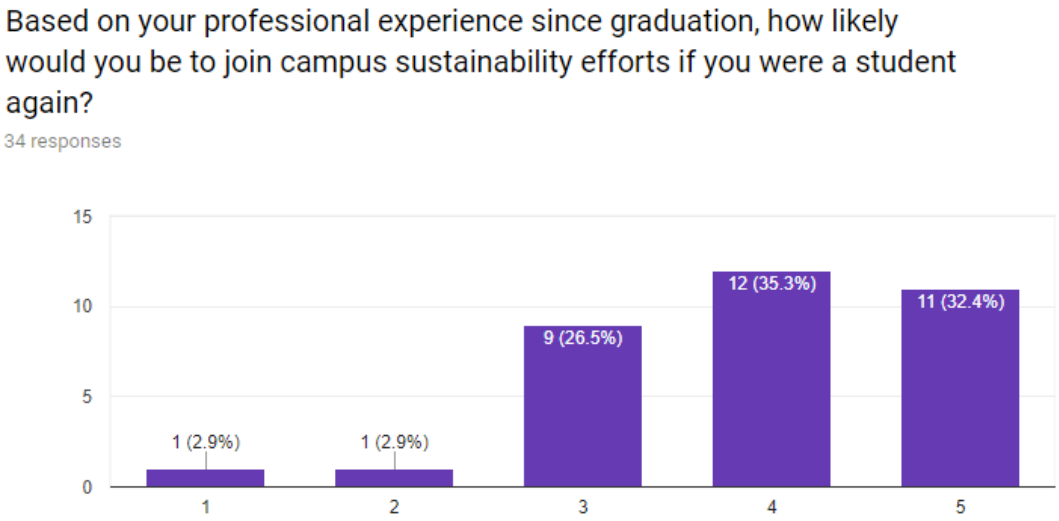

Figure 4.22. Campus sustainability efforts retrospective.

The most common reasons for them not having participated were that there wasn't any project or event they could participate in, that participation wasn't a priority for them and that they were not informed about the existence of any projects or efforts.

4.2.5. Boğaziçi University's Role in Sustainable Development

Alumni were asked if campus sustainability efforts at Boğaziçi University were important to maintain its position as a domestic and global leading higher education institution, 67.4% reported that they are important.

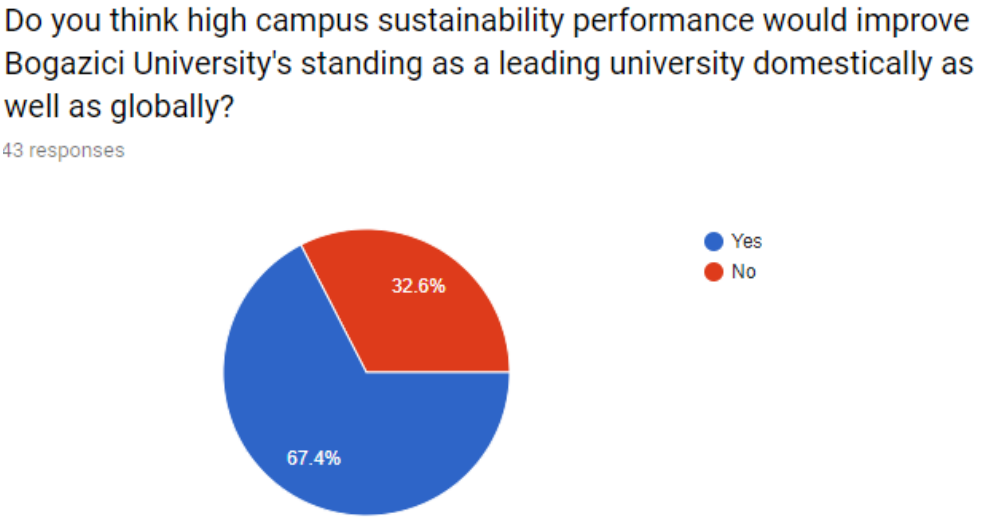

Figure 4.23. Campus sustainability's effect on university's standing.

Similarly, 72.1% of alumni believes that in their professional experience since graduation, sustainability education at Boğaziçi University would benefit its students in their professional lives.

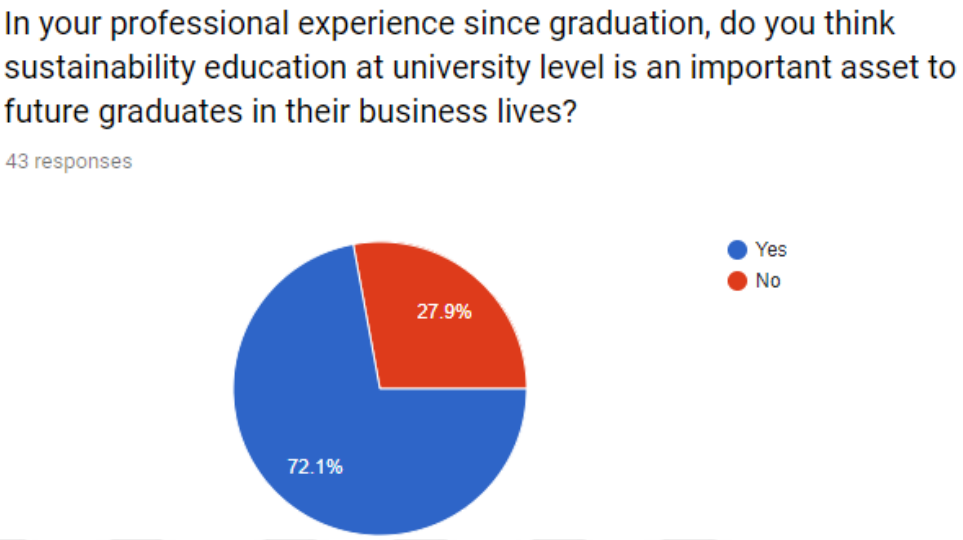

Figure 4.24. Importance of sustainability education in working life.

For the question regarding what SDGs should be the focus of Boğaziçi University for prioritizing its action and depending on its strengths, most picked options were SDG 4: Quality Education, SDG 5: Gender Equality and SDG 8: Decent Work and Economic Growth.

Lastly, alumni were asked to pick which activities would most contribute to securing Boğaziçi University's position as a leading institution in campus sustainability and sustainability education. Most picked option was an efficient campus sustainability program with the goal of eliminating all negative environmental impacts of the university. The second most picked option was forming research groups to address the social, economic and environmental barriers to sustainable development. Sustainability courses for all students and sustainability concerned campus activities were picked the least.

4.3. Boğaziçi University UI GreenMetric Ranking and the 2016 Application

Boğaziçi University's latest application for UI Greenmetric was submitted with supporting documents in November of 2016. Supporting documents contained; (a) information on the campus buildings and land area, (b) information on numbers of students and staff, (c) university's available budget on sustainability related activities and its total budget, (d) carbon footprint calculations, (e) routes list for personnel shuttles, (f) student shuttles information, (g) evaluation of its courses related to sustainability education, (h) available research funds, (i) the consortium partner

agreement for the UE4SD P33 project and (j) a presentation containing data on Boğaziçi University activities. The UI Greenmetric report prepared by the university was the main application document.

These documents serve the purpose of establishing a baseline for the university's performance in the time of its previous application. This baseline, alongside an analysis of the university's most recent ranking both in Turkey and the world will function as part of a series of university indicators that will help determine the courses of action that the university can take in order to increase its sustainability performance.

4.3.1. Boğaziçi Univeristy UI GreenMetric Ranking

To begin with, table below outlines the current ranking of Boğaziçi University among the universities that participate in the UI Greenmetric both inside Turkey and around the world. Both the overall rank as well as ranks in different sections of the UI Greenmetric are given, alongside percentiles. Complete lists of the rankings as provided by UI Greenmetric in their website can be found in Appendix D.

Table 4.1. Boğaziçi University GreenMetric rating.

		Turkey	World
Rank	Overall	9	356
	Setting and Infrastructure	5	120
	Energy and Climate Change	9	297
	Waste	17	466
	Water	12	358
	Transportation	11	261
	Education	9	374
Percentile	Overall	67	42
	Setting and Infrastructure	83	81
	Energy and Climate Change	67	52
	Waste	33	24
	Water	54	42
	Transportation	50	55
	Education	33	39

These results indicate that Boğaziçi University is the 9th top scoring university in Turkey, at the 67th percentile, according to UI Greenmetric criteria. In the world, Boğaziçi University places 356th in the rankings, being at the 42nd percentile. It is important to note, however, that the last application by the university was in 2016 and its current rank is a product of its score in 2016 ranked against more recent scores of other universities. This has important implications since Boğaziçi University was 3rd in Turkey in 2016, when the data was newly submitted. Still, thinking entirely along the UI Greenmetric scores, this analysis points out where the university's sustainability performance requires improvement and what its strong areas are in consideration for a new application.

Setting and Infrastructure is seemingly the university's strongest section, with 5th place in Turkey at the 83rd percentile and 120th in the world at the 81st percentile. Similarly, waste management seems to be the weakest section with 17th place in Turkey at the 33rd percentile and 466th place in the world at the 24th percentile. Waste and Water sections seem to be generally underachieving while the Transportation section is lagging behind locally in Turkey and the Education section has fallen behind globally, in comparison to the university's overall score ranking.

Comparison of the university's scores for each section and overall performance compared to median values of all participants' scores yields the following table. According to these results, the university is behind the median in its Waste, Water and Education related sections, and its total score.

Table 4.2. GreenMetric ranking analysis.

	Setting and Infrastructure	Energy and Climate Change	Waste	Water	Transportation	Education	Total Score
Boğaziçi University Score	874	886	750	350	863	508	4231
Median Value	696	865	1101	390	813	585	4448
Standard Deviation	181.94	296.28	410.60	228.86	248.94	236.40	1185.58

Looking at the questions in each section while considering the weighing of scoring criteria between each section should identify specific areas for improvement for the university.

4.3.2. Analysis of Weak Sections

4.3.2.1. Waste. Boğaziçi University's waste management performance is well below the global mean and also one of its weakest UI Greenmetric sections. Waste management questions of the UI Greenmetric criteria cover areas such as reducing waste, recycling, handling of toxic or hazardous wastes, organic waste management, inorganic waste management and sewerage treatment.

4.3.2.2. Water. Water section of the UI Greenmetric questionnaire addresses the concerns over the implementations of a water conservation program, a water recycling program, use of efficient water appliances and the amount of water used.

4.3.2.3. Education. With regards to education, the questions assess (a) the number or courses related to environment and/or sustainability topics and its comparison to the total number of courses offered at the university, (b) total funds allocated to sustainability and environment research compared to total research funds, (c) Number of campus event related to environment or sustainability and (d) if a website is run by the university dedicated to sustainability.

4.3.3. Analysis of Strong Sections

4.3.3.1. Setting and infrastructure. This section collects information regarding participating universities with regards to type of higher education institution, number of campuses, campus area, buildings area, smart buildings area, forest covered areas, vegetation area, number of students and staff, as well as the available campus budget for sustainability efforts.

4.3.3.2. Energy and climate change. Energy and Climate Change questions are concerned with the use of energy efficient appliances, smart buildings, renewable energy production on campus, total electricity use, ratio of renewable energy production to total energy use, green building implementation, greenhouse gas emission reduction and total carbon footprint.

4.3.3.3. Transportation. With regards to transportation, Greenmetric UI is concerned with the number of vehicles that the university owns, number of cars and motorcycles entering the university, number of shuttles operating in the university, average number of passengers for shuttles, number of daily shuttle trips, average daily numbers of bicycles on campus, parking spaces and a program to decrease their numbers, efforts to decrease the number of private vehicles on

campus, shuttle services, bicycle and pedestrian policies and daily travel distance of vehicles in campus.

4.4. Courses Evaluation

Boğaziçi University has an extensive course catalog which contains thousands of courses from very different departments. Looking at the 2017-2018 academic year's autumn and spring courses for courses related to sustainability and the environment yielded 53 related courses in the autumn 2017 semester and 34 courses in the spring 2018 semester. Focus on sustainability and the environment is required by UI GreenMetric and therefore any and all courses concerned with eother subject have been selected. Full list of related courses can be found in Appendix F. The list counts one course just once, therefore eliminating duplicate courses which might have been repeated in the spring semester.

A further breakdown of these courses by departments shows the following:

Table 4.3. Course analysis.

Department/Institute	Undergraduate Courses	Graduate Courses
Management		1
Executive MBA		2
Civil Engineering	4	2
Chemical Engineering	1	
Chemistry	1	1
Economics	5	
Environmental Sciences	4	51
Industrial Engineering	1	1
International Trade	1	
International Relations		2
Political Science	2	1
Sociology	2	
Tourism Administration	1	3

All three pillars of sustainability are represented among different departments at the university. Environmental aspects are discussed in engineering and sciences courses, economic aspects are discussed in business and economics courses, social aspects are somewhat underrepresented but are still discussed in sociology and political sciences courses. With the establishment of the ESC351 course in 2015, the university moved towards reaching a wider audience with sustainability

education. Since the Institute of Environmental Sciences does not have undergraduate programs, without courses such as ESC351, ESC301, ESC305, ESC307 and others the undergraduate students which make up more than two thirds of the university's student population did not have access to multidisciplinary content on sustainability issues. However, this number can yet be increased. Literature supports that multidisciplinary introduction courses to sustainability work well with students. Such courses can be created and could even be made mandatory for certain degrees at undergraduate level.

4.5. Discussion and Recommendations

The answers from student and alumni questionnaires have drawn a portrait of Boğaziçi University that often touches on the actual progress achieved by the university. However, there are a few gaps in awareness and between the actual and the perceived when it comes to the students' views on campus sustainability and sustainability education. These will be analyzed within a SWOT framework in this chapter. In order to coherently address each issue, UI Greenmetric sections will be used to group together the various elements that the university should consider in order to establish and sustainably progress a culture of sustainability for its students.

4.5.1. Setting and Infrastructure

Criteria SI4 of UI Greenmetric is based on area of campus covered by planted vegetation. This includes gardens, green roofs and green walls. Criteria SI3 is concerned with forest area. When asked about agricultural and ecological actions, students answered they would prefer green walls and roofs and organic composting and more trees being planted. Boğaziçi University is already placed around the 80th percentile in this section and can be considered successful, but with student support, these scores can be increased. This points to a strength for Boğaziçi University. A permaculture club that would engage in composting, green walls and roofs management, etc. can be formed or the activities of an already existing club can be extended to include these activities. Boğaziçi University's Tarla Taban Group was engaged in permaculture Boğaziçi University's Tarla Taban Group was engaged with permaculture (Tarla Taban, 2012) and the university was co-operating with the Yeşil Nesin Restoran movement, a movement for green restaurants that aim to reduce their food waste and participate in composting activities, (Boagazici Universitesi, 2014) in the past. If undertaken, this would also help increase the university's Waste section score via indicator WS4 which is concerned with organic waste treatment and awards points based on percentage of organic waste composted.

4.5.2. Energy and Climate Change

Majority of students have identified renewable energy sources that are already installed in campus as preferable. These include wind power, solar heating panels and solar photovoltaic panels. In that regard, the university's actions are aligned with student expectation. Therefore, growth of these systems will be well supported by the student body. This reflects well with UI Greenmetric criteria EC3. However, there is an opportunity for a seminar or a training in this area since the feasibility of installing more solar or wind power may not be in the university's best interest either due to financial reasons or efficiency. This is especially important since while the Green Campus reports provide figures on the amount of power that these systems produce, an energy efficiency study is missing. Results of such a study can be shared with the students to either numerically back their enthusiasm or to explain why further investment is not feasible. Benchmarking of these systems against average operational figures of similar systems in Turkey would provide important feedback on their use and potential. However, the most important purpose that these systems serve could be as examples and their greatest values could be symbolic. In this case, student interest is an opportunity to establish and support project groups that could be centered around running and improvement of the photovoltaic and wind power systems in all campuses.

Students related high carbon footprint with the high number of people using the buildings. This makes sense, since the more people use a building, more utilities will be used and the energy demand will increase. Regarding the carbon footprint and greenhouse gas emissions, the results of the calculations from 2016 Carbon Footprint report of the Green Campus Program has identified Natuk Birkan building, Women's Dorm, Hamlin Hall and the Faculty of Engineering as the sources of highest carbon emissions on campus (Cılız et al, 2016). Students' choices when asked about the same set of buildings was to go for Men's Dorm, Women's Dorm and the Student Activities Building the most. Engineering students' top answers were Men's Dorm, Women's Dorm and Natuk Birkan and Student Activies Buildings. Education students answered the same way with Men's and Women's Dorm followed Student Activities Building and the exact same three picks were selected by business and economics students. This portrays that while their awareness is high regarding the sources of carbon emissions, there are yet factors that they mostly fail to take into account. This presents an opportunity for student engagement for the Green Campus program and the various student clubs and societies on campus. Using social media, or other popular media, simple events and competitions can be communicated to students that are based on correct estimation of carbon footprints of campus buildings with symbolic rewards.

Again, most students were able to identify the existing green buildings on campus, so awareness is not a problem for green building implementation, which is another criterion in the framework, EC6. Engineering students were mostly able to identify Hamlin Hall (Men's Dorm) building, Education students were not able to identify either certified building and the same was true for business and economics students. In practical terms, the university can take faster steps towards further green building implementation projects, barring budget constraints. The same can be said for smart building implementation. Students were able to tell the difference between a green building and a smart building; therefore, the students can be expected to manage their expectations from these two different types of building and that will help towards ownership and participation, which are essential for culture development. In the meantime, taking example from the two LEED Gold certified green buildings, student interest and awareness can be directed towards energy efficiency in non-green buildings. This could either take the shape of energy efficiency projects or just sharing the results of any energy efficiency audits that can be conducted for the non-green buildings. Availability of data on sustainability activities is something that the students want to have more access to, using the social media. Therefore, sharing of these results in a well managed green campus social media account would catch the eye of interested students. Increasing energy efficiency of campus buildings would also help contribute towards increasing the amount of points obtained from criteria EC4, electricity usage per year, of UI GreenMetric.

4.5.3. Water

Boğaziçi University, or indeed most universities, is not a heavily water-polluting institution. Principal use of water is for domestic purposes; ie. cafeterias, lavatories, irrigation, etc.. With that being the case, water use and efficiency, rather than waste water treatment should be the university's main area of concern and GreenMetric UI also recognizes this. The only question regarding waste water is asked in the Waste section and asks what is done with it. WWF's Water Risk Filter service maps Istanbul region as a medium-risk area with regards to water availability, this is also the grading for the rest of Turkey (WWF, 2018). While not graded as high risk, this still increases the importance of both awareness and practice regarding efficient water use. Presently, majority of students identify dormitories as the main campus spaces where water conservation would be most beneficial. This is supported by the 2014 water footprint analysis identifying dormitories as the principal users of water on campus (Cılız et al, 2014b). This implies that awareness, or at least the ability to correlate, is high. Engineering students have selected dormitories as their first pick with green spaces and teaching halls following, Education students have made the same selection and so have economics and business students. However, very few number of

students were able to list any water conservation measures currently being employed in campus buildings. One of which is the grey water recycling systems in Men's Dorm and UDIM Building. Almost none of the participant students were able to clearly describe what grey water is. Most label it simply as waste water. While technically it can be labelled as such, the implications for water circularity and therefore the water budget are significantly different enough to warrant increased awareness. This is one of the areas that must be addressed, especially since Water is one of the weak sections for UI GreenMetric. Awareness of the efficiency measures already being taken is a transparency issue. Such activities should be more visible to the students who should be the ones to take up ownership of their campuses. Since the students are most interested in water recycling as a measure of water conservation, any awareness raising activity can be built upon a water recycling project or study on campus, which is a detailed enough process that it can cover grey water, as well as any other measures via touchin upon the total water balance of university campuses. Water is a weak section for Boğaziçi University in the GreenMetric grading. With such an important and popularly concerned-over resource such as water, catching the attention of students to be involved in any projects or studies on water should not be difficult.

4.5.4. Waste

Waste is another weak section for Boğaziçi University, and one with high potential and need for improvement. As far as GreenMetric is concerned, the main areas of focus should be reducing waste, increasing recycling, managing toxic waste, organic and inorganic waste management and waste water management. According to the student survey, students believe the level of awareness on recycling waste and the availability of recycling points are the top reasons why the recycling rate is not higher. Engineering students have picked student awareness ahead of availability of recycling points, Education students have also ranked the same way. Business and economics students also made the top two picks, but followed by existence of a university recycling policy. This is an issue which has been in the agenda of the Green Campus Program for a long time too. Agreements with concerned municipalities and waste handling companies often inhibit reaching ideal levels of performance. But the legal requirements set out by the concerned environmental laws and regulations of Turkey are a driving factor on an administrative level for each public institution, including public universities like Boğaziçi. This driving factor can be put to use for giving priority to waste management improvements, especially since awareness levels seem to be high among students according to their prioritization of answers in questions 44, 45 and 46.

The top types of waste that the students recycle are paper and cardboard wastes, alongside plastics. This synergizes well with GreenMetric criteria WS1, as it too is concerned with paper and plastics waste. Students also reported that they use double sided printing and printing only when necessary measures to reduce their waste most. Considered altogether, a detailed look into the behavior around printer use in and around campus should be a major step towards improvements in this area. Whether through incentivizing recycling or making it more difficult to get printouts for students and faculty alike, there is room to think. One potentially helpful approach could be to organize a reward scheme for collecting most recyclable waste among different departments. Filled bags and boxes for recycling could be weighed and reaching certain thresholds could be rewarded with coffee coupons that can be used in campus cafeterias, or something similar. The problem regarding the availability of recycling points in campus must be addressed in order to support this scheme as well, a cooperation with the Environment Club can have volunteer students manufacturing additional recycling boxes out of waste paper and plastic. This could be an engaging way of both reducing waste and directly addressing a campus-wide problem.

Toxic, or other hazardous, wastes is another critically important subject for the university. Not only the laws and regulations are stricter for hazardous waste disposal, but both the specturum of hazardous wastes produced in campus is wide, and student expectations regarding their management can potentially be unrealistic.

When asked about what special wastes can be recycled or reused at the university, student top choices were batteries, electronics and printer toners, in ascending order. These waste types have been the subject of the Green Campus Program's several project and studies in the past. Through third party partnerships with industry and NGOs, and occasionally being supported by student projects, successful implementations of toner, electronics and battery waste management have previously taken place at Boğaziçi University. Similar partnerships and projects can again be initiated and be expected to yield similarly successful results; however student perceptions provide insight into what might be more effective approaches. Regarding toner waste, students are very much in favor of refilling and reusing these waste items. While certainly environmentally sound, this suggestion relies on the toner producers to willingly cooperate in this project. Previous cooperation with HP nonwithstanding, the most common way of refilling toners includes unlicenced stationary stores illegally refilling the toner with ink. Students' idea of managing electronics waste is more plausible in that regard, they prefer finding new users for old but still usable electronic items the most. This is followed by recycling unusable waste items for raw materials and repair workshops to increase the lifetimes of electronics. While these suggestions may

not strictly encourage electronics suppliers to cooperate, unlike the toner suggestion there is nothing strictly illegal in organizing them either. When asked about which special and hazardous waste types are most important to manage in campus, the top three picks were similar to those for recycling with the only difference being the inclusion of organic waste in place of printer toners. Composting practices are being attempted at Boğaziçi University for some time now with student initiatives such as Tarla Taban. However, it was not the top pick for organic waste and ecological applications preference among students. Their top pick was instead implementation of green walls and roofs on campus buildings, with composting coming in second. This presents an opportunity for the university to either focus on the already existing practice and supporting it with research efforts from departments such as the Institute of Environmental Sciences or Biology, which will be welcomed by the students still; or look into the feasibility of implementing green walls and roofs, which will also significantly contribute to energy efficiency efforts.

Finally, with regards to hazardous wastes, awareness among students seems to be a problem. Most students believe that removal of hazardous waste by authorized company is the most important aspect of managing hazardous wastes. This includes engineering students who placed safe transport and disposal by authorized company ahead of leak proof containment. Education students have ranked the same two, with the addition of an existing hazardous waste policy ahead of leak proof conatainment. Business and economics students have perhaps showed more awareness since their top pick was disposal by authorized company and leak-proof storage, followed closely by data on sources and amount of hazardous waste. However, as mentioned earlier, removal can often take long times on account of the municipalities or authorized disposal company being busy elsewhere. Collections may not happen for long periods of time and they are costly. With the laws and regulations also requiring hazardous waste to be kept in specific conditions, focus should be on leak-proof temporary containment. Since the students are not expected to handle hazardous waste themselves, this problem will not necessarily adversely affect campus life in Boğaziçi University. However, this level of awareness will be a problem for the students in their professional lives, especially in fields of engineering, natural sciences or even management. As an institution of higher education with their primary output being responsible professionals, this should be a higher concern for Boğaziçi University. Similarly, when asked about handling of hazardous wastes from laboratory experiments, one of the top two preferred methods of controlling that waste was to set up innovation criteria before authorizing research with high chemical or other hazardous waste producing materials. It was equally preferred alongside payment of chemical disposal fees by each individual department for their own laboratory waste. What is remarkable here is that the students are willing to put innovation and research in secondary priority. This being selected for a higher

education institution has significant implications for the university management to consider. However, these results can be interpreted such that the students are highly motivated with regards to stopping soil contamination.

4.5.5. Transportation

The Green Campus Program has previously looked into carbon emissions from vehicles in campus and there is a bicycle sharing program being implemented in campus currently. UI GreenMetric's expectations from this area regards type and availability of parking spaces in campus, number of vehicles allowed in campus, shuttle services and implementation of a bicycle and pedestrian policy. With regards to how students perceive what can be done for inter- and intra-campus transportation, majority of answers indicate that the students are in favour of car sharing, bicycle use, use of electric or hybrid vehicles and optimization of shuttle routes.

Avoiding any suggestions that would require expensive investments on behalf of university management, the most plausible and acceptable method to improve campus transportation can be to promote car sharing. Incenives can be given to cars that enter the campus with three or more passengers such as being allowed to park closer to the campus buildings and maybe a loyalty-scheme type of incentive that decreases the cost of campus parking stickers for drivers that shared their vehicles with their colleagues often. This will both reduce the number of vehicles entering campus and save up on parking space to be repurposed for other uses. Similarly, students that own bicycles can be incentivized to bring them to campus and share them in bicycle-sharing schemes.

There is already an effort under way to promote car sharing in Boğaziçi University, which shows great initiative on behalf of those students participating. Social media posts in student groups often invite students to come together and use one vehicle when travelling in the same direction around the same times. Overall, the transportation practices and potential in Boğaziçi Univerity have a strong foundation and is open for autonomous improvement.

4.5.6. Education

Literature on estalishin a strong and engaging curriculum for education towards sustainable development it quite rich and various implementation examples from around the world provide significant data to suggest working alternatives to current practices. That being said, one of the key areas for improvement not only in Boğaziçi University but all institutions of higher education

around the world is to how to better equip their graduates with the necessary awareness, skills and capabilities to live in a world increasingly suffering from the effects of unsustainable business and consumption practices for over a century.

Boğaziçi University's commitment towards sustainable development is instilled in its mission and represented by the various efforts by its students and faculty to offer an alternative point of view towards looking at the world. Significant efforts, including offering undergraduate courses on sustainability or hosting a student sustainability network already mark Boğaziçi University as an agent for change in Turkey. But the fact that its UI GreenMetric score has fallen short of its efforts is a situation that should be amended. Especially since the results of the survey indicate that the students have come to internalize what they learn from their sustainability courses and change their lives outside the campuses, as suggested by the results of the questions 59 and 60.

As the methodology for this thesis states, the student questionnaire was distributed to undergraduate students of sustainability related courses offered by the Boğaziçi University Institute of Environmental Sciences. This effectively turns the questionnaire into a detailed test of awareness for the students of those courses, based on the contents of the courses to a certain extent. With strictly awareness-related questions such as asking the difference between a green and a smart building or asking to define what grey water is, the results were revealing in the sense that while the practical information from the courses was transferred with a certain degree of success, the theoretical information has not been so successfully transferred. This can suggest that when they graduate, the students will probably seek to live sustainable lives in an individual level, but not necessarily apply their theoretical knowledge in their professional capacities. Educating for sustainable development requires more from universities than just individual contributions, and, luckily, Boğaziçi University has a lot of options available for improvement.

ESC351 was the first multidisciplinary sustainability related undergraduate course offered to students at Boğaziçi University. Since its creation in 2015, others have followed. But these being elective classes with no strict follow up courses and little impact on graduation, their effects on the students may not be long lasting as would be desired. Literature suggests several methods to overcome this difficulty that can easily be applied in Boğaziçi University too. To begin with, forming a simple, entry-level sustainable development class that is compulsory for all undergraduate students can be considered. This course would have a global point of view towards explaining what sustainability is, the diverse ways by which sustainability can be defined, the current trends in sustainable development and related topics. Even though the students have

expressed that they would less prefer sustainability education being integrated into compulsory courses, by keeping this class very basic and multidisciplinary, eventual acceptance by the students can be achieved. As long as the course retainds its multidisciplinarity, students are seemingly willing to accept according to the way they prioritized the answers to question 23, with multidisciplinary courses centered around fields of study being the top pick and followed by comprehensive large-scale multidisciplinary courses and specialized sustainability courses centered around the SDGs as the preferred methods of delivery. If obtained, UNSDSN support could provide custom access to their SDG Academy online learning tool that can be used in the context of this course. SDG Academy is a freely available online tool so no strict UNSDSN cooperation is needed *per se*, but cooperation could allow ways to customize content and access as would suit the needs of this university course.

However, this entry-level course would not be able to provide the perspective and the in-depth thinking ability that would be required from graduates of the university. To build upon its foundations, a second, more focused follow-up course should be planned for each undergraduate student. Literature contains examples of sustainability courses that are required for graduation alongside credits and dissertations. This more advanced course can be formed around that concept, and therefore its subject should be related to the student's field of study. This will also be advantageous in terms of equipping the student with some job-specific knowledge and skills to be able to better integrate sustainability thinking into their professional lives. Such a course should again provide a multidisciplinary point of view, but the scope should be more limited. For example, for business and economics students, a course can be planned to teach business ethics, financial sustainability, and corporate social responsibility. For engineering students, this course could be adapted to teach environmental management, systems thinking, and labour standards for sustainability. An important point here is that these courses should remain role-specific and relatable for the students. If they are implemented as a requirement for graduation, then a simple pass/fail assessment for these classes can alleviate the students' concerns over grades and would allow room for more creative and immersive activities that could benefit the students more. Alternatively, this pass/fail scheme can lead to a project-based learning experience which the students would likely support as the students' answer to question 18 indicates that campus sustainability projects is the second most effective method for more student involvement in sustainability, alongside organizing sustainability discussion groups and following making campus sustainability information more available.

Students have most commonly thought of environmental and social sustainability when asked about what aspects of sustainability comes first to their minds. These were followed by good governance and cultural effects and barriers. The fact that the third widely accepted pillar of sustainability, economic sustainability, was left trailing has important implications for student expectations. To address this preference, course contents of existing sustainability courses should be expanded to cover these trailing aspects of good governance and cultural barriers. One method could be to incorporate laws and regulations regarding environmental sustainability and labour standards into the curricula. This does not strictly have to follow local applications of laws and regulations, but also global movements and programs like the SDGs. Global programs and success stories from around the world could help students put the local outlook into a global context and make them ask questions on why sustainable development progresses differently in different societies. The resulting discussion would help students better understand the role of culture and barriers to sustainable development in a global context.

As the global setting is understood by the students, a wide-scale, truly multidisciplinary sustainable development course can be established to further drive the students towards awareness on the global outlook. This course would again have to be compulsory, but the students have answered that they would welcome a wide-scale multidisciplinary course in question 23. The ESC351 Sustainable Development course already exists at the university, accepting students from a variety of different departments. What needs improvement is that this course can be expanded with rectorate support to be run by a commission of professors that meet each semester to discuss and set the course content so that it is always up to date, and its individual topics always taught by a professor of the topic's field. This would mean that there would have to be several professors lecturing for this course every semester so that all major fields are covered. But the potential benefits could potentially address every preference that the students indicated in the questionnaire answers.

In terms of student participation, courses and lectures are on one side of the coin, with the other side being campus events and activities. Students have been asked about which campus events that they most closely follow, and the existing sustainability events, as well as their organizing clubs and societies, are seemingly not as popular among the student base as perhaps they could be. Even Greenfest, a long-running sustainability event organized by the Environment Club was scarcely mentioned alongside much more popular events like Taşoda, or even Brands Summit. The key benefit of these events with regards to student education on sustainability stands on two points. The first is that in a social context, students currently unaffiliated with sustainability could be drawn in and later join courses or projects. Secondly, Albrecht et al references vicarious learning as an

example of how extracurricular events can help learning, vicarious learning refers to learning by the experience of others and in this context, campus events and activities provide the perfect environment for vicarious learning to take place (Albrecht et al., 2007). Therefore, popularity of existing events should be increased as a priority, and new events like the Boğaziçi Sustainability, first organized in May 2018 should be well prepared and well supported by both the rectorate and by partnerships, like how SDSN support was obtained for the latter.

Research and development is a key role of any university, and as a newly designated research university (Boğaziçi Üniversitesi, 2017b), Boğaziçi University is no exception. Sustainability research can take many forms and incorporate many fields owing to the multidisciplinary nature of the subject. With that in mind, more student interest and faculty areas of research should be guided towards sustainability. Students believe that student interest is the leading limiting factor for sustainability research on campus according to how they have answered question 19. By following the previous recommendations, significant increase in student awareness could be achieved which might naturally correspond to increased student interest for research, however, that is not to say that the university does not have other options. Sustainability is a hot topic for current research and both governments and international institutions are constantly launching new projects to meet their global commitments to sustainability. Researh opportunities rise from these projects and should be capitalized upon by the university.

Student clubs and campus events related to sustainability are scored under the Education criteria of UI Greenmetric. They respectively correspond to indicators ED4 and ED5. Boğaziçi University already has an active student body and deep-rooted student clubs which can easily be supported to increase performance pertaining to these sections. Firstly, efforts already suggested and recommended in the previous sections of this study can be used as subject matter for increasing the number of campus sustainability events and clubs. For example, if the organic wastes from university cafeteria are to be composted for use in ecological farming, this process can involve the Tarla Taban committee of the Environment Club to carry out the processes of composting and planting the fields. The produce of these fields could be sold on campus events to the benefit of either supporting more projects or maintaining the compost project, and the sale event can be supported by BUKOOP club since they already perform similar activities on campus. As for increasing the number of student clubs, different environmental projects for, for example water conservation or energy conservation, could be organized into different clubs so that effective management of these systems can involve dedicated students. Similarly, project interim reports of their activities can be developed into more expansive studies which might eventually lead to

publications, in turn increasing the number of sustainability related publications and contributing the university's performance with regards to indicator ED3.

4.5.7. SWOT Analysis

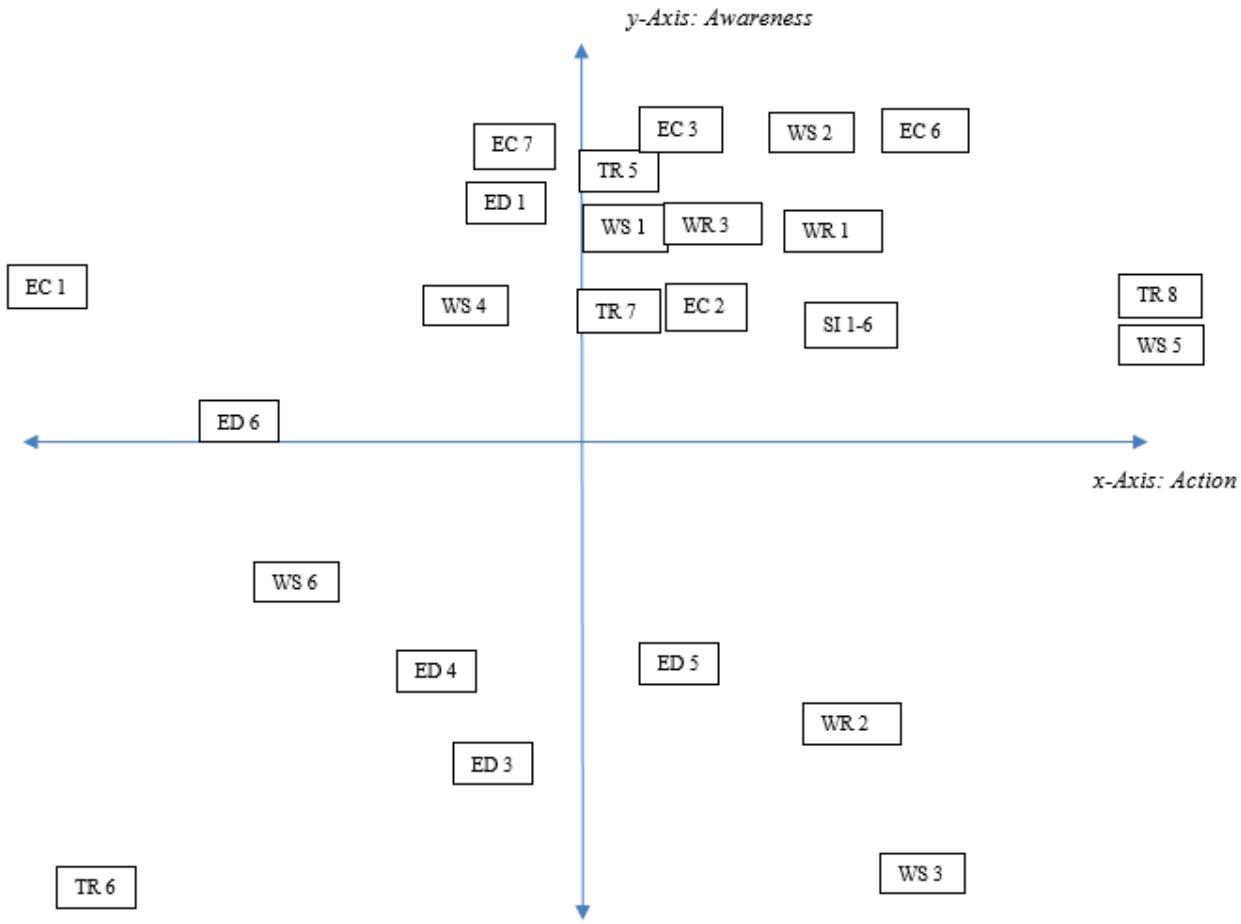

Figure 4.25. SWOT Analysis.

In this chart, Boğaziçi University's performance with regards to UI GreenMetric criteria are placed along the awareness (y) and action (x) axes. Awareness placement is based on the students' awareness of university efforts in that particular area as well as theoretical knowledge where applicable while action is a measure of both activities currently being undertaken by the university and the students' willingness to act on topics that they are interested in. Placement of criteria have been determined as analyzed within the body of this section. Full list of criteria can be found in Appendix A. Ratios and otherwise calculated criteria not dependant on student awareness and action are left out.

Low awareness and low action items are considered threats. Low awaraness, high action areas are considered weaknesses. High awareness, low action areas are considered opportunities. High awareness and high action areas are considered strengths. These are determined by looking from a student perspective.

5. CONCLUSIONS

Boğaziçi University, as a deep-rooted and internationally well-respected university, has already taken upon itself to become more sustainability-minded both in its campus performance, and its role as an institution of higher education. Significant steps have already been taken with the forming and activities of the Green Campus Program, the university's participation in the UI GreenMetric framework, education efforts to raise awareness of its students with regards to sustainable development, and others.

According to Krizek et al, there were four stages of the sustainability process on campus: grassroots; executive acceptance of the business case for sustainability; the visionary campus leader; and fully self-actualized and integrated campus community (Krizek et al., 2012). During the course of preparing this thesis, findings were pointing towards the existence of all the stages up to the campus leader level. Commitment to campus sustainability is evident in the activities of the Boğaziçi University Sustainale Development and Cleaner Production Center. Plus, the Boğaziçi Rectorate has shown clear intention that sustainability is in their agenda. Therefore, the only logical next step for the university is the full self-actualization and integration of the campus community. With multiple layers of multidisciplinary courses on sustainability and campus level organizations and projects that would bring together faculty and students from a wide variety of departments, this harmonization can be achieved.

On a more specific level, integration of these students and faculty in multiple layers, referring to the suggested courses being offered at entrance, department and 3rd-year levels, is an essential task for top management (Sammalisto et al., 2015). Such courses would educate students about sustainability and at the same time, through shared learning objectives, instill a shared mental model in them, as suggested by Kurlan et al's 2010 paper. This shared mental model is, in essence, the culture that a university establishes. In fact, perhaps the establishment of a campus program like the ISAC (Integrating Sustainability Across the Curriculum) program of Penn University could lead to a natural increase in the number of sustainability courses (Dmochowski et al., 2015) at Boğaziçi University all the while providing a forum for a dialogue about disciplines' contribution to the sustainability program. However, curricular activities cannot be responsible for this culture on their own since co-curricular activities did not necessarily transform into increased environmental performance on campus (Lang, 2015). Since campus sustainability is an important part of sustainability in higher education, this highlights the importance of Boğaziçi students' extra-

curricular activities.

Zeegers and Clark supported the view that students are enviro-centric (Zeegers and Clark, 2014) and this is the case in Boğaziçi University as the students have answered that they mostly associate sustainability with the environment. Together with the need to address campus sustainability, student clubs and activities about the environmental aspect of sustainability are an important subject for the culture of sustainability in Boğaziçi University. Through student clubs like the Environment Club and BUKOOP, the university can open the way for increased student involvement with support and guidance given to the activities of these clubs. This would both contribute to the student ownership of the sustainability agenda, while at the same time leaving the university management's hands free to pursue other goals. This will be especially true if these events and organizations on campus are designed in such a way to address and target contemporary, real-life concerns about the environment. This will serve the purpose of attracting resources from outside the university on subjects that are popular points of concern, therefore allowing the student events and projects to increase their scope and commitment via increased funds and promotion opportunities (Lipscombe et al., 2008). As Amaral et al states, the need for including environmental issues and giving special attention to resource consumption is a good focus for universities to plan accordingly for. To that end, student participation in running campus environmental projects should be encouraged and supported by means of both funding and organizational assistance (Amaral et al, 2016). This subject has come up with a lot of the suggestions targeting the environmental performance of the university's campus like carbon footprint reduction and waste management. Like Duram and Williams' 2013 paper states, a motivated core of students can play a key role in campus initiatives.

Constant improvement is a crucial aspect of all development and of course there are major areas of improvement required at the university to reach is vast potential. Some of these are reflected in the UI GreenMetric score and where it stands in the global and domestic rankings. These issues have been addressed in light of the student questionnaire's insights into what changes might be welcomed and absorbed by the students. The other questionnaire conducted for this thesis was the alumni questionnaire, and it serves an entirely different purpose. Alumni are, in a sense, one of the end products of an institution of higher education alongside its research and development findings. What its alumni does in the rest of their lives defines the quality and character of a university. It is also a great asset to any university if their alumni base is as active and still interested in their university. It is important that the alumni view their university's commitment to sustainability in a positive way and that they validate that a sense of sustainability in future alumni

will be beneficial to them too.

Overall, this thesis has analyzed the length and breadth of Boğaziçi University's performance in sustainability in higher education. The UI GreenMetric framework that the university chooses to measure its performance against has been a significant focus of the analysis thus far. But, one particular conclusion is yet to be made in that regard: what would the suggestions and recommendations put forward by this thesis translate to in terms of grading on the UI GreenMetric scale? This question cannot be entirely answered due to how the points calculation mechanism of UI GreenMetric. To clarify, certain questions have certain corresponding points values according to the answer being selected for each question. As can be seen from the guideline presented in Appendix A, this is certainly the case for majority of the questions asked in the more environmental application concerned sections of water, waste, energy and transportation. However, the remaining sections of Setting and Infrastructure and Education almost entirely consist of questions that are awarded points according to the performance of the entire sample of universities participating in the UI GreenMetric ranking. Therefore, for these sections, the only viable recommendation is to focus on the entirety of the indicators and seek to increase performance towards them as much as possible. That being said, an overview of how the environment questions of the four sections are awarded points, the following table can be calculated as the potential new score of the university after implementing the recommendations of this thesis.

Table 5.1. Potential 2018 scores.

Boğaziçi University Potential 2018 Application Scores						
Setting and Infrastructure	Energy and Climate Change	Waste	Water	Transportation	Education	Total
874*	1099	1400	350	963	508*	5194

These scores show an increase in total points of 963. Scores noted with an asterisk have not changed in this calculation due to the reasons given above. The new total score of 5194 would place Boğaziçi University in second place in Turkey without the added points from Setting and Infrastructure and Education sections. Considering that the changes suggested to the way sustainability education and student activities at Boğaziçi University have been a significant concern of this thesis, increase in the Education section should be expected as high, potentially carrying Boğaziçi University to first place position in Turkey.

The multi-faceted nature of sustainable development makes achieving it a complex and difficult task. Therein lies a special role for education, and higher education institutions in particular: the way that they shape their graduates' standpoint on sustainability should also come from a variety of different activities and applications. Education itself cannot be enough. Activities alone would not have long lasting effects. Focusing entirely on campus sustainability would have very limited impact. Therein also lies the question of management for effective change and continued good performance. University hierarchy changes from region to region and sometimes the decision-making procedure may slow down or even pause progress towards effective management of universities. This includes indecision and ambiguity over who has authority over what and whose priority and responsibility is it to act for making changes. This can be a problem for other universities than Boğaziçi University, but rectorate support being high as it is there should be no problems with regards to support, and that support can make a significant portion of the bureaucracy stop being a speed bump. As for ambiguity, however, there is room to grow. Moore reports that progress was slowed due to faculty members believing it was the administrators who have the power to make the changes towards progress, the administrators believed in exchange that it was the faculty with the power over changing their departments and classrooms (Moore, 2005a). A similar practice of shifting responsibilities should be at all costs avoided. Goals of administration and faculty might not necessarily align all the time; therefore, the risk is ever present in any institution. It is lucky for Boğaziçi University that it does not seem to be the case currently.

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APPENDIX A: UI GREENMETRIC GUIDELINE APPENDIX 1

Appendix 1

Details of the scoring are described as follows:

No	Categories and Indicators	Points	Score	Weighting
1	**Setting and Infrastructure (SI)[§]**			**15%**
SI 1	The ratio of open space area towards total area	**300**		
SI 2	The ratio of open space area towards campus population	**300**		
SI 3	Area on campus covered in forest	**200**		
SI 4	Area on campus covered in planted vegetation	**200**		
SI 5	Area on campus for water absorbance	**300**		
SI 6	University budget for sustainable effort	**200**		
	Total	**1500**		
	Energy and Climate Change (EC)			**21%**
EC 1	Energy efficient appliances usage	**200**		
	None		0	
	Less than 20%		0.15×200	
	20% - 40%		0.25×200	
	40% - 60%		0.50×200	
	60% - 80%		0.75×200	
	80% - 100%		200	
EC 2	Smart building implementation	**300**		
	None		0	
	Program in preparation (e.g. feasibility study or detailed engineering designed phase)		0.15×300	
	Program in initial implementation (e.g. builder already appointed)		0.25×300	
	Implemented in less than 30% of the total building area		0.50×300	
	Implemented in between 30% - 70% of the total building area		0.75×300	
	Implemented in more than 70% of the total building area		1.00x300	
EC 3[†]	Renewable energy produce on campus	**300**		
	None		0	
	Bio diesel		1/7×300	
	Clean biomass		1/7×300	
	Solar power		1/7×300	
	Geothermal		1/7×300	
	Wind power		1/7×300	
	Hydropower		1/7×300	
	Combine heat and power		1/7×300	
EC 4	The ratio of total electricity usage towards campus population[§]	**300**		
EC 5	The ratio of renewable energy produce towards energy usage	**200**		

No	Categories and Indicators	Points	Score	Weighting
	None		0	
	Less than 20%		0.15×200	
	20% - 40%		0.25×200	
	40% - 60%		0.50×200	
	60% - 80%		0.75×200	
	80% - 100%		1.00x200	
EC 6	Element of green building implementation‡	**300**		
	None		0	
	Natural ventilation		0.25×300	
	Full natural day-lighting		0.25×300	
	Existence of building energy manager		0.25×300	
	Existence of Green Building		0.25×300	
EC 7	Greenhouse gas emission reduction program	**200**		
	None		0	
	Program in preparation (e.g. feasibility study and promotion)		0.33×200	
	Program in initial implementation (e.g. initial measurement of gas emission reduction)		0.66×200	
	Implemented in HVAC System/Refrigerator/Laboratory Gases		1.00x200	
EC 8	The ratio of total carbon footprint towards campus population§	**300**		
	Total	**2100**		
	Waste (WS)			**18%**
WS 1‡	Program to reduce the use of paper and plastic in campus	**300**		
	None		0	
	Double sided-printed policy program		0.25×300	
	The use of tumbler		0.25×300	
	The use of reusable bag		0.25×300	
	Print when necessary		0.25×300	
WS 2	Recycling program for university waste	**300**		
	None		0	
	Partial (less than 25% of waste)		0.33×300	
	Partial (25%-50% of waste)		0.66×300	
	Extensive (more than 50% of waste)		1.00x300	
WS 3	Toxic waste handled	**300**		
	Not managed		0	
	Partly contained and inventoried		0.5×300	
	Completely contained, inventoried and handled		1.00x300	
WS 4	Organic waste treatment	**300**		
	Open dumping		0	
	Partly composted and compost dumped		0.25×300	
	Partly composted and compost used		0.5×300	

No	Categories and Indicators	Points	Score	Weighting
	Fully composted, compost used		0.75×300	
	Fully composted, compost used internally and externally		1.00x300	
WS 5	Inorganic waste treatment	**300**		
	Burned in open area		0	
	Taken off campus to a dump site		0.33×300	
	Partially recycled (less than 50%)		0.66×300	
	Fully recycled (more than 50%)		1.00x300	
WS 6	Sewerage disposal	**300**		
	Disposed untreated to waterways		0	
	Treated individually in septic tank		0.33×300	
	Centralized treatment before disposal		0.66×300	
	Treatment for recycling		1.00x300	
	Total	**1800**		
	Water (WR)			**10%**
WR 1[∞]	Water conservation program	**300**		
	None		0	
	Program in preparation (e.g. Feasibility Study and promotion)		0.15×300	
	Program in initial implementation (e.g. initial measurement of potential water conserved)		0.25×300	
	Implemented in Rain Harvesting System		0.25×300	
	Implemented in Ground Water Tank		0.25×300	
	Implemented in Lake or Pond		0.25×300	
WR 2[∞]	Water recycling program	**300**		
	None		0	
	Program in preparation (e.g. Feasibility Study and promotion)		0.15×300	
	Program in initial implementation (e.g. initial measurement of potential water conserved)		0.25×300	
	Recycled water is used for garden sprinkler system		0.25×300	
	Recycled water is used for toilet flush		0.25×300	
	Recycled water is used for cooling system		0.25×300	
WR 3	The use of water efficient appliances	**200**		
	None		0	
	Program in preparation (e.g. water efficient appliances selection priority are identified)		0.15×200	
	Water efficient appliances installed (less than 25%)		0.25×200	
	Water efficient appliances installed (25%-50%)		0.50×200	
	Water efficient appliances installed 50%-75%)		0.75×200	

No	Categories and Indicators	Points	Score	Weighting
	Water efficient appliances installed (more than 75%)		1.00x200	
WR 4§	Treated water consumed	**200**		
	Total	**1000**		
	Transportation (TR)			**18%**
TR 1§	The ratio of vehicles (cars and motorcycles) towards campus population	**200**		
TR 2§	The ratio of shuttle services towards campus population	**200**		
TR 3§	The ratio of bicycles found towards campus population	**200**		
TR 4	Parking area type	**200**		
	Open space or horizontal type		0.25×200	
	Combination of open space and building		0.50×200	
	Building or vertical space		0.75×200	
	Parking is restricted		1.00x200	
TR 5‡	Transportation initiatives to decrease private vehicles on campus‡	**200**		
	None		0	
	High charging parking fee		0.25×200	
	Car sharing		0.25×200	
	Metro/tram/bus station on campus		0.25×200	
	Metro/tram/bus services inside campus		0.25×200	
TR 6	Transportation program designed to limit or decrease the parking area on campus over the last 3 years (from 2014 to 2016)	**200**		
	None		0	
	Program in preparation (e.g. feasibility study and promotion)		0.25×200	
	Program resulting in less than 10% decrease		0.50×200	
	Program resulting in between 10% - 30% decrease		0.75×200	
	Program resulting in more than 30% decrease /or parking is restricted		1.00x200	
TR 7	Shuttle services	**300**		
	Shuttle service is possible but not provided		0	
	Shuttle service is available, but not free		0.5×300	
	Shuttle service is available, and free. Or shuttle use is not possible		1.00x300	
TR 8	Bicycle and pedestrian policy on campus	**300**		
	Bicycle and pedestrian way is not available		0	
	Bicycle use not possible or practical, but pedestrian way is available		0.33×300	

No	Categories and Indicators	Points	Score	Weighting
	Bicycle , and pedestrian way is available		0.66×300	
	Bicycle and pedestrian way are available, and bicycles provided freely by university		1.00x300	
	Total	**1800**		
6	**Education (ED) §**			**18%**
ED 1	The ratio of sustainability courses towards total courses/modules	**300**		
ED 2	The ratio of sustainability research funding towards total research funding	**300**		
ED 3	Sustainability publications	**300**		
ED 4	Sustainability events	**300**		
ED 5	Sustainability student organizations	**300**		
ED 6	Sustainability website	**300**		
	Total	**1800**		
	TOTAL	**10000**		

Notes:

§ : The score of these categories and/or indicators is based on the minimum and maximum numbers from participants. Hence, the score of these categories and/or indicators can only be calculated after all participants have submitted their data.

† : Each response (except 'None') scores 1/7×300. For example, if you choose 'Bio diesel' only, your score is 1/7×300; if you choose 'Bio diesel', 'Solar power', and 'Geothermal', your score is [(1/7)+(1/7)+(1/7)]×300

‡ : Each response (except 'None') scores 0.25×300 (for EC6 and WS1) or 0.25×200 (for TR5). For example, if you choose 'Natural ventilation' only, your score is 0.25×300; if you choose 'Full natural day-lighting' and 'Existence of building energy management', your score is (0.25+0.25)×300

∞ : For WR1 and WR2, the score for 'None' is 0, the score for 'Program in preparation' is 0.15×300, the score for 'Initial implementation' is 0.25×300. You may select more than one option for [4], [5], and [6], and get 0.25×300 (with additional 0.25×300) for each score. For example, if you choose option [4], your score is [o.25+(0.25)]×300. If you choose options [4], [5], and [6], your score is [o.25+0.25+0.25+(0.25)]×300.

APPENDIX B: STUDENT QUESTIONNAIRE

Basic Information

*Required

1. **What level of education are you currently studying in?** *
   Mark only one oval.
   - ◯ Bachelor's Degree
   - ◯ Master's Degree
   - ◯ Doctoral Degree

2. **What is your field of study?** *

3. **What is your future career interest?** *

4. **What semester of your studies are you currently in?** *
   Mark only one oval.
   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ◯ 5
   - ◯ 6
   - ◯ 7
   - ◯ 8
   - ◯ 9
   - ◯ 10+

5. **Please rank the university campuses according to the time you spent in your preparatory year.** *
   1 being most time spent. You can skip this question if you did not attend preparatory year or if you are a grad/post-grad student.
   Mark only one oval per row.

	1	2	3	4	5	6
South Campus	◯	◯	◯	◯	◯	◯
North Campus	◯	◯	◯	◯	◯	◯
Hisar Campus	◯	◯	◯	◯	◯	◯
Ucaksavar Campus	◯	◯	◯	◯	◯	◯
Kandilli Campus	◯	◯	◯	◯	◯	◯
Saritepe Campus	◯	◯	◯	◯	◯	◯

6. **Please rank the university campuses according to the time you spent in your first year.** *
1 being most time spent.
Mark only one oval per row.

	1	2	3	4	5	6
South Campus	◯	◯	◯	◯	◯	◯
North Campus	◯	◯	◯	◯	◯	◯
Hisar Campus	◯	◯	◯	◯	◯	◯
Ucaksavar Campus	◯	◯	◯	◯	◯	◯
Kandilli Campus	◯	◯	◯	◯	◯	◯
Saritepe Campus	◯	◯	◯	◯	◯	◯

7. **Please rank the university campuses according to the time you spent in your second year.**
1 being most time spent. You can skip this question if this is your first year only.
Mark only one oval per row.

	1	2	3	4	5	6
South Campus	◯	◯	◯	◯	◯	◯
North Campus	◯	◯	◯	◯	◯	◯
Hisar Campus	◯	◯	◯	◯	◯	◯
Ucaksavar Campus	◯	◯	◯	◯	◯	◯
Kandilli Campus	◯	◯	◯	◯	◯	◯
Saritepe Campus	◯	◯	◯	◯	◯	◯

8. **Please rank the university campuses according to the time you spent in your third year.**
1 being most time spent. You can skip this question if this is your first or second year only.
Mark only one oval per row.

	1	2	3	4	5	6
South Campus	◯	◯	◯	◯	◯	◯
North Campus	◯	◯	◯	◯	◯	◯
Hisar Campus	◯	◯	◯	◯	◯	◯
Ucaksavar Campus	◯	◯	◯	◯	◯	◯
Kandilli Campus	◯	◯	◯	◯	◯	◯
Saritepe Campus	◯	◯	◯	◯	◯	◯

9. **What is your gender?** *
Mark only one oval.

- ◯ Woman
- ◯ Man
- ◯ Other: _____

10. **If you are currently living in university accommodation, please select your dormitory.**
    You can skip this question if you're not living in university accommodation.
    Mark only one oval.

- ◯ Ucaksavar Dorm
- ◯ 1st North Dorm
- ◯ 2nd North Dorm
- ◯ 3rd North Dorm
- ◯ 4th North Dorm
- ◯ Men's Dorm
- ◯ Women's Dorm
- ◯ 1st Kilyos Dorm
- ◯ 2nd Kilyos Dorm
- ◯ Superdorm

Sustainability in Social & Academic Life at Bogazici University

11. **How would you rank the following branches of sustainability in order of requiring priority action in your campus and community?** *
    1 being most prior.
    Mark only one oval per row.

	1	2	3	4	5	6
Cultural Effects & Barriers	◯	◯	◯	◯	◯	◯
Transparency	◯	◯	◯	◯	◯	◯
Social	◯	◯	◯	◯	◯	◯
Environmental	◯	◯	◯	◯	◯	◯
Economic	◯	◯	◯	◯	◯	◯
Good Governance	◯	◯	◯	◯	◯	◯

12. **In your opinion, please rank the importance of sustainability awareness for the following campus habitants.** *
    1 being most important
    Mark only one oval per row.

	1	2	3	4
Faculty Members	◯	◯	◯	◯
Campus employees (maintenance, cleaners, nurses, security, etc.)	◯	◯	◯	◯
Students	◯	◯	◯	◯
Administration	◯	◯	◯	◯

13. **What motivates you to join campus sustainability events or programs?** *

1 being most motivating.
Mark only one oval per row.

	1	2	3	4
Content/Theory	◯	◯	◯	◯
Awareness	◯	◯	◯	◯
Faculty Support/Incentives	◯	◯	◯	◯
Applicability/Practical Information	◯	◯	◯	◯

14. **Is your university's sustainability performance certified in any of the following programs?** *

Please select all that apply.
Tick all that apply.

- ☐ AASHE STARS.
- ☐ Certified Green Building(s).
- ☐ Greenmetric UI.
- ☐ Other: _____

15. **Please list any buildings in your university that have Green Building certification.** *

If any.

_____

16. **Please pick up to five out of the following clubs/organizations at Bogazici University according to your knowledge of and participation in their activities.** *

Tick all that apply.

- [ ] Gastronomy and Degustation Club (BUGUSTO)
- [ ] Ataturkist Thought Club (ADK)
- [ ] Radio Bogazici (RADYO)
- [ ] Historical Analysis Club (BUTIK)
- [ ] Caricature and Humor Club (BUKOMIK)
- [ ] Informatics Club (COMPEC)
- [ ] Folklore Club (BUFK)
- [ ] Political Science and International Relations Club (BUSUIK)
- [ ] Aviation Club (BUHAK)
- [ ] Management & Economics Club (BUIK)
- [ ] Green Campus Commission
- [ ] Islamic Studies Club (BISAK)
- [ ] Theatre Club (BUO)
- [ ] Literature Club (BUED)
- [ ] Underwater Sports Club (BUSAS)
- [ ] Maritime and Sailing Club (BUYELKEN)
- [ ] LGBTI Studies Club (BULGBTI)
- [ ] Sports Committee (SK)
- [ ] Mountaineering Club (BUDAK)
- [ ] Fine Arts Club (GSK)
- [ ] International Students Network Club (BUNIS)
- [ ] Cave Studies Club (BUMAK)
- [ ] Science Club (BUBK)
- [ ] Construction Club (BUYAP)
- [ ] Dance Club (BUDANS)
- [ ] Music Club (BUMK)
- [ ] Behavioral Sciences Club (BUDAV)
- [ ] Translation Club (BUCEV)
- [ ] Machine Technology Club (BUMATEK)
- [ ] Environment Club (BUCEK)
- [ ] Operations Research Club (BUYAK)
- [ ] Education Research Club (EREC)
- [ ] Turkish Music Club (BUTMK)
- [ ] Sustainable Development Solutions Network - Youth
- [ ] Chess Club (SATRANC)
- [ ] Photography Club (BUFOK)
- [ ] Womens' Studies Club (BUKAK)

- [ ] Gaming Club (BUOK)
- [ ] Village Cooperative Club (KOY-KOOP)
- [ ] Electro Technology Club (BUEC)
- [ ] BrIdge Club (BRIC)
- [ ] Engineering Club (ENSO)
- [ ] Cinema Club (BU(S)K)
- [ ] Debate Club (BUDS)

17. **Please pick up to five out of the following events/projects at Bogazici University according to your knowledge of and participation in them.** *

Tick all that apply.

- [ ] MBT (BUEC)
- [ ] Bogazici Marka Zirvesi (BUIK)
- [ ] CONNEXT (BUEC)
- [ ] Hayata Renk Ver (EREC)
- [ ] Gulen Gozler (BUSOS)
- [ ] Dance Festival (BUDANS)
- [ ] Kol Dugmeleri (BUSOS)
- [ ] Humanspire (BUIK)
- [ ] BETA Sector Days (BUEC)
- [ ] Cocuk Senligi (BUSOS)
- [ ] Adhere (BUIK)
- [ ] Film Analizi Atolyesi (BU(S)K)
- [ ] Techsummit (COMPEC)
- [ ] Investimate (BUIK)
- [ ] Brandmarker (BUIK)
- [ ] Tag Night (COMPEC)
- [ ] Darussafaka (EREC)
- [ ] BGM (EREC)
- [ ] Tea Talks (BUMATEK)
- [ ] Sustainability Panel (BUCEK)
- [ ] Tasoda Festivali (BUMK)
- [ ] ILKYAR (EREC)
- [ ] Finance Break (BUIK)
- [ ] BUIK Akademi
- [ ] Career Path (BUIK)
- [ ] Sari Yengecler (BUSOS)
- [ ] Bogazici Bridge Summit (BUYAP)
- [ ] Days of Art and Technology (BUMATEK)
- [ ] Civil Meeting (BUYAP)
- [ ] Audit Days (BUIK)
- [ ] EnergyPanel (BUMATEK)
- [ ] Greenfest (BUCEK)
- [ ] Robotics Trainings (BUEC)
- [ ] Koy-Koop Kitap Sergisi (KOY-KOOP)
- [ ] Pratikte Film Atolyesi (BU(S)K)
- [ ] Bogazici Yonetim ve Liderlik Zirvesi (BUIK)
- [ ] FMCG Case Camp (BUIK)

- [ ] Bogazici Yatirimci Akademisi (BUIK)
- [ ] Deniz Yildizi (BUSOS)
- [ ] BBO (COMPEC)
- [ ] Casedays (BUIK)
- [ ] Civil Career (BUYAP)
- [ ] P&R Days (COMPEC)
- [ ] Yel Degirmeni (BUSOS)

18. **In order to raise awareness on sustainability, please rank the methods that you think would be more effective in your university.** *

1 being most effective.
Mark only one oval per row.

	1	2	3	4	5	6
Organising sustainability related seminars or discussion groups.	◯	◯	◯	◯	◯	◯
Establishing sustainability-concerned student groups.	◯	◯	◯	◯	◯	◯
Increasing the number of sustainability related courses.	◯	◯	◯	◯	◯	◯
Making campus sustainability information more available. (Website, posters, etc.)	◯	◯	◯	◯	◯	◯
Sustainability themed art exhibitions or film screenings.	◯	◯	◯	◯	◯	◯
Project competitions for campus sustainability.	◯	◯	◯	◯	◯	◯

19. **Please pick three limiting factors for conducting more sustainability related research or studies that you think are most important.** *

Tick all that apply.

- [ ] Faculty Expertise
- [ ] Student interest
- [ ] Administrative Staff Awareness or Expertise
- [ ] Availability of research funds
- [ ] Legal framework.
- [ ] Campus Infrastructure
- [ ] Municipality services and policies.

20. **Please pick three methods that your university can use to share information sustainability in terms of effectiveness in your opinion.** *
Tick all that apply.

- [ ] Various art forms
- [ ] E-mail newsletter
- [ ] Handouts
- [ ] Social Media
- [ ] Bulletin Boards
- [ ] Periodic journal or magazine
- [ ] Website updates

21. **Which of the following undergraduate courses have you taken so far?** *
Please select all that apply.
Tick all that apply.

- [ ] ESC 351 Sustainable Development
- [ ] ESC 301 The Environmental Dimension
- [ ] ESC 305 Global Climate Change
- [ ] ESC 307 Social Ecology
- [ ] ESC 311 Environmental Science and Technology
- [ ] None.
- [ ] N/A (Not an undergraduate student)

22. **Which of the following undergraduate courses would you like to take?** *
Please select all that apply.
Tick all that apply.

- [ ] ESC 351 Sustainable Development
- [ ] ESC 301 The Environmental Dimension
- [ ] ESC 305 Global Climate Change
- [ ] ESC 307 Social Ecology
- [ ] ESC 311 Environmental Science and Technology
- [ ] None.
- [ ] N/A (Not an undergraduate student)

23. **What would be, in your opinion, a better way to further integrate sustainability education into your curriculum? Please rank in descending order.** *

1 being most preferable.
Mark only one oval per row.

	1	2	3	4
Comprehensive, large-scale multidisciplinary courses				
Specialized sustainability courses centered around the Sustainable Development Goals				
Multidisciplinary courses organized around your field of study				
Integrated into the content of mandatory courses.				

Sustainable Energy Practices at Bogazici University

24. **Which of the following renewable energy sources do you know are being utilized in at least one of your university's campuses?**

Please select all that apply.
Tick all that apply.

- [ ] Bio Diesel
- [ ] Clean Biomass
- [ ] Solar Power
- [ ] Geothermal
- [ ] Wind Power
- [ ] Hydropower
- [ ] Combine Heat and Power
- [ ] Other: _____

25. **Please pick three of the following renewable energy sources according to potential to use in your currently main university campus.** *

Tick all that apply.

- [ ] Solar Power
- [ ] Hydropower
- [ ] Geothermal
- [ ] Bio Diesel
- [ ] Combine Heat and Power
- [ ] Clean Biomass
- [ ] Wind Power

26. **Considering replacement costs, including waste disposal, against their potential benefits; please pick the three most efficient energy saving measures for campus buildings from the following in your opinion.** *

Tick all that apply.

- [ ] Motion sensor Lighting
- [ ] Use of Energy-Efficient Appliances
- [ ] LED Lighting
- [ ] Building Insulation
- [ ] Improving or replacing central heating.
- [ ] Smart Climate Control
- [ ] Other: _____

27. **Please briefly explain what do you think the difference between a smart and a green building is.** *

_____

_____

_____

_____

_____

28. **Which of the following campus buildings do you think could benefit most from the energy saving measures you have chosen in the previous question.** *

Please select at most 5 buildings.
Tick all that apply.

- [ ] Faculty of Arts and Sciences
- [ ] Kennedy Lodge
- [ ] Faculty of Economics and Administrative Sciences
- [ ] BTS Building
- [ ] Student Activities Building
- [ ] Natuk Birkan Building
- [ ] Women's Dorm
- [ ] Rectorate Building
- [ ] Men's Dorm

Carbon Footprint of Bogazici University

29. **Please pick three of the following dormitory buildings according to your guess of their carbon footprints being the highest.** *

Tick all that apply.

- [ ] Women's Dorm
- [ ] 1st North Dorm
- [ ] 1st Kilyos Dorm
- [ ] Superdorm
- [ ] Ucaksavar Dorm
- [ ] 2nd Kilyos Dorm
- [ ] 3rd North Dorm
- [ ] 4th North Dorm
- [ ] 2nd North Dorm
- [ ] Men's Dorm

30. **Please pick three of the following administrative buildings according to your guess of their carbon footprint being the largest.** *

Tick all that apply.

- [ ] BUREM
- [ ] Kennedy Lodge
- [ ] Construction Works Building (North Campus)
- [ ] Management Building (South Campus)
- [ ] Teknopark
- [ ] Alumni Office
- [ ] Student Activities Building
- [ ] Rectorate Building
- [ ] Technology Transfer Office

31. **Please pick three of the following departmental buildings according to your guess of their carbon footprint being the largest.** *

Tick all that apply.

- [ ] Biomedical Engineering & TETAM
- [ ] Faculty of Engineering
- [ ] Faculty of Economics and Administrative Sciences
- [ ] Department of Geophysics
- [ ] Departments of Sociology & Psychology
- [ ] Institute of Ataturk Principles and Revolutions History
- [ ] Department of Geodesy
- [ ] Department of Earthquake Engineering
- [ ] Computer Engineering Building
- [ ] Faculty of Education
- [ ] Academy of Foreign Languages (YADYOK I & II)
- [ ] Faculty of Arts & Sciences

32. **Please pick three of the following lecture halls according to your guess of their carbon footprint being the largest.** *

Tick all that apply.

- [ ] Natuk Birkan Building
- [ ] BTS Building
- [ ] North Park Building
- [ ] New Building (North Campus)
- [ ] Park II Lecture Hall
- [ ] Hisar Campus Building
- [ ] Sciences and Engineering Building (North Campus)
- [ ] John Freely Building
- [ ] Park I Lecture Hall

33. **Please pick three of the following campus facilities according to your guess of their carbon footprint being the largest.** *

Tick all that apply.

- [ ] Civil Engineering Laboratory and Polymer Center
- [ ] IT Center (South Campus)
- [ ] Ucaksavar Sports Hall
- [ ] Aptullah Kuran Library
- [ ] Astronomy Laboratory
- [ ] Geodesic and Magnetism Observatory
- [ ] Hisar Sports Complex
- [ ] Heritage Museum
- [ ] Magnetism Observatory
- [ ] High Current Laboratory
- [ ] Geomagnetism Laboratory
- [ ] Meteorology Laboratory
- [ ] Student Activities Building
- [ ] Kilyos Sports Hall
- [ ] Regional Earthquake Observatory
- [ ] Mithat Alam Film Center

34. **Please pick three of the following campus buildings according to your guess of their carbon footprint being the largest.** *

Tick all that apply.

- [ ] Men's Dorm
- [ ] Natuk Birkan Building
- [ ] Student Activities Building
- [ ] BTS Building
- [ ] Faculty of Economics & Administrative Sciences
- [ ] Rectorate Building
- [ ] Women's Dorm
- [ ] Kennedy Lodge
- [ ] Faculty of Arts & Sciences

35. **Please pick three of the following campus transportation ideas that you think would be most useful.** *

Tick all that apply.

- [ ] Limiting the access of private vehicles to campuses.
- [ ] Limiting the number of vehicles belonging to the University.
- [ ] Efficiency of campus shuttle routes and university road layout.
- [ ] A centrally managed bicycle program (including electric bicycles).
- [ ] Using hybrid/electric vehicles or alternative fuel for existing vehicles on campus.
- [ ] Pedestrian policy.
- [ ] Private vehicle sharing program.
- [ ] Funicular transportation.
- [ ] Other: _____

Waste Management in Bogazici University

36. **Please rank the following in importance to increasing the rate of recycling on campus.** *

1 being most important.
Mark only one oval per row.

	1	2	3	4	5	6
Raising recycling awareness.	◯	◯	◯	◯	◯	◯
Availability of recycling points.	◯	◯	◯	◯	◯	◯
Recycling data collection.	◯	◯	◯	◯	◯	◯
Source separation.	◯	◯	◯	◯	◯	◯
University's Recycling Policy.	◯	◯	◯	◯	◯	◯
Legal Requirements.	◯	◯	◯	◯	◯	◯

37. **Which of the paper and plastic use reducing measures are you practicing?** *

Please select all that apply.
Tick all that apply.

- [ ] Printing only when necessary.
- [ ] Double-sided printing.
- [ ] Use of tumblers or reusable bottles.
- [ ] Use of reusable bags.
- [ ] Other: _____

38. **Which of the following waste types do you recycle?** *

Please select all that apply.
Tick all that apply.

- [ ] Paper & Cardboard
- [ ] Textiles
- [ ] Wood
- [ ] Organic Waste
- [ ] Glass
- [ ] Metals
- [ ] Plastics (including PET bottles)

39. **Which of the following special waste types do you think can be recycled or reused at your campus?** *

Please select all that apply.
Tick all that apply.

- [ ] Oil Waste
- [ ] Medical Wastes
- [ ] Electronics
- [ ] Combustion Waste
- [ ] Printer Cartridges & Toners
- [ ] Batteries

40. **Please rank the following in ascending order of preference when handling printer cartridge or toner waste.**

1 being most preferred.
Mark only one oval per row.

	1	2	3	4
Refilling and reusing.	◯	◯	◯	◯
Returning to office supplier.	◯	◯	◯	◯
Sending to recycle facility for raw materials.	◯	◯	◯	◯
Sending to disposal facility for incineration.	◯	◯	◯	◯

41. **Please rank the following in ascending order of preference when managing electronics waste.**

1 being most preferred.
Mark only one oval per row.

	1	2	3	4
Reuse schemes where old electronics can find new users.	◯	◯	◯	◯
Recycling electronic waste for raw materials.	◯	◯	◯	◯
Repair workshops to increase the lifetime of electronics.	◯	◯	◯	◯
Return schemes with electronics retailers for store credit.	◯	◯	◯	◯

42. **Please pick three of the following wastes that you think is important to be managed and handled at your university.** *

Tick all that apply.

- [ ] Chemical Waste from Laboratories
- [ ] Printer Cartridges & Toners
- [ ] Batteries
- [ ] Medical Wastes
- [ ] Combustion Waste
- [ ] Electronics
- [ ] Gardening Waste
- [ ] Oil Waste
- [ ] Food Waste

43. **Please rank the following in importance to safe handling of hazardous wastes in campus.** *

1 being most important.
Mark only one oval per row.

	1	2	3	4	5
Disposal by authorized facility.					
Safe transport of hazardous waste.					
Leak-proof temporary containment.					
Existence of a hazardous waste policy.					
Data on sources, amount and properties of hazardous waste.					

44. **Considering hazardous waste from laboratory experiments, please rank the following for importance regarding reducing the amount of chemicals in laboratory use.** *

1 being most important.
Mark only one oval per row.

	1	2	3	4
Payment of chemical waste disposal fees by the researching institute or department for each experiment.				
Establishing a campus-wide banned chemicals list.				
Departments/Institutes becoming responsible for temporary storage of experiment chemicals waste.				
Establishing innovation criteria before allowing research with heavy chemical use.				

45. **32) Please rank the following practices according to applicability in your university's campuses in descending order.** *

1 being most applicable.
Mark only one oval per row.

	1	2	3	4	5	6
Green walls & roofs.						
Organic waste composting.						
Planting trees for carbon sequestration.						
Ecological farming.						
Hydroponic cultivation.						
Preservation of endemic flora.						

46. **Please list the sources of waste water in your campus that you know of.** *

Water Efficiency in Bogazici University

47. **Please note any water conservation measures being taken in your university that you are aware of.** *

48. **Please rank the following water conservation measures according to importance in your campus in descending order.** *

1 being most important.
Mark only one oval per row.

	1	2	3	4	5
Rainwater collection.					
Recycling water.					
Drip Irrigation.					
Motion activated taps.					
Water-efficient appliances.					

49. **Please rank the following campus areas according to amount of water that can be saved with efficiency measures.** *

1 being most amount of water.
Mark only one oval per row.

	1	2	3	4	5
Dormitories.					
Teaching halls.					
Green spaces.					
Office areas.					
Kitchens & cafeterias.					

APPENDIX C: ALUMNI QUESTIONNAIRE

Basic Information.

Please tell a little about yourself.

*Required

1. **What year did you graduate from Bogazici University?** *

2. **What did you study at Bogazici University?** *

3. **Which sector do you currently work in?** *

4. **Which degree(s) do you have from Bogazici University?** *
   Please select all that apply.
   Tick all that apply.
   - [ ] Bachelor's Degree
   - [ ] Master's Degree
   - [ ] Doctoral Degree

5. **Which campuses did you spend most of your time in Bogazici University at?** *
   Please select at most three options.
   Tick all that apply.
   - [ ] South Campus
   - [ ] North Campus
   - [ ] Hisar Campus
   - [ ] Ucaksavar Campus
   - [ ] Kandilli Campus
   - [ ] Saritepe Campus

6. **Did you ever stay at a Bogazici University accommodation?** *
   Mark only one oval.
   - ◯ Yes *Skip to question 7.*
   - ◯ No *Skip to question 9.*

Skip to question 9.

Bogazici Accommodation

Some questions about your dorm experience at Bogazici University.

7. **Which dorm(s) have you stayed at in Bogazici University?** *
Please select any that apply.
Tick all that apply.

- [ ] 1st Kilyos Dorm
- [ ] 3rd North Dorm
- [ ] Women's Dorm
- [ ] Men's Dorm
- [ ] 2nd Kilyos Dorm
- [ ] 2nd North Dorm
- [ ] Superdorm
- [ ] Ucaksavar Dorm
- [ ] 1st North Dorm
- [ ] 4th North Dorm

8. **How many semesters did you stay at university accommodation?** *
In total.

Sustainability Awareness

What does sustainability mean to you?

9. **Please select three of the following that you think are most related to sustainability today.** *
Tick all that apply.

- [ ] Human Rights
- [ ] The Economy
- [ ] The Environment
- [ ] Governance
- [ ] Innovation
- [ ] Society

10. **In 2015, the United Nations adopted the 17 Sustainable Development Goals (SDGs) to be completed by 2030. Please pick the three that you think are most important for sustainable development.** *

Tick all that apply.

- [ ] SDG 1: End poverty in all its forms everywhere
- [ ] SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- [ ] SDG 3: Ensure healthy lives and promote well-being for all at all ages
- [ ] SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- [ ] SDG 5: Achieve gender equality and empower all women and girls
- [ ] SDG 6: Ensure availability and sustainable management of water and sanitation for all
- [ ] SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- [ ] SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- [ ] SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- [ ] SDG 10: Reduce inequality within and among countries
- [ ] SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable
- [ ] SDG 12: Ensure sustainable consumption and production patterns
- [ ] SDG 13: Take urgent action to combat climate change and its impacts
- [ ] SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- [ ] SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- [ ] SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- [ ] SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

11. **Please provide a short explanation for your choices in the previous question. (Optional)**

12. **Please pick three of the following that you think are the most important actors that can make sustainable development happen.** *
Tick all that apply.

- [ ] Research and Scientific Institutions
- [ ] Governments
- [ ] Private Companies
- [ ] Education Institutions
- [ ] The Youth
- [ ] Non-governmental Organizations
- [ ] Other: _____

Sustainability Education at Bogazici University

13. **During your studies at Bogazici University, did you take any sustainability-related courses?** *
Mark only one oval.

- ◯ Yes *Skip to question 14.*
- ◯ No *Skip to question 17.*

Sustainability Education at Bogazici University

14. **Please list the courses you took.** *

_____

15. **How would you rate the range of courses offered on sustainability during your time at Bogazici University?**
Mark only one oval.

	1	2	3	4	5	
Uniform	◯	◯	◯	◯	◯	Diverse

16. **Based on your professional experience after graduation, how would you rate the influence of the sustainability course(s) you took on your career choices?**
Mark only one oval.

	1	2	3	4	5	
Not Influential at All	◯	◯	◯	◯	◯	Very Influential

Skip to question 19.

Sustainability Education at Bogazici University

17. **Based on your professional experience after graduation, please rate the likelihood of you having taken a course in sustainability as a student if you could.** *
Mark only one oval.

	1	2	3	4	5	
Very Unlikely	◯	◯	◯	◯	◯	Very Likely

18. **What would you look for in a sustainability course that you would have taken?** *
Mark only one oval.

- ◯ Comprehensive, large-scale multidisciplinary courses
- ◯ Specialized sustainability courses for individual fields of study
- ◯ Multidisciplinary courses focused on specific areas of sustainable development
- ◯ Sustainability content integrated into the curriculum of mandatory courses.

Skip to question 19.

Campus Sustainability at Bogazici University

19. **Did you take part in any student organizations, clubs or events at Bogazici University that were concerned with sustainability?** *
Mark only one oval.

- ◯ Yes *Skip to question 20.*
- ◯ No *Skip to "Campus Sustainability at Bogazici University."*

Campus Sustainability at Bogazici University

20. **Which organization, club or event(s) were you a part of?** *

_____

_____

_____

_____

_____

21. **How would you rate the frequency of sustainability related events that happened in campus?** *
Mark only one oval.

	1	2	3	4	5	
Rare	◯	◯	◯	◯	◯	Often

22. **Based on your professional experience since graduation, what is more important in a sustainability event or organization that would make it successful in raising awareness?** *

Please rank in ascending order of importance.
Mark only one oval per row.

	1	2	3	4
Content/Theory	◯	◯	◯	◯
Applicability/Practical Information	◯	◯	◯	◯
Faculty Support/Incentives	◯	◯	◯	◯
Relatability/Evoking Empathy	◯	◯	◯	◯

Skip to question 23.

Campus Sustainability at Bogazici University

Skip to question 23.

Campus Sustainability at Bogazici University

23. **Were you a part of any campus sustainability efforts during your time at Bogazici University?** *

Mark only one oval.

- ◯ Yes *Skip to question 24.*
- ◯ No *Skip to question 28.*

Campus Sustainability at Bogazici University

24. **What were these efforts?** *

_____

_____

_____

_____

_____

25. **Please rank the following areas of concern for campus sustainability according to how you think they can benefit the students and the public.** *

Please rank in ascending order of benefit.
Mark only one oval per row.

	1	2	3	4	5	6
Carbon Footprint Management	◯	◯	◯	◯	◯	◯
Water Efficiency	◯	◯	◯	◯	◯	◯
Hazardous Waste Management	◯	◯	◯	◯	◯	◯
Waste Management	◯	◯	◯	◯	◯	◯
Transport Efficiency	◯	◯	◯	◯	◯	◯
Energy Efficiency	◯	◯	◯	◯	◯	◯

26. **How important do you think is obtaining certification or joining scoring schemes for campus sustainability efforts?** *
Mark only one oval.

	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	Very Important

27. **Please briefly explain your reasoning for your answer to the previous question.** *

_____

_____

_____

_____

_____

Skip to question 30.

Campus Sustainability at Bogazici University

28. **What were the reasons for you to not be a part of campus sustainability efforts?**
Please select all that apply.
Tick all that apply.

- ☐ Lack of any such efforts.
- ☐ Lack of awareness on sustainability
- ☐ Not having enough time.
- ☐ Not being a priority.
- ☐ Not having any information on such efforts.
- ☐ Other: _____

29. **Based on your professional experience since graduation, how likely would you be to join campus sustainability efforts if you were a student again?** *
Mark only one oval.

	1	2	3	4	5	
Very Unlikely	◯	◯	◯	◯	◯	Very Likely

Skip to question 30.

Bogazici University's Role in Sustainability

APPENDIX D: GREENMETRIC RANKING

Ranking	University	Country	Setting and Infrastructure	Energy and Climate Change	Waste	Water	Transportation	Education	Total Score
1	Wageningen University & Research		1128	1606	1800	976	1012	1030	7552
2	University of Nottingham		1088	1469	1800	925	1162	1020	7464
3	University of California Davis		1050	1502	1800	972	1362	679	7365
4	University of Bradford		839	1511	1800	925	1262	953	7290
5	Nottingham Trent University		997	1587	1800	850	962	1014	7210
6	University of Oxford		1006	1273	1725	1000	1412	783	7199
7	University of Connecticut		1084	1386	1701	895	1212	870	7148
8	Bangor University		1044	1437	1800	650	1062	888	6881
9	University College Cork		777	1410	1701	905	1112	956	6861
10	Hochschule Trier – Umwelt-Campus Birkenfeld		752	1733	1527	761	1012	1021	6806
11	University of Groningen		774	1181	1725	925	1262	906	6773
12	Universitat fur Bodenkultur Wien		942	1186	1800	730	1062	1025	6745
13	University of North Carolina Chapel Hill		1013	1161	1725	875	1162	787	6723
14	North Carolina Agricultural & Technical State University		1089	1039	1500	848	1212	1023	6711
15	Dublin City University		768	1280	1800	873	1012	925	6658
16	Universidad de Alcala		915	1579	1524	625	1112	893	6648
17	Keele University		923	1521	1725	648	963	868	6648
18	Georgia Institute of Technology		701	1198	1800	750	1262	912	6623
19	Newcastle University Newcastle upon Tyne		719	1197	1725	700	1312	968	6621
20	University of Sussex		939	1319	1626	873	1062	774	6593
21	Shandong Normal University – Lishan College		920	1737	1377	789	1012	731	6566
22	Delft University of Technology TU Delft		752	1113	1725	760	1212	978	6540
23	University of Indonesia		957	1233	1602	725	1162	840	6519
24	University of Limerick		874	1441	1602	700	962	896	6475
25	University of Melbourne		735	1030	1551	800	1312	1030	6458
26	Freie Universitat Berlin		800	1342	1800	775	913	810	6440
27	Universiti Putra Malaysia		1092	1157	1602	723	962	884	6420
28	Universidade de Sao Paulo USP		1033	1280	1476	700	1112	817	6418
29	Universita di Bologna		791	1423	1650	550	1012	985	6411
30	University of Northern British Columbia		1066	1096	1626	675	963	965	6391
31	Western Michigan University		1055	1437	1476	775	1013	630	6386
32	Hokkaido University		895	1137	1551	900	1113	788	6384
33	Carleton University		648	1113	1725	775	1212	845	6318
34	University of Malaya		936	1185	1428	945	1112	674	6280
35	Universidade Federal de Lavras – UFLA		867	1134	1452	883	913	1030	6279
36	University of Texas Austin		714	1081	1575	875	1312	720	6277
37	Universiti Malaysia Sabah		1087	1266	1251	750	1062	858	6274
38	Aalto University		807	1280	1650	675	1113	738	6263
39	York University		837	1163	1602	925	1212	520	6259
40	King Abdulaziz University		898	997	1551	909	961	935	6251
41	Washington University Saint Louis		658	1145	1626	925	1163	728	6245
42	Universite de Sherbrooke		971	1273	1800	500	1062	624	6230
43	University of Leicester		830	1399	1500	875	962	643	6209
44	RUDN University		943	1137	1428	725	1113	856	6202
45	University of Ottawa		640	1025	1551	1000	1312	663	6191
46	University of California Merced		951	1254	1650	675	1063	579	6172
47	University of Zanjan		1028	997	1551	755	963	877	6171
48	Universidade do Minho		735	1383	1401	660	963	1016	6158
49	Leiden University		487	1120	1725	775	1262	752	6121

50	Universitat Autonoma de Barcelona	767	1255	1428	721	1162	776	6109
51	UNSW Sydney	689	985	1626	950	1013	824	6087
52	Bogor Agricultural University	1008	1071	1452	522	1012	1011	6076
53	Kyoto University	848	972	1725	650	1113	767	6075
54	Tampere University of Technology	687	1111	1800	850	1063	562	6073
55	Universita degli Studi di Torino	687	1343	1476	550	1113	895	6064
56	Universitat Bayreuth	758	1034	1800	650	963	858	6063
57	Institut Teknologi Sepuluh Nopember	799	1326	999	925	1162	848	6059
57a	University of Tasmania	787	1235	1176	750	1013	1002	6054
58	Czech University of Life Sciences Prague	729	1166	1626	695	1162	665	6043
59	Dublin Institute of Technology	410	1515	1575	575	1062	893	6030
60	National Pingtung University of Science & Technology	933	976	1101	825	1162	1030	6027
61	McMaster University	733	975	1725	850	1212	531	6026
62	National Chi Nan University	977	1049	1452	515	1063	966	6022
63	University of Dundee	711	1213	1725	490	1112	763	6014
64	Chaoyang University of Technology	757	1349	1527	557	863	954	6007
65	Da Yeh University	763	969	1725	775	863	880	5975
66	Universiti Teknologi Malaysia	1120	1180	1428	625	813	786	5952
67	Universidad Autonoma de Occidente	677	1191	1551	750	811	965	5945
68	Modul University	515	1404	1626	425	1113	861	5944
69	Universidad Nacional de Colombia	998	1171	1452	592	1012	710	5935
70	Stavropol State Agrarian University	645	1117	1476	574	1262	860	5934
71	Universitat Bremen	674	981	1551	690	1163	872	5931
72	Universidad del Rosario	612	1350	1326	834	1212	594	5928
73	Trent University	932	1001	1725	300	963	1004	5925
74	University of Eastern Finland	658	895	1800	700	963	878	5894
75	Inseec Business School	422	1373	1725	625	761	961	5867
76	University at Albany	798	1184	1353	700	1012	815	5862
77	Istanbul Technical University	832	1213	1350	582	1262	621	5860
78	Università Ca' Foscari Venezia	577	1180	1326	650	1312	806	5851
79	Asia University Taiwan	777	1236	1125	700	1063	937	5838
80	University of Reading	726	1151	1626	600	863	865	5831
81	Indiana University Bloomington	982	1032	1377	650	1062	717	5820
82	Universidad Rey Juan Carlos	759	951	1650	611	913	908	5792
83	Universiti Utara Malaysia	1013	1046	1353	785	1012	578	5787
84	Universitas Negeri Semarang	888	1223	1074	750	1062	788	5785
85	Fundación Universidad del Norte Barranquilla	748	1150	1500	925	811	650	5784
87	University of A Coruna	732	1070	1551	600	913	916	5782
86	Mahidol University	829	1095	1302	560	1162	834	5782
88	University of Szeged	1076	1070	1575	775	963	314	5773
89	Universidad Autonoma de Nuevo Leon	958	925	1626	615	1062	586	5772
90	Chulalongkorn University	697	860	1452	620	1212	913	5754
91	Universidad Autonoma de Madrid	850	1212	1377	520	763	1030	5752
92	Nanhua University Taiwan	928	1116	1725	649	761	572	5751
93	University of Massachusetts Amherst	893	818	1575	550	1162	751	5749
94	De La Salle University – Dasmarinas	539	1288	1626	580	713	985	5731
95	Universitas Sebelas Maret	723	1328	1227	480	1062	909	5729
96	Kasetsart University	758	835	1251	670	1162	1030	5706
97	Anglia Ruskin University	690	1027	1626	725	1063	565	5696
99	National Taipei University of Technology	1039	1085	1128	634	913	890	5689

98	Webster University	953	978	1476	750	1063	469	5689
100	National Yunlin University of Science & Technology	834	1019	1551	720	663	896	5683
101	Universidad Nacional Autonoma de Mexico	915	1199	1401	583	1012	567	5677
102	Glasgow Caledonian University	406	1118	1800	425	1163	733	5645
103	Diponegoro University	773	1132	1101	545	1062	1030	5643
104	Universitat Politècnica de València	633	1175	1701	383	913	835	5640
105	University of California Riverside	769	938	1701	725	1012	491	5636
106	Universita degli Studi di Milano Bicocca	568	754	1725	390	1262	933	5632
107	Universiti Malaysia Pahang	959	1345	849	430	1013	1030	5626
109	Universitat de Girona	387	1460	1452	425	1062	833	5619
108	University Of Kashan	905	1177	1203	575	1112	647	5619
110	Universidad de Bogota Jorge Tadeo Lozano	529	1314	1401	500	963	902	5609
111	Princess Nourah University	733	1036	1551	775	961	544	5600
112	Universidad de Oviedo	752	1051	1476	445	863	1010	5597
113	Gordon College	901	1099	1476	656	813	651	5596
114	Politecnico di Torino	552	1136	1575	600	863	857	5583
115	Yamaguchi University	813	1093	1527	750	963	431	5577
116	Universiti Tunku Abdul Rahman	688	1135	1401	644	913	781	5562
117	Kafrelsheikh University	651	1255	1275	750	1063	562	5556
118	Universidade de Vigo	737	1074	1302	565	1112	756	5546
119	Osaka University	780	795	1626	725	911	688	5525
120	Metropolia University of Applied Sciences	418	1133	1800	450	1013	702	5516
121	Hochschule fur nachhaltige Entwicklung Eberswalde	845	1215	1275	550	662	967	5514
122	Rambhai Bhanni Rajabhat University	911	1165	1203	526	913	754	5472
123	Edge Hill University	718	924	1275	600	963	978	5458
124	Universidad Miguel Hernandez	738	1224	1551	660	713	561	5447
125	Liverpool John Moores University	645	964	1227	750	1112	740	5438
126	Orel State University named after I.S.Turgenev	679	1305	1176	570	963	744	5437
127	Rochester Institute of Technology	899	1131	1227	548	963	664	5432
128	MaynoothUniversity	799	932	1428	640	913	695	5407
129	Universidad de Caldas	572	917	1701	510	1111	592	5403
130	Universidad de Navarra	775	901	1425	698	1013	585	5397
131	Università degli Studi di Genova – Savona Campus	584	1402	1275	560	663	912	5396
132	California State University, Sacramento	587	874	1350	775	1013	784	5383
133	ITESO, Universidad Jesuita de Guadalajara	558	1388	1452	416	863	703	5380
134	Gorno Altaisk State University	897	1034	1428	375	963	683	5380
135	Universidad Autonoma de Puebla	501	940	1800	470	1212	457	5380
137	Centro Universitario do Rio Grande do Norte UNI-RN	936	1180	1353	445	763	699	5376
136	National Cheng Kung University	906	1109	1176	585	1013	587	5376
138	Stevens Institute of Technology	800	1108	1626	400	913	520	5367
139	Aalborg University	668	967	1650	608	663	802	5358
140	Southern Methodist University	1003	1119	975	510	811	916	5334
141	Universitat Jaume I	834	958	1203	650	1012	675	5332
142	Slippery Rock University	717	869	1377	600	1062	689	5314
143	Naresuan University	803	972	1251	651	861	771	5309
144	I-Shou University	513	1118	1449	726	861	631	5298
145	Purchase College SUNY	964	1211	1227	400	813	680	5295
146	University of Lincoln	491	1175	1551	650	812	612	5291
147	University of Lucerne	450	1086	1551	500	1113	585	5285
148	Riga Technical University	757	1211	1278	420	913	702	5281

149	Universidad de los Andes Colombia	740	1019	1203	459	1262	595	5278
150	University of Louisiana at Lafayette	1001	1055	1227	520	963	511	5277
151	Ben-Gurion University of the Negev	885	791	1302	610	762	911	5261
152	Goldsmiths University of London	456	1129	1701	650	762	560	5258
153	Daffodil International University	649	987	1173	775	862	801	5247
154	Universite Joseph Fourier Grenoble 1	744	1034	1128	611	1012	718	5247
155	University of Ontario Institute of Technology	692	1134	1224	970	563	653	5236
156	Mae Fah Luang University	899	1045	672	620	1012	982	5230
157	Universidad de Valladolid	500	1411	1377	460	962	498	5208
158	Yuan Ze University	539	995	1053	930	812	870	5199
159	Teesside University	408	1067	1350	700	1113	559	5197
160	Wentworth Institute of Technology	547	1126	1278	525	913	804	5193
161	Brawijaya University	766	1278	1026	435	762	924	5191
162	Birkbeck University of London	487	863	1476	625	1163	576	5190
163	University of San Francisco	453	679	1626	670	1063	695	5186
164	Indian Institute of Information Technology and Management Gwalio	774	1074	1200	290	1112	733	5183
165	East Stroudsburg University	977	881	1626	595	763	334	5176
166	Universidad de Santander	881	1107	1302	340	763	778	5171
168	Siam University	573	843	1224	700	1062	769	5171
167	Universitas Islam Indonesia	682	1408	1203	320	1012	546	5171
169	An-Najah National University	693	1182	951	655	1013	675	5169
170	Universiti Teknikal Malaysia Melaka	935	1216	1251	465	1012	288	5167
172	Eindhoven University of Technology	609	1034	1275	390	912	943	5163
171	University of York	706	906	1551	370	913	717	5163
173	Adam Mickiewicz University, Poznan	680	1137	1203	740	763	639	5162
174	Technische Universitat Wien	605	931	1275	650	1062	636	5159
175	American University in Cairo	973	1048	1077	650	913	496	5157
176	King Mongkuts University of Technology North Bangkok	433	1051	1350	617	1063	639	5153
177	University of Ioannina	1150	1065	1551	165	761	440	5132
178	Universitat de Valencia	640	895	1476	475	613	1030	5129
179	University of Pecs	668	1173	1326	625	713	624	5129
180	Universitat de Barcelona	620	646	1650	530	963	712	5121
181	University of Kent	719	1144	1326	440	963	528	5120
182	Telkom University	682	1181	1323	352	862	716	5116
183	Maejo University	825	1192	1101	504	461	1030	5113
184	Universitas Padjadjaran	812	959	1299	875	761	395	5101
185	Sumy State University	907	1097	1251	550	613	677	5095
186	Al-Farabi Kazakh National University	855	1441	774	280	912	827	5089
187	Universidade Federal de Vicosa – UFV	905	1054	1077	505	513	1020	5074
188	Universitat Rovira i Virgili	620	1093	1626	290	713	730	5072
189	London School of Hygiene & Tropical Medicine	508	772	1575	320	1163	724	5062
190	Bulent Ecevit University	813	874	1302	600	961	511	5061
191	Loyola Marymount University	612	1011	1401	590	863	573	5050
192	University of Central Florida	1018	588	1002	665	1112	662	5047
193	Al-Balqa Applied University	889	1057	948	540	861	742	5037
194	Ankara University	843	963	927	455	1112	735	5035
195	Dhurakij Pundit University	629	939	1428	690	713	633	5032
196	Lincoln University Canterbury	838	717	1176	275	1013	1001	5020
197	University of Isfahan	795	1232	1053	640	963	335	5018
198	Universiy Of Kufa	483	1270	876	585	1163	637	5014

199	University of Jordan	961	912	1101	269	1113	655	5011
200	Tzu Chi University	793	1142	1101	565	863	542	5006
201	Tel Aviv University	624	897	1176	525	1162	619	5003
202	Universidad de la Punta	925	981	1725	220	812	340	5003
203	Universita degli Studi di Brescia	525	798	1374	345	1262	698	5002
204	University of Texas Rio Grande Valley	655	561	1053	722	1112	887	4990
205	Appalachian State University	787	669	1425	285	962	861	4989
207	Universiti Kebangsaan Malaysia	1053	688	1128	425	763	924	4981
209	Universidad de Ciencias Aplicadas y Ambientales UDCA	730	780	1500	620	511	833	4974
208	West Texas A&M University	490	842	1452	800	913	477	4974
210	University of Hertfordshire	676	671	1500	775	913	439	4974
211	Universidad Autónoma del Estado de Hidalgo	554	960	1200	453	962	827	4956
212	Politecnico di Milano	564	622	1626	380	762	997	4951
214	Suranaree University of Technology	850	1247	597	470	763	1016	4943
213	Pontificia Universidade Catolica do Rio de Janeiro PUC-RIO	790	509	1227	390	1162	865	4943
215	University of Illinois Springfield	958	920	1278	370	962	441	4929
216	Universidad Autonoma de Chiapas	628	789	1452	350	1112	592	4923
217	Illinois State University	801	1221	1152	350	863	530	4917
218	Russian State Pedagogical University Al Herzen	741	1076	1125	370	1213	390	4915
219	Perm National Research Polytechnic University	850	1183	1053	340	863	604	4893
220	Aix Marseille University	794	922	1401	300	663	811	4891
221	Manipal Academy of Higher	682	750	1203	620	913	717	4885
222	Universidad Icesi	758	868	1299	455	761	742	4883
223	Pascual Bravo University	711	1184	1452	140	663	711	4861
224	University of Maribor	436	1027	1353	384	863	792	4855
225	Yeditepe University	542	885	1575	430	961	440	4833
226	Uman National University of Horticulture	1063	1082	774	550	613	750	4832
227	Thammasat University	798	714	1101	465	1013	736	4827
228	Shiraz University	852	849	876	580	1013	657	4827
229	Silpakorn University	596	955	924	577	1063	707	4822
230	Mahasarakham University	778	906	774	350	1013	999	4820
231	Mangalore University	844	1124	648	620	963	616	4815
232	Minin University	661	1229	999	145	1213	562	4809
233	Ming Chi University of Technology	1047	678	1251	375	811	636	4798
234	Universitas Sumatera Utara	858	1032	897	135	1062	812	4796
235	University of Westminster	564	792	1401	621	913	496	4787
236	Universitat de Vic – Universitat Central de Catalunya	361	1528	1200	518	613	559	4779
237	Universidad de Las Palmas de Gran Canaria	732	937	1176	575	611	743	4774
238	University of Maryland Eastern Shore	857	1185	1176	380	761	414	4773
239	Holy Spirit University of Kaslik (USEK)	584	1105	1002	420	863	798	4772
240	Universitas Multimedia Nusantara	681	1023	1125	705	1013	220	4767
241	Voronezh State University	494	813	1452	250	1111	641	4761
242	Universidad El Bosque	522	1141	975	591	913	612	4754
243	Shanghai Jianqiao College	831	1104	1200	530	913	174	4752
244	Escuela Agricola Panamericana Zamorano	981	790	1227	363	763	625	4749
245	Ton Duc Thang University	583	1016	1176	500	813	659	4747
246	University of North Carolina at Greensboro	819	895	1152	370	962	548	4746
247	Tomsk Polytechnic University	1014	853	672	300	913	990	4742
248	Valahia University of Targoviste	660	1195	1053	378	863	587	4736
249	Far Eastern Federal University	787	901	924	515	963	643	4733

250	Oranim College of Education	720	607	1575	400	761	668	4731
251	University of North Carolina Wilmington	642	828	1053	750	1113	330	4716
252	Universidad Nacional Abierta y a Distancia Colombia	348	1373	1152	550	463	826	4712
253	University of Petra	632	1148	798	525	811	785	4699
254	Fo Guang University	850	1056	1176	496	811	297	4686
255	Institucion Universitaria Politecnico Grancolombiano	696	900	1626	320	863	280	4685
256	University of Babylon	820	1189	774	470	811	618	4682
257	Dibrugarh University	995	915	1149	310	763	550	4682
258	University of Alabama Birmingham	663	641	1053	711	1013	600	4681
259	University of Kelaniya	439	1200	1128	605	711	597	4680
260	Universiti Sains Malaysia	910	709	801	650	761	845	4676
261	Chang Jung Christian University	801	688	1251	525	713	696	4674
262	King Mongkuts University of Technology Thonburi	632	801	747	481	1063	945	4669
263	Rajabhat Maha Sarakham University	603	881	924	455	1112	692	4667
264	Universitas Riau	944	1069	747	250	811	845	4666
265	Tunghai University	994	690	1101	250	763	863	4661
266	Institute for Financial Management and Research Chennai	939	1212	1224	636	362	282	4655
267	Universidad de Jaén	567	1060	675	520	1012	809	4643
268	Northwest Missouri State University	836	644	1278	350	1013	509	4630
269	Universita degli Studi di Bari Aldo Moro	638	754	1377	500	813	539	4621
270	King Mongkuts Institute of Technology Ladkrabang	633	940	999	370	1112	561	4615
271	University of Agriculture Faisalabad	821	829	672	400	861	1030	4613
273	Universidad de Castilla la Mancha	686	803	1050	455	663	954	4611
272	Universita degli Studi di Ferrara	493	1021	1302	390	813	592	4611
274	University of North Texas	990	485	1227	275	863	760	4600
275	Universita degli Studi Roma Tre	408	1138	1125	410	762	742	4585
276	Providence University	750	805	1101	560	811	552	4579
277	School of Oriental and African Studies University of London	359	731	1500	325	1163	500	4578
278	Universidad Tecnologica de Pereira	727	1137	1053	600	511	547	4575
279	National Chung Hsing University	713	547	1551	455	563	731	4560
280	Ferdowsi University of Mashhad	907	1003	1101	210	1013	325	4559
281	Kalasalingam University	960	1133	1275	425	513	253	4559
282	Al-Zaytoonah University of Jordan (zuj)	694	1057	1050	396	963	388	4548
283	Universidade de Santiago de Compostela	624	856	1227	133	812	885	4537
284	Sabanci University	908	1128	975	613	561	351	4536
285	Pontificia Universidad Javeriana	430	1007	975	595	1212	317	4536
286	Islamic Azad University, Science and Research Branch (SRBIAU)	932	997	1050	120	861	572	4532
287	University of Lodz	515	662	1098	330	1013	912	4530
288	EAN university	350	1020	1302	447	812	598	4529
289	Chiba University	690	622	1353	588	563	712	4528
290	Moscow State Institute of International Relations	655	849	1101	350	1013	550	4518
291	University of Cyprus	933	865	1200	410	613	496	4517
292	Universitas Mataram	912	1084	1176	300	613	429	4514
293	Universidad Santiago de Cali	590	1189	1101	555	813	265	4513
294	Universita degli Studi di Salerno	545	635	1401	340	913	678	4512
295	Erciyes University	950	877	573	441	913	756	4510
296	Technische Universitat Bergakademie Freiberg	748	669	1425	445	513	709	4509
297	Ozyegin University	604	956	699	710	1013	523	4505
298	Universidad Popular De La Chontalpa	596	1448	873	340	861	379	4497
299	Universita della Calabria	942	736	1323	0	963	529	4493

300	Universidad San Francisco de Quito	472	757	1251	320	1213	468	4481
301	Institute of Technology Bandung	582	1085	1176	320	813	503	4479
302	Roskilde University / Roskilde Universitet	785	750	1125	440	913	461	4474
303	National Institute of Technology Rourkela	918	744	897	580	963	366	4468
304	Ariel University	700	659	1401	320	1013	374	4467
305	Tra Vinh University	596	1144	1176	621	563	365	4465
306	Birzeit University	789	1014	849	625	613	568	4458
307	University of Bahrain	978	638	1023	340	813	665	4457
308	Universidad Nacional de San Martin Argentina	516	892	951	350	813	929	4451
309	Shepherd University	813	810	1251	280	813	481	4448
310	Universidad de Zaragoza	653	1044	1200	255	513	780	4445
311	Amirkabir University of Technology	357	753	1101	440	1213	578	4442
312	Universidade do Vale do Itajai UNIVALI	556	546	1350	320	811	854	4437
313	University of Phayao	911	921	747	285	561	1002	4427
314	Universita degli Studi di Roma La Sapienza	703	977	852	124	1162	609	4427
315	University of Alabama Huntsville	770	812	1077	660	612	495	4426
316	Nanzan University	621	832	1326	340	863	443	4425
317	Universidad EAFIT	545	635	1377	470	663	731	4421
318	National Institute of Technology Hamirpur	820	567	1200	630	813	391	4421
319	Andalas University	789	891	924	350	761	701	4416
320	University of Kragujevac	627	840	1227	670	663	380	4407
321	North Eastern University	604	899	849	265	961	823	4401
322	Eötvös Loránd University Budapest	602	381	1575	260	813	769	4400
323	Universidad de Puerto Rico Mayaguez	755	797	1152	320	863	510	4397
324	Petrozavodsk State University	564	960	597	500	1013	759	4393
325	Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas	933	974	849	410	513	708	4387
326	Russian State Agrarian University – Moscow Timiryazev Agricultural .	1023	717	924	425	863	432	4384
327	University of Guilan	856	1032	897	695	711	193	4384
328	Universitat Duisburg Essen	719	309	1425	400	861	660	4374
329	The University of the West Indies	861	761	672	410	863	804	4371
330	Universidad de Alicante	396	671	1425	407	913	559	4371
332	Jordan University of Science & Technology	764	728	999	510	811	557	4369
331	Central Connecticut State University	725	837	1227	325	811	444	4369
334	Politecnico di Bari	500	713	849	390	1011	899	4362
333	Escuela Superior Politecnica del Litoral	806	782	873	540	912	449	4362
336	University of Tennessee Martin	1041	719	1002	348	463	786	4359
335	Laucala Campus, University of the South Pacific	720	646	1101	320	863	709	4359
337	Pontificia Universidad Catolica del Peru	432	1200	1026	505	763	432	4358
338	Blekinge Institute of Technology	644	985	1176	400	813	338	4356
339	Universita IUAV di Venezia	610	859	903	205	963	812	4352
340	University of Arid Agriculture Rawalpindi	888	791	924	385	661	702	4351
341	University of the Arts London	522	903	1251	375	563	719	4333
342	Universidad EIA	475	1047	774	704	862	470	4332
343	Ege University	829	527	1128	120	1013	714	4331
344	Karl Franzens Universitat Graz	638	717	924	503	763	780	4325
345	Southern Utah University	350	566	1452	598	863	491	4320
346	Brandenburgische Technische Universitat Cottbus	636	907	1026	260	813	672	4314
347	Universita Politecnica delle Marche	376	914	1251	650	661	459	4311
348	Pontificia Universidade Catolica do Parana	963	600	1302	110	913	401	4289
349	Soochow University Taiwan	608	608	1251	450	861	487	4265

350	Universidad Pontificia Comillas	475	702	1350	675	563	499	4264
351	CUNY Brooklyn College	649	500	1152	550	911	486	4248
352	University of TRIESTE	569	653	1476	350	611	588	4247
353	Unitec Institute of Technology	721	626	978	320	863	733	4241
354	Universidade Estadual de Londrina	795	675	1302	360	511	595	4238
355	Al-Aqsa University	582	924	597	445	1013	672	4233
356	Bogazici University	874	886	750	350	863	508	4231
357	Universidade Federal do Rio Grande do Sul – UFRGS	476	782	1278	40	1013	638	4227
358	Kobe University	661	725	1275	450	611	505	4227
359	Universidad de Salamanca	402	983	1050	395	863	529	4222
361	Airlangga University	400	742	999	240	1162	675	4218
360	Skyline College	503	693	1275	500	811	436	4218
362	Pontificia Universidade Catolica do Rio Grande do Sul PUCRS	555	425	1251	382	913	687	4213
363	New Granada Military University	395	1247	1275	395	362	538	4212
364	Universite de Versailles Saint Quentin en Yvelines	614	657	1149	295	812	682	4209
365	Universita degli Studi di Padova	607	592	1374	370	862	399	4204
366	TOBB Economics and Technology University	767	914	900	420	861	341	4203
367	Bangkok University	729	1074	975	234	611	574	4197
368	University of Arkansas Little Rock	980	708	774	325	863	542	4192
369	National Dong Hwa University	1026	589	1149	340	863	221	4188
370	National Institute of Technology Karnataka, Surathkal	1096	891	747	450	863	140	4187
371	Murray State University	891	563	1326	320	913	163	4176
372	Mutah University	673	489	873	310	1013	802	4160
373	Bowie State University	752	765	924	380	863	474	4158
375	Babes Bolyai University	697	522	999	370	1062	503	4153
374	Altai State University	895	543	951	550	763	451	4153
376	University of Macedonia	375	690	1551	105	963	458	4142
377	Pacific Union College	889	669	1425	595	262	286	4126
378	Atyrau State University	594	976	648	350	811	730	4109
379	Siberian Federal University	849	846	822	192	861	539	4109
380	Ubon Ratchathani Rajabhat University	996	1078	849	140	463	578	4104
381	Winthrop University	861	792	876	350	763	459	4101
382	Rajamangala University of Technology Thanyaburi	670	675	849	445	913	543	4095
384	National Taipei University of Education	567	622	1050	698	662	495	4094
383	Hitit University	810	819	951	330	812	372	4094
385	Xavier University Ateneo de Cagayan	841	911	1026	330	411	574	4093
386	Tecnologico de Monterrey	712	946	522	420	1062	425	4087
387	Akhmet Yassawi University	999	843	597	395	863	388	4085
388	Santo Tomas university	591	935	900	303	711	642	4082
389	Universitas Negeri Medan	608	854	1152	245	563	650	4072
390	University of Malta	530	986	1101	370	861	218	4066
391	Indian Institute of Technology Madras	797	708	1176	249	761	373	4064
392	World Maritime University	556	380	1200	400	913	611	4060
393	Universita` degli Studi di Perugia	898	814	774	245	713	611	4055
394	Bartin Universite	914	1016	774	200	613	534	4051
395	Radboud University	583	478	1302	320	713	654	4050
396	Don State Technical University	571	1063	999	340	863	194	4030
397	MacEwan College	623	391	1275	235	611	894	4029
398	Okayama University	1036	812	1026	400	513	241	4028
399	University of Hradec Kralove	750	850	1128	100	1013	182	4023

401	University of Nova Gorica	854	651	1152	230	513	607	4007
402	Walailak University	783	783	774	360	563	738	4001
403	Volgograd State University	536	957	873	295	863	471	3995
404	Universitas Pelita Harapan	712	509	999	445	862	467	3994
405	Derzhavin Tambov State University	422	771	951	180	963	702	3989
406	Suleyman Demirel University Turkey	615	993	801	220	912	429	3970
407	Universidad Austral de Chile	569	631	1101	140	712	808	3961
408	Universidad Central de Venezuela	658	420	900	250	813	911	3952
409	Texas Southern University	720	642	1101	575	613	288	3939
410	Tilburg University	582	774	1326	100	663	489	3934
411	Jacksonville University	939	479	900	230	463	919	3930
412	Technical University of Crete	666	1093	876	90	713	489	3927
413	Universidade de Aveiro	618	694	1101	346	663	501	3923
414	University of Tehran	520	389	1125	375	963	547	3919
415	Gandhi Institute of Technology and Management	552	971	573	585	811	424	3916
416	University of Pardubice	753	833	1176	230	513	408	3913
417	Universidad de Granada	411	651	1251	300	513	784	3910
418	Kakatiya University	693	1114	597	570	461	472	3907
419	Canadian Memorial Chiropractic College	409	804	1401	380	663	235	3892
420	Stockholm University	639	311	1500	400	563	472	3885
421	University of Tokushima	756	798	849	370	563	543	3879
422	City College of San Francisco	627	503	1074	445	511	713	3873
423	Kazakh National Agrarian University	725	882	876	290	713	386	3872
424	Universidad Sergio Arboleda	370	645	1302	384	612	553	3866
425	Universidad Autonoma Metropolitana	657	710	924	412	561	594	3858
426	Yildiz Technical University	654	520	927	550	912	287	3850
427	Bilkent University	1023	376	951	230	813	447	3840
428	National Chiao Tung University	738	262	1026	670	612	521	3829
429	Technische Universitat Dresden	565	534	1227	275	811	415	3827
430	Universiti Malaysia Terengganu	651	604	849	202	1012	504	3822
431	The University of Lahore	431	1094	801	340	1013	143	3822
432	Rider University	576	632	951	245	913	493	3810
433	University of Jeddah	719	831	774	350	811	295	3780
434	HungKuang University	556	656	672	470	761	662	3777
435	Ondokuz Mayis University	704	429	873	380	1063	327	3776
436	Bennett College	655	785	774	370	761	415	3760
437	Universitas Lampung	693	984	597	335	562	588	3759
438	Universidad del Valle	921	657	900	400	463	411	3752
439	Feng Chia University	585	1149	675	171	713	435	3728
440	University of Miskolc	771	875	675	50	562	782	3715
441	University of Agricultural Sciences and Veterinary Medicine Cluj Nap	687	916	675	245	813	375	3711
442	Nakhon Ratchasima Rajabhat University	546	900	774	202	511	768	3701
443	Universidad Centroamericana Jose Simeon Canas	690	809	825	327	713	331	3695
444	Universidad de Medellin	720	745	750	425	312	728	3680
445	Hashemite University	890	1267	648	250	361	257	3673
446	Saratov State University	507	514	1077	200	763	610	3671
447	European University Cyprus	392	1278	825	250	513	406	3664
448	Yogyakarta State University	609	678	822	200	1012	333	3654
449	Thaksin University	693	980	549	255	513	662	3652
450	Universidad Industrial de Santander	745	774	876	150	763	343	3651

451	Duzce University	701	696	549	520	812	349	3627
452	University of Sharjah	668	334	873	320	811	620	3626
453	Azerbaijan University of Architecture and Construction	686	896	498	411	612	520	3623
454	Tver State University	737	515	849	340	863	314	3618
455	Universitas Syiah Kuala	580	1037	597	190	963	248	3615
456	Taipei Medical University	466	461	1203	340	661	478	3609
457	United Arab Emirates University	708	338	1149	275	711	426	3607
458	Kyrgyz Turkish Manas University	1011	301	525	45	813	907	3602
459	Alzahra University	464	940	951	145	711	385	3596
460	Fairfield University	922	647	774	265	563	423	3594
461	Kainan University	684	505	1101	290	561	448	3589
462	Universidade Federal de Santa Catarina	537	447	951	200	711	731	3577
463	University of Dhaka	765	1057	672	176	711	194	3575
464	Poltava National Technical Yuri Kondratyuk University	568	706	651	350	713	585	3573
465	Universidade Federal de Itajuba	854	601	801	275	411	630	3572
466	Universitat de les Illes Balears	791	647	825	404	561	340	3568
467	Penza State University	627	587	750	250	963	364	3541
468	Universitas Teuku Umar	845	825	624	47	463	721	3525
469	Inonu University Malatya	781	934	726	255	411	406	3513
470	Universitas Bengkulu	812	974	672	205	563	286	3512
471	Madonna University	821	973	978	100	262	355	3489
472	Christian Medical College Vellore	710	737	1125	150	361	404	3487
473	Universitas Surabaya	705	905	498	300	813	263	3484
474	University of the Virgin Islands	901	590	699	115	863	310	3478
475	Chienkuo Technology University	638	672	1401	77	511	172	3471
476	Universidade Federal de Sao Paulo UNIFESP	699	642	648	550	613	313	3465
477	Universiti Tun Hussein Onn Malaysia	738	514	849	300	561	498	3460
478	Universidade Federal Do Abc Ufabc	472	777	423	475	863	437	3447
479	Islamic University College	604	393	999	330	911	198	3435
480	Tadeusz Kosciuszko Cracow University of Technology	373	803	750	230	863	411	3430
481	Universita degli Studi Mediterranea di Reggio Calabria	686	815	675	30	913	309	3428
482	Universitas Terbuka	786	849	747	170	461	413	3426
483	North Carolina Central University	533	489	951	305	713	434	3425
484	Universidad La Gran Colombia	705	650	699	215	711	398	3378
485	Lahore University of Management Sciences	679	957	498	350	763	129	3376
486	University of Baghdad	703	699	423	315	713	518	3371
487	Hasanuddin University	693	802	447	425	812	190	3369
488	Tomsk State University of Architecture and Building	696	860	774	175	411	449	3365
489	Rezekne Higher School	510	1148	849	175	463	216	3361
490	Daugavpils University	762	785	549	120	463	677	3356
491	Saint Petersburg State University	916	695	522	340	713	169	3355
492	Azerbaijan State University of Economics (UNEC)	629	521	1101	175	411	509	3346
493	Universitas Sanata Dharma	612	547	975	285	511	411	3341
494	Budapest University of Technology and Economics	454	792	876	100	863	255	3340
495	Westminster College Fulton	768	670	726	325	562	285	3336
496	Foundation University	412	968	750	170	711	322	3333
497	South Valley University	555	565	774	264	713	461	3332
498	Voronezh State Technical University	727	642	747	140	463	612	3331
499	University of Crete	868	574	1050	230	411	197	3330
500	Taiwan Hospitality & Tourism College	768	793	675	385	511	185	3317

501	University of Debrecen	568	389	1074	180	612	491	3314
502	Corvinus University of Budapest	710	637	651	340	613	361	3312
503	Agricultural University of Cracow	696	711	525	330	461	586	3309
504	Universidad Autonoma del Caribe	616	575	726	50	862	476	3305
505	Universitas Medan Area	418	859	597	340	262	818	3294
506	Universidad Autonoma de Tamaulipas	370	511	501	125	861	903	3271
507	Odessa State Polytechnic University	797	637	1026	220	412	164	3256
508	Ludwig Maximilians Universitat Munchen	1035	493	1152	50	361	161	3252
509	Kilis 7 Aralk University / December 7 University of Kilis	493	723	876	150	862	144	3248
510	Universitas Bangka Belitung	846	823	273	95	411	786	3234
511	University of Karachi	729	660	498	275	661	405	3228
512	Universitas Jember	675	869	624	85	513	443	3209
513	Universitas Negeri Surabaya	510	617	828	360	361	531	3207
514	Universidad del Magdalena	646	725	648	145	361	676	3201
515	Universitas Pancasila	699	759	597	375	613	147	3190
516	Universidad Tecnica Federico Santa Maria	468	632	648	380	763	290	3181
517	University of South Africa	660	565	1227	82	361	279	3174
518	West University of Timisoara	557	642	675	145	962	171	3152
519	Karabuk University	515	458	576	195	863	525	3132
520	Pontificia Universidad Catolica de Chile	638	492	576	180	713	528	3127
521	Islamic Science University of Malaysia	824	492	624	170	611	383	3104
522	Universitas Sriwijaya	866	718	423	255	412	428	3102
523	University Petru Maior	415	700	549	250	613	555	3082
524	Universitas Pembangunan Nasional Veteran Yogyakarta	622	716	522	150	463	604	3077
525	Mindanao State University Iligan Institute of Technology	415	568	774	205	763	352	3077
526	Selcuk University	455	274	1176	50	863	255	3073
527	Islamic University of Gaza	499	542	699	295	411	597	3043
528	Altai State Technical University	555	397	549	180	713	639	3033
529	Universidad de La Laguna	396	582	750	246	511	546	3031
530	University of Southern Brittany	537	698	624	245	511	412	3027
531	University of Education Winneba	549	759	474	420	663	159	3024
532	American University of Beirut	448	389	951	245	462	518	3013
534	Pontificia Universidade Catolica do Campinas	690	709	624	60	711	207	3001
535	Universitas Maritim Raja Ali Haji	904	931	348	180	462	175	3000
535a	Odessa National Meritime University	539	433	777	75	813	356	2993
536	Universidad Tecnologica de Panama	681	698	447	170	411	581	2988
537	Universitas Negeri Manado	746	790	0	180	461	809	2986
538	Universitas Muhammadiyah Surakarta	467	790	447	75	811	383	2973
539	Instituto Politecnico de Santarem	686	534	774	30	411	534	2969
540	Universitas Sam Ratulangi	706	719	249	250	813	219	2956
541	Guru Nanak Dev Engineering College	739	798	273	120	711	306	2947
542	Jawaharlal Institute of Postgraduate Medical Education & Research	886	834	348	75	663	123	2929
543	Universitas Tanjungpura	800	635	522	95	511	361	2924
544	Universidad de Pamplona	493	351	552	320	562	628	2906
545	Indian Institute of Management Ahmedabad	746	651	573	140	411	378	2899
546	International Islamic University of Malaysia	730	367	525	295	713	254	2884
547	Universite de Monastir	624	630	423	385	512	298	2872
548	Greifswald University	675	494	699	150	463	383	2864
549	Gunadarma University	610	708	876	125	361	161	2841
550	Cyprus University of Technology	352	584	699	32	711	458	2836

551	Vidzeme University of Applied Sciences	379	548	975	273	463	193	2831
552	Universitas Halu Oleo	734	853	348	256	361	271	2823
553	International Islamic University Islamabad	727	755	198	275	411	452	2818
554	Universiti Malaysia Perlis	863	481	0	150	713	610	2817
555	Government College of Engineering Pune	675	922	450	215	411	128	2801
556	National Taiwan University of Arts	544	255	825	250	513	404	2791
557	Integral University	658	678	99	160	812	380	2787
558	Irkutsk State Technical University	658	667	174	546	411	323	2779
559	University of Kwazulu Natal	501	351	549	230	711	434	2776
560	Swedish Defence University	341	425	801	250	763	184	2764
561	Universidad Autonoma de la Ciudad de Mexico	602	579	348	385	562	282	2758
562	University of Trnava	478	648	927	0	312	392	2757
563	University at Bialystok / Uniwersytet w Biaymstoku	473	343	774	400	463	289	2742
564	Valaya Alongkorn Rajabhat University Under the Royal Patronage	778	702	447	170	361	263	2721
565	Atma Jaya Yogyakarta University	628	667	297	75	361	690	2718
566	Universitas Negeri Malang	559	683	447	330	411	288	2718
567	Universite de Valenciennes et du Hainaut Cambresis	773	296	399	230	511	492	2701
568	University of Tourism and Management in Skopje	530	751	549	0	513	349	2692
569	Celal Bayar University	602	191	723	230	561	381	2688
570	Burapha University	727	350	423	95	863	224	2682
571	Immanuel Kant Baltic Federal University	656	290	423	295	513	502	2679
572	Anadolu University	540	273	774	298	661	130	2676
573	Polish Japanese Institute of Information Technology in Warsaw	576	504	474	370	611	129	2664
574	Amman Arab University	495	812	726	170	312	140	2655
575	University of Calcutta	618	592	498	220	362	363	2653
576	Gulbarga University	672	646	324	95	663	245	2645
578	Minia University	577	544	324	180	561	441	2627
579	Universidad Tecnologica Metropolitana	341	696	726	50	312	498	2623
580	Sekolah Tinggi Teknik Malang	355	1089	198	80	362	505	2589
581	Universidad Nacional del Sur	562	265	675	110	663	301	2576
582	NARXOZ University	593	572	450	0	513	442	2570
583	Petra Christian University	575	607	549	320	361	140	2552
584	Universitas PGRI Ronggolawe	432	650	174	140	763	391	2550
585	University of Sri Jayewardenepura	382	376	447	275	411	657	2548
586	Mykolas Romeris University	717	172	849	50	463	275	2526
587	Universitas Tarumanagara	519	344	549	180	312	608	2512
588	Polytechnic of Namibia	341	352	651	275	262	630	2511
589	Universite Cadi Ayyad	378	203	348	190	663	716	2498
590	Universitas Negeri Padang	375	290	423	330	462	610	2490
591	Instituto Nacional de Antropologia e Historia	341	406	648	75	612	407	2489
592	Obuda University	389	680	648	150	411	196	2474
593	Panjab University	427	451	498	170	463	459	2468
594	Indira Gandhi National Open University	645	361	348	200	761	151	2466
595	Universita di Macerata	459	564	273	30	411	715	2452
596	Damascus University	368	301	573	200	562	441	2445
597	Dr Hari Singh Gour University Sagar University	524	719	423	120	461	196	2443
598	Universidade Federal de Pernambuco	722	384	450	135	562	180	2433
599	Astrakhan State University	501	583	297	30	612	409	2432
600	Izmir University of Economics	456	527	597	90	613	141	2424
601	Russian Presidential Academy of National Economy and Public Admi	741	201	675	182	461	148	2408

602	Universitas Samudera	676	750	198	100	262	387	2373
603	Universidad Metropolitana Caracas	540	610	498	250	262	185	2345
604	Universitas Lambung Mangkurat	586	603	348	0	562	123	2222
605	New Jersey City University	504	152	801	10	612	130	2209
606	University of Latvia	1099	301	249	120	262	177	2208
607	Universidad de Cartagena	478	291	825	0	262	291	2147
608	Universitas Islam Negeri Maulana Malik Ibrahim Malang	415	524	324	100	463	280	2106
609	Universitas Islam Negeri Sumatera Utara Medan	398	376	522	75	411	315	2097
610	Universitas Khairun	494	576	423	160	262	132	2047
611	Russian State Vocational Pedagogical University	350	649	273	75	411	283	2041
612	Universitas Pendidikan Ganesha (UNDIKSHA)	417	643	99	50	411	371	1991
613	Uzhhorod National University	544	376	348	40	262	307	1877
614	Universite Abou Bekr Belkaid Tlemcen	477	394	0	0	711	223	1805
615	Politeknik Negeri Malang	437	739	0	40	411	129	1756
616	Universidad Central de Nicaragua	458	227	324	200	361	160	1730
617	Tamil Nadu Dr M G R Medical University	341	301	174	450	262	123	1651
618	Ivan Franko National University of Lviv	411	301	99	0	262	449	1522
619	Universitas Muria Kudus	443	131	348	10	262	219	1413

APPENDIX E: BOĞAZİÇİ UNIVERSITY 2016 UI GREENMETRIC APPLICATION FORM

UI GREENMETRIC

1 Setting and Infrastructure (SI)

1 Type of higher education institution

Comprehensive

2 Climate

Mediterranean

3 Number of campus sites

8

Table 1: Bogazici University Campus Locations

Name of the Campus	Location of the Campus
Güney Kampüs / South Campus	Bebek/ Beşiktaş/ İstanbul
Hisar Kampüs / Hisar Campus	Hisarüstü, Nispetiye Caddesi, Rumelihisarı, Sarıyer/İstanbul Türkiye
İznik Kampüs / İznik Campus	Selçuk Mah. İznik/ Bursa
Kandilli Kampüs/ Kandilli Campus	Kandilli Mahallesi, Vaniköy Caddesi, Eşref Bitlis Sokak, Üsküdar/İstanbul
Kuzey Kampüs / North Campus	Bebek/ Beşiktaş/ İstanbul
Sarıtepe-Kilyos Kampüs / Sarıtepe-Kilyos Campus	Boğaziçi Üniversitesi, Sarıtepe Kampüsü, Sarıyer/İstanbul
Uçaksavar Kampüs / Uçaksavar Campus	Cengiz Topel Caddesi, Özden Sok., Rumelihisarı, Beşiktaş/İstanbul, Türkiye
Tarsus Çırçır Fabrikası / Tarsus Ginning Factory	-

4 Campus Setting

Urban

7 **Total main campus buildings area (meter square)**

244404

8 **Total main campus smart building area (meter square)**

9936,2

9 **Total parking area (meter square)**

13455

10 **Area on campus covered in vegetation in the form of forest (%)**

80,5 %

11 **Area on campus covered in planted vegetation (%)**

4,4 %

12 **Total area on campus for water absorption beside forest and planted vegetation (percentage)**

0,5 %

13 **Total number of online students (part time and full time)**

0

1..13 **Number of students including part time and full time students**

16 517 *

* 2015/2016 spring semester

14 **Number of academic and administrative staff**

Total : 1745

Administrative staff: 943,

Full time faculty : 445

Research Assisstants: 316

15 **University budget for sustainability effort (%)**

6,4 %

2 Energy and Climate Change (EC)

16 Energy efficient appliances usage are replacing conventional appliances

Less than 20%

Lighting with LED technology is firstly applied in the road of South Campus and Natuk Birkan Building in 2012. Feasibility studies continue for the other buildings. Usage efficiency increase 30% since LED lambs are 10 times more long-lasting than classic lambs turning some energy into heat. Lighting with LED technology is started to be applied in the North Campus by considering the increase of efficiency, as well.

Table 3: LED Lamp Usage in Bogazici University

Year	Application Location	Supply Rate for the Application Location, %	Provided Energy Saving Rate, %	Estimated Prevented CO_2 Release Amount, kg CO_2/yr	Investment Cost, TL	Investment Cost, USD
2012	Natuk Birkan	100%	30	820	50,000	27,778
2012	South Campus Road	100%	30	800	?	?

17 Smart Building implementation

Implemented in less than 30% of the total building area

18 Renewable energy produce inside campus

Solar power
Wind power

Wind power

Windpower Plant(LİNK)

Table 4: Wind Power Application in Bogazici University

Year	Application Location	Technical Application	Installed power	Supply Rate for the	Provided Energy Saving	Estimated Prevented CO_2	Investment Cost, TL	Investment Cost, USD

				Applicatio n Location, %	Amount, kwh/yr	Release Amount, kg CO_2/yr		
2014	Kilyos Campus	Windpowe Plant (RES) Wind Measureme nt Mast	1000 kWp	140%	1,034,550	900,000	4,222,000	2,020,096

Solar power

Hot Water System with Sun Collector

Hot water systems with sun collector are generated from the equipments such as plane collectors collecting solar power the storage where the warmed water is stored and insulated pipes connecting this to parts and pump and controller. These studies are planned to be increased in our school. 22% of hot water need of 1. Male dormitory is provided by hot water system of with sun collector applied in 2011.

Table 5: Hot Water System with Sun Collector Application in Bogazici University

Year	Applicati on Location	Installed power	Supply Rate for the Application Location, %	Provided Energy Saving Amount, kwh/yr	Estimated Prevented CO_2 Release Amount, kg CO_2/yr	Investm ent Cost, TL	Investm ent Cost, USD
2011	South Campus First Male Dormitor y	54.42	22	62,560	14,640	43,100	26,770
2015	Tarsus History and	?	100	?	?	10,000	3,846

	Culture Center						

Application of photovoltaic panel

Power of photovoltaic panels applied in North Campus 3.dormitory in 2009 and providing power generation is 20520 kWp and supplies 30% of power generation need of the dormitory.

Power of photovoltaic panels applied in North Campus 4.dormitory in 2010 and providing power generation is 20160 kWp and supplies 30%of power generation need of the dormitory.

Power of the panels existing in South Campus Faculty of Economics and Administrative Sciences in 2013 and providing power generation is 0,480 kWp. Panels provide 100% of power generation power required for totally 15 LED lambs in corridors of faculty.

Power of photovoltaic panels applied in Kandilli Campus National Earthquake Monitoring Center (UDIM), Tsunami Monitoring Building in 2013 and providing power generation is 16032 kWp.

Power of panels constructed in North Campus and Superdorm in 2013 and providing power generation is 0,480 kWp. Panels provide 100% of power generation need for night lighting in the area where they are constructed.

Power of panels constructed in leaning roof of Mersin Tarsus Museum in 2014, October and providing power generation is 19500 kWp. Panels are designed to provide 100% power generation need of the museum during sunny days.

Hot water system with sun collector and applications of photovoltaic panel are constructed by the studies conducted mutually by Sustainable Development and Clean Production Applications and Research Center(BU-SDCPC), Bogazici University Directorate of Construction and Technical Works, Industrial Plant Design Ltd. Şti.

Table 6: Application of photovoltaic panel in Boğaziçi University

Year	Application Location	Installed power	Supply Rate for the Application Location, %	Provided Energy Saving Amount, kwh/yr	Estimated Prevented CO_2 Release Amount, kg CO_2/yr	Investment Cost, TL	Investment Cost, USD
2010	North Campus 3th Dormitory	20.16	30	23,174	14,300	193,000	122,152
?	Faculty of Economics and Administrative Sciences Building	0.48	100% of the energy needed for 15 Led light	1,620	1,000	?	?
2011	North Campus 4th Dormitory	20.16	30	23,174	14,300	400,000	248,447
2013	Kandilli Campus UDIM Building	16.032	?	18,430	11,370	?	?
2014	North Campus Turgut Noyan Building	14.4	?	16,550	8,885	?	?
2015	Tarsus history and Culture Center	19.5	?	22,415	13,830	?	?

19 Electricity usage per year (in kilo watt hour)

18.673.116 KWh (2015 total)

20 Ratio of renewable energy produce/production towards total energy usage per year

Less than 20%

21 Elements of green building implementation as reflected in all construction and renovation policy

Full-day natural lighting
Building efficiency

South Campus I. Male Dormitory (Hamlin Hall)

The dormitory became entitled to receive LEED Gold Certificate in September 2012 by making comprehensive improvements complying with sustainable areas, water efficiency, energy and atmosphere, sustainable and local material use in indoor and exterior, roof and surroundings of building criteria in 2011. Besides being the first university building having LEED Gold Certificate, it is also the first historical building with LEED Certificate.

Bogazici University Kandilli Observatory and Earthquake Research Institute National Earthquake Monitoring Institute (UDIM)

The building was constructed complying with maximum energy and water efficiency, renewable energy applications, storm water recovery applications, internal air quality and more daylight utilization criteria and became entitled to recieve LEED Gold Certificate in February 2015. 39% less energy than average energy consumption values is consumed in UDIM Building. The investment cost for LEED Gold Certificate was 1.313.000,00 TL

22 Greenhause gas emission reduction program

Program Preparation

23 Please provide total carbon footprint (CO2 emission in the last 12 months, in metric tones)

16505 tone^3

3 Waste (WS)

24 Program to reduce the use of paper and plastic in campus

None

25 Recycling program for university waste

Partial (25-50%)

Recyclable Wastes

150 easy-to-use recycle bins donated by Sarıyer Municipality were used in our university in 2012 within the collection of solid waste by decomposing in the source and were placed in different areas of our university buildings as a result of data got from " Waste Producer Information Assessment Form" in quartet sets as written "metal-glass", "paper", "plastic", "organics" on them. The places of recycle bins determined by former study were controlled again due to reduction in efficiency of blue bins and the importance given to recycling and new bins are replaced.160 bins in quartet sets and as written paper, plastic, organics, metal-glass wee placed in buildings in South Campus.

Electronic Wastes:

Electronic wastes and all the wastes in the university including precious metal are taken by Machine Chemistry Institute Institution (MKEK) every 5 months. That transferring of scrap materials (metal alloyed) to MKE Scrap Operation Directorate by means of selling is required is indicated in accordance with the law no.7/2156 of Cabinet Decree. Wastes in this scope in our university are stored in locked boxes in the storehouse under the north car park. The project of collection of electronic wastes saved in many houses in containers placed in determined areas in the campus, initiated by university students is planned to begin by the end of 2014 with the cooperation of related firm. Classic taps in our university buildings are replaced by sensor-fitted taps providing water saving in return for electronic wastes to be collected within the project. Pre-interviews with possible project partners continue to exist.

26 Toxic waste handled

Completely contained, inventoried and handled

Toner Wastes:

Toner waste collection forms and informing notes are conveyed to all the department secretarial and building chiefs with the aim of administration of toner wastes every year and on the other hand, toner bags required for the application are distributed to all the department secretarial. The cooperation for 2013 is constructed with Hewlett Packard (HP) for recycling of toner waste. 430 toner wastes are conveyed to HP'S authorized company Anel Doğa Engre Recycling End. A.Ş at

the end of the year and are sent to interim storage for dangerous recycling of toner waste. There has been no attempt to new cooperation yet.

Hazardous Wastes:

Wastes generated from hazardous materials including the mixtures of lab chemicals or lab chemical including hazardous materials, created in our labs of Chemistry, Chemical Engineering, Physics, Molecular Biology and Genetics, Biomedical Engineering Institute and Ecological Sciences Institute, coded in 16 05 06 are detracted from our university in the dates indicated in the following table in cooperation with Ecological Energy A.Ş. with licenced vehicles in accordance with the instructions no.25755 Control of Hazardous waste

Table 8: Laboratory Waste and Waste Toner Removal in Bogazici University

Year	Application Location	Technical Application	Amount	Investment Cost, TL	Investment Cost, TL
2011	Hisar/ Kuzey/ Kandilli Campuses	Disposal of Hazardous Wastes generated in laboratories	5,800 kg	25,000	13,889
2012			2,200 kg		
2013			4,500 kg		
2014			2,880 kg	15,000	7,177
2015			2,600 kg		
2013	University	Waste Toners Disposal	430 adet atık toner	-	-

Medical Wastes:

Medical wastes generated from infirmary and Molecular Biology and Genetics department in our university are stored in the storage of medical waste in accordance with the instruction no.21586 numbered “Control of Medical Waste” and collected by Beşiktaş Municipality by licenced vehicles every Thursday.

Medical wastes generated in our university are going to be collected by İSTAÇ A.Ş. as of 2015, January.

Radioactive Wastes:

Low-activated radioactive wastes formed in Molecular Biology and Genetics Department are detracted from our university periodically in cooperation with Turkish Atomic Energy Authority (TAEK) and Çekmece Nuclear Research and Training Center and in accordance with the instruction no. “Administration of Radioactive Waste”. 50 kg radioactive wastes are detracted in May,2012. 50 kg saved waste are going to be detracted as of the end of 2014 in accordance with related instructions.

The radioactive wastes type of 3H and 14C generated as a result of laboratory studies in our university do not spread radiation the outside of the container where they exist. These wastes conserved as closed are collected in an equipment or a device and are preserved with unbreakable and water-proof objects.

27 Organic waste treatment

None of the options are suitable for our university. Organic wastes are removed from campus to be sent to landfill by municipality

28 Inorganic waste treatment

Taken off campus to a dump site

29 Sewerage disposal

Disposed untreated to waterways

4. Water (WR)

30 Water conservation program

Program in initial implementation (e.g. initial measurement of potential water conserved)

- Imlepented in rain harvesting system

31 Water recycling program

Program in initial implementation (e.g. initial measurement of potential water recycle)

- Recycled water is used for toilet flush
- Recycled water is used for garden sprinkler system

32 The use of Water efficient appliances (water tap, toilet flush, etc.)

Water efficient appliances installed is less than 25 %

Grey Water Recycling System

Grey water composing the biggest percentage of domestic waste water with the share of 75% volumetrically is the waste water except toilet water. There are 2 buildings including grey water recycling systems in our university.

Each of grey water recycling systems applied in South Campus 1. male dormitory in 2010 and in North Campus 4.dormitory in 2014 was designed in the way that they recycle 16m3/day grey water in a day

Rainwater Recycling System:

Rainwater recycling system collected from the roof of Kandilli Campus National Earthquake Monitoring Center(UDIM) Building was put into usage in 2013. Rainwater collected in 46 m3 storage is used for garden irrigation, cleaning and reservoirs.

Rainwater Recycling System: Rainwater recycling system collected from the roof of North Campus ETA Building was put into usage in 2014. Rainwater collected in 20 m3 storage is used for garden irrigation.

Hisar Campus is seen as the most appropriate campus for collecting rainwater since its topography is suitable for this application. The estimated amount of rainwater to be collected from the roofs of Hisar Campus Buildings is calculated as 1747m3/year. Rainwater collected four times in a year in 40m3 volumed storage with the designed rainwater recycling system can be used as reservoirs and cleaning water by refining in Hisar Campus Buildings. Feasibility studies continue to exist.

Water Saving Cartridges

Water saving is given importance within the studies of green campus.That water saving cartridges inserted all of the taps in dormitories of our university provide 35% water saving is determined by counter measurements.

33 Treated water consumed

5 Transportation

34 Number of campus owned by your university

26

35 Number of cars entering the university daily

1500

36 Number of motorcycles entering the university Daily

20

37 Number of campus bus operated in your university

73

38 Average passengers of each campus shuttle

17

39 Total trips for campus shuttle service each day

289

40 **Number of bicycles that are found on campus on an average day**

50

41 **Parking area type**

Combination of open space and building

42 **Parking area reduction for private vehicles within 3 years (from 2013 to 2015)**

None

43 **Initiatives to decrease private vehicles on campus**

Metro / tram / bus station on campus

44 **Campus shuttle service**

Shuttle service is available, and free service. Or shuttle use is not possible

45 **Bicycle and pedestrian policy on campus**

Bicycle and pedestrian way are available

46 **The approximate travel distance of a vehicle each day inside campus only (in kilometers)**

10

6 Education

47 **Number of courses related to environment and sustainability offerred**

7

48 **Total number of courses offered**

2325

49 **Total research funds dedicated to environmental and sustainability research (in US Dollars)**

2936705 $

50 Total research funds (in US Dollars)

31912942 $

51 Number of scholarly publications on environment and sustainability published

52 Number of scholarly events related to environment and sustainability

53 Number of student organizations related to environment and sustainability

5

54 Existence of a university-run sustainability website

Available

55 Sustainability website address if available

https://yesilkampus.boun.edu.tr/

APPENDIX F: SUSTAINABILITY RELATED COURSES IN THE BOĞAZİÇİ UNIVERSITY COURSE CATALOG FOR ACADEMIC YEAR 2017-2018

2017-2018 Autumn Semester

Code.Sec	Desc.	Name	Cr.	Ects	Instr.	Days	Hours	Rooms	Exam	Sl.	Required f Departments
CHE 543.0:	Desc.	CATALYSIS FOR GREEN TECHNOLOGIES	3	7	AKSOYLU	TBA			20.12.2017	1	
CHEM471.(	Desc.	ENVIRONMENTAL CHEMISTRY	3	6	İLKER	TTT	789	EF 102 | EF	29.12.2017	3	
CE 331.01	Desc.	EARTH SCIENCES	3	5	BAYKAL	ThTh	23	M 2181 | M	22.12.2017	1	
CE 421.01	Desc.	ENVIRONMENTAL ENGINEERING	3	6	AKKOYUNL	MMT	345	M 2181 | M	27.12.2017	3	
CE 49B.01	Desc.	SP.TP.GREEN BUILDING	3	5	ÇAMLIBEL	WWW	678	M 2152 | M	20.12.2017	3	
EC 471.01	Desc.	GROWTH AND DEVELOPMENT	3	6	ELGİN	TThTh	323	NH 303 | E	28.12.2017	2	
EC 482.01	Desc.	SP.TOP.:INSTITUTIONS,DEVELOPMENT&HISTORY	3	6	KARAMAN	MWW	434	NB 119 | N	27.12.2017	3	
EC 48C.01	Desc.	SP.TP.ENVIRONMENTAL&ECONOMIC POLICIES	3	6	KULAÇOĞL	WWW	789	NB Z12 | N	21.12.2017	2	
ESC 301.01	Desc.	THE ENVIRONMENTAL DIMENSION	3	5	ERDİNÇLER	WWTh	343	HD 101 | H	25.12.2017	1	
ESC 305.01	Desc.	GLOBAL CLIMATE CHANGE	3	6	DEMİREL	MMT	787	HD 101 | H	23.12.2017	3	
ESC 307.01	Desc.	SOCIAL ECOLOGY	3	6	SAYSEL	TTTh	786	KP 01 | KP	26.12.2017	1	
ESC 351.01	Desc.	SUSTAINABLE DEVELOPMENT	3	6	CILIZ	TTT	8910	HD 101 | H	29.12.2017	3	
ESC 501.01	Desc.	PRINCIPLES OF ENVIRONMENTAL POLLUTION	3	8	İNCE(KASA	WWW	567	HC 104 | H	19.12.2017	3	
ESC 502.01	Desc.	INTRODUCTION TO ENVIRONMENTAL SCIENCE	3	8	GÜVEN	TTT	234	HC 01 | HC	19.12.2017	3	
ESC 505.01	Desc.	PUBLIC HEALTH AND ENVIRONMENT	3	8	BEKBÖLET	TTT	678	HC 105 | H	26.12.2017	2	
ESC 541.01	Desc.	ENVIRONMENTAL ECONOMICS	3	8	ERTÖR AK\	MMM	678	HC 02 | HC	19.12.2017	2	
ESC 554.01	Desc.	BIOFUELS	3	8	HAZNEDAF	WWW	678	HC 203 | H	21.12.2017	1	
ESC 595.01	Desc.	SP.TP.DYNAMICS OF SOCIO-ECOLOGICAL SYS.	3	8	SAYSEL	MMM	234	HC 02 | HC	20.12.2017	1	
ESC 568.01	Desc.	POLLUTION PREVENTION ASSESSMENT	3	8	CILIZ	MMM	678	HC 01 | HC	19.12.2017	1	
ESC 572.01	Desc.	GLOBAL ENVIRONMENTAL SYSTEMS	3	8	ÇEÇEN	ThThTh	234	HC 01 | HC	19.12.2017	2	
ESC 59D.01	Desc.	SP.TP.ENVIRONMENTAL GOVERNANCE	3	6	DALOĞLU	WWW	567	HC 02 | HC	25.12.2017	3	
ESC 59L.01	Desc.	SP.TP.DRINKING WATER DISINFEC.&HEALTH AS	3	8	UYGUNER	FFF	345	HC 01 | HC	29.12.2017	2	
ESC 521.01	Desc.	AIR POLLUTION AND MODELLING	3	8	COPTY	FFF	678	HC 203 | H	23.12.2017	3	
ESC 531.01	Desc.	SOLID WASTE MANAGEMENT	3	8	ONAY	FFF	234	HC 02 | HC	25.12.2017	3	
ESC 535.01	Desc.	COMPOSTING TECHNOLOGIES	3	8	ONAY	FFF	678	HC 02 | HC	02 | HC 02	0	
ESC 511.01	Desc.	ENVIRONMENTAL BIOTECHNOLOGY	3	8	ÇEÇEN	MMM	234	HC 01 | HC	01 | HC 01	0	
ESC 565.01	Desc.	ENV.TECHNOLOGIES FOR WASTE TREATMENT	3	8	BALCIOĞLU	TTT	234	HC 203 | H	19.12.2017	2	
ESC 634.01	Desc.	TREATMENT&DISPOSAL OF WASTEWATER SLUDGES	3	8	ERDİNÇLEF	TTT	345		29.12.2017	2	
IE 461.01	Desc.	ENERGY POLICY & PLANNING	3	6	KUMBARO	WWF	562	M 2180 | M	20.12.2017	2	
IE 550.01	Desc.	DYNAMICS OF SOCIO-ECONOMIC SYSTEMS	3	7	BARLAS	TTThTh	5656	M 2152 | M	19.12.2017	1	
MIR 550.0:	Desc.	EUROPEAN CITIES IN A GLOBALIZED WORLD	3	7	ARSLANALI	MMM	101112			0	
MIR 503.0:	Desc.	INTERNATIONAL ECONOMICS&TRADE	3	8	ELGİN	TBA				0	
INTT413.0:	Desc.	INTERNATIONAL TRADE & ECONOMIC DEVELOPME	3	5	IŞIK	TThTh	723	HC 218 | H	03.01.2018	2	
POLS634.0	Desc.	CONTEMPORARY ISSUES IN GENDER & POLITICS	3	9	ARAT	WWW	678		20.12.2017	2	
SOC 221.0:	Desc.	SOCIAL CHANGE & DEVELOPMENT	3	5	KUYUCU	MMW	565	KP 01 | KP	25.12.2017	1	
TRM 525.0	Desc.	SUSTAINABLE BUSINESS DEVELOPMENT	3	7	ERTUNA	TTT	678		29.12.2017	3	
TRM 532.0	Desc.	SUSTAINABLE HUMAN RESOURCE PRACTICES	3	7	HATİPOĞLU	TTT	234		29.12.2017	2	
TRM 104.0	Desc.	ENVIRONMENT & TOURISM	3	5	İLHAN	FFF	234	HC 108 | H	29.12.2017	3	
ESC 504.01	Desc.	COMPUTATIONAL METHODS IN ENV. ANALYSIS	3	8	NADİM CO	FFF	234	HC 203 | H	29.12.2017	3	
ESC 516.01	Desc.	WATER&WASTEWATER TREAT.:PHYSIC-CHEM.PROC	3	8	NİLSUN İN(	TTT	678	HC 01 | HC	03.01.2018	1	

General Information

ESC 518.01	Desc.	FUNDAMENTALS OF ANAEROBIC DIGESTION PROC	3	8	BAHAR İNC	ThThTh	567	HC 01 | HC 01 | HC 01	0
ESC 306.01	Desc.	EVOLUTION	3	6	İBRAHİM R	TTTh	345	EF 03 | EF	23.12.2017	1
ESC 550.01	Desc.	INSTRUMENTAL METHODS IN ENV. ANALYSIS	3	8	ULAŞ TEZE	MMM	234	HC 203 | H	02.01.2018	3
ESC 552.01	Desc.	CHEMISTRY FOR ENV. SCIENCE & ENGINEERING	3	8	MELEK TÜF	WWW	234	HC 203 | H	20.12.2017	2
ESC 558.01	Desc.	CONCEPTS & MODELS IN ECOLOGY	3	8	ANDRZEJ F	TTT	567	HC 203 | H	29.12.2017	1
ESC 559.01	Desc.	MOLECULAR ECOLOGY&EVOLUTION	3	8	İBRAHİM R	ThThTh	678	HC 203 | H	19.12.2017	1
ESC 569.01	Desc.	MICROBIAL BIOTRANSFORMATION AND GENETICS	3	8	ULAŞ TEZE	TTT	234	HC 02 | HC	22.12.2017	2
ESC 579.01	Desc.	GRADUATE SEMINAR	0	2	ORHAN YE	F	5	ÇBETO		0
ESC 592.01	Desc.	SP.TP.METHODSAND APP.IN QSAR STUDIES	3	8	MELEK TÜF	TBA			29.12.2017	2
ESC 598.01	Desc.	SP.TP.IN ENV.SCI.STATISTICS FOR ENV.SCI	3	8	ANDRZEJ F	ThThTh	456	HC 02 | HC	19.12.2017	2
ESC 59Q.0	Desc.	SP.TP.PHYTOREMEDIATION	3	8	MOHAMM	ThThTh	678		19.12.2017	1
ESC 601.01	Desc.	PhD. SEMINAR	0	8	NİLSUN İN	MM	67	ÇBETO		
ESC 615.01	Desc.	ENVIRONMENTAL SYSTEMS MODELING	3	8	BAŞAK GÜ	ThThTh	234	HC 203 | H	29.12.2017	2

2017-2018 Spring Semester

Code.Sec	Desc.	Name	Cr.	Ects	Instr.	Days	Hours	Rooms	Exam	Sl.	Required f	Departments
CHE 465.0	Desc.	OPERATIONAL&ENVIRONMENTAL SAFETY OF CHEMICAL PLANTS	3	5	Info	HORTAÇSU	MMWW	5623	KB 428 | KB 428 | KB 428 | KB 428			
CE 491.01	Desc.	SP.TP.MULTIDISCIPLINARY DESIGN OF SUSTAINABLE COASTAL PROJECTS	3	6	Info	OTAY	MMM	678	M 1100 | M 1100 | M 1100			
CEM 515.0	Desc.	GREEN BUILDINGS	3	7	Info	ÇAMLIBEL	ThThTh	111213				
CEM 571.0	Desc.	ENVIRONMENTAL IMPACT ASSESSMENT	3	7	Info	AVCI	ThThTh	111213				
EC 317.01	Desc.	GENDER & THE ECONOMY	3	6	Info	ÖZAR	TThTh	878	İB 301 | İB 312 | İB 312			
EC 481.01	Desc.	SP.TP.CLIMATE CHANGE,ECONOMICS&POLICY	3	6	Info	KARAPINA	FFF	234	M 2170 | M 2170 | M 2170			
ESC 543.01	Desc.	TREATMENT TECHNOLOGIES	3	8	Info	BALCIOĞLU	WWW	234	HC 01 | HC 01 | HC 01			
ESC 549.01	Desc.	CLIMATE CHANGE POLICY	3	8	Info	DALOĞLU	TTT	567				
ESC 590.01	Desc.	SP.TP.IN ECOLOGICAL ECONOMICS	3	8	Info	ERTÖR AK\	MMM	678	HC 02 | HC 02 | HC 02			
ESC 59M.0	Desc.	SP.TP.SYSTEMS&SUSTAINABILITY	3	8	Info	SAYSEL	WWW	678	HC 02 | HC 02 | HC 02			
ESC 503.01	Desc.	TRANSPORT OF POLLUTANTS IN THE ENVIRONME	3	8	Info	COPTY	FFF	678	HC 203 | HC 203 | HC 203			
ESC 517.01	Desc.	WATER & WASTEWATER TREATMENT:BIOLOGICAL	3	8	Info	ERDİNÇLEF	TTT	567	HC 01 | HC 01 | HC 01			
ESC 632.01	Desc.	HAZARDOUS SUBSTANCES & MGMT. TECHNIQUES	3	8	Info	ONAY	ThThTh	234	HC 105 | HC 105 | HC 105			
ADEX568.(	Desc.	FUNDAMENTALS OF ORGANIZATIONAL SUSTAINAB	2	3	Info	AVCI	St	5				
ADEX569.(	Desc.	ENERGY&CARBON IN THE NEW ECONOMY	2	3	Info	KUMBARO	St	5				
AD 510.01	Desc.	MANAGEMENT OF ETHICAL ISSUES&SUSTAINABIL	3	6	Info	BORAK	TTT	567				
POLS329.0	Desc.	ENVIRONMENT AND POLITICS	3	5	Info	AKSOY	MMT	347	M 2170 | M 2170 | İB 201			
POLS375.0	Desc.	GENDER AND POLITICS	3	5	Info	ARAT	WWW	234	İB 103 | İB 103 | İB 103			
SOC 324.0	Desc.	POWER & INEQUALITY	3	5	Info	SİRMAN	WThTh	334	NH 302 | NH 201 | NH 201			
TRM 522.0	Desc.	ENVIRONMENT, SUSTAINABILITY & TOURISM	3	7	Info	ACAR AYTEKİN						
ESC 500.01	Desc.	ON SITE TRAINING	0	2	BURAK DEI	ThThTh	234	HC 02 | HC	23.05.201	3		
ESC 556.01	Desc.	ENVIRONMENTAL BIOLOGY	3	8	İBRAHİM R	ThThTh	567	HC 02 | HC	25.05.201	2		
ESC 557.01	Desc.	ENVIRONMENTAL MICROBIOLOGY	3	8	BERAT HAZ	MMM	678	HC 203 | H	24.05.201	1		
ESC 59F.01	Desc.	STES:GENETIC DATA ANALYS	3	8	İBRAHİM R	TTT	567		22.05.201	1		
ESC 59P.01	Desc.	SP.TP.PHYTOREMEDIATION OF ORGANIC COMPOUNDS	3	8	MOHAMM	WWW	678	HC 01 | HC	28.05.201	3		
ESC 616.01	Desc.	SURFACE WATER QUALITY MODELING	3	8	BAŞAK GÜVEN				25.05.201	2		
AD 510.01	Desc.	MANAGEMENT OF ETHICAL ISSUES&SUSTAINABIL	3	6	Info	BORAK	TTT	567				
POLS329.0	Desc.	ENVIRONMENT AND POLITICS	3	5	Info	AKSOY	MMT	347	M 2170 | M 2170 | İB 201			
POLS375.0	Desc.	GENDER AND POLITICS	3	5	Info	ARAT	WWW	234	İB 103 | İB 103 | İB 103			
SOC 324.0	Desc.	POWER & INEQUALITY	3	5	Info	SİRMAN	WThTh	334	NH 302 | NH 201 | NH 201			
TRM 522.0	Desc.	ENVIRONMENT, SUSTAINABILITY & TOURISM	3	7	Info	ACAR AYTEKİN						
TRM 104.0	Desc.	ENVIRONMENT & TOURISM	3	5	Info	İLHAN	WWW	567	HD 101 | HD 101 | HD 101			
ESC 500.01	Desc.	ON SITE TRAINING	0	2	BURAK DEI	ThThTh	234	HC 02 | HC	23.05.201	3		
ESC 550.01	Desc.	INSTRUMENTAL METHODS IN ENV. ANALYSIS	3	8	ULAŞ TEZE	MMM	234	HC 02 | HC	25.05.201	3		
ESC 552.01	Desc.	CHEMISTRY FOR ENV. SCIENCE & ENGINEERING	3	8	MELEK TÜI	WWW	234	HC 02 | HC	18.05.201	2		
ESC 556.01	Desc.	ENVIRONMENTAL BIOLOGY	3	8	İBRAHİM R	ThThTh	567	HC 02 | HC	25.05.201	2		
ESC 557.01	Desc.	ENVIRONMENTAL MICROBIOLOGY	3	8	BERAT HAZ	MMM	678	HC 203 | H	24.05.201	1		
ESC 558.01	Desc.	CONCEPTS & MODELS IN ECOLOGY	3	8	ANDRZEJ F	ThThTh	567	HC 203 | H	24.05.201	1		
ESC 569.01	Desc.	MICROBIAL BIOTRANSFORMATION AND GENETICS	3	8	ULAŞ TEZE	TTT	234	HC 105 | H	28.05.201	1		
ESC 579.01	Desc.	GRADUATE SEMINAR	0	2	ORHAN YE	F	5					
ESC 598.01	Desc.	SP.TP.IN ENV.SCI.STATISTICS FOR ENV.SCI	3	8	ANDRZEJ F	TTT	345	HC 02 | HC	26.05.201	1		
ESC 59F.01	Desc.	STES:GENETIC DATA ANALYS	3	8	İBRAHİM R	TTT	567		22.05.201	1		
ESC 59P.01	Desc.	SP.TP.PHYTOREMEDIATION OF ORGANIC COMPOUNDS	3	8	MOHAMM	WWW	678	HC 01 | HC	28.05.201	3		
ESC 601.01	Desc.	PhD. SEMINAR	0	8	NİLSUN İN	MM	67		25.05.201	2		
ESC 616.01	Desc.	SURFACE WATER QUALITY MODELING	3	8	BAŞAK GÜVEN				25.05.201	2		