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MARMARA ÜNİVERSİTESİ

AVRUPA BİRLİĞİ ENSTİTÜSÜ

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CAMPUS SUSTAINABILITY IN THE EUROPEAN UNION AND TURKEY: DEVELOPING A HOLISTIC APPROACH IN TURKEY

DOKTORA TEZI

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ONAY SAYFASI

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ABSTRACT

Higher Education Institutions (HEIs) should be responsible for the needs of global sustainability because HEIs play an essential role in society, creating new knowledge and fostering innovation. The sustainable campus concept has been rising among HEIs in the world since the 1980s, and different implementations have started in many Member States of the European Union (EU) both at legal and voluntary levels. However, HEIs in Turkey have been lagging behind. In this regard, this thesis highlights the importance of campus sustainability by examining HEIs in the EU and Turkey in the context of energy outlook, approaches to energy efficiency and energy efficiency in buildings. Energy consumption on university campuses, particularly, is considered one of the most important components of campus sustainability. A comparison of EU HEIs and a case study in Turkey demonstrate how HEIs could play a role in responding to national challenges in energy issues in the context of campus sustainability, as European HEIs are far beyond the Turkish HEIs. In addition, even though energy consumption is important in campus sustainability, a university should take a holistic approach to environmental, social and economic aspects of sustainability and develop a campus sustainability strategy and road map to be successful. In this regard, the KU Rumelifeneri Campus is chosen as a campus sustainability case study to develop a holistic approach in Turkey demonstrating how Turkish HEIs could support Turkey's harmonization process to the EU through successful sustainable campus implementations. The KU sustainable campus strategic plan and road map were developed and suggestions were made based on campus sustainability criteria. Results indicate that campus sustainability at KU should be beyond green as the university has already made strong commitments on environmental, social and economic aspects of sustainability.

ÖZET

Yeni bilgi oluşturmada ve yaratıcılığı teşvik etmede toplumda önemli bir yere sahip olan Yüksek Öğretim Kurumları küresel sürdürülebilirliğin ihtiyaçlarından sorumlu tutulmalıdırlar. 1980'lerin başından beri dünyada çevresel duyarlılığın artması ile gelişmeye başlayan sürdürülebilir kampüs konsepti Avrupa Birliği (AB) Üye Ülkeleri'nde de hem yasal çerçevede hem de gönüllü uygulamalar ile hayata çoktan geçmiştir. Türk Yüksek Öğretim Kurumları bu gelişmelere karşılık verememiştir. Bu tez sürdürülebilir kampüs konseptini tanıtırken, bu konseptin önemli bir parçası olan kampüslerde enerji tüketiminden yola çıkmış ve AB ve Türkiye'de enerji, enerji verimliliği ve binalarda enerji verimliliğini incelemiştir. Yüksek Öğretim Kurumlarının ulusal bir sorun olan enerji konusuna yaklaşımları sürdürülebilir kampüs uygulamaları çerçevesinde incelendiğinde AB'deki üniversitelerin Türkiye'deki üniversitelere göre oldukça ileride oldukları tespit edilmiştir. Ayrıca, tez sürdürülebilir kampüs uygulamalarının başarılı olması için Yüksek Öğretim Kurumlarının sürdürülebilirliği çevresel, sosyal ve ekonomik boyutu ile bütünsel bir yaklaşım ile ele almaları gerektiğini, sürdürülebilir kampüs starteji ve yol haritasının önemini savunmaktadır. Bu bağlamda, Koç Üniversitesi (KU) Rumelifeneri Kampüsü'nün vaka analizi yapılarak, KU için sürdürülebilir kampüs stratejik plan ve yol haritası geliştirilmiş Türkiye'nin AB uyum sürecini desteklemek için Yüksek Öğretim Kurumlarının sürdürülebilir kampüs uygulamalarını nasıl kullanabilecekleri gösterilmiştir. Bu çalışma sonucunda KU'nun çevresel, sosyal ve ekonomik sürdürülebilirlik kapsamında var olan taahhütlerini kolaylıkla ileri götürerek Türkiye'de bütünsel yaklaşımı uygulayan bir sürdürülebilir kampüs olabileceği tespit edilmiştir.

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ABBREVIATIONS

AASHE	Association for the Advancement of Sustainability in Higher Education
ALIS 350	Academic and Life Skills
ALTENER	The Sub-Programme of the Intelligent Energy
ANU	Australian National University
ARUP	American Agricultural Group
AT	Austria
BE	Belgium
BEP	Energy Performance Regulation in Buildings
BEST Cert	Building Energy Standards-Tool for Certification
BG	Bulgaria
BIH	Bosnia and Herzegovina
BITC	Business in the Community's Environmental Index
BRE	Building Research Establishment Ltd.
BREEAM	Building Research Establishment Environmental Assessment Method
CARNOT	EC Program promoting clean technologies
CASE	College of Administration Sciences and Economics
CCS	Carbon Capture and Storage
CE	College of Engineering
CEMS MIM	CEMS Master's in International Management
CFA	Chartered Financial Analyst
CH	Switzerland

CH4	Methane
CHP	Combined Heat and Power
CIP	Competitiveness and Innovation Funding
CIT	Computer Information Technology
CO2	Carbon Dioxide
COOPENER	The external component of the first Intelligent Energy Europe (IEE) Programme
COPERNICUS	University Charter for Sustainable Development
CSSH	College of Social Sciences and Humanities
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EA 17	Euro Area (17 countries)
EA	Euro Area (Changing Position)
EAP	European Environmental Action Plans
EAUC	Environmental Association for Universities and Colleges
EC	European Commission
ECCP	European Climate Change Program
ECSC	European Coal and Steel Community
EE	Estonia
EEA	European Environmental Agency
EEC	European Economic Community
EEE-F	European Energy Efficiency Fund
EEPR	European Energy Program for Recovery

EEPRD	European Programme for the Reconstruction and Development
EHEA	The European Higher Education Area
EL	Greece
EMS	Environmental Management System
ENTEK KUAS	Turkish Energy Company
ENVER	Energy Efficiency Program in Turkey
ENVERDER	Energy Efficiency Association
EPA-NR	Energy Performance Assessment for Existing Non Residential Buildings
EPBD CEN	Energy Performance of Buildings Directive European Committee for Standardization
EPBDs	Energy Performance of Buildings Directives
EPCs	Energy Performance Certificates
EPFL	Ecole Polytechnique Federal de Lausanne
EREC	European Renewable Energy Council
ES	Spain
ESCOs	Energy Service Companies
ETH Zurich	Swiss Federal Institute of Technology Zurich
EU 27	EU (27 countries)
EU ETS	EU Emissions Trading System
EU	European Union
EUR	Erasmus University of Rotterdam
EURATOM	European Atomic Energy Community
EUSEW	EU Sustainable Energy Week
FI	Finland
FR	France

GDP	Gross Domestic Products
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIA	Gross Internal Area
GRI	Global Reporting Initiative
GSB	Graduate School of Business
GSSH	Graduate School of Social Sciences and Humanities
GSVC	Global Social Venture Competition
GWh	Gigawatt Hours
HEIs	Higher Education Institutions
HR	Croatia
HU	Hungary
HVAC	Heating, Ventilation, and Air Conditioning
IE	Ireland
IEA	International Energy Agency
IEE	Intelligent Energy - Europe
IFIs	International Financial Institutions
IMSAD	Association of Turkish Construction Material Producers
INOGATE	Interstate Oil and Gas Transport to Europe
IPA	Instrument for Pre-Accession Assistance
IS	Iceland
ISCN	International Sustainable Campus Network
ISO	International organization for Standardization
IT	Information Technology
IT	Italy

IZODER	Association of Thermal Insulation, Waterproofing, Sound Insulation and Fireproofing Material Producers, Suppliers and Applicators
JP	Japan
kcal	Kilocalories
KFW	Kreditanstalt für Wiederaufbau
kg	Kilogram
KOÇ MIM	KOÇ Master's in International Management
KOLT	Koç Office of Learning and Teaching
KU	Koç University
KUSIF	Koç University Social Impact Forum
KUTEM	Koç University Tüpraş Energy Center
kWh	Kilowatt-hour
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
LIFE	Learning in Future Environments
LPG	Liquefied Petroleum Gas
LT	Lithuania
LU	Luxembourg
LV	Latvia
ME	Montenegro
MER	Market Exchange Rates
METU	University of Middle East Technical University
MK	Former Yugoslav Republic of Macedonia
MT	Malta

MTOE	Million Ton Equivalent Petrol
MW	Megawatt
N2O	Nitrous Oxide
NEEAPs	National Energy Efficiency action Plans
NGOs	Non-governmental Organizations
NIHAnkara	Netherlands Institute for Higher Education Ankara
NL	Netherlands
NO	Norway
NPAA	National Programmes for the Adoption of the EU Acquis
OECD	Organization for Economic Co-operation and Development
OIP	Office of International Programs
OPEC	Organization of the Petroleum Exporting Countries
PHARE	Poland and Hungary Assistance for the Restructuring of the Economy
PL	Poland
ppm	Parts per million
PPP	Purchasing Power Parity
PPPs	Public-Private Partnerships
PRIME	Principles of Responsible Management Education
PT	Portugal
RED	Renewable Energy Directive
RES	Renewable Energy Sources
RO	Romania
RS	Serbia
RTD	Research and Technology Development

SAVE	Specific Actions for Vigorous Energy Efficiency
SE	Sweden
SEA	Single European Act
SEERF	The South East Europe Electricity Regulation Forum
SET-PLAN	European Strategic Energy Technology Plan
SI	Slovenia
SK	Slovakia
STARS	Sustainability Tracking, Assessment & Rating System
STEER	The sub-programme of the Intelligent Energy
TACIS	Technical Assistance to the Community of Independent States
TAP	Association of Battery Manufacturers and Importers
TAs	Teaching Assistants
TEN-E	Trans-European Networks for Energy
TEVEM	Turkish Energy Efficiency Assembly
TOE	Ton Equivalent Petrol
TOKI	Ministry of Public Works and Settlements, Housing Development Administration
TR	Turkey
TRACECA	Transport Corridor Europe- Caucasia-Asia
TSKB	Industrial Development Bank of Turkey
TTO	Technology Transfer Office
TUDelft	Delft University of Technology
TÜSİAD	Turkish Industry and Business Association
U28	EU (28 countries)
UBC	University of British Columbia

UCM	Universidad Complutense de Madrid
UEA	University of East Anglia
UK	United Kingdom
UM	University of Michigan
UN	United Nations
UNCED	Rio Conference
UNDP	United Nations Development Programme
UNLV	University of Nevada Las Vegas
UoS	University of Southampton
UPC	Technical University of Catalonia
UPM	Universidad Politecnica de Madrid
US	United States
USA	The United States of America
UTS	University Technology of Sydney
WCC	Waste Collection Center
WEC-TNC	World Energy Council Turkish National Committee
WEO	World Energy Outlook
YURTKUR	Higher Education Credit and Dorms Institutions

1 INTRODUCTION

The notion of sustainability has become important in our lives as communities; cities, buildings, production, consumption, transportation, campuses, food and energy have been in transformation towards sustainability because all are important aspects of sustainable economic, social and environmental development. The global system needs a radical change for the needs of global sustainability with the collaboration of all stakeholders. No doubt that Higher Education Institutions (HEIs) should be one of the important stakeholders of this change and be responsible for the needs of global sustainability because HEIs play an essential role in society, creating new knowledge, and fostering innovation. They are part of the global energy transformation, climate change and social change because they educate millions of young people and they are consumers with their big campus communities and campuses. Thus, "campus sustainability" should be included in strategies of the HEIs. Campus sustainability has been on the agenda of most universities in North America and the European Union (EU) due to an increase in environmental awareness after the 1980s. In addition, world and national energy agendas, and general tendency towards more clean technologies affected also HEIs to consider campus sustainability. As a consequence, the sustainable campus concept has arisen among HEIs, and different implementations have started in many countries especially in North America and EU Member States. European universities have come together to support sustainable development in education since the early 1990s by signing the COPERNICUS University Charter for Sustainable Development in 1993, which is a response to the Rio Conference (UNCED) in 1992, and establishing the network called COPERNICUS CAMPUS. By the announcement of the Guidelines, 320 universities from 38 countries including universities from Turkey have signed the Charter since 1993; thus, the Guidelines can support them for curricula development, institutional management, establishing services for local or regional societies, and for having a responsible balance between economic, ecological and social/cultural aspects (Copernicus Campus, 2007 p.6). Even though there are some universities signing this charter, Turkish universities have been lagging behind the

European universities in sustainable campus implementations. Additionally, campus sustainability is important for Turkish universities to support Turkey in the EU harmonization process.

Even though there is not already a set definition of “sustainable campus” in the world, components of a sustainable campus could be generalized to develop a holistic approach such as: campus management (energy consumption, on-site renewable, energy efficiency, waste and recycling, sustainable campus development of housing and buildings, water management, transportation, procurement, landscape, food); research; education and outreach (curriculum, programs, community engagements); development and implementations of sustainable campus policies and efforts in the campus; social sustainability and economic sustainability.

Every component is important for the holistic approach but energy efficiency in buildings in the sustainable campus could be an important priority especially in Turkey, where energy issues are national priorities. Energy consumption in every university campus is very high; that is why energy efficiency becomes one of the most important components to be addressed for campus sustainability. Energy efficiency strategies and implementations on campus should be active in buildings as the buildings have the highest percentage of the energy consumption in the campus with heating, cooling, and lighting. Indeed, buildings have high and untapped energy saving potential. Energy efficiency in buildings should be prioritized to become a sustainable campus.

HEIs are very important stakeholders to increase energy efficiency in the country through their implementations for campus sustainability. Through campus sustainability, HEIs can raise responsible generations during their education to be aware of the limited energy sources, to decrease energy consumption and improve the environmental impact of the university through energy efficiency programs on campus.

To understand the role of energy efficiency in buildings in becoming a sustainable campus, it is important to understand driving forces, implementations, and as well as regulations in the background. That is why it is important to understand the energy outlook, energy efficiency approaches, and energy efficiency in building regulations and implementations in the European Union and Turkey. Besides

regulations that university campuses should implement such as in the case of energy efficiency and energy efficient buildings, there are various local, national and international voluntary ratings, initiatives, and networks to promote a sustainable campus approach in the EU, which all take energy consumption of the campus as one of the main criteria. Universities show their commitment to having a sustainable campus by applying these ratings and networks. Especially leading universities in the EU as well as in the world put sustainability in their core strategies and become an example to other universities. Most of these universities have put sustainability at the core of their ethos and university wide strategies. Some universities publish detailed reports, environmental policy declarations, sign charters, and become part of the sustainable campus network as well as put strategic aims, objectives and key performance indicators to be a sustainable campus.

Successful universities in the EU and the world in sustainability are the ones which take a holistic approach and develop strategies not focused on short term barriers but oriented with long-term goals. Thus, even though energy consumption, energy efficiency, and energy efficiency in campus buildings are very important, a university should take a holistic approach and develop a campus sustainability strategy and a road map to be successful in campus sustainability. Unless universities adopt a holistic approach regarding campus sustainability in every aspect of social, economic and environmental sustainability, they cannot reach their goals to decrease energy consumption on the campus or trigger behavioral change towards the use of energy efficiently within the campus community. Campus communities should see the big picture of campus sustainability in order to support or engage in campus sustainability measures and improvements in the campus.

This thesis evaluates sustainable campus, energy efficiency in the sustainable campus, energy outlook, an energy efficiency approach and energy efficiency of buildings in the EU and Turkey, sustainable campus ratings and networks in the EU and Turkey, sustainable campus examples in the EU and Turkey. Additionally, Koç University (KU) Rumelifeneri Campus is taken as an example of a sustainable campus in Turkey to guide universities on how to develop a holistic approach to campus sustainability in Turkey since Turkish universities are at the stage of environmental sustainability in campus operations. That is why it is crucial to demonstrate a case with

a holistic approach to campus sustainability to be an example for other Turkish universities. KU is chosen as an example because of access to and availability of data, willingness from the senior management to collaborate, and already existing programs and units that could easily support developing a holistic approach to campus sustainability.

2 THEORETICAL STUDY

Sustainability issues and discussions do not have a long history but have become part of our lives during the last several decades. Many people have been trying to define what sustainability is. Even though there are differences among sustainability definitions, most of the definitions have three important common points. First, sustainability definitions emphasize that humans need to live within the limits of what the environment can provide. Second, sustainability definitions focus on the various interconnections between economy, society and environment. Third, sustainability definitions emphasize that resources and opportunities in the world should be distributed equally.

Indeed, sustainability as a term became widely used after the The Brundtland Report in 1987. The Brundtland Commission's report defined sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (www.unece.org, 2013). The Global Reporting Initiative (GRI) (www.globalreporting.org, 2013), which is a worldwide reporting system, defines sustainability based on economics, society and environment.

Humans need to fulfil their existing needs without compromising the ability of future generations to meet their own needs. So, the question is how to prioritise our needs without putting in danger the needs of future generations? In addition, resources such as environment, technology, finance, capacity and timing are limited. Lastly, social and cultural issues are involved in the parameter as the problem of fairness arises in exploiting human rights in one part of the world to fulfil existing needs with cheaper prices in another part of the world.

In short, sustainability and sustainable development has entered the discussions because the world has been changing. Some of the actors behind this change are as follows:

Increased population: The population has been growing rapidly, and according to the United Nations (UN), the current world population of 7.2 billion will reach 8.1 billion in 2025 and 9.6 billion in 2050 (UN, 2013, p.1).

Increased wealth and economic growth: Developing countries have been taking the place of developed countries in high population and economic growth. The population growth will occur mostly in the developing countries triggering over 90.0% of the global energy demand growth (BP, 2013a, p.9) in the coming future. According to the GDP Ranking of the World Bank, the five big GDP countries in purchasing power parity (PPP) terms are the U.S., China, India, Japan, and the Russian Federation in 2012 (www.worldbank.org, 2013). By 2035, the 5 big economies based on GDP in PPP terms will be China, India, U.S., Brazil, and Japan. China is projected to overtake the US as the largest economy by 2017 in PPP terms (PwC, 2013, p.9).

More demand for mobilization: The world has been mobilizing as a consequence of economic growth and increased population and the number of cars on the roads will be doubled by 2050 (International Energy Agency, 2012, p.90).

Increased access to electricity: Electricity will be accessible to 90.0% of the world population by 2050. At present, 1.6 billion people do not have access to electricity.

However, the world has limited resources to provide the necessary energy for a more mobilized, economically growing and more populated world with increased needs.

That is why, to understand the role of campus sustainability in the big picture, the results of the theoretical study are presented in six main topics with sub headings, giving a detailed look on energy:

- ✓Sustainable Campus
- ✓Energy Efficiency in the Sustainable Campus
- ✓Energy Outlook and Energy Efficiency of Buildings
  - ✓ Energy Outlook

- ✓ Energy Efficiency Approach and Energy Efficiency in Buildings in the European Union
- ✓ Energy Outlook, Energy Efficiency Approach and Energy Efficiency in Buildings in Turkey

✓Sustainable Campus Ratings and Networks in the EU and Turkey

✓Sustainable Campus Examples in the EU and Turkey

✓Sustainable Campus Literature Review

2.1 Sustainable Campus

Due to an increase in environmental awareness after the 1980s, the world and national energy agendas, and a general tendency towards more clean technologies the sustainable campus concept has arisen among HEIs, and different implementations have started in many countries. The campus is the physical environment of an HEI. However, in addition to the physical environment, education, research, and the community should be included in campus sustainability. In fact, community as the university community (administration, faculty, students) and the local community, campus operation, education, and research should collaborate (www.sustainablecampus.org, 2012).

There is no already set definitions of “campus sustainability” that people have agreed on. In general, universities define their own sustainable campus definition (www.wpi.edu, 2012). Primarily, the start of sustainability was to focus on environmental sustainability and implementations in campus operations (http://sustainability.tufts.edu, 2012).

Richard R. Johnson, Director of Energy and Sustainability at Rice University, describes the current situation as that “Green” campuses or “Sustainable” campuses are two terms which people tend to use interchangeably. Furthermore, the focus tends to be primarily on environmental sustainability, not social or economic sustainability (Johnson, 2012). This is true regardless of whether HEIs are using the phrase “campus greening” or “campus sustainability” to describe the works in the campus. On the other hand, “campus sustainability” could be preferred over “campus greening” because

“campus sustainability” at least implies that social and economic sustainability are included along with environmental sustainability, although not always with equal emphasis. In contrast, “campus greening” does not necessarily imply social or economic sustainability – it is even more strongly environmental in focus. Unfortunately, there is no standard definition of sustainability in the university campuses, unlike in other professions or topical areas.

HEIs play an essential role in society, creating new knowledge and fostering innovation. They are the part of global energy transformation and climate change because they educate millions of young people for their future lives, as well as being one of the main energy consumers. Thus, the sustainable campus concept should be included in strategies of the HEIs.

University campuses are small and sometimes medium sized villages having direct and indirect effects on their environments, with facilities such as sport centres, large faculty buildings, dormitories, laboratories, parking lots, classrooms and offices. The university President is the Mayor of this academic town. So, HEIs are responsible to their students, faculty, alumni, as well as to the local community and the nation.

A university should be a model for sustainability. There are many components to develop a holistic approach on a sustainable university campus. The social side is as important as the technical side in campus sustainability. Campus sustainability is not the responsibility of only administrative management but the responsibility of all stakeholders in the campus: students, staff and faculty.

The so-called campus sustainability or campus greening action started in the early 1990s (Sharp, 2009, p.2). In many cases, sustainability actions on campus started small with student volunteers or small class projects supported by faculty teaching the classes and by time grew to become sustainability programs on campus. Indeed, these initiatives became the driving force for establishing sustainability committees in universities, and developing a sustainability strategy for a university to be accepted by the university top management. A sustainability strategy even became the core of main strategies in some universities. University top and middle management defined their

own road maps to become a sustainable campus. Universities mostly started green with an aim to become a sustainable campus. In this path, some prioritized energy efficiency programs to decrease energy consumption in the campus; some developed waste and recycling programs in the campus; some focused on transportation programs; some developed community integrated programs for students However, a few universities have made a real commitment towards sustainable campus, and have become successful in developing sustainability strategies, creating a sustainability culture, and implementing these strategies through an operating, learning and community involvement.

A general criteria that universities seem to follow to become a sustainable campus and a living laboratory for students are gathered under the main components of environmental sustainability: campus management such as energy and climate change, renewable, sustainable campus development of housing and buildings, water management, waste & recycling; transportation, procurement, landscape; research; education and outreach; development and implementation of sustainability policies and efforts on the campus as well as social and economic sustainability (www.tilburguniversity.edu, 2011; www.greenstudentu.com, 2011; www.drcetiner.org, 2011; www.nottingham.ac.uk, 2011a; The University of Nottingham, 2010; ww.drcetiner.org, 2011). A short description of selected campus sustainability follows:

Environmental Sustainability

Management of the campus is very challenging, where the President of the school has to act as a kind of Mayor of this academic town. Usually, administrative staff work for the management of the campus under the General Secretary, the Vice President responsible for campus administration, or staff scattered in different departments. In fact, to be an energy efficient and sustainable campus, campus management plays an important role regarding energy usage, carbon emission, usage of renewable energy sources and green technologies, sustainable campus development for housing and building, waste and recycling, water management, transport, procurement, and landscape. These activities are mostly related with infrastructure investment, strategic planning and programming, and as well as campus management.

Energy consumption is equal money and usually takes a major portion of the university budget. If the university consumes less energy, this budget portion could be used to increase education quality. Public schools have limited resources and take their budgets from the government. So, decreasing energy consumption on the campus, as well as using energy efficiently, is a large commitment for public schools. On the other hand, private schools could charge less tuition to their students by consuming less energy and spending less money for their energy needs. There is an important economic role of energy consumption on the campus, while less energy consumption also means less carbon release harmful to the environment. Energy consumption produces the most significant environmental impact associated with campus operations. Continuous maintenance of the existing energy technologies, long term energy investment for the school, and as well as renewing current technologies with more energy efficient technologies are important to decrease energy consumption and carbon release on a campus. Energy management on a campus is a challenging task. HEIs should have comprehensive climate change and energy plans to cope with the energy issues on campus.

Campuses have the options of using *on-site renewables* and installing solar, wind, biomass energy systems to decrease energy consumption and support climate change action. Providing the needed energy as much as possible from the renewable energy sources is critical for campus sustainability. Renewable energy should always be included in the main energy and climate change strategy of the campus. Assessments of wind energy resources, solar energy resources and biomass energy resources should be conducted to see their feasibility. There are some prejudices about renewable energy as they are costly investments; however, there are many best practices where renewable energy projects could save money, as well as create profit for a university.

Sustainable campus development of housing and buildings are important components of campus greening and energy efficiency. Universities have many facilities such as sport centres, large faculty buildings, dormitories, laboratories, parking lots, classrooms, offices. Thus, there is a need to operate campus buildings and equipment in an energy-efficient manner and to employ conservation measures

wherever possible (Simpson, 2003, p.2). In a sustainable campus concept, university buildings are evaluated based on their environmental effect and energy performance. Indeed, buildings should use energy efficiently to decrease their environmental impact. Most energy efficiency outreach programs are focused on campus buildings.

Water management in campus sustainability means managing available water resources to meet university needs while preserving ecological systems and maintaining this vital non-renewable resource for future generations (http://sustainablestanford.stanford.edu, 2013a). In addition, historically, water efficiency is not something that the universities are focused on but, it is changing (www.uea.ac.uk, 2013a). So, water efficiency is crucial for sustainable water practices on campus. That is why an increasing number of universities practice water conservation programs. Key performance indicators for water are total water consumption, water consumption per student and CO2 emissions from water use and waste water on campus. In addition to technological investment such as dual flush & sensor based toilets, drip irrigation systems, rain sensors, self-charging, hand-free faucets, and other water efficiency retrofit projects regarding water management, there are also innovative initiatives supporting sustainability programs requiring community contribution on campus such as "trayless dining" (ARAMARK Higher Education, 2008, p.2) saving between one third and one half gallon of water per tray, besides other benefits reinforcing sustainability in the campus (www.bu.edu/sustainability, 2013a).

Waste and Recycling differs from medical waste, lab waste, infirmary waste, home waste, plastic, aluminium, glass, paper, and steel on a campus. Following the waste hierarchy of the three Rs, "Reduce, Reuse and Recycle", some universities have more programs on recycling, but mostly ignore other two Rs: Reduce and Reuse. With increasing environmental regulations, developed countries and developing countries as well have put regulations on waste management into effect. Of course, university management should obey these regulations, as well as develop waste and recycling programs on campus.

Transportation means burning fossil fuels, causing green gas emissions and increasing dependence on energy from fossil fuels. Richardson (Richardson, 2007, p.1)

defines a sustainable transportation system as one in which fuel consumption; vehicle emissions, safety, congestion, and social and economic access are of such levels that they can be sustained into an indefinite future without causing great or irreparable harm to future generations throughout the world. Ways of *transportation on campus* varies depending on the physical location of the campuses, whether urban or rural. Transportation to the campus causes disturbance to teaching, auto-related air pollution, energy consumption, generates traffic, and may well trigger health problems (Balsas, 2003, p.36). In addition, parking lots on campus could be used in green areas instead of parking. Besides the environmental impact of transportation for the campus community, the local community is also affected by campus transportation. Because the major factors in transportation planning is land use and distance (Parker and Fields, 2012, p.1), university campuses should develop sustainable transportation strategies as promoting walking, bicycling, using mass transport vehicles, ridesharing, discouraging the use of single-occupancy cars, and linking transportation planning to land-use planning (Balsas, 2003, p.37). *Green Procurement* known as green purchasing, eco-procurement, or environmentally preferred purchasing (Hignite and Lyons, 2008, p.177) adds a third criteria of being environmentally friendly in addition to price and performance while purchasing services and materials. In general, green procurement is one of the areas that HEIs are less involved in due to the absence of a purchasing department, decentralized purchasing through departments and faculties, and lack of knowledge to ask the right questions to the suppliers. Greening a process is as important as using a green product. Greening could be achieved through environmentally and socially preferable products and services, and working with contractors and suppliers who could provide these requirements. In a university, thousands of purchasing transactions are done in a year so, developing sustainable procurement policies and implementing them could create a real change; for example, purchasing recycled content products, using environmentally preferable products and services, bio-based products, energy and water-efficient products, operating alternate fuel vehicles, buying products using renewable energy, and disposing solid waste (www.purchasing.upenn.edu, 2013).

Sustainable landscaping is a way of designing and maintaining yards, gardens and landscapes in a way that reduces harm to the environment, provides healthier places

to work, live, and play, and saves time and money by offering reduced maintenance (www.harford.edu, 2013). Indeed, creating a healthier environment for study, work, and leisure on campus decreases stress and the daily routine of pressure (Lau and Yang, 2009, p.55). Sustainable landscaping services are a combination of activities related to ecology, personal health and enhancement of educational value. Some examples of these activities are integrated pest management, habitat restoration projects, campus gardens, organic landscaping programs, applying natural design principles, yard waste composting, irrigation systems, campus as a botanical garden, and outdoor classrooms.

Research on Sustainability is a part of research which is a major function of HEIs. By researching sustainability issues and refining theories and concepts, higher education institutions can continue to help the world understand sustainability challenges and develop new technologies, strategies, and approaches to address those challenges (AASHE, 2012, p.65). *Research* is a piece of every component of a sustainable campus. Integrating research in these components is an important way of creating a living laboratory on campus. Each university should define sustainability research and engage faculty in this research.

Education and Outreach are again important pieces of every component of campus sustainability. HEIs incorporate sustainability into the curricula or expand the curricula. Additionally, increasing awareness on campus sustainability and supporting behavioral change of the campus community are done via such actions as innovative programs, community engagement, effective communication, guidance on green jobs or third sectors..

Development and implementation of campus sustainability policies on campus are needed to build governance structure on campus. Some people should develop the policies, plans and s others should implement the plans. Sustainability coordination and monitoring is essential to further the sustainability on campus

Social sustainability and economic sustainability

Social sustainability and economic sustainability of campuses are barely discussed directly, as many schools focus on environmental sustainability of the

campus. However, effective investment and management of a sustainable campus bring economic sustainability to the campus as saving energy, producing less waste, or even selling recycled products, resulting in budget savings for education and research. On the other hand, social sustainability of the campus includes public engagement with the local community, transparent and democratic investment processes promoting accountability, and engagement by the campus and community (AASHE, 2012, p.264); diversity, affordability, fairness and equity, campus inclusion incorporation of sustainability into HR programs and activities as well as fostering social innovation on campus through education, research and collaboration to create social impact.

None of the major components of campus sustainability can be ignored to create successful sustainable campus cases. However, energy use is the most important issue within a university's sustainability efforts because it is affected by indefinite market volatility and can reduce operating costs and CO2 emissions, which contribute to climate change (www.bu.edu/sustainability, 2013b). Consequently, among the environmental sustainability components of a sustainable campus, energy management on campus requires the most investment, commitment, long term planning, as well as community involvement on campus. Many universities have comprehensive climate change and energy plans to reduce greenhouse gas (GHG) emissions, making energy management programs a priority in these universities.

Indeed, an effective energy management must contain energy efficiency programs. As campuses have many facilities such as sport centers, large faculty buildings, dormitories, laboratories, parking lots, classrooms, offices, dining halls, and cafeterias, energy efficiency in buildings becomes prominent in effective energy management on a sustainable campus. Potential cost savings as a result of energy efficiency could be redirected to research and education. The next section reviews energy efficiency in the sustainable campus.

2.2 Energy Efficiency in the Sustainable Campus

Delivering goods and services more efficiently and using less energy are the core components of today's efforts to reduce carbon emissions, as well as to cope with energy challenges (Cullen and Allwood, 2010, p.75). "Sustainability," in reference to energy and environmental activities, is often defined as provisions that meet the needs of the present without compromising the ability of future generations to meet their needs (Lattanzio, 2011, p.1). Energy efficiency and renewable energy are perfect complements to each other as they are the two components of a working sustainable energy economy. Renewable energy is provided from natural undeletable sources such as hydroelectric, solar, wind, geothermal, biomass, and tidal while energy efficiency as "the new form of energy" or "low-hanging fruit" has been accepted as the most secure and sustainable energy. Even though it is slow, there is a global trend to persistently decarbonize the world's energy systems to create low carbon economies by using carbon free energy. This trend has already created "a green economy" by the development and deployment of clean, renewable energy and energy efficiency technologies and millions of "green-collar jobs" worldwide.

The use of energy efficiently is a must to control the energy demand, but cost-effective energy efficiency options are often overlooked, causing an "energy paradox" (Cullen and Allwood, 2010, p.75; Green, 2010, p.608). Energy efficiency involves three fundamentals. First, unless energy is used efficiently, the increased use of carbon free renewable energy sources cannot decrease the use of fossil energy resources. Second, even though there is an untapped potential of energy efficiency to reduce energy demand, the current rate of energy efficiency improvement is not nearly enough to overcome the other factors driving up energy consumption, accelerating the increase of CO2 emissions from economic growth, and heading toward an unsustainable future (International Energy Agency, 2008a, p.3). Third, energy efficiency cuts down energy consumption, which means that less GHG emission is produced. So, this new energy source provides countries extra time to decarbonize their economies and heavy industries. Modern energy systems should be designed and constructed to become more

efficient and diversified, and productivity improved by shifts in economic mix and modification in behavior (Abulfotuh, 2007, p.276).

At present, even though the persevering uncertainty about the mid-century carbon emissions target influences the current and future low carbon energy investment decisions of the energy producing firms (Durand-Lasserve and others, 2010, p.5108),the global trend of decarbonization of the energy systems has already started. Thus, sustainable campus implementations and outreach programs have become even more important in using energy efficiently for decarbonization of the energy systems on university campuses.

HEIs are important stakeholders in the energy efficient reality of the nation through their activities on sustainable campuses not only to raise responsible generations aware of the limited energy sources but also to implement energy efficiency programs to decrease energy consumption, as well as decrease the environmental impact of the institution.

Energy efficiency and savings on a campus could be possible in many areas such as electricity consumption, heating, cooling, lighting, transportation, lab processes, and buildings. Universities implement energy efficiency programs to increase energy efficiency and decrease energy consumption on campus. Energy efficiency and conservation strategies are summarized as : conducting building energy conservation retrofits, incorporating energy efficiency and energy conservation in new construction, implementing energy efficiency and saving awareness & outreach programs, incorporate energy efficiency and conservation goals in master planning and implementing cogeneration (Walton, 2008, p.59).

Energy efficiency strategies and implementations on a campus should be active mostly in buildings as the buildings have the highest percentage of the energy consumption on campus with heating, cooling and lighting and most importantly, buildings have a high and untapped energy saving potential. Energy efficiency in buildings should be prioritized to become a sustainable campus. Various rating systems are used for energy efficiency in buildings; many university campuses take these

certifications for their campus buildings. The most commonly used certification internationally is the U.S. Green Buildings Council's Leadership in Energy and Environmental Design (LEED) rating system to lower operating costs, reduce waste, conserve energy and water, and create healthier and safer environment for the occupants (www.usgbc.org/leed, 2013). Many American universities use LEED for their campus buildings to show that their silver, gold and platinum rated buildings are energy efficient and environmentally friendly. Europe has no common EU certification for buildings, but does have heavy regulations. Each country has its own certification on energy efficient buildings. The most well-known is BREEAM in the U.K., which is the design and assessment method for sustainable buildings. As a result, university campuses in Europe mostly use their locally developed or national certifications for their buildings.

The next section discusses energy efficiency in buildings for a sustainable campus.

2.3 Energy Outlook and Energy Efficiency in Buildings

This section provides detailed information on energy outlook and energy efficiency implementations in the European Union and Turkey to give an understanding of the role of energy efficiency in buildings.

2.3.1 Energy Outlook

Human and economic development has always depended on energy for societies. The only difference between now and the past is that the dependence on energy for the well-being of society has increased, and energy sources have become scarce. Although in a few places in the world, humans can still use the natural resources around them, most of humanity can no longer use the forest behind their houses to have heat for wood fires, as humans have started migrating to cities. Neither oil nor any of the other fossil fuels are unlimited resources. However, the wind is still the energy of sailing overseas. So, there are some similarities as well as drastic changes

in our current energy sources. As the world population is almost 7.2 billion, and resources are rapidly being depleted, the importance of energy has become first national, and now global. Not to mention the energy security, and the climate change issues of the last century, adding another dimension to energy discussions.

These days, the global energy sector with all stakeholders is at an important point in terms of its short and long term outlook. Since the world economic crisis of 2008-2009 –the economic outlook is still not very promising. Additionally, the political and social unrest in the Middle Eastern countries and North Africa—which are the main sources of fossil oils— and climate change issues have put a heavy burden on the world to find more holistic and integrated policy approaches to tackle the global energy challenges. Projections have been made with many policy scenarios. For instance, International Energy Outlook 2011 takes into account only marketed energy, and does not include in its estimates non-marketed energy sources used mostly in some developing countries. Additionally, the projections are made to 2035, based on government laws which were in effect in the year 2011, and do not take into the consideration pending or proposed legislation, regulations and standards in the countries. The BP Energy Outlook 2030's estimates are based on careful consultations of assumptions on changes in policy, technology and the economy and do not offer a business as usual scenario, but offers a policy case to assess the impact of possible changes on energy production and consumption in the world. Meanwhile, the World Energy Outlook 2012 offers three possible policy scenarios: the New Policies Scenario, the 450 Scenario and the Efficient World Scenario. The reason behind these three alternative scenarios is that the world is full of uncertainties — the economic crisis in 2008-2009, the unrest in the Middle-East, and the Fukushima nuclear accident, for example — which could mitigate all the projections, and affect the actual results. Additionally, even though many countries will continue to put energy in high priority in their national policies, and already announce formal objectives and commitments, it is not always easy to predict their success of the implementation in the policies and measures.

Energy, actually exergy, is as essential to the functioning of the global economic system today as gasoline is to a car or electricity to a light bulb (Ayres, Turton and Castenc, 2007, p.634). Thus, understanding truly global energy challenges, developing relevant energy policies for sustainable and secure energy, and using energy efficiently are the new headlines of the last century because the gap between energy demand and supply has been increasing drastically to procure energy for billions of people for better lives, and this gap is forecasted to increase even more drastically. The world needs integrated *energy policies*, so that countries can strategize how to address issues of energy development along with the development of the energy industry to sustain its growth including energy production, distribution and consumption. The components of an energy policy may include legislation, international treaties, incentives to investment, the country's targeted energy generation, guidelines for energy conservation, strategies to stimulate the energy industry, taxation and other public policy techniques as well as the focus on new (usually renewable) energy sources (Saidur and others, 2010, p.1744; International Energy Agency, 2006, p.314).

Meeting this increasing energy demand will present significant challenges with all the current realities in mind. Thus, knowing the global trends, challenges, and projections will help policy makers and other stakeholders understand how to cope with the actual situation and produce new realistic policies. Even though there are some improvements in policy developments such as incentives for renewable projects, new technologies and systems as well as an increased number of energy efficiency awareness programs, it is just not enough to change the global energy system because the system needs a radical change with the collaboration of all stakeholders. Therefore, HEIs should be one of the important stakeholders of this radical change happening in the word.

The energy outlook of countries is shaped based on world energy trends. Indeed, the world's energy demand is large as a result of increased population and income growth. In addition, security issues, higher energy prices, and climate warming have put high pressure on countries to find solutions for increased energy demand.

The increase of 1.6 billion of the world's population over the last 20 years is expected to be followed by almost another 1.4 billion people by 2030 so, the increase will keep rising almost at the same level (BP, 2011a, p.9). The GDP grew 3.3% annually over the past 30 years, and is expected to grow 3.5 % per year through 2035 (International Energy Agency, 2012, p.33) so the growth of the world's economy will persevere. Meanwhile, growth in the more mature, industrialized OECD economies is expected to be slower, and growth in the emerging non-OECD economies is projected to be higher than in the past (U.S. Energy Information Administration, 2011, p.17). With this picture, there is no doubt that the world's demand for energy is large and growing (ExxonMobile, 2004, p.3). The results are that the world marketed energy consumption will increase by 49.0% from 2007 to 2035 (International Energy Agency, 2010a, p.11). Total energy demand in non-OECD countries will increase by 84.0%, compared to an increase of 14.0% in OECD countries by 2035 (International Energy Agency, 2010a, p.11). New Asian countries, mainly China and India, the most populated countries are still hungry to consume. This is not good news for OECD countries, where the demand growth seems to have stabilized on a high level. Projections are that parallel to the growth in consumption, the energy demand of non-OECD countries will grow and Asian countries especially China will explode. Other striking news is that these countries are mostly using traditional energy sources to feed their increased energy demand, which makes energy dependence worse. OECD countries already have 44.0 % of the world's total primary energy consumption (Figure 1).

Non-OECD countries have 56.0 % of the world total primary energy consumption and the EU has only 13.4 %. As one of the major players of the OECD countries in the energy arena and one of the highest fossil fuel consumers in the world, the Unites States of America (USA) is expected to become the biggest petrol producer and net petrol exporter by 2020 due to non- conventional petrol and natural gas production (T.R. Ministry of Development, 2013a, p. 15).

The global energy system and needs have been transforming. The following sections show how the world's increased energy demand, particularly in the EU and

Turkey, shape their energy outlook, energy efficiency approaches and energy efficiency in building regulations and implementations.

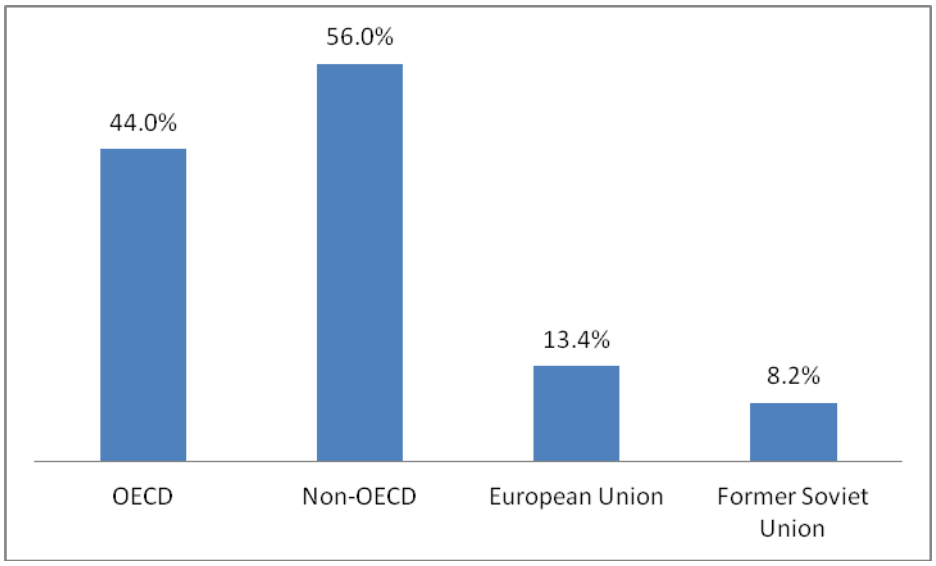

Figure 1. Total World Primary Energy Consumption
Source: BP, Statistical Review of World Energy, 2013.

2.3.2 Energy Outlook, Energy Efficiency Approach and Energy Efficiency in Buildings in the European Union

Energy is one of the oldest common policy areas in the EU and has been always at the heart of the European integration from the start. The current principle of the energy policy of the EU is the access to competitive, sustainable and secure energy accompanied by serious efforts towards a balance of economic, social and environmental factors necessary for sustainable development. To understand this principle, it is important to know how the EU has evolved and shaped its energy policy through the decades.

The EU evolved out of the Treaty of Paris signed on 12 April 1951 in Paris. It came into force on 23 July 1952, establishing the European Coal and Steel Community (ECSC), which became the first supranational integration by integrating the energy market, allowing equal and free access to common energy resources and a secure energy supply. There are some external and internal motivations behind the establishment of this Treaty: First, after WWII, the cold war between the East and the West dominated

the 1950s. There was a need for a strong and united West to protect Europe from the communist threat of the Soviet Union. Meanwhile, the Marshall Plan, formally known as the European Recovery Program, offered by the USA to European countries to rebuild their nations, increased Europe's financial dependence on the USA. Second, it is not surprising that after the Second World War, Europe had to be reconstructed and needed a significant amount of energy and steel. The supranational management of the coal and steel reserves —to solve the disputes arising between Germany and France for the reserves in Ruhr region, to prevent another war in Europe, and to secure a lasting peace in Europe—was considered a wise action among European countries.

Thus, European countries, called the "Original Six", France, West Germany, Italy, Belgium, the Netherlands, and Luxemburg came together to integrate coal and steel industries in Western Europe. The U.K did not become part of the ECSC at its establishment, and only became a member in 1973 because the UK was implementing an ambitious economic program which included the nationalization of the coal and steel sector (Staab, 2011, p.8). Behind the first inspiration of this supranational integration, was a French civil servant named Jean Monnet, envisioning the importance of the supranational regulation of a European coal and steel market (Staab, 2011, p.8). Jean Monnet presented his concept to the French Foreign Minister, Robert Schuman who made the famous announcement known the Schuman Declaration on 5 May 1950, which was the basis for the Paris Treaty, and led to the creation of the ECSC to make war not only unthinkable but materially impossible in Europe (www.europa.eu, 2011a). Economically, ECSC achieved early success; between 1952 and 1960 iron and steel production rose by 75% in the ECSC nations, and industrial production rose by 58% (EU Press Release, 2002, p.2). But, later on, the availability of other fuels and imported coal after 1959 decreased the competitiveness of the European coal industry. The ECSC treaty expired after fifty years on 23 July 2002, when its governing bodies were merged into the European Community.

The political and economic success of the ECSC led the member states to further integrate with the Rome Treaty, signed in Rome on 25 March 1957, and came into force on 1 January 1958, which provided the creation of two important Treaties:

First, the European Atomic Energy Community (EURATOM) to promote nuclear energy, which was seen as a great potential supply of affordable energy, as well the foundation of a common energy policy. Indeed, the Treaty has enabled the Community to carry out important activities in a strategic sector, in particular in terms of energy supply for the EU (Commission of the European Communities, 2007a, p.7), and has remained as a distinct entity, the only one of the three communities still in existence. Second, the European Economic Community (EEC) created the common market in Europe.

Now, there were three European Communities: the ECSC, the EEC, and EURATOM. In 1967, the institutions of all three Communities were united by the Merger Treaty, signed on April 8, 1965, and entered into force on July 1, 1967.Their executives formed the European Commission, the European Council and the European Parliament. The European Communities came into existence through the merger of the ECSC, the EEC, and EURATOM in 1967 and existed until the Maastricht Treaty transformed the EC into the EU (Hein, 2004, p.174). The Maastricht Treaty was signed on 7 February 1992, and entered into force on 1 November 1993. This Treaty, also known as the Treaty on the European Union, changed the name of the EEC to “the European Community”, and created a new structure with political and economic three pillars: The European Union.

Until the early 1970s, due to the low oil prices in the world, energy dependence on imported oil of the countries increased. Europe's dependence on energy imports grew from 33.0% to 65.0% between 1960 and 1972 (Enders, 1975). Meanwhile, the organisation of the industry, and of the resource itself, was under the control of the major western multi-national oil companies (Enders, 1975). Therefore, Europe did not need to further its energy collaboration towards a common energy policy. However, the first oil crisis of 1973, caused by the Yom Kippur War between Israel and the Arab world, showed that it was necessary to increase energy policy collaboration among the member states that would aim to minimise the future disruptions of the high oil price fluctuations, and maximise the availability of energy to increase Europe’s energy self-sufficiency. This crisis triggered high inflation, industrial breakdown, unemployment,

and conservative demand-management policies in Europe. Unfortunately, the EEC was not equipped with institutional mechanisms to cope with this crisis at the community level. After 1973, more energy policies were made at the national level than at the European level. In fact, even though the Commission made many attempts during these years, the energy policy in the EEC stayed limited and could not go any further than collecting information, setting objectives, supporting some research, and making recommendations to member countries (Kohl, 1978). The most important steps were the Community Energy Policy Objectives for 1985 COM (74)1960 in November 1974 to set common objectives to decrease the Community's energy dependence on the outside world from 63.0% to 40.0% by 1985 (Commission of the European Communities, 1974, p.3) and the establishment of the International Energy Agency (IEA), which became an European instrument to monitor and analyze world energy markets (Belkin, 2008, p.6). Indeed, this New Energy Policy Strategy for the European Community (European Commission Information Memo, 1974, p.1) proposed by the Commission to the Council was based on three factors increased influence of oil as policy power, a high degree of imported oil dependence in energy sources and lastly, a drastic increase of oil prices by the1973-1974 crisis. It is interesting to see that the strategy gives a projection for the year 2000 in its long term objectives, and noted that nuclear energy, as a secure energy source, would cover at least 50.0% of total energy needs, and gas 35.0%, resulting a decrease in the coal an oil dependence (European Commission Information Memo, 1974, p.1). There was no emphasis on security issues of nuclear energy production. The intentions in those days were purely in the context of energy supply security, and coping with the enormous price increase of oil.

The Iranian revolution in 1979 caused another shock in oil prices, and a recession in Europe, making sure to give the message to Europe that its energy dependence will not decrease sooner. There was a higher need for intra collaboration as well international collaboration to cope with the energy supply problems having worldwide results. Russia and other Eurasian countries became other energy suppliers of the European countries after 1974. The UK and Norway began North Sea production in the late 1970s. Thus, while Europe diversified its energy suppliers to feed its energy needs, the 1980s became the decade for Europe to increase its efforts towards energy

transition. Additionally, the Commission's efforts were finally successful in 1980-1981 regarding a holistic approach to develop and implement a common energy policy to cope with the energy problem in Europe. This was important because the ECSC gave priority to coal as the main source of most available energy sources. EURATOM saw nuclear energy as the primary energy source in the future while the EEC covered only agriculture and transport policies as common policy areas, not an energy policy. "Energy Policy" COM(80) 130, published in March 1980 for the European Council meeting, indicated that besides policies on diversifying the energy supply, the Community needed a common energy market with common policies as different oil prices and taxes in the member states hindered achievement of greater energy independence. In 1980 May, "Energy" COM(80) 301 prepared by the Commission reported Community progress in the energy field to the Council which saw the urgency of new energy investment in the Community, and started further discussions and approved a "Resolution on Community Energy Objectives for 1990, and Convergence of the Policies in the Member States." The Commission was given the work to publish a report every year from 1990 to see how far the member states were in line with the Community's energy objectives of: *reducing the ratio between the rate of growth in energy consumption and the rate of economic growth; reducing oil consumption in the community; raising the share of coal and nuclear in electricity production; encouraging an increase in renewable energy sources; the pursuit of the energy pricing policies geared to attaining Community energy objectives* (Commission of the European Communities, 1980, p.3). The new energy objectives of the Community started the energy transition of the 1980s.But, while marking targets as oil percentages, coal and nuclear energy usage, the Council did not even mention gas, nor put any specific target for renewable energy usage. In the mid- 1980s, the Commission published "New Community Energy Objectives" COM(85) 245 in May 1985, and announced that there had been significant improvements in the overall energy situation of the Community, and the objectives of 1990 were almost certain to be achieved. Additionally, the Commission established new horizontal, sectorial, and overall objectives for 1995. The Commission proposal on energy policies started to be more dimensional and holistic by adding new objectives such as external relations, integration of the Community Energy Market, environmental impact, regional development, and energy technology. One of

the significant changes was that environmental issues started to interact with the energy policies. Moreover, regarding energy transformation, the target of at least a further 25.0% of improvement in energy efficiency was set by 1995 and a tripling in new and renewable energy production was proposed by the end of the century; even though it was a very vague target, it was a step further from the previous target set previously in 1980.

Another leap through a common and coherent energy policy was observed between late 1980s and late 1990s despite pressures from national governments, and new enlargement. The Single European Act (SEA), the fourth Treaty, which entered into force on 1 June 1987, was a big step for the Community towards a common internal market. Even though a common energy policy was not specifically indicated in the Treaty, energy was no exception, and a failure in the internal energy market could not be tolerated (Commission of the European Communities, 1990, p.1). Indeed, the Council Resolution of 16 September 1986 concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States accepted the need for a "greater integration, free from barriers to trade, of the internal energy market with a view to improving security of supply, reducing costs and improving economic competitiveness." (OJC 241, 1986). Later, the details of the successfully implemented internal energy market was reported by the Commission Working Document, Internal Energy Market COM(88) 238 on May 1988.

The Energy Charter Declaration, first declared in 1991, later became the ground for the Energy Charter Treaty in 1994, which entered into legal force in 1998. This initiative and Treaty were to promote international energy cooperation, as well diversify Europe's energy supply (Belkin, 2008, p.3). The Maastricht Treaty in 1993 did not have a Chapter on Energy; however, similar to the SEA, it created a new dynamic ground in approaching traditional energy policy issues. During 1990s, launching the liberalization of energy market in 3 stages, and some new directives entering into force became significant steps towards the actualization of the internal energy market (Tendera-Wlaszczuk, 2010, p.6).

Moreover, The Commission issued the first Community Strategy to limit carbon dioxide (CO2) emissions and improve energy efficiency SEC(91) 1744 on 14 October 1991, in response to the Report prepared in 1990 by the Inter-Governmental Panel on Climate Change (IPCC). Even though proposals such as "*a directive to promote electricity from renewable energy, voluntary commitments by car makers to reduce CO 2 emissions by 25% and proposals on the taxation of energy products*" (www.ec.europa.eu, 2011a), made by the Community Strategy were not satisfactory to ensure substantial decrease of the GHG emissions in the EU, it was an important step to activate the efforts on climate change issues during the 2000s.

Additionally, the Commission prepared two major documents on energy to develop a more integrated energy policy for the Community supported by a plan of actions and guidelines for the future: First, the Green Paper "For An EU Energy Policy" COM(94) 659 in January 1995, and second, the White Paper "An Energy Policy for the EU" COM(95) 682 in December 1995. The Green Paper provided the basis for evaluating the challenges and possible solutions whether or not the Community had a greater role to play in energy (Commission of the European Communities, 1995a, p.5). After the Green Paper was published, an intense discussion started with many opinions from all stakeholders about the content of the document. Thus, the Commission published the White Paper, taking into consideration all the input from discussions after the Green Paper, and set the actions and guidelines for the Community's Energy Policy Framework characterized by 4 key concepts: "external dimension-globalization of markets; increasing environmental concerns; technology developments; and Community institutional responsibilities" (Commission of the European Communities, 1995b, p.9). The White Paper became the framework for an integrated energy policy with energy security supply, competitiveness, and environmental issues.

Indeed, renewables have started to be seen as local, clean, secure and undepletable energy sources. The creation of a strategy to increase the share of renewables in the energy mix was discussed in the White Paper, "An Energy Policy for the EU" The Green Paper for a Community Strategy, "Energy for the Future: Renewable Sources of Energy" COM(96) 576 was issued on November 1996 to start

the discussions on renewable sources of energy. The contribution of the renewable energy in the energy mix of the EU was 5.0% both in 1990 and 1994 (Commission of the European Communities, 1996, p.12), reflecting a very high untapped potential.

Additionally, many international programs were started in energy improvement on energy usage, and sustainable environmental policies during the 1990s and early 2000s to connect Europe with important energy suppliers and transport countries and other strategically important countries to European energy supply security. Technical Assistance to the Community of Independent States (TACIS) was run between 1991 and 2006. After the collapse of the Soviet Union, the EC started TACIS Program to help newly developed countries in the region. A technical assistance program for the development of a transport corridor, Transport Corridor Europe- Caucasia-Asia (TRACECA) was initiated on May 1993 has financed 62 technical assistance and 14 investment projects, and is still active. The Interstate Oil and Gas Transport to Europe (INOGATE) was launched in 1995 as an energy technical cooperation program between the EU, Eastern Europe, the Caucasus, and Central Asia, and is still active in supporting countries during the convergence of their energy markets. The South East Europe Electricity Regulation Forum (SEERF), also known as the Athens Forum, was established in 2002 by the Athens Memorandum. The EC, similar to its intentions in the Caucasus and Central Asia, started an initiative on energy in Southeastern Europe. This time, the aim was to support the countries in developing an integrated regional electricity market by time to the European Internal Electricity Market. This initiative was welcomed by interested countries, and the Energy Community was established in 2005. The Energy Community Treaty based on the Community Acquis on Energy, especially the electricity and gas, Environment, Renewables and Competition was entered into force on 1 July 2006. Upon the Treaty, SEEERF became an institution of the Energy Community (Energy Community, 2007). Turkey was the signatory of the Athens Memorandum, but still has the status of observer with Armenia, Georgia, Norway at the Energy Community.

In March, 1999, the crude oil price per barrel was $10.90 and tripled to $33.92 in a year (Verleger, 2000, p.1). This drastic price increase was mainly the result of the

OPEC determining that the oil prices were too low, and deciding to cut production. This situation showed once again the vulnerable structure of the Union to react to sudden increases in the prices and became another turning point for the EU. The response of the Commission was to adopt the Green Paper "Towards a European Strategy for the Security of Energy Supply" COM(2000) 769 on 29 November 2000, to establish the basis for a common energy policy to reduce energy dependence of the Union, especially from imported oil (European Parliament Briefing Note, 2001, p.3). This Green Paper created a significant interest both within and outside the EU, and triggered the most alive discussion of the last 30 years in the EU on energy security, not only in the narrow context of reducing import dependency by increasing domestic production, but more in the broader context with all its dimensions of integrating policies on diversifying energy sources and technologies. The debates covered a wide range of important topics for the future of the EU: From the Kyoto commitments, an intelligent approach to energy use, and energy efficiency targets for the member states, to an Energy Chapter in the Treaty, and many others. All the concerns for the 2000s were put on the table, and the Final report of this Green Paper COM(2002) 321 was issued on 26 June 2002 which provided a strategy based on demand management, and looked ahead to the next 20 to 30 years.

Indeed, the 2000s became the decade in which considerable numbers of new legal instruments on climate change, renewables and energy efficiency were adopted. New Community Programs were developed and run successfully in the area of energy security, climate change, renewables, energy efficiency, and nuclear energy, internally and internationally: **Intelligent Energy – Europe (IEE)** was launched in 2003 to support the sustainable energy future of the EU, is still active with many projects and initiatives in various areas as renewable energy, energy-efficient buildings, industry, consumer products and transport. The main programs of the IIE are STEER, ALTENER, SAVE, and COOPENER. **STEER,** as part of the IIE, focuses on usage of sustainable energy in the transport sector. **ALTENER II** was run between 1998 and 2002 to promote new and renewable energy sources, and has been replaced by IIE. Central and local production of electricity and heat, and their integration into local energy systems have been especially promoted. **SAVE** aims to reveal the huge potential of energy saving in buildings and industry. Meanwhile, **COOPENER** is the tool for IIE

to disseminate the EU norms on sustainable energy to developing countries in Africa, Asia, Latin America and the Pacific by capacity building and training. The program is also aligned with the EU's aim to support the United Nations Millennium Development Goals to eliminate extreme poverty and hunger, as access to reliable and affordable energy is considered one of the main components of reducing poverty in the world.

The EC has created and implemented other programs for different purposes in the energy field such as the SYNERGY Program which will strengthen international cooperation in the field of energy. The EU became involved in energy related co-operation projects following the oil crises in the 1980s, with the "EC International Energy Co-operation Programme", which has evolved into today's "SYNERGY" Programme (www.cordis.europa.eu, 2011a). The CARNOT Program promoted clean technologies in the field of solid fuels and was implemented between 1998-2002 periods. CARNOT was a product of the Council of the EU's Decision (1999/24/EC) to adopt a multiannual programme of technological actions promoting the clean and efficient use of solid fuels (www.cordis.europa.eu, 2011b). The SURE Program focused on activities in the nuclear sector in the countries participating in the TACIS programme, and was implemented between1998 and 2002 (Tanritanir, 2002).

Climate change and environmental concerns have likewise been a focus. The Heads of the States decided on the EU's Lisbon Strategy in March 2000, and committed to bring economic as well as social and environmental renewal to the EU (www.ec.europa.eu, 2011b). The EU has become a leading authority in environmental policy worldwide, and the strongest supporter of the Kyoto agreement. Unlike the energy policy, the environmental policy was not one of the driving forces for an integrated Europe until 1972 when the first series of European Environmental Action Plans (EAP) was launched. However, with the introduction of the principle that environmental protection should be considered in all new Community legislation by the Single European Act in 1986, environmental protection in EU policy-making started to be more significant. The aims of the environmental policy are to protect the natural environment so as to make contributions to sustainable growth and to support the single market. Effective implementation of the energy policy and environmental policy is vital

to cut carbon emissions, transition to low carbon and energy economy. Of course, this is a challenge and burden for the European sectors, as well as an opportunity because new jobs and markets will be created both within the EU and globally. The EC started the 2000s ambitiously to show the seriousness of the EU to cut its GHG emissions to 8.0% below 1990 levels by the 2008 and 2012 periods as foreseen in the Kyoto Protocol. It was obvious that with the current agenda of the Member States, the EU could not achieve its commitments to cut the GHG emissions. The EC, with the request of the EU Council of Environment Ministers, launched the European Climate Change Program (ECCP) in June 2000 which will be replaced by the second ECCPII by October 2005. The aim of the first phase of the ECCPs was to identify the priorities and policy measures of the EU to succeed on 8.0% target, while the second phase was focused on more implementation at the EU level. During the first phase, 11 working groups were active, among them 3 working groups were directly related to energy: Energy supply, Energy demand, and Energy efficiency in end-use equipment and industrial processes. Additionally, the ECCP was successful in developing the emissions-related activities in renewable energy and energy demand management areas. Indeed, the EU Emissions Trading System (EU ETS), which has become the world biggest emissions trading system with 30 countries, was developed during the ECCP period, and launched in 2005. Via ETS, industries causing high carbon emissions were able to buy and sell emission allowances. Directive 2003/87/EC established a scheme for GHG emission allowance trading within the Community and amending Directive 96/61/EC on 13 October 2003 to combat climate change, fulfill its commitments set in the Kyoto Protocol, and go beyond. This Directive is expected to encourage the use of more energy efficient technologies (OJ L 275/32, 2003, p.34).

On 27 October 2005, the European Council gathered at Hampton Court, London for the informal European summit and approved the concept of a compulsory and inclusive energy policy in Europe to combat climate change and boost energy and recommended that the member states should work together. After the summit, the EC published the Green Paper “A European Strategy for Sustainable, Competitive and Secure Energy” COM(2006) 105 in March 2006, which outlined an EU energy strategy with three core principles of sustainability, competitiveness, and supply security with

six priority areas, in which completion of the European electricity and gas market, and a strategic European energy technology plan were among them. Additionally, the EC proposed periodic preparation of a "Strategic EU Energy Review" to monitor improvements in the objectives and priorities. The member states reacted to this interference by the EC but it started a comprehensive debate on a future European energy policy (www.euractive.com, 2011). The European Council Spring Meeting on 9 March 2007 adopted a comprehensive "Energy Action Plan for an Energy Policy for Europe", based on the Commission's proposals in the "First Strategic Energy Review" COM(2007) 1. This defining moment in the EU energy policy history gave the Union the foundation for a broad EU energy policy for the first time and addressed three issues that have made energy such an important issue: supply security, the development of a single market in energy and climate change (COM(2007) 1).

To combat climate change, the EU combined its efforts under the "EU Climate and Energy Package" which was first launched in March 2007, reached an agreement in December 2008, and finally adopted in April 2009 by the Council. The package contains measures, the so called "20-20-20 Targets" on emissions cut, renewables, and energy efficiency. The goals were to reduce the emissions of GHGs by 20.0% compared to 1990 levels, increase energy efficiency in the EU by 20.0%, and increase the use of renewable energy sources to 20% in total energy consumption of the EU. Additionally, the Council agreed to a reduction of 30.0% provided that other major emitters agree to take on their fair share of a global reduction effort (European Environmental Agency, 2010, p.8).

To achieve these ambitious targets "20-20-20", A European Strategic Energy Technology Plan (SET-PLAN) "Towards a Low Carbon Future" COM(2007) 723 final was issued by the EC on 22 November 2011.The SET Plan increases innovation on a new generation of technologies such as European low carbon technologies to support the EU in reaching its targets by 2020, and towards its 2050 vision of the Energy Policy for Europe (Commission of the European Communities, 2007b, p.7).

Later, the First Strategic Energy Review was followed by the Second Strategic Energy Review in November 2008, "An EU Energy Security and Solidarity Action Plan

COM(2008) 781, which emphasized developing relevant financing mechanism for low carbon technologies and sustainable energy. This was followed by the Strategic Energy Review 2009 (www.managenergy.net, 2011). It was another turning point for European energy policy history where, with an integrated approach, EU climate and energy policies have been developed collaboratively.

Another important piece of progress was the last Treaty of the EU, the Treaty of Lisbon, signed in Lisbon on 13 December 2007, and entered into force on 1 December 2009, where for the first time, the Energy Chapter to the original Treaty was introduced. The Energy Chapter contains sections on the European Energy Policy, the Internal Energy Market, Energy Efficiency, Renewable Energy, Nuclear Energy, Security of Supply, external dimension, and enlargement. The Treaty puts energy under the share competence of the Member States and the Union; i.e., if the Union is not exercising competence, the Member States exercise their own competence in the energy area. So, the Treaty, creating the hope to develop a truly European energy policy, defines the general goals, where the Member States are free to decide on how and from which energy sources to use and produce. The Union was enabled to "legislate to harmonise the functioning of the energy market; enhance the security of Union's Member States' energy supplies; promote energy saving and the development of new and renewable forms of energy (Fondation Robert Schuman, 2009, p.14)."

The EU has proceeded vigorously to meet the ***"20-20-20"*** by the 2020 Goals set in 2007. However, it is relevant to see in what level the EU has achieved its targets:

Reduction of GHG emissions: The current trend to reduce GHG emission 20.0% by 2020 is positive. This target is implemented through the EU ETS and the Effort Sharing Decision (Commission of the European Communities, 2013a, p.8) which was prepared by the EC to determine Member States' annual emission allocations for the period from 2013 to 2020 (OJL 90/106, 2013). These national emission targets for sectors which are not covered by the EU ETS such as transport (aviation is not included), buildings, agriculture and waste, are set for each Member for 2020. Additionally, these targets are measured as percentage changes from 2005 levels, and differ depending on the country's GDP per capita showing national wealth.

Total GHG emissions in the EU-15 was 4254504 million tons in 1990, and decreased by 15.0% to 3630657 million tons in 2011, while total GHG emissions in the EU-27 was 5574424 million tons in 1990, and decreased by 18.4% to 4550212 million tons in 2011 (Figure 2).

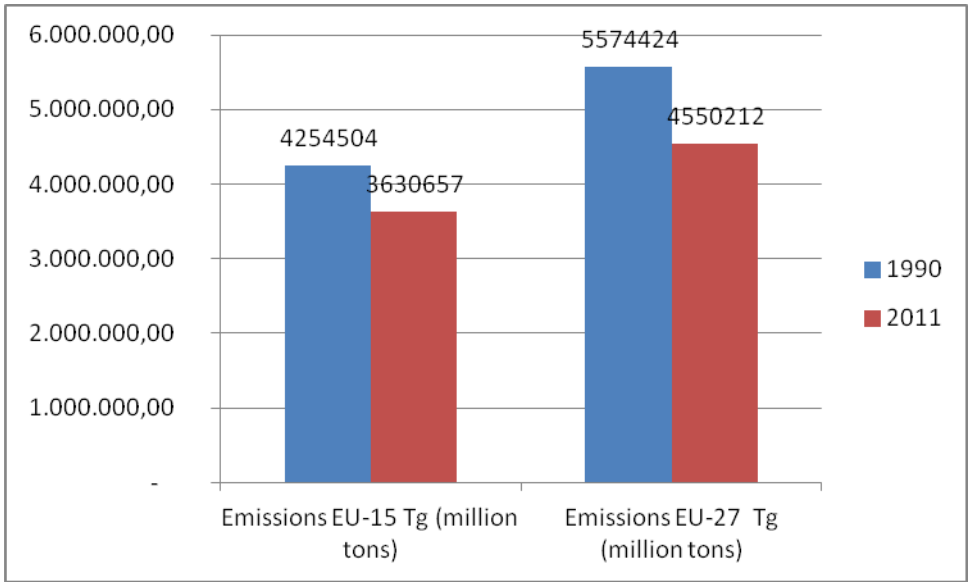

Figure 2. Total GHG Emissions in the EU (1990-2011)
Source: EEA, GHG Data Viewer, 2013.

Currently, the use of carbon markets as a means to use renewables to cut GHG emissions is limited in the world, while working on a large-scale only in the EU. The use of energy was responsible for the majority of GHG emissions in 2011. The reduction in the use of energy is a high priority in decreasing greenhouse emissions (Figure 3).

Increasing the share of renewables in the total energy mix: The current trend to increase the share of renewables in the EU to 20% by 2020 is positive. According to the World Energy Outlook 2010 New Policy Scenario, demand for renewable energy will increase in all regions in the world between 2008 and 2035. The demand remains the highest in the European Union, where the increase is driven by strong political support, and market progress to raise the share of renewables to 20.0% or even exceed the 20.0% target in gross final energy consumption by 2020. There is the commitment to cut greenhouse-gas emissions by 20.0% relative to 1990. In January 2008, the EC

presented a draft Directive, the Renewable Energy Directive (RED) to promote the use of energy from RES. The Directive contains a series of elements to create the necessary legislative framework for making 20.0% renewable energy become a reality.

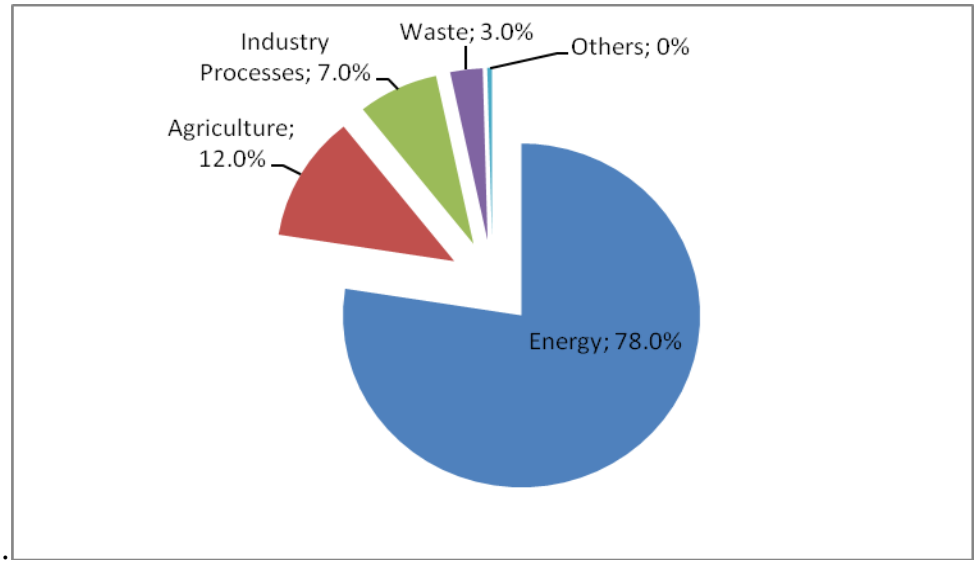

Figure 3. Share of Total GHG Emissions in EU-27 (2011)
Source: EEA, GHG Data Viewer, 2013.

The Directive sets the legislative framework that imposes stretching renewables targets for 2010 across Europe. After the European Parliament and the Council agreed upon the RED in December 2008, it entered into force in June 2009 (www.estif.org; European Renewable Energy Council, 2007, p.2). According to the European Renewable Energy Council, EREC, this target is realistic, but also vital in supporting the usage of renewable energy sources by strong energy efficiency measures to stabilize the energy consumption between 2010 and 2020. Based on 2013 data from Eurostat, the contribution of RES to total final energy consumption (Mtoe) in the EU-27 was 8.5% in 2005; 9.0% in 2006; 10.4% in 2008; 11.6% in 2009; 12.5% in 2010 and 13.0% in 2011 and it is projected to be 20.9-22.08% in 2020 (International Energy Agency, 2010a, p.283; European Renewable Energy Council, 2007, p.7; Roubanis, Dahlström and Noizette, 2010, p.1). With binding national targets, growth in renewable energy has increased; however, there is a need to average 6.3% per year to meet the overall 2020 targets (Commission of the European Communities, 2013a, p.8).

Increasing energy efficiency by 20.0% in the EU: Unfortunately, the current trend to reduce energy consumption by 20.0% by 2020 is lagging behind the target (Figure 4).

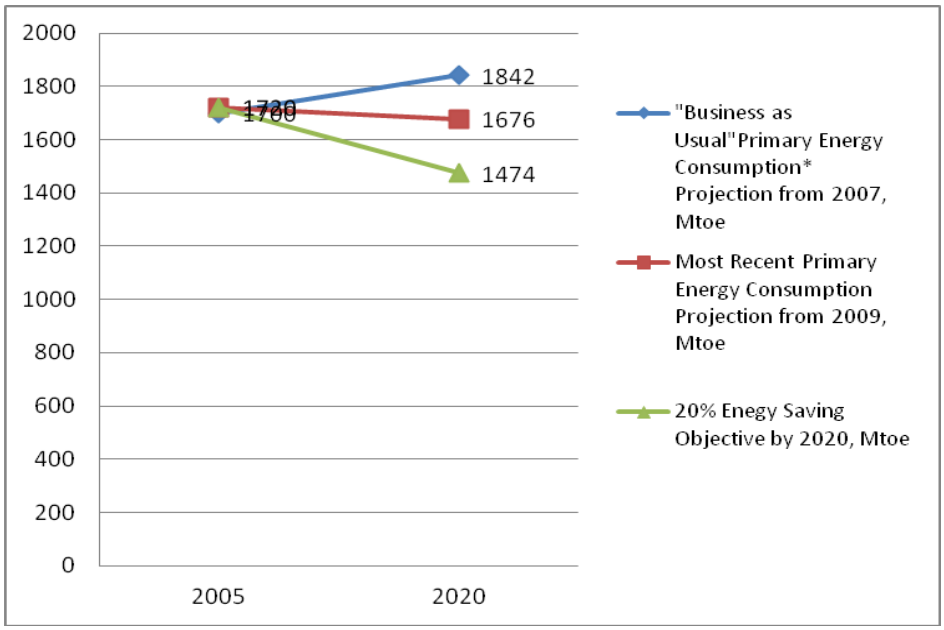

Figure 4. EU Energy Consumption Target 2020
Source: EC, Information prepared for the European Council, Background on Energy in European Union, 2011.
*Primary energy consumption is gross inland consumption minus non-energy uses.

According to information prepared by the EC for the European Council in February 2011, as shown in Figure 4, the projection shows that only 10.0% primary energy consumption reduction will be achieved from business as usual 1842 Mtoe to 1676 Mtoe by 2020 under the current policies. Stronger efforts are fundamental to reach 20.0% reduction from business as usual 1842 Mtoe to 1474 Mtoe by 2020 (Commission of the European Communities, 2011a).

Parallel to supply-side policies, the EU has launched a number of initiatives which aim to reduce energy demand and attempt to decouple it from economic growth. Even though several instruments and implementing measures exist in this field, including the promotion of co-generation, the energy performance of buildings, and energy labeling of domestic appliances (www.epp.eurostat.ec.europa.eu, 2011a), there are untapped opportunities for energy efficiency in the EU-27 to make an additional

10.0% reduction in the primary energy consumption by 2020. The peaked primary energy consumption during 2005 and 2006 has been slightly decreasing since 2007 and was 1730 Mtoe in 2011(Commission of the European Communities, 2013a, p.8).

The EU has been trying rigorously to reach its 20-20-20 target and has been almost successful. The current trends to reduce GHG emission 20.0%, and increase the share of renewables to 20.0% by 2020 are positive. However, the current trend to reduce energy consumption by 20.0% by 2020 is lagging behind the target. The EU has been shaping its future to increase its targets even higher as the security of energy supply is still a treat for the EU.

Supply Security in the EU The supply of energy in the economies of EU member countries is still highly dependent on imported energy. This energy dependency in the EU has increased from 46.7% in 2000 to 53.8% in 2011. Energy dependence is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers (Table 1).

Indeed, more than half (54.8 % and 53.9%) of the EU's gross inland energy consumption in 2008 and 2009 came from imported sources. The increasing gap between the production and the consumption worry the EU as a whole, causing an increased dependency on energy imports from non-member countries, especially, from politically unsecure countries. Unfortunately, this energy dependence is expected to grow even more radically. If nothing is done, based on the "business as usual" scenario of the EC on 2009 figures, oil import dependency will increase from 82.0% in 2005 to 94.0% in 2030 and natural gas import dependency will increase from 58.0% to 83.0% in 2030 (Commission of the European Communities, 2011a, p.10). Oil and natural gas are two main imported fossil resources for the EU, coming from only a few countries. The EU is a net importer of crude oil. According to Eurostat numbers 2013, 63.8 % of crude oil import came from Russia, Iran, Iraq, Libya, Nigeria, and Saudi Arabia in 2010 (Figure 5), while 61.2% of EU's natural gas import came from Russia, Algeria, Qatar, Nigeria and Libya in 2010. Norway supplies 13.8% of the crude oil, and 28.2% of the natural gas to the EU in 2010 (Figure 5; Figure 6; Commission of the European Communities, 2011a, p.11).

Table 1

Energy Dependency % of EU Countries for All Products (2000-2011)

% of Net Imports in Gross Inland Consumption and Bunkers, Based on Ton of Oil Equivalent

Region	2000 %	2001 %	2002 %	2003 %	2004 %	2005 %	2006 %	2007 %	2008 %	2009 %	2010 %	2011 %
EU-27	46.7	47.4	47.6	49.0	50.2	52.4	53.7	53.0	54.6	53.8	52.6	53.8
BE	78.1	80.6	77.5	79.6	79.8	80.1	79.8	77.1	79.9	74.3	76.8	72.9
BG	46.5	46.3	46.7	46.8	48.4	47.5	46.2	51.3	52.1	45.3	40.1	36.6
CZ	23.0	25.3	26.6	25.3	25.7	28.3	27.8	25.0	27.9	27.1	25.6	27.9
DK	-35.0	-28.4	-42.0	-32.0	-48.0	-50.9	-35.9	-24.7	-21.7	-20.4	-16.9	-8.5
DE	59.5	61.0	60.3	60.8	60.8	61.2	60.7	58.1	60.5	61.5	59.8	61.1
EE	32.0	32.1	29.5	26.3	28.4	25.4	28.5	23.8	24.0	21.4	13.1	11.7
IE	84.6	89.5	89.0	89.5	90.3	89.3	90.4	87.5	89.6	88.2	85.6	88.9
EL	69.5	68.9	71.5	67.5	72.7	68.6	71.8	71.3	73.3	67.8	69.1	65.3
ES	76.7	74.7	78.5	76.7	77.6	81.4	81.2	79.6	81.3	79.2	76.8	76.4
FR	51.6	50.7	51.0	50.6	50.8	51.7	51.5	50.5	50.9	51.0	49.1	48.9
HR	53.1	52.0	59.9	56.2	57.3	58.6	54.0	56,6	60.0	51.0	52.2	54.4
IT	86.5	83.3	86.0	83.9	84.7	84.4	87.0	85.1	85.3	82.8	83.8	81.3
CY	98.6	96.0	101.0	96.0	95.4	100.7	102.5	95.9	97.5	96.3	100.7	92.4
LV	59.7	58.9	57.9	62.5	68.8	63.1	65.8	61.5	57.9	58.8	41.6	59.1
LT	59.8	46.9	42.1	44.2	47.0	57.0	62.3	61.3	58.1	50.3	82.0	81.8
LU	99.6	97.4	98.6	98.4	97.9	97.3	98.1	96.5	97.4	97.4	97.0	97.2
HU	55.2	53.6	56.9	62.0	61.0	63.2	62.7	61.3	63.4	58.7	58.3	52.0
MT	100.0	99.8	99.8	99.9	99.8	100.0	99.9	100.0	100.0	101.2	99.2	101.0
NL	38.7	34.3	34.1	37.8	30.8	38.4	37.4	38.9	34.4	36.5	30.7	30.4
AT	65.6	65.0	68.0	70.6	70.8	71.4	72.3	68.9	68.9	65.0	62.1	69.3
PL	10.6	10.4	11.3	13.1	14.6	17.6	20.0	25.6	30.6	31.7	31.6	33.7
PT	84.9	84.9	84.0	85.4	83.9	88.5	83.0	82.0	82.8	81.0	75.4	77.5
RO	22.0	26.3	24.4	25.5	30.2	27.6	29.2	31.5	27.7	20.2	21.7	21.3
SI	52,6	50,2	50,5	53,4	52,2	52,3	52,1	52,5	55,1	48,1	49.4	48.3
SK	65	62,2	64,1	64,6	67,8	65,4	63,9	68,4	64,6	66,4	63.0	64.2
FI	55.3	55.1	52.2	58.8	54.5	54.2	53.8	53.0	54.2	54	48.3	538
SE	39.2	36.9	37.6	43.7	37.4	37.7	37.8	36.3	37.9	37.1	36.7	36.8
UK	-17.0	-9.4	-12.5	-6.5	4.6	13.4	21.2	20.5	26.2	26.2	28.1	36.0
IS	31.4	27.8	28.0	27.2	30.1	28.9	24.7	:	:	:	:	:
NO	-731.0	-719.0	-802.0	-740.0	-740.0	-703.3	-665.0	-654.0	-612.0	-639.0	-520.0	-585.0
CH	53.2	54.6	55.5	54.4	55.9	60.1	57.0	52.3	54.9	55.4	54.2	:
MK	40.5	38.6	46.1	38.8	42.0	43.4	45.1	48.0	46.2	44.8	43.9	45.5
TR	66.3	65.1	67.8	71.1	70.4	71.6	72.6	74.4	72.2	70.4	69.3	71.1

Source: Eurostat, 2013.

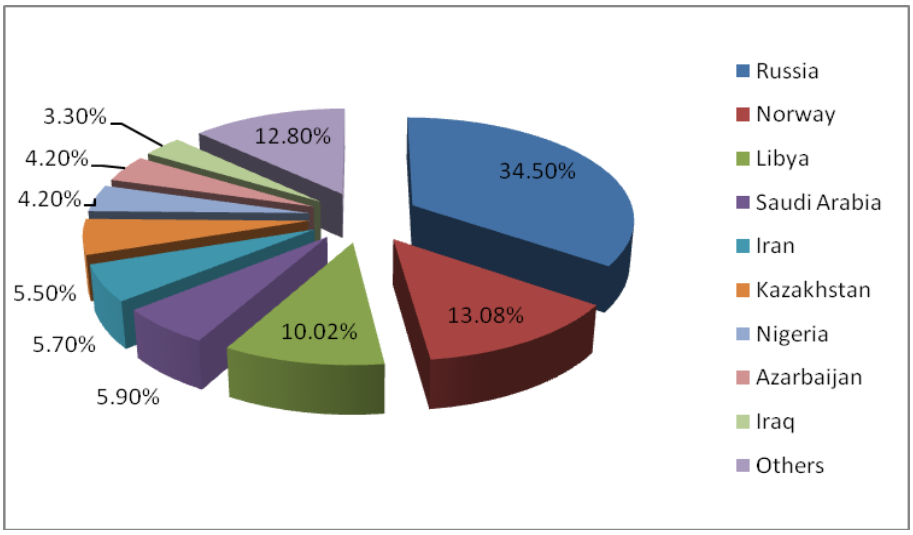

Figure 5: EU Imports of Crude Oil Share in 2010
Source: Eurostat, 2013.

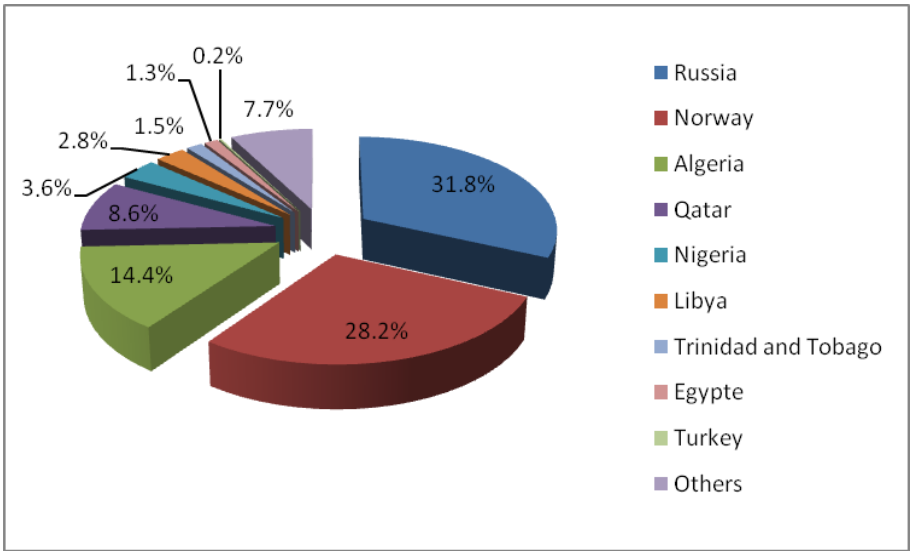

Figure 6: EU Imports of Natural Gas Share in 2010
Source: Eurostat, 2013.

After the experience of the oil price shocks that the EU went through during 1970s, the decreasing stocks of oil and natural gas in the North Sea, the turmoil in most of the OPEC countries, especially Libya, the main supplier of crude oil to EU after Russia and Norway (www.epp.eurostat.ec.europa.eu, 2011b) and high dependence on Russia in both crude oil, and natural gas imports pushed the EU to seriously consider the security of energy supply. Norway is the only safe energy supplier of EU-27. The EU needs to diversify its suppliers, but this is not an easy task. Among the EU-27,

besides Norway, only Denmark has been having a negative energy dependency rate since 2000 (Table 1).

The Czech Republic, Romania, and Estonia have lower than 30.0% energy dependency. However, the United Kingdom has been having lower than 30% energy dependency since 2004, but ended up having 36.0% energy dependency in 2011. On the other hand, Belgium, Ireland, Spain, Italy, Cyprus, Luxembourg, Malta, Lithuania and Portugal had higher than 70.0% energy dependency; meanwhile, Malta, Luxembourg and Cyprus were almost entirely dependent on primary energy imports (Table 1).

Because of these supply security issues, the EU has been acting seriously to change its energy mix from fossil fuels causing energy dependency on third countries to renewable energy sources increasing EU self sufficiency. According to the two reports prepared by the EC to the European Council in 2011 and 2013, there are some changes in the energy mix of the EU as follows (Table 2):

- ✓The EU plans to aggressively increase renewable percentage in the energy mix in 2030 in both reports.
- ✓Solid fuels were not decreased in the energy mix from 2008 to 2011. The EU plans to aggressively decrease solid fuels from 17.0% to 12.0% in the 2030 scenario of the 2013 report.
- ✓The percentage of the oil in the energy mix is expected to decrease from 37.0% in 2008 to 32.0% in the 2030 scenario of the 2011 report, while from 35.0% to 33.0% in the 2030 scenario of the 2013 report.
- ✓The percentage of the nuclear energy source will increase from 13.0% in 2008 to 15.0% in 2030 scenario of 2011 report, and to 14.0% in the 2030 scenario of the 2013 report. The existence of nuclear fuel was particularly high in Belgium, Spain, France, Lithuania, Slovakia and Sweden – where it accounted for more than half of the national production of primary energy (www.epp.eurostat.ec.europa.eu, 2011b).

Table 2
EU Gross Inland Consumption in 2008, 2011 and 2030 Scenarios

	EC 211 Report		EC 2013 Report	
Energy Mix	EU Gross Inland Consumption in 2008 %	2030 Scenario %	EU Gross Inland Consumption in 2011 %	2030 Scenario %
Renewables	8.0	15.0	10.0	18.0
Solid Fuels	17.0	14.0	17.0	12.0
Oil	36.5	32.0	35.0	33.0
Gas	24.5	24.0	24.0	24.0
Nuclear	13.0	15.0	14.0	14.0

Source: EC, Information prepared for the European Council, Background on Energy in Europe, 2011; EC, Energy Challenges and Policies, Commission Contribution to the European Council of May 2013, 2013.

However, this is not enough to decrease the energy dependence of the EU; still 70.0% of the energy mix will depend on the fossil fuels as oils, solid fuels and gas in both 2030 scenarios.

Especially, the global financial crises in 2008-2009 became another corner stone of the EU's history to again review its energy policies, and make the most contribution to support the EU overcome financial crises. A "European Economic Recovery Plan" COM(2008) 800 final was communicated by the EC in December 2008 and entered into force in summer 2009 to give the message that the " time to act is now" to all Member States after the financial crisis striking the world, as well Europe. One more time, *"investing in the right skills for tomorrow's needs; investing in energy efficiency to create jobs and save energy; investing in clean technologies to boost sectors like construction and automobiles in the low-carbon markets of the future; and investing in infrastructure and inter-connection to promote efficiency and innovation"* (Commission of the European Communities, 2008a, p.2) for directing Europe towards smart investing to reinforce Europe's competitiveness became a top priority of the EU. Energy, and energy efficiency investments, were considered by the EC as important tools to support the EU's economic growth, create new job opportunities, and at the same time to reach 20/20/20 objectives. However, the Council of the EU and the European Parliament amended Regulation (EC) No 663/2009 on the European Energy Program for Recovery (EEPR) to support economic recovery by granting a financial

envelope of €3.98 billion for 2009 and 2010 (OJ L 346/5, 2010, p.5). The EEPR was considered part of the Sustainable Energy Financing Initiative proposed by the EC jointly by the European Investment Bank to provide capital for energy efficiency, renewable energies, and clean use of fossil fuels (Commission of the European Communities, 2008b, p.18). By 31 December 2010, a total of €3833 million was committed for investments on carbon capture and storage, offshore wind energy, electricity infrastructure, ad gas infrastructure, spending almost 96.0% of the total EEPRD budget (Commission of the European Communities, 2011b, p.3).

Indeed, the rest of the EEPR budget, €146 million of funds in cooperation with financial institutions were made available under the EEPR to projects in energy efficiency and renewable energies (Commission of the European Communities, 2011b, p.10). This financing facility called "European Energy Efficiency Facility" became available for local, national and regional authorities to support investment projects. Via the new "European Energy Efficiency Fund (EEE-F)" launched by the EC on 1 July 2011 as a part of the EEPR, funds of €265 million became eligible to facilitate European Energy Efficiency projects (www.ec.europa.eu, 2011c). Before the economic crisis these subsidies were channeled through the Trans-European Networks for Energy (TEN-E) Program, the Research and Technology Development (RTD) Framework Programs and the Intelligent Energy Europe (IEE) Program (www.inforse.org, 2011). The first guidelines and the list of projects of common interest for Trans-European Networks in the energy sector (TEN-Energy) were adopted on 28 March 1996 by the European Council Decision (96/391/EC) of 28 March 1996 (OJ L 161, 1996).

As proposed in the First Strategic Energy Review, the Energy Policy for Europe COM(2007) 01, Europe has been reshaping its energy policy to become *a highly energy efficient and low carbon energy economy catalysing a new industrial revolution, accelerating the change to low carbon growth and, over a period of years, dramatically increasing the amount of local, low emission energy that is produced and consumed* (Commission of the European Communities, 2007c, p.5). In this regard, the EC has been successful in mobilising all financing mechanisms.

Meanwhile, the EC has communicated several strategic documents, road maps, and action plans focusing on the years between 2020 and 2050, even looking as far as 2050.. Indeed, the EU target has been shaped towards reducing carbon emissions by 80.0-95.0% by the year 2050, as accepted by the European Council Conclusions EUCO 2/1/11 on February 2011. The latest actions of the EC to bring the EU further to 2050 include:

Europe 2020 "A strategy for smart, sustainable and inclusive growth" COM(2010) 2020 on 3 March 2010

The European Council adopted "Europe 2020" COM(2010) 2020 in June 2010, the new strategy for jobs and smart, sustainable and inclusive growth (Council of the European Union, 2010). There are 7 flagship initiatives to implement the strategy by the EU and national authorities. Smart growth covers 3 main areas such as a digital agenda for Europe, an innovation union, and youth on the move. Sustainable growth covers 2 main areas: a resource efficient Europe, and an industrial policy for the globalization era. Inclusive growth covers 2 main areas: an agenda for new skills and jobs, and a European platform against poverty (www.ec.europa.eu, 2011d). The European Council believes that to reveal the EU's growth potential, the EU should focus on innovation and energy policies—the need for a common energy policy (Council of the EU, 2010, p.2).

Energy 2020 "A strategy for competitive, sustainable and secure energy" COM(2010) 639 final on 10 November 2010

Energy 2020, European strategy under the Europe 2020 initiative, was communicated by the European Commission on November 2010 for a sustainable, competitive and secure energy. The Communication defines *"the energy priorities for the next ten years and sets the actions to be taken in order to tackle the challenges of saving energy, achieving a market with competitive prizes and secure supplies, boosting technological leadership"* (www.ec.europa.eu, 2011e). The European Commission provided the tools to make the necessary shifts possible for the targets embodied in the flagship initiative "Resource efficient Europe" by Energy 2020 in its communication to

the European Parliament, the Council on November 2010. The EC proposed 5 priorities to the European Council: *1) Achieving an energy efficient Europe 2) Building a truly pan-European integrated energy market 3) Empowering consumers and achieving the highest level of safety and security 4) Extending Europe's leadership in energy technology and innovation 5) Strengthening the external dimension of the EU energy market* (Commission of the European Communities, 2010a, p.5,6). The European Council meeting on February 2011, the first EU Summit on Energy, became a very important council meeting to give the operational implementation of the energy policy of the EU. After the economic and financial crisis, the main concern of the EU became sustainable and job-creating growth. Thus, the energy sector plays a vital role in contributing to Europe's future growth and success, as well as its competitiveness (Council of the EU, 2011, p.2).

Energy infrastructure priorities for 2020 and beyond "A Blueprint for an integrated European energy network" COM(2010) 677 final on 17 November 2010

Energy infrastructure priorities for 2020 are important components of the flagship initiative "A resource efficient Europe" COM(2011) 21 (Commission of the European Communities, 2011c, s.7). Over the next ten years, huge energy investments totaling almost €1 trillion are needed to diversify existing energy resources and replace equipment. Even though the policy and legislative measures that the EU has adopted since 2009 have provided a strong foundation for the European energy infrastructure, the challenge of interconnecting and adjusting the infrastructure to the new demands is important. All sectors such as electricity grids and storage, natural gas grids and storage, district heating and cooling networks, CO2 capture, transport and storage, oil and olefin transport and refining infrastructure should be reconsidered when building reliable energy networks (Commission of the European Communities, 2010b, p.7; Commission of the European Communities, 2010c, p.1).

A Resource Efficient Europe, "Flagship initiative under the Europe 2020 Strategy" COM(2011) 21 on 26 January 2011

A Resource-Efficient Europe is one of seven flagship initiatives as part of the Europe 2020 strategy to deliver smart, sustainable and inclusive growth. The initiative aims to create a framework for policies to support the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth (www.ec.europa.eu, 2011f). Increasing economic performance while decreasing energy usage, exploring and developing new opportunities for economic growth and innovation to reveal the EU's potential for competitiveness, securing the supply of essential resources, while combating climate change and decreasing the environmental impact of growth (Commission of the European Communities, 2011c, p.4) are the strategies outlined in the document.

Low Carbon Economy 2050"A Roadmap for moving to a competitive low carbon economy in 2050" COM(2011) 112 Final on 8 March 2011

Low Carbon Economy 2050 is a sister initiative to the Energy Roadmap 2050. Together, they guide the European economy to cut carbon emission, consume less energy, but at the same time provide a sustainable growth. The challenge is to find cost effective ways to achieve economic growth. Based on the Low Carbon Road Map Communication from the EC, March 2011, the EU will reach its 20.0% reduction of the GHG emissions (GHG) with the current policies in implementation. Furthermore, if the Energy Efficiency Plan is well implemented, and the20.0% energy efficiency target is achieved, the reduction will be up to 25.0% by 2020, which shows the importance of supporting policies working together (Commission of the European Communities, 2011d, p.15). Meeting the climate change and energy objectives are the shared objectives guiding the action of Member States (Council of the EU, 2010, p.4). The Commission's approach to decarbonisation is firmly grounded in the EU's growth agenda, set out in the Europe 2020 strategy (Commission of the European Communities, 2011e, p.1). The EU's commitments to decarbonisation are as follows: 1) The EU is committed to move to a 30.0% reduction in GHG emissions by 2020 compared to 1990 level as its conditional offer with a view to a global comprehensive agreement for a period beyond 2012 (Council of the EU, 2010, p.12). 2) The European Council reconfirmed in February 2011 that the EU is committed to reducing GHG

emissions to 80.0-95.0% below 1990 levels by 2050 in the context of necessary reductions by developed countries as a group (Council of the EU, 2011, p.7). This commitment is also relevant with the position accepted by world leaders in the Copenhagen and Cancun Agreements. 3) The EU has been in the process of achieving, in any event, at least a 20.0% reduction of GHG emissions by 2020 compared to 1990 and has already made huge progress towards it (Commission of the European Communities, 2011d, p.4).

Energy Efficiency Plan 2011 COM(2011) 109 final on 8 March 2011

Energy Efficiency Plan 2011 was developed comprehensively by the EC in response to the European Council Meeting, February 2011.The European Council considered the Energy efficiency investments core to the competitiveness and support security of energy supply and sustainability at low cost – at the heart of the EU 2020 Strategy. Still, there is considerable untapped potential for higher energy savings inn buildings, transport and products and processes. The European Commission estimates that if no further action is taken, only half of the 20.0% target in energy efficiency will be reached (Council of the EU, 2011, p.4; wwwec.europa.eu, 2011c).

Smart Grids: from innovation to deployment COM(2011) 202 final on 12 April 2011

Smart Grids, Intelligent electricity networks, are a key component in the EU energy strategy to facilitate the internal energy market and integrate vast amounts of renewable energy, as well as to give more control to consumers by providing a two way exchange of information and power between producers and consumers, leading to increased transparency and promoting responsible energy saving measures on the consumers' side. The European Commission produced the Communication "Smart Grids: from innovation to deployment" on April 2011 to establish policy directions to promote future European electricity networks. Even though smart electricity grids require a significant investment from all member states to make them a reality, based on the projections, the grids could reduce GHG emissions in the EU by 9.0% and the

annual household energy consumption by 10.0% (www. ec.europa.eu, 2011g; www.ec.europa.eu, 2011h).

The European Council confirmed that the member states, the European standardization bodies and industry adopt technical standards for smart grids and meters by the end of 2012. A commitment from the member states was strongly needed as the opportunities created by smart grids enable energy saving and energy efficiency while accelerating the development of the energy market (Council of the European Union, 2011, p.3; Commission of the European Communities, 2011f, p.3).

Roadmap to a Resource Efficient Europe COM(2011) 571 final on 20 September 2011

The Roadmap to a Resource Efficient Europe drove the road for Europe to be resource efficient and to continue to its growth in a sustainable manner. The EC emphasized transforming the economy towards sustainable production and consumption, using natural capital wisely, and developing ecosystem services. Food, buildings and transportation are the key sectors targeted in the roadmap.

Energy Roadmap 2050

The Energy Roadmap *2050* is part of the Resource Efficiency Flagship of the Europe 2020 strategy. The Energy Roadmap 2050, similar to the Low Carbon Economy Road 2050 will present different roads to reach the targets in the sector. It will work to support the established objectives of the EU energy policy – sustainability, energy security and competitiveness, and focus on how energy security and competitiveness can be improved throughout the transition to a low-carbon energy system (www.ec.europa.eu, 2011i). The Energy Road Map 2050 COM(2011) 885/2 was published on 15 December 2011, in which the European Commission offered 5 decarbonisation scenarios: A High Energy Efficiency Scenario, A Diversified Supply Technologies Scenario, A High renewable Energy Sources Scenario, A Delayed CCS Scenario, and A Low Nuclear Scenario. The Energy Road Map 2050 states that decarbonisation is possible and can be less costly than current policies in the long run (Commission of the European Communities, 2011k, p.5).

Historically, with the establishment of the ECSC, the economic and political integration of Europe has started. Thus, the energy policy has been a crucial cornerstone since the start of European countries coming together with the aim of an integrated Europe and legislation in the energy area has existed for years. But, the first oil crisis of 1973, and the OPEC embargo became a cornerstone for Europe to unify towards a common energy policy step by step by 2011 with three main dimensions: security of supply, development of a single market in energy and climate change.

Today, more than 500 paragraphs of law are present in the EU's Acquis Communautaire on energy and environment alone. Currently, the EU is an important player in the global energy arena. Although the EU still faces many challenges, a new phase of an industrial revolution has been going throughout Europe, shaping the EU's future for the next 50 years.

The EU energy outlook has been summarized from the start of the European Union and energy has always been a priority for European countries. The next section presents the role of energy efficiency and energy efficiency in buildings in the European energy outlook.

Reducing energy consumption and eliminating energy waste are among the main goals of the EU. The EU considers energy efficiency a a key tool for a competitive internal energy market, supply security and for meeting the commitments on climate change made under the Kyoto Protocol for a sustainable future (www.ec.europa.eu, 2011; www.herbertsmith.com, 2011).

During the 2000s, the European Commission introduced several policies and directives stimulating and forcing Member States to focus on strengthening their policies to use energy efficiently. The Energy Efficiency Directive, the Energy Efficiency Plan 2011, Labelling, Buildings, End-use & Services, Voluntary Agreements, Industry, Cogeneration, Eco-design are among the top priorities of the EC to set minimum energy efficiency standards and rules on labelling products, services and infrastructure (www.ec.europa.eu, 2011a).

The 2000s is very important regarding the energy efficiency to be seen a major component of the effective energy policies. There are some important documents that made energy efficiency a crucial part of life for an effective EU. The European Commission published "Doing More with Less: Green Paper on Energy Efficiency" COM(2005) 265 on 22 June 2005, which identified the available options, as well as started discussions on how to achieve cost-effective savings, and initiated the process to take concrete actions involving all the layers of society from the Community level to the individual consumers. The Green Paper on Energy Efficiency showed that 20.0% of current energy use could be saved by 2020 compared to 2005 levels; Europe's energy dependency could be decreased with better energy savings and energy savings could be a cost-effective route towards lowering GHG emissions (www.euroace.org, 2011a; Commission of the European Communities, 2005, p.34). The conclusion on climate and energy efficiency of the 2695th Transport, Telecommunications and Energy Council Meeting on 1 December 2005 welcomed the Green Paper on Energy Efficiency. Further, the Council encouraged the EC to develop an Action Plan on Energy Efficiency in 2006 (Council of the European Union, 2005).

Directive 2006/31/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EC has adopted a framework for energy end-use efficiency and energy services. This Directive is especially important as it foresees in Article 14(2) an indicative energy savings target for the Member States, obligations on national public authorities as regards energy savings and energy efficiency procurement, and measures to promote energy efficiency and energy services (www.ec.europa.eu, 2011b; OJ L 114/64, 2006). Directive 2006/31/EC of the European Parliament and of the Council of 5 April 2006 on energy en-use efficiency and energy services and repealing Council Directive 93/76/EC has adopted a framework for energy end-use efficiency and energy services. Two main Energy Efficiency Action Plans were published in 2006 and 2011 after the Green Paper on Energy Efficiency. The first action plan was published on 19 October 2006 named Action Plan for Energy Efficiency: Realizing the Potential COM(2006) 545, identifying 75 specific actions in 10 priority areas to be implemented by the end of six years via policies and measures on dynamic energy performance requirements for energy-using

products, buildings and energy services; improving energy transformation; moving and transport; financing energy efficiency, economic incentives and energy pricing; changing energy behavior; international partnership. The Action Plan set the following 10 priority actions: *1) Appliance and equipment labelling and minimum energy performance standards, 2) Building performance requirements and very low energy buildings ("passive houses"), 3) Making power generation and distribution more efficient, 4) Achieving fuel efficiency of cars, 5) Facilitating appropriate financing of energy efficiency investments for small and medium enterprises and Energy Service Companies, 6) Spurring energy efficiency in the new Member States, 7) A coherent use of taxation, 8) Raising energy efficiency awareness, 9) Energy efficiency in built-up areas, 10) Foster energy efficiency worldwide* (www.euroace.org, 2011a; Commission of the European Union, 2006). Indeed, the Action Plan on Energy Efficiency was accepted by the European Council on 09 November 2006 (Council of the European Union, 2006). The Council gave its further comments to the EC to work on: *"Dynamic energy performance requirements for energy-using products, buildings and energy services; Improving energy transformation; Moving on transport; Financing energy efficiency, economic incentives and energy pricing; Changing energy behavior; International partnerships."*

The second, as a follow up, 5 years later, the Energy Efficiency Action Plan 2011 COM(2011) 109 was published on 8 March 2011 as a new plan on energy efficiency. The Energy Efficiency Plan 2011 was developed comprehensively by the European Commission in response to the European Council Meeting, February 2011. The European Council considered the energy efficiency investments as core to the competitiveness and security of energy supply and sustainability at low cost – at the heart of the EU 2020 Strategy as well as realizing the 2050 vision of a resource efficient and low carbon economy. There isstill considerable untapped potential for higher energy savings in buildings, transport and products and processes. The European Commission estimates that if no further action is taken, only half of the 20.0% target in energy efficiency will be reached (Council of the European Union, 2011, p.4; www.ec.europa.eu, 2011c). The energy efficiency measures will be implemented as part of the EU's wider resource efficiency goal encompassing efficient use of all natural

resources and ensuring high standards of environmental protection (Commission of the European Communities, 2011g, p.4,16). The main areas covered in the Action Plan are the public sector, leading by example, paving the way towards low energy consuming buildings, energy efficiency for a competitive European industry, appropriate national and European financial support, savings for consumers, transport, and framework for national efforts.

After the adoption of the Energy Efficiency Action Plan 2011, the European Commission worked on a *new Directive on energy efficiency* to establish a common framework to increase energy efficiency and reach the 20.0% energy efficiency target by 2020. The new directive aimed to make the revision and consolidation of the Cogeneration and Energy Services Directives, as well as the Energy Efficiency Action Plan, legally binding. As a result, the European Commission proposed a new directive on 22 June 2011 for further savings in energy supply and use, affecting all stages of the energy chain with ambitious targets such as a legal obligation to establish energy saving schemes in all EU member countries, for the public sector to lead by example, and major energy savings for consumers. The EU adopted the Directive 2012/27/EU on Energy Efficiency (OJL315/1, 2012) on 25 October 2012 to establish a common framework of measures for the promotion of energy efficiency within the Union to reach the 20.0% energy efficiency target by 2020 (www.ec.europa.eu, 2013a).

Behind all the action plans and legislative framework to promote energy efficiency in the EU is that a "*generation of financial savings of up to €1000 per household every year, improving industrial competitiveness, creating 2 million jobs, as well as reducing GHG emissions by 740 million tons"* are possible by full implementation of the existing and planned measures (Commission of the European Communities, 2011g, p.3).

Even though there are some yearly decreases and increases, final energy consumption is still very high in every sector (Figure 7, Table 3).

Based on data provided by Eurostat on EU-27 final energy consumption by sector division, 24.0% in 2009 and 26.0% in 2011 of the final energy was consumed in

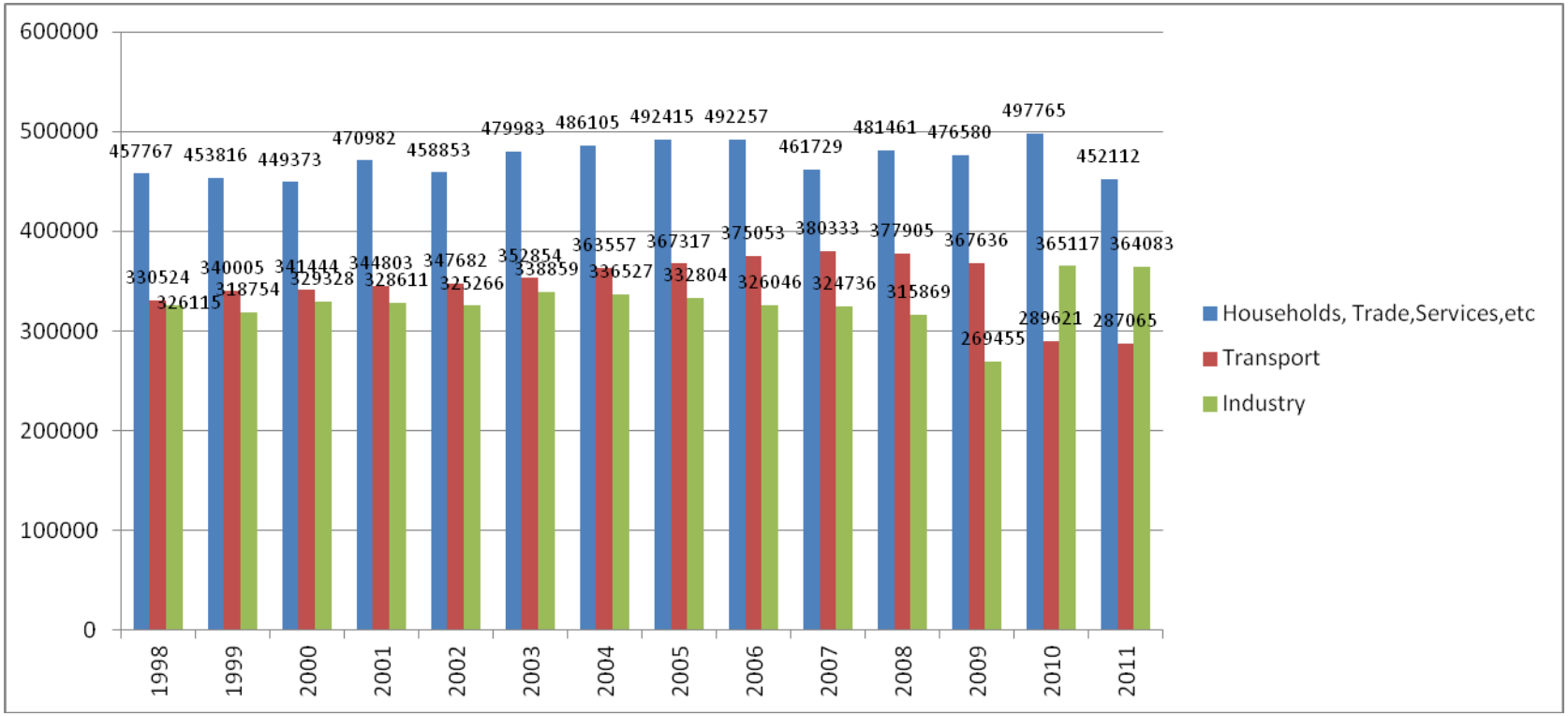

Figure 7. EU-27 Final Energy Consumption by Sector Division (1998-2011) / 1000 toe

Source: Eurostat, 2013.

Table 3
EU-27 Final Energy Consumption and Change by Sector Division (1998-2011) / 1000 toe

	1998	2009	2011	98-09 Change %	09-11 Change %	98-11 Change %
Households,	457767	476580	452112	4.0	-5.0	-1.2
Transport	330524	367636	287065	11.0	-22.0	-13.0
Industry	326115	269455	364083	-17.0	35.0	12.0

Source: Eurostat, 2013.

industry, 33.0% in 2009 and 33.0% in 2011 of the final energy was consumed in transport. On the other hand, 43.0% in 2009 and 41.0% in 2011 of the final energy was consumed in households, trade and service (Figure 8, Figure 9).

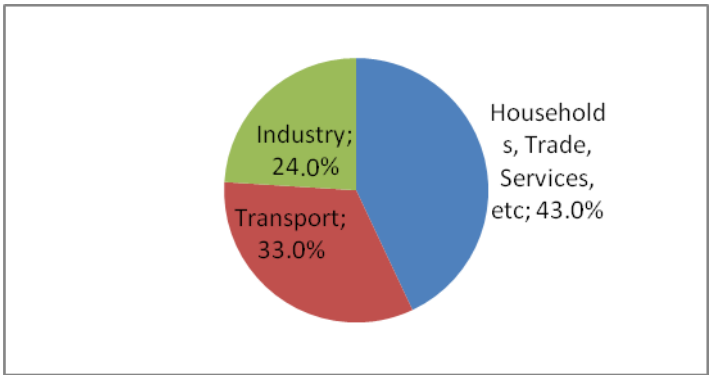

Figure 8. EU-27 Final Energy Consumption by Sector Division in 2009/1000 toe
Source: Eurostat 2013.

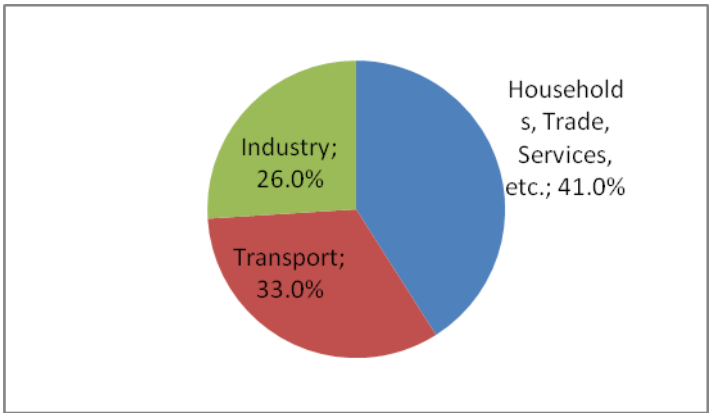

Figure 9. EU-27 Final Energy Consumption by Sector Division in 2011/1000toe
Source: Eurostat 2013.

Final energy consumption in households, trades, services covers all energy products consumed by private households, small-scale industry, crafts, commerce, administrative bodies, services with the exception of transportation, agriculture and fishing.

In 2011, the total of the final energy consumption by sectors in the EU-27 was 1103.260 Mtoe in 2011. Each year, at the sector level, households, trade and services have consumed most of the final energy in the EU-27 between 1998 and 2011, and showed a moderate decrease as 1.2% (Table 3).

The largest growth was observed in the transport sector as 11.0% until 2009 (Table 3), where the highest energy consumption occurred in 2007 (Figure 7). However, the transportation sector had a declining trend in 2008 and 2009, and a drastic decline occurred in 2010 and 2011 (Figure 7). The decline of the energy consumption from 2009 to 2011 is 22.0% (Table 3) percent in the transportation sector was due to the economic recession in 2008.

Energy consumption by the industrial sector declined 3.0% between 1998 and 2008 while a drastic decrease of 14.0% from 2008 to 2009 was observed from the effects of the financial crises. After the recovery of the negative effects of the global financial crisis, energy consumption in the industry increased 22.0% from 2009 to 2011 (Figure 7, Table 3). There are still untapped energy efficiency opportunities in the sectors. The EU has been looking to promote energy efficiency in every sector, but especially in the households by new action plans and new legislative frameworks.

The second reason behind further actions of the EC is that although the energy intensity in the EU-27 decreased by 16.0% from 2000 to 2011 and reached 144.2 kgoe/€1000 in 2011 (Figure 10), there is still untapped energy efficiency potential in the sectors.

Even though there has been a significant decrease in the energy intensity in the EU-27, the European Commission has emphasized energy's untapped potential savings in all sectors in all its communications.

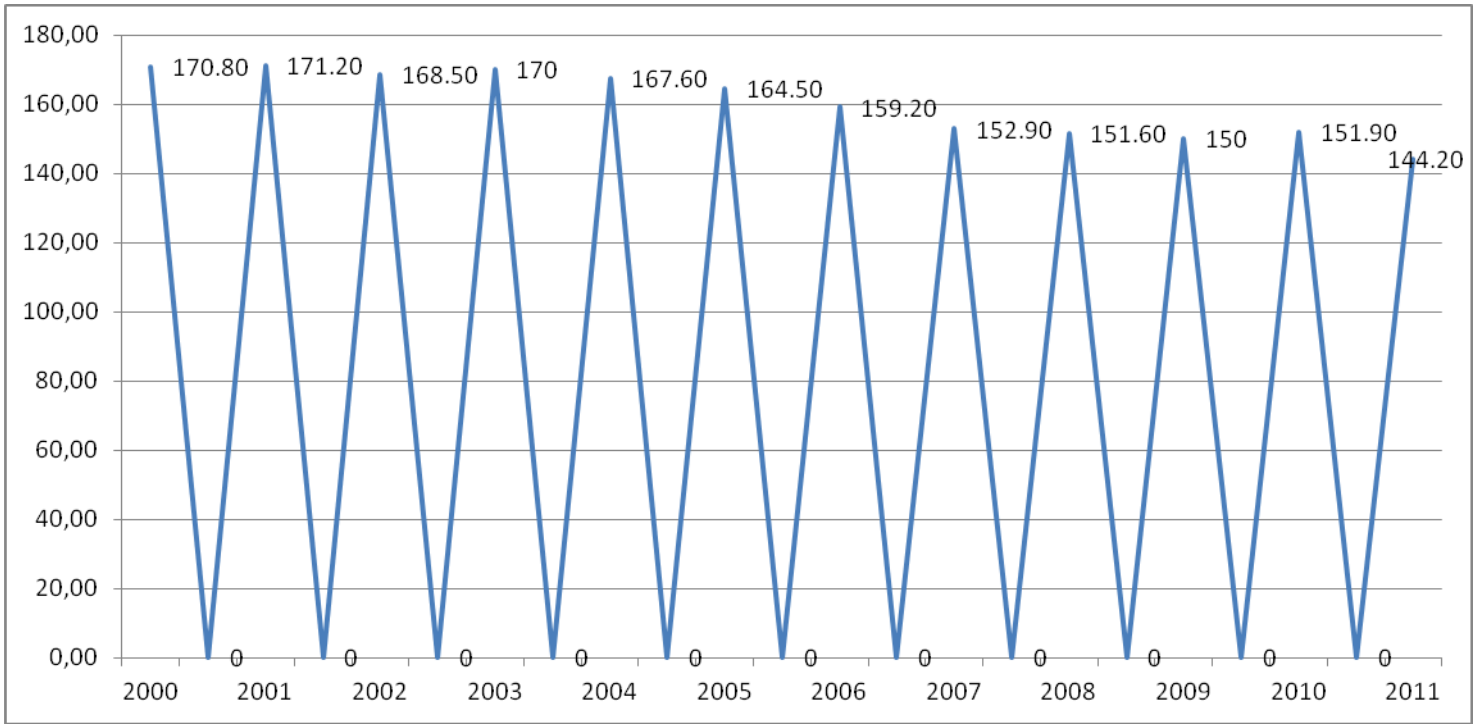

Figure 10. Energy Intensity* of the Economy in the EU-27 (2000-2011)

Source: Eurostat, 2013.

*Gross inland consumption of energy divided by GDP (kilogram of oil equivalent per 1000 Euro).

The Green Paper for Energy Efficiency COM(2005) 265 final in 2005, the first Energy Efficiency Action Plan COM(2006) 545 final in 2006, and as well as the Energy Efficiency Action Plan COM(2011) 109 final in 2011 discussed energy savings. The Green Paper on Energy Efficiency published in 2005 by the European Commission highlighted the potential cost-effective savings in different sectors (Commission of the European Communities, 2005, p.34). Table 4 shows that the total energy savings potential through the rigorous implementation of adopted measures by 2020 is 190 Mtoe, while the energy saving potential is 360 Mtoe, if additional measures are implemented after 2020.

Table 4
Potential Energy Savings Mtoe in the EU-27

Sectors	**2020 Rigorous Implementation of Adopted Measures**	**2020+ Implementation of Additional Measures**
Buildings: Heating/Cooling	41	70
Electrical Appliances	15	35
Industry	16	30
Transport	45	90
Combined Heat and Power (CHP)	40	60
Other Energy Transformation, etc.	33	75
Total Energy Savings	190	360

Source: EC, Doing More with Less, Green Paper on Energy Efficiency, COM(2005) 545 Final, 2005, p.31.

Both the Energy Efficiency Action Plans 2006 and 2011 indicated that the largest cost-effective energy saving potential is in the buildings partly because of their large share of total consumption (Table 5), while transport has the second largest potential. There are still actions to take for industry to use energy in the most effective ways (Commission of the European Communities, 2011g, p.4; Commission of the European Communities, 2006, p.6).

Based on the index of final energy intensity and energy intensity by sector in the EU-27, the decrease in the final energy intensity over the years between 1995 and 2008 was -1.64% (Table 6). Among the sectors, households have the increasing trend of energy intensity (Table 6; Figure 11) with 0.14% per year, thus making the

Table 5
Estimates for Full Energy Saving Potential in End-Use Sectors in the EU-27

Sectors	Energy Consumption (Mtoe) 2005	Energy Consumption (Mtoe) 2020 (Business as Usual)	Energy Saving Potential 2020 (Mtoe)	Full Energy Saving Potential 2020 (%)
Households (Residential)	280	338	91	27
Commercial Buildings (Tertiary)	157	211	63	30
Transport	332	405	105	26
Manufacturing Industry	297	382	95	25

Source: EC, Action Plan for Energy Efficiency: realizing the Potential COM(2006) 545 Final, 2006, p.7.

households the sector which needs to take the most measures to reveal the energy efficiency potential by the EC.

As a result, the contribution of buildings to increase energy efficiency in the EU is very high. The EU has been aware of it, and has already taken many actions to implement energy efficiency measures in the buildings. The building sector has both a high energy demand and a long life span. Thus, improving the energy efficiency of buildings in the residential and tertiary sector (offices, public buildings accounting for 9.0% of the EU-27 GDP, 8.0% of total employment (www.ec.europa.eu, 2011j), 40.0% of Europe's final energy consumption, and 36.0% EU CO2 emissions, offers a great potential for energy efficiency gains and GHG emissions reduction, improved energy security, and more job creation as an economic stimulus for the EU (Sunikka, 2006; www.ec.europa.eu, 2011d).

Therefore, there is a need to introduce further Community-level specific instruments and measures to harness the impact of this very important energy sector causing Community-level challenges to reveal the potential for cost-effective energy savings in the buildings which are estimated will be as high as 28.0% of primary energy demand by 2020 (Gerlagh, 2008, p.427; www.europa.eu, 2011; Commission of the European Communities Energy Directorate General, 2011, p.3).

Table 6
Index of Final Energy Intensity and Energy Intensity by Sector, EU-27 (1995-2008)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	%/year
Households	100	108	104	103	102	101	106	103	106	107	107	105	98	102	0.14%
Transport	100	102	101	101	101	98	97	97	97	97	96	95	93	92	-0.65%
Final Energy Intensity	100	102	98	96	93	90	90	88	90	89	87	85	81	81	-1.64%
Services	100	105	97	96	93	85	89	84	90	89	88	89	82	85	-1.24%
Agriculture	100	97	92	90	85	86	86	83	92	85	88	83	78	74	-2.26%
Industry	100	99	96	93	89	88	87	86	88	85	83	79	78	75	-2.18%

Source: Eurostat, 2013.

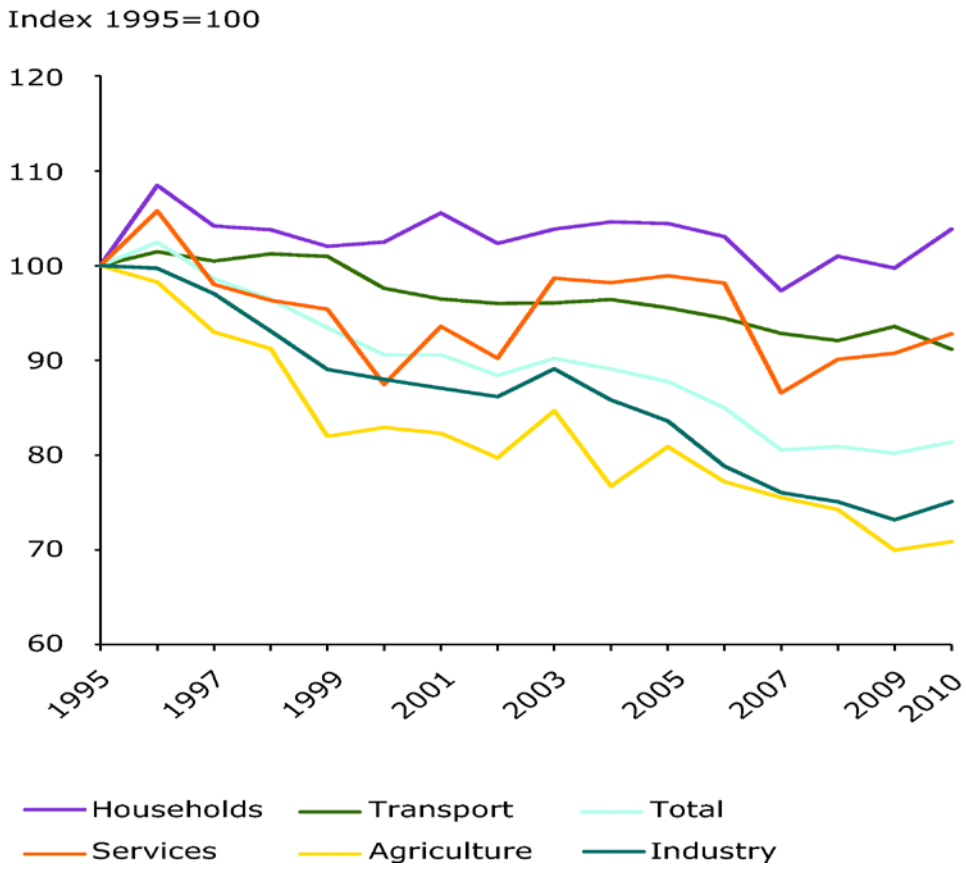

Figure 11. Index of Final Energy Intensity and Energy Intensity by Sector, EU-27 (1995-2010)

Source: EEA, 2013.

The Directive on the energy performance of buildings (2002/91/EC) is the main legislative instrument at the EU level to achieve energy performance in buildings. Under this Directive, the Member States must apply minimum requirements for the energy performance of new and existing buildings, ensure the certification of their energy performance and require regular inspection of boilers and air conditioning systems in buildings (www.ec.europa.eu, 2011d; www.europa.eu, 2011). There have been two Energy Performance of Buildings Directives (EPBDs) adopted by the European Parliament and Council.

Directive 2002/91 of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings and its amendments was

entered into force in 2003, and transposed in the Member States in 2006. The four main obligations to the Member States are listed below (www.europa.eu, 2011; www.euroace.org, 2011b):

1) A common methodology to calculate and rate the integrated energy performance of buildings;

2) A system of energy certification for new and existing buildings, with display requirements for public buildings. Certificates must be less than five years old;

3) Regular inspections of heating and air-conditioning systems, and an assessment of heating installations in which the boilers are more than 15 years old;

4) Minimum energy performance standards for new buildings and for existing buildings that undergo major renovation with a useful floor area over $1000m^2$.

The EPBD contributed mainly to alert politicians and the public to the need for the energy efficiency in buildings. Even though the Member States have encountered many challenges during the implementation of the EPBD, 22 of them fully transposed the Directive into their national legislations. The Member states declared also that the benefit of the energy savings is significantly higher than the cost of the implementation of the Directive (Commission of the European Communities, 2008c, p.3).

After the Directive was implemented in the Member states, the need for re-casting the Directive occurred to clarify and simplify certain aspects, extend the scope of the Directive, strengthen certain provisions, and give the public sector a leading role in promoting energy efficiency (Communities and Local Governments, 2009, p.4). The minimum total impact of the Recast EPBD is expected to be 60 – 80 Mtoe/year energy savings by 2020, which means a reduction of 5.0-6.0% of the EU final energy in 2020 and 160 to 210 Mt/year CO_2 savings by 2020, which is 4.0-5.0% of EU total CO_2 emissions in 2020 (Commission of the European

Communities, 2008d, p.5). The Recast Directive is proof that the EU is not only putting targets, but also taking measures to reach these targets. Directive 2010/31 of the European Parliament and of the Council of 17 May 2010 on the energy performance of buildings and its amendments (the recast Directive) was entered into force in July 2010, but the invalidation of the current Directive took place on 01 February 2012 (Commission of the European Communities, 2011h, p.7). The new Directive was transposed in national law by July 2012 for an entry into force in 2013. Some of the Articles replace or amend the Directive 2002/91 Articles, and others are new.

Below are important articles listed in the Recast EPBD, developed on the best practices and experience gained by the Member States during the implementation of the previous EPBD (EuroACE, 2011; NHB foundation, 2011, p.5):

Article 3 Calculation Methodology: There must be a national calculation methodology.

Article 4 Minimum Energy Performance Requirements: Minimum energy performance requirements must be set for new and existing and for different building Article 5 categories.

Article 5 Cost Optimal Calculation: The European Commission will establish a framework for assessing cost-optimality before 30 June 2012.

Article 6 New Buildings: All new buildings must consider low- and zero-carbon technologies, as well as energy efficiency systems.

Article 7 Existing Buildings: All existing buildings (and individual building elements) must meet the standards of Article 4 when renovated.

Article 8 Technical Building Systems: Performance standards must be set for new and replacement 'technical building systems' (heating, hot water, air conditioning and large ventilation).

Article 9 Nearly Zero-Energy Buildings: The number of 'nearly zero-energy' buildings are to be increased. This is mandatory for new buildings by 31 December 2020, and for public sector by 31 December 2018. Non-mandatory targets and encouragement for existing buildings will be set in the national plans of the Member States.

Article 10 Financial Incentives and Market Barriers: A list of financial incentives and barriers to improving energy performance must be drawn up and updated every 3 years to the Commission.

Article 11 Energy Performance Certificates: **E**nergy performance certificates (EPCs) must be issued at key stages of a building's life; public authorities must implement the recommendations. A voluntary harmonized scheme for non-residential buildings will be established.

Article 12 Issue of Energy Performance Certificates: EPCs must be issued for construction, selling or renting, and in any case for public buildings (over 500m2 and frequently visited. This threshold will be decreased to 250 m2 by 2015.) All sale and rental advertisements must include the headline energy performance indicator.

Article 13 Display of Energy Performance Certificates: Public buildings (including smaller ones) must display their EPCs.

Article 14 Heating System Inspection: Larger boilers must be inspected or advice given. Member States have to submit reports to the Commission every three years starting 30 June 2011 on measures in place.

Article 15 Air-Conditioning Systems Inspection**:** Larger air-conditioning systems must be inspected or advice given. Member States have to submit reports to the Commission every three years starting by 30 June 2011 on measures in place.

Article 17 Independent Experts: only qualified and accredited independent experts may fulfill Articles 11, 14 and 15.

Article 18 Independent Control System: Independent control systems must be established for certification and inspections.

Article 20 Information: Mandatory information campaigns on enhancing buildings' energy performance will take place, and training must be made available.

Article 21 Consultation: Stakeholders must be consulted, especially for nearly zero-energy buildings.

Article 27 Penalties: Penalties for non-compliance must be introduced.

Indeed, there are some key changes with the EPBD Recast, putting challenges for the Member States (www.euroace.org, 2011b; REHVA, 2010):

Development of a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements: The money of the society is wasted if it is spent for non-cost-optimal energy performance requirements. Thus, setting the requirements at a cost-optimal level is very important for the Member States. The recast Directive offers flexibility for the Member States to choose whether to calculate or set the requirements from the building owner's perspective or from a macro-economic perspective. This is a win - win situation for all stakeholders such as building owners, investors, occupants, and society as a whole. Additionally, the recast Directive requires a national calculation methodology of the energy performance of buildings. Even though some insisted on having uniform European calculation methodology for the energy consumption of buildings, due to the complex building codes in each country, the European Commission considered it unrealistic to force the Member States to have a uniform calculation methodology under this Directive, which will take decades to harmonize. However, the EPBD CEN standards exist for the Member States to use, leading the Member States to a partial harmonization over time.

Extension to all buildings (removal of 1000m^2 floor area threshold) of requirement to set minimum energy performance levels when a major renovation

takes place, including building envelope elements that are retrofitted or replaced: This was a crucial decision for the European Commission because the majority of the building stocks within the EU are under 1000m^2, making the EPBD not effective. Removal of 1000 m^2 threshold is expected to increase €8 billion/year additional capital investments, but would result in €25 billion/year energy cost savings by 2020, which also means considerable negative CO_2 abatement costs (Commission of the European Communities, 2008c, p.5). So, the recast Directive is expected to be effective in saving energy in the existing housing stock, while creating new jobs in the relevant sectors, which is in line with the EU's Lisbon Strategy. However, the EU is currently lacking the trained and educated new skills. Today, about 1.1 million qualified workers are available, while it is estimated that 2.5 million will be needed by 2015 (Commission of the European Communities, 2011g, p.8).

The Member States had already some experience from the previous EPBD, so they should be able to use the existing and new mechanisms, programs in order to develop the skilled work force for renovation. It is estimated that there are 200 million buildings within the EU (REHVA, 2010, p.3). Renovation of these buildings is a challenge for the Member States, but the Recast Directive requires increased and more transparent information and financial tools to make to increase the EU renovation rate from 1.0% to 1.5and 2.0% annually (REHVA, 2010, p.3).

All new buildings are to be nearly zero energy level by December 2020 (December 2018 for public authority buildings): The annual growth rate of new buildings added to the housing stock is currently estimated at around 1.0-1.5% of the housing stock (Energy Efficient Buildings PPP, 2009, p.7), which makes "nearly zero energy level" a crucial step towards achieving its goal for Europe. The high standards for the new buildings mean high energy efficient housing stock for the EU. With the Recast Directive, the European Commission puts a framework for the Member States, because buildings are different across Europe as they depend on the culture, the climate, the construction materials available, the differing legal frameworks and the economic development, which makes it difficult to have a

common approach at the EU level. These new buildings will be the future construction standard in the EU.

Requirement for Member States to list financial incentives in place to enable the transition towards nearly zero energy levels in buildings: The Member States are currently able to use support energy efficiency in buildings through all the EU channels such as Cohesion Policy Funds, the Intelligent Energy Europe Programme (2007-2013), Intermediated Finance, the European Economic Recovery Plan, and the Framework Programme for research, technological development and demonstration (2007-2013) (Commission of the European Communities, 2011g, p.12). The Recast Directive ensures also that each member state prepare its own national funding programs for energy efficient buildings and report to the Comission every three years (OJL 153/13, 2010; www.euroace.org, 2011b). Additionaly, it creates targeted funding tools such as linking energy efficiency improvements included in the recommendations of the certificate and financial incentives (Commission of the European Communities, 2008c, p.6). The usage of renewable sources will increase to make the transition towards nearly zero energy levels in buildings.

Mandatory energy certification for all properties constructed, sold or rented out, and for all public buildings over 500m^2 or those frequently visited by the public: Energy Performance Certificates, which are already mandatory under the previous EPBD, did not function well in many of the Member States, which is why the Recast Directive emphasizes the reliability and content of the certificate based on an effective quality control mechanism. Only when this mechanism works effectively will the aim of higher market prices and rents for energy efficient building be realized which will also encourage energy efficient renovations.

Enhanced heating and cooling system inspections and reporting requirements and setting requirements at system level: Setting requirements at the system level takes the vast cost-effective savings potential seriously, which lies in the technical building systems. For instance, combining very energy efficient products based on EcoDesign standards does not always result in a very efficient system if they are not installed or adjusted well.

Requirement for Member States to establish penalties for non-compliance: Member States must set up and enforce effective and dissuasive penalty rules for non-compliance (NHBC Foundation, 2011, p.11).

In addition to the EPBD, there are other directives that have a large impact on energy performance or energy efficiency of buildings: *The Eco-Design Directive* and the *Directive on Energy end-use and Energy Services* (International Energy Agency, 2008b, p.39). The energy efficiency of products such as household electrical appliances will have an impact on the energy performance of buildings. Additionally, buildings are largely covered in the Energy End-Use Efficiency and Energy Services Directive. The residential and tertiary sectors are covered under the Directive as eligible areas for energy efficiency improvement measures. These include heating and cooling systems, insulation and ventilation and lighting (www.euroace.org, 2011b).

Figure 12 shows that in residential buildings 39.0% of the energy is used for heating & cooling, 12.0% for water heating, which together make more than 50.0% of the energy used in residential buildings, while 12.0% of the energy is used for lighting, 8.0% for electronics, 7.0% for refrigeration, 5.0% for cooking, and 1.0% for computers.

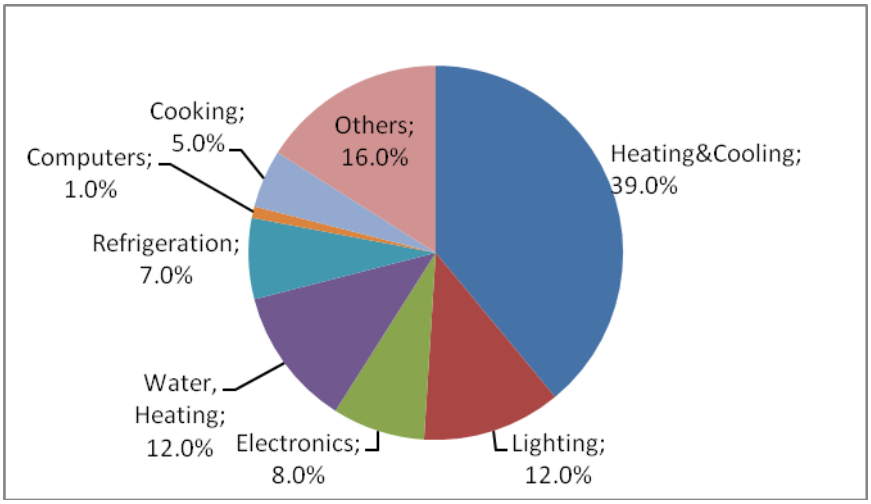

Figure 12. Energy Use in Residential Buildings
Source: Energy Efficient Buildings PPP, 2009, Research Priorities for the Definition of a Multi-Annual Road Map and longer Term Strategy, p. 5.

There is an untapped energy saving potential in the residential buildings. The Commission listed the challenges of the energy saving potential in the residential buildings at the Energy Efficiency Action Plan 2011 such as*: tackling heat use in buildings which will be a signifacant problem in the coming years; legal obstacles of split incentives for upgrading energy performance, which is a common situation between the owner and the tenant; technical training needed for energy efficienct buildings solutions for architects, engineers, auditors, craftsmen, technicians and installers involved in refurbishment; establishing the role of the Energy Service Companies (ESCOs) as catalysts for renovation* (Commission of the European Communities, 2011g, p.6,7,8).

The need of energy consumption in commercial buildings is different than that of residential buildings. Figure 13 shows that commercial buildings demand very high electricity, as 32.0% of the energy is needed for HVAC, and 25.0% for lighting. On the other hand, heat is a minor factor and mainly cooling is required.

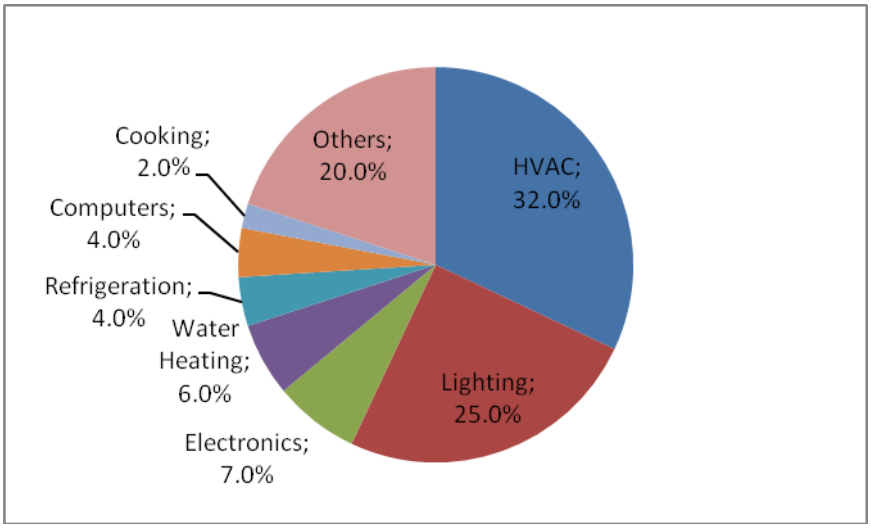

Figure 13. Energy Use in Commercial Buildings
Source: Energy Efficient Buildings PPP, 2009, Research Priorities for the Definition of a Multi-Annual Road Map and longer Term Strategy, p. 5.

Member States have taken some different policies to promote energy efficiency in buildings such as financial incentives, certification, pilot projects, training activities, supporting low energy buildings through regulation, and

awareness raising by communication and information activities (Commission of the European Communities, 2009a, p.1). Some member states became more successful in implementation, some stayed behind. But, the EU as a whole has been able to move ahead with ambitious targets and new strategies for low energy buildings. Some member countries with ambitious targets are the UK, the Netherlands and France. For instance, in December 2006, the UK Government committed that all new homes would meet the zero carbon standard by 2016.

Furthermore, the Government also introduced a stamp duty rebate for new zero carbon homes, (www.ukgbc.org, 2011). However, the UK Government was criticized due to the change from its firm commitment in March 2011 on zero carbon homes which were supposed to provide their energy from carbon free sources. But, only the energy used for heating and lighting should come through the carbon free energy sources. In France, the *Grenelle Environnement*, which is a multi-party green initiative to protect the environment, has increased the targets in the building sector. Regulatory developments planned by the Grenelle Environment in the Building Plan for 2012 require that all new buildings must comply with the Low Consumption Building or BBC label (www.electrical-efficiency.com, 2011). Moreover, new residential buildings should be passive or positive energy buildings by 2020 (Thomsen and Wittchen, 2008, p.17). The "Low Consumption Building" label (BBC-EFFINERGIE Label) was launched in 2007 by Effinergie, the collective initiative established in 2005 in France similar to the ones in Germany and Switzerland, with the public authorities (Mesureur, 2010, p.3). Meanwhile, the Netherlands aimed for a 25.0 % reduction by 2011 and 50.0% energy reduction by 2015, compared to current code plans. Further, energy-neutral buildings are targeted for 2020 (Commission of the European Communities, 2009a, p.9,10).

In all the Member States, energy efficiency in buildings has been considered important in both their first and second NEEAPs in response to the EC's required precautions to tackle energy challenges. Governments especially have provided different kinds of incentives and programs to promote energy efficiency in buildings, and develop a functioning market mechanism among the stakeholders. There are

some direct and indirect financial supports offered by the governments such as: "*Subsidies and loans zero or low interest rate to finance low energy buildings; or lower taxes for energy efficient buildings"* are some general direct financial supports. Additionally, "*simplified heating billing requirements, no obligation to take public heat supply, CO2 taxes, and certification or labeling of low energy buildings"* are among the indirect financial supports in the most of the EU Member States (Thomsen, 2008, p.25).

Many different kinds of financing mechanisms have been developed through the Member States as financial barriers have been one of the main barriers hindering energy efficient buildings such as access to capital, initial cost, perceived high risk, high uncertainty, small size of the projects and high transaction costs, and information failure in the finance sector (T'Serclaes, 2009, p.5). In general, the financial sector is accustomed to financing large scale energy efficiency projects; however, most of the energy efficient buildings projects have been uneconomical to invest in due to their small sizes and complexity. A good example of the innovative energy efficiency credit lines on residential buildings developed and implemented by a non-profit public banking group in Europe is KfW's housing programme on energy efficient construction and rehabilitation: Ecological Construction, CO2 Building Rehabilitation, Housing Modernisation-ECO PLUS (Beck, 2009, p.13). KFW has also provided free information and advice to the public. Indeed, KfW has successfully integrated Energy Performance Certificate and Financing Programs to improve market transparency, to promote energy efficiency as a sign of building quality, and hinder energy demand in the buildings. Through the projects financed by KFW, over 800 thousand housing units were supported; more than 600 thousand employments were created; approx. 2.2 million t p.a. CO2 emissions reduction and 2.5 billion kWh p.a. energy savings were reached between 2006 and 2008 (Beck, 2009, p.14). France has also been one of the countries successful in implementing innovative financial services in the residential sector since 2007. Generally, the public authorities partner with banks to offer low interest loans for energy efficient building projects (International Energy Agency, 2009b, p.46).

Besides financial incentives, energy performance certificates are another important technical policy tool which can become a powerful instrument to create a demand-driven market for energy efficient buildings (www.proceedings.eceee.org, 2011) So far, the effectiveness of energy performance certificates in the member states is discussable. To be effective, certification schemes should be supported by information, communication actions, financing mechanism, and other instruments. According to surveys run in the UK, 32.0% of new home buyers plan to implement the recommendations in the certificate in couple of months, while 9.0% in the near future (International Energy Agency, 2010b, p.19). Even though 41.0% of the home buyers are positive about the implementation of the recommendations in the certificates, 60.0% are not planning to do anything. That is why, certification schemes should be complemented by other instruments. For instance, Ireland has a national grant scheme for energy retrofit and provides an additional certificate after the measure is completed. Some member states have made certification mandatory in order to obtain subsidies or tax exemption for energy saving measures (International Energy Agency, 2010b, p.19). Besides mandatory schemes, there are successful implementations of voluntary certification schemes to promote low energy standards in the Member States such as Passive Houses in Germany, Minergie in Switzerland, Effinergie in France, Klima:aktiv Haus Programme and Passive House Planning Package in Australia, KlimaHaus Gold category under the KlimaHaus/CasaClima in Northern Italy, Passive House Standard prepared by the nonprofit organization Passiefhuis-Platform in Belgium, and the Building Research Establishment Ltd. (BRE), which is authorized by the German Passive House Institute Darmstadt to provide passive house certificates in the UK (Mlecnik, Kaan and Hodgson, 2008). There are many voluntary certification schemes throughout Europe causing many levels of national standards in the EU.

The newest report on energy performance certificates published by the EC on June 2013 shows that energy efficiency is rewarded in the market through energy efficiency certificates indicating the status of the energy efficiency of the buildings. An initial analysis of the residential sector showed that better energy efficiency of a

building has a positive impact on higher sales and rental values (Commission of the European Communities, 2013c, p.11).

Additionally, the EC has funded many projects with multi partners to support the Member States on energy efficiency in buildings through many programs such as the Energy Efficient Buildings PPP &FP7 Funding which is one of three Public-Private Partnerships (PPPs) that the EC has launched in 2009 as a part of the European Economic Recovery Plan. This program is the initiative for the construction sector, and planned to be financed by the industry and the EC. Two calls have already been made during 2010 and 2011 to fun 41 European wide projects (TUBITAK, 2011). On the other hand, Intelligent Energy Europe (IEE) SAVE projects were run as a cohesive EU policy support mechanism on EPBD and their implementation in the Member States (Sutherland, 2006, p.4). Some of these projects such as BEST Cert, Building Energy Standards-Tool for Certification; BUDI, Pilot actions to develop a functioning market for energy performance certificates; Electronic Energy Buildings Directive; EPA-NR, Energy Performance Assessment for Existing Non Residential Buildings, EU-LAB, European High Quality Low Energy Buildings were directly related to EPBD until 2006 (Heijmans, 2005). In addition, 25 projects on renewable energy in buildings were funded under the IEE by 2009 (Executive Agency for Competitiveness and Innovation of the European Commission, 2009). Energy efficiency in buildings has been and will be funded in different programs by the EC for the Member States, candidate countries, and as well pre-accession countries. For instance, there is the Business Support Program to fund energy efficiency in buildings projects under the PHARE Program for the enlargement of the EU, and the Sectorial Collaboration Projects under the Instrument for Pre-Accession Assistance (IPA).

At the end of 2013, the 7th Research Framework will be replaced by "Horizon 2020" which is the EU's new research and innovation program. Under Horizon 2020, a €7.3 billion fund, 10.5% of the total budget is reserved for energy research such as nuclear programs, renewable energy, end-use efficiency, energy storage and smart grids. In addition, market uptake projects related to renewable

energy and energy efficiency products are taking funding besides energy research (www.greenovate-europe.eu, 2013; Council of the European Union Press Release, 2013).

Recently, the EC published a report on financing energy efficiency in buildings in April 2013. The COM(2013)225 Financial Support on Energy Efficiency in Buildings Report covers all available financial mechanism in the EU on financing energy efficiency in buildings and emphasizes that the EU should improve the financial mechanism in the sector to reach its 2020 and 2050 targets. Under the Multiannual Financial Framework (2007-2013), the Cohesion Policy Funding provided €5.5 billion funding for energy efficiency, co-generation and energy management, €290 million of the Research Funding is for energy efficiency, one third of the Enlargement Policy Funding is for projects in industry and buildings, 70.0% of the EEPR is for energy efficiency and half of the Competitiveness and Innovation Funding(CIP) is dedicated to energy efficiency in all sectors (Commission of the European Communities, 2013b, p.5). In addition to EU funding programs, International Financial Institutions (IFIs) have been offering various energy efficiency funding during the 2000s. Almost €22.1 billion on energy efficiency has been mobilized in the EU market during 2000, where some funding was specifically for buildings (Commission of the European Communities, 2013b, p.7). Third, the building sector has received funding through governments of the Member States. Through EPBD and NEEAPS, existing measures have been reported to the EC. Energy savings by the measures implemented in the buildings have a high share of the reported energy savings in the NEEAPs (Commission of the European Communities, 2013b, p.7). Lastly, the private sector spends money for energy efficiency in the buildings. However, in order to meet 2020 and 2050 energy efficiency targets, the financial mechanism should be improved such as barriers to access financing, implementation of the regulations should be ensured, and more financing should be available (Commission of the European Communities, 2013b, p.12).

Energy and energy efficiency issues have been and will be on the agenda of the EU to reach its targets for 2020 and 2050. In addition to various funding programs, the EC has successfully raised awareness by communication and information sharing activities: BUILD UP Initiative and the European Union Sustainable Energy Week are two successful new initiatives of the EC. The BUILD UP web portal was established by the European Commission in 2009 to support EU Member States in implementing the Energy Performance of Buildings Directive (EPBD) (www.buildup.eu, 2011). The EU Sustainable Energy Week (EUSEW) has become Europe's key event for awareness raising and communicating a more sustainable energy future with a series of activities run during the year such as Energy Days Europe, Energy Week Brussels, Sustainable Energy Europe Awards Competition (www.eusew.eu, 2011).

. Energy, energy efficiency and energy efficient buildings are clearly top priorities in Europe. Likewise, these issues have become priorities in Turkey as well. The next section discusses Turkey's situation and approaches to energy issues. .

2.3.3 Turkish Energy Outlook, Energy Efficiency Approach and Energy Efficiency in Buildings in Turkey

Energy has become one of Turkey's most vital development priorities. Consequently, the importance of energy resources and related energy policy issues has increased significantly in Turkey. Turkey has been forced to adopt new long-term energy strategies to reduce the share of fossil fuels in the primary energy consumption (Hacisalihoglu, 2008, p.1872). The primary energy consumption in Turkey has increased by 2.8% per year between 2007 and 2011, while electricity energy consumption has increased 5.6% per year between 2007 and 2012 periods (T.R. Ministry of Development, 2013, p.23). Of course, looking through the Turkish energy policy independently from world energy policies and the EU's energy policy is not possible. Thus, this section examines only the Turkish energy outlook, energy efficiency approach and energy efficiency in buildings in Turkey.

Turkey's energy policy was mostly shaped after the post-cold war period, putting Turkey in the center of the main consumers and producers of oil and gas, as a natural energy bridge. Turkey has recently revised its energy strategy, where the energy policies and strategies are defined clearly in the main documents: Turkey's Energy Strategy ESYG-I, the Strategic Plan of the Ministry of Energy and Natural Resources between 2010 and 2014, and as well as the State Development Plans. Turkey has been doing tremendous work regarding energy security, economic growth, and environmental protection dimensions of its energy policy since 2005. The main dimensions of the Turkish energy policy are set as follows(www.energy.gov.tr, 2011a; T.R. Prime Ministry State Planning Organization, 2007, p. 118; Commission of the European Communities, 2011i, p.23; T.R. Ministry of Energy and Natural Resources, 2010; T.R. Ministry of Foreign Affairs, 2011):

- ✓ *Ensuring the security of supply by minimizing the dependency on imported energy resources, enabling the usage of the renewable energy resources at a maximum level, assuring the diversification of energy sources, routes, and technologies, and taking the alternative energy sources including nuclear energy into consideration to meet the energy needs of increasing economic growth*
- ✓ *Keeping the environmental effects at the minimum level, while increasing social development in a continuous, quality and secure manner at a minimum cost*
- ✓ *Contributing to the international competitiveness of the national industry through a competitive energy industry structure, and free market environment, while activating the potential within the private and public sector*
- ✓ *Increasing the global and regional effectiveness of Turkey and furthering the transit position between producer and consumer countries in the energy*
- ✓ *Increasing energy efficiency*

Turkey is pushing to develop an active energy strategy during the 2000s and publish important strategy papers, plans, documents with motivation from the 2004 Electricity Sector Reform and Privatization Strategy Paper, the 2009 Electricity Energy Market and Supply Security Strategy Paper, the 2009 Energy and Natural Resources Strategic Plan (2010-2014), and finally the 2012 Energy Efficiency Strategy Document (2011-2023).

Turkey has been facing population and income growth, which are the two most powerful driving forces behind the demand for energy (BP, 2011, p.9). Indeed, Turkey has a growing economy and increasing young population, where the energy usage is still low. According to the Turkish Statistical Institute, the annual population growth rate in Turkey has been over 15.0% between the 1986 and 1996 periods; the growth rate has been fluctuated between 15.0% and 13.0% by 2010 and gradually it is expected to be 7.7% by 2025. Currently, Turkey's population is almost 75 million. Moreover, the Turkish economy has shown remarkable success with its strong and steady growth over the last years. By the end of 2010, economic growth captured its 8.9% level of 2007, before the global financial crisis.

Real GDP growth rate of EU-27 was 1.8% by the end of 2010, while the growth rate in Turkey was 8.9%, which was the level in 2001, just before the global financial crisis. Turkey became one of the fastest growing economies after the global financial crisis in 2008 with 8.9% growth while other developing and emerging economies grew 7.3%, and the world economy 4.9% (Figure 15). Additionally, according to the OECD, Turkey is expected to be the fastest growing economy of the OECD members during 2011-2017, with an annual average growth rate of 6.7% (www.invest.gov.tr, 2011). Along with the economic growth and especially the population increase, significant increases have been observed both in primary energy and electricity consumption. During the last decade, consumption of primary energy reached 115728 thousand toe, and final energy consumption of electricity had reached 15802 thousand toe by the end of 2011 (Figure 16; Figure 17).

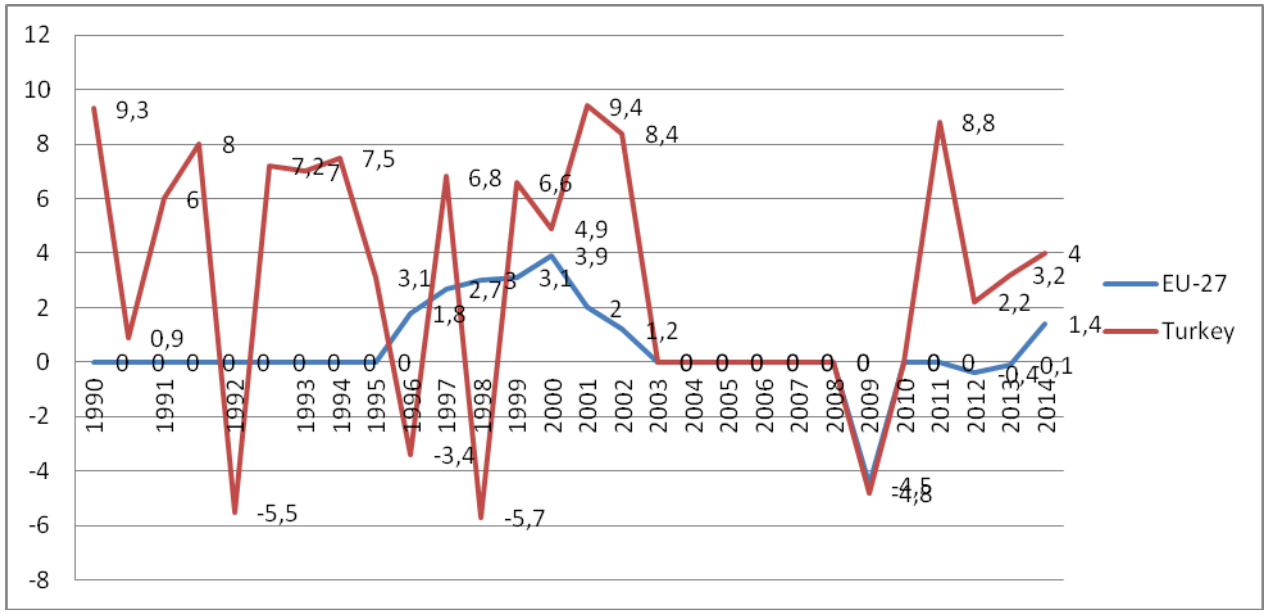

Figure 14. Real GDP Growth Rate* of EU-27 and Turkey (1990-2014**)

Source: Eurostat, 2013.

*Growth rate of GDP volume - percentage change on previous year.

** 2013 and 2014 numbers are forecasts.

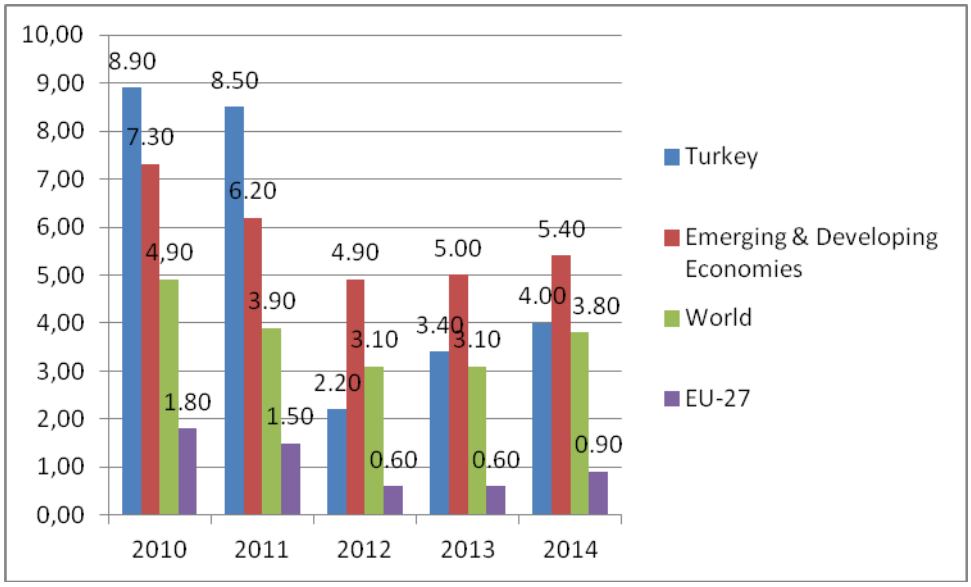

Figure 15. Real GDP Growth % (2010-2012) and Forecasts (2013-2014)
Source: Eurostat, 2013; IMF, World Energy Outlook Update, 2013; Turkish Republic of Undersecretariat of Treasury, 2013.

Turkey's total primary energy production was only 32133 thousand toe (Figure 18), while final energy consumption was 80911 thousand toe (Figure 19) in 2011. There have always been significant gaps between the consumption and production of the primary energy in Turkey (Figure 18; Figure 19). Therefore, ensuring sufficient energy supply to a growing economy, population and parallel to these growths, growing energy demand has become the government's main energy policy concern even more than market reform and environmental protection (International Energy Agency, 2010d, p.9).

Considering that Turkey has a unique geo-political and geo-strategic location, Turkey's energy policy and strategies are not only important for Turkey's future but also for both the EU and the Eurasian countries, which are exporter and importer countries of energy. Turkey is in close proximity to 72.0% of the world's proven gas and 73.0% of oil reserves, in particular to those in the Middle East and the Caspian basin. Although Turkey is not a major oil and gas producer, its role as a major regional energy transit hub with supplies from Russia, the Caspian Sea region and the Middle East transported via Turkey westward towards Europe, has been increasingly important to the world oil and gas markets

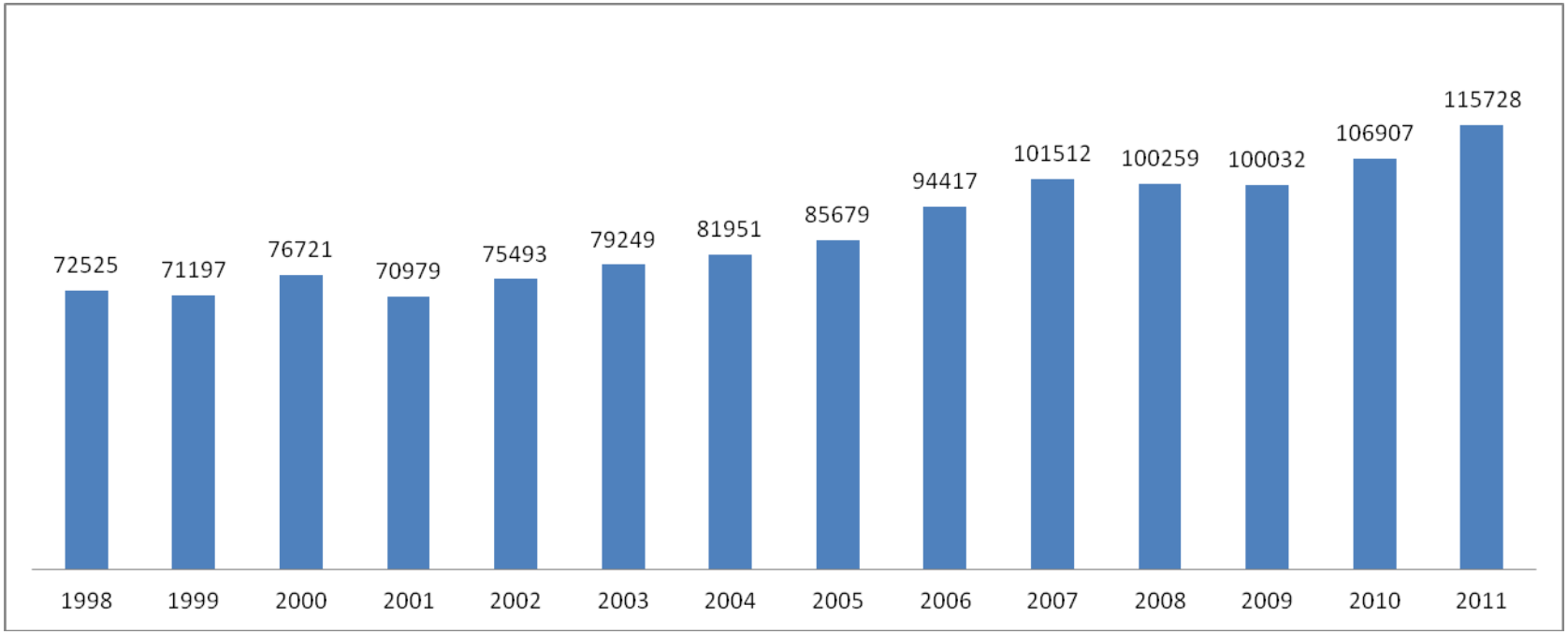

Figure 16. Turkey's Gross Inland Consumption of Primary Energy / 1000 toe (1998-2011)
Source: Eurostat, 2013.

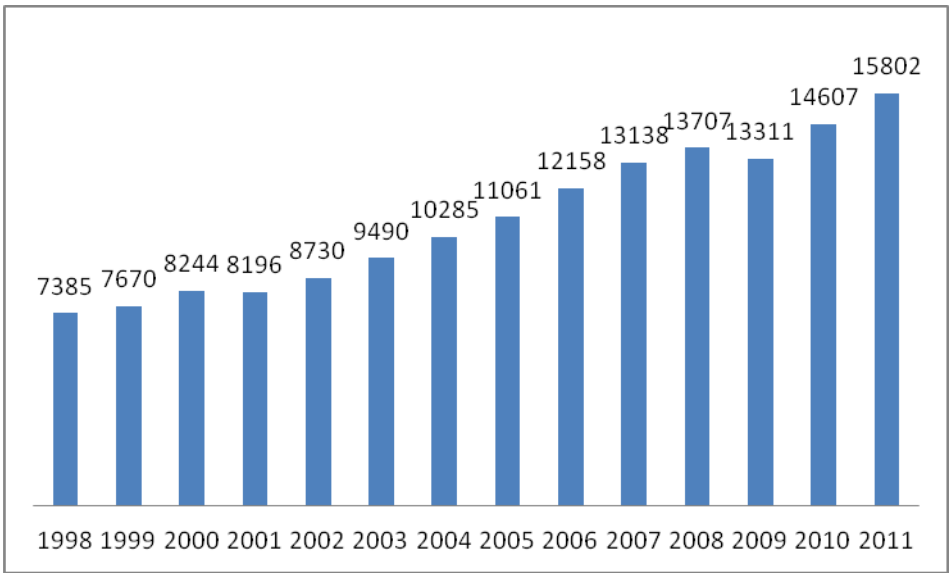

Figure 17. Turkey's Final Energy Consumption of Electricity / 1000 toe (1998-2011)

Source: Eurostat, 2013.

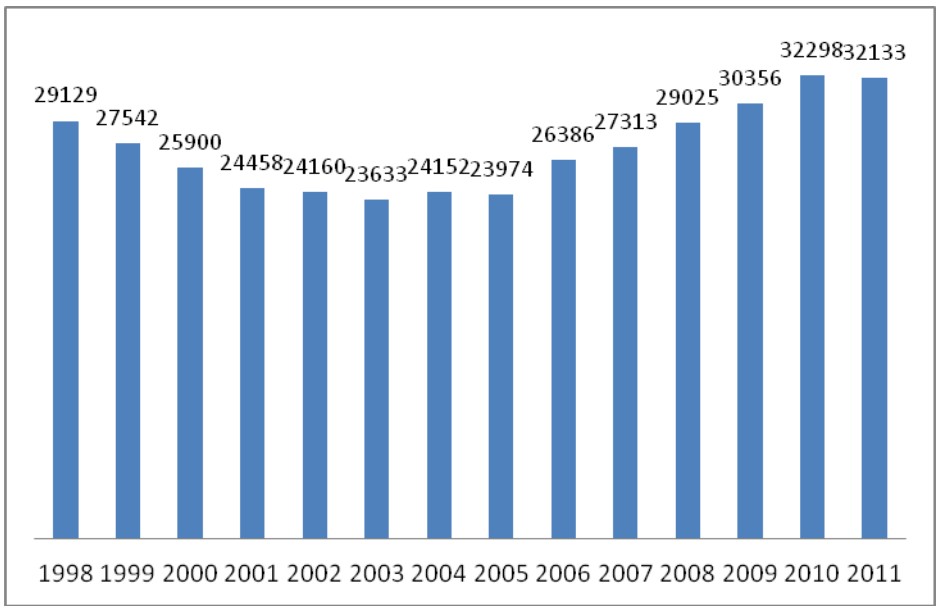

Figure 18. Turkey's Total Primary Energy Production / 1000 toe (1998-2011)

Source: Eurostat, 2013.

(www.smefit.eu, 2011; U.S.A. Energy Information Administration, 2011, p.1; Baris, 2011, p.1754).

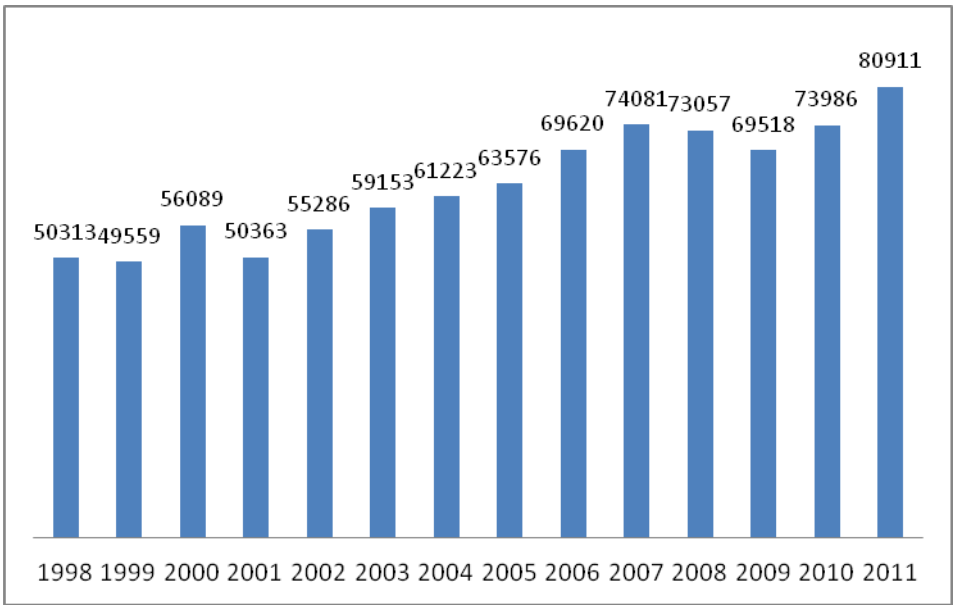

Figure 19. Turkey's Final Energy Consumption / 1000 toe (1998-2011)
Source: Eurostat, 2013.

Turkey does not have a sustainable energy mix. Unfortunately, Turkey has neither natural gas nor oil, even though it is a country close to the natural gas and oil producing regions. On the other hand, Turkey is considered a middle-level country in terms of lignite reserves and production amounts, and a lower-level country in hard coal as well as a high-level country in hydropower. However, 68% of the tertiary coal reserves, which are distributed almost in all regions, have low quality (Baris, 2011, p.1758; www.energy.gov.tr, 2011b). In the energy mix of Turkey, natural gas, coal, oil and a small percentage of renewables including wood and hydraulic—94.0% of the renewables coming from hydropower— are the major energy sources for energy consumption. Natural gas became important in the 1980s. In recent years, natural gas consumption has become the fastest growing primary energy source in Turkey. In the past two decades, the share of natural gas of the country's energy supply has rapidly increased, while the share of oil has recently decreased (Hacisalihoglu, 2008, p.1867, 1869). Natural gas had the highest percentage in energy consumption in 2007; however, gradually from 2007 to 2009, the consumption of natural gas decreased and became 31.9% in 2009. Natural gas consumption fluctuated slightly fewer than 32.0% between 2008 and 2011. Still, Turkey has high natural gas dependency. Oil consumption has declined from 29.9%

in 2008 to 27.0% in 2011 while the consumption of coal was 29.5% in 2008 and kept its same percentage with slight decrease in 2011 as 29.0%, even though it saw increases in 2009 and 2010. The percentage of renewables including hydraulics and wood increased from 8,6% in 2008 to 9.3% in 2009 (Figure 20). Still, 88.0% of the energy consumption came from fossil fuels in 2011.

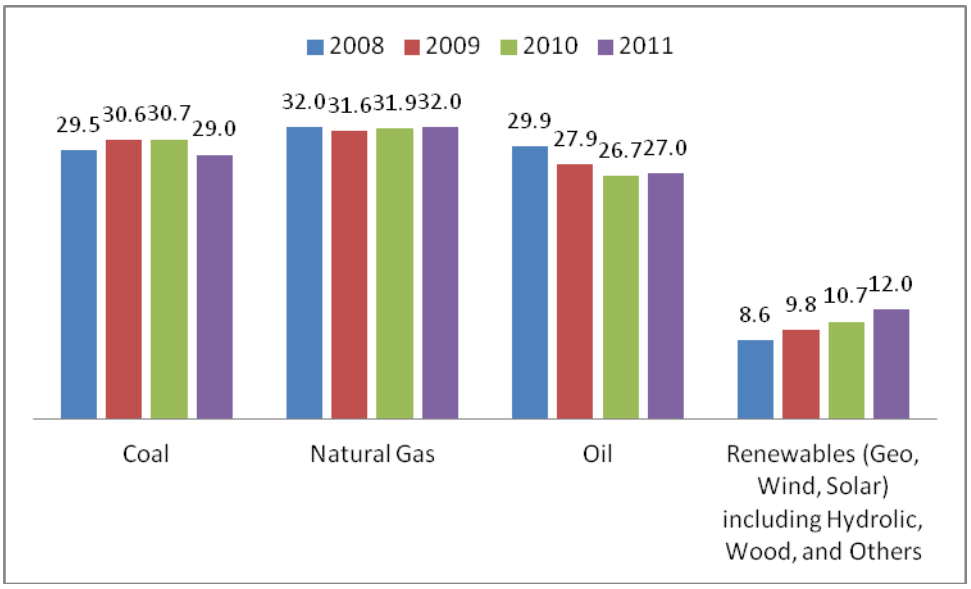

Figure 20. Total Energy Mix of Turkey % (2008-2011)
Source: Union of Chamber of Turkish Engineers and Architects (TMMBO), Energy Outlook of Turkey, August 2012; World Energy Council Turkish National Committee, Energy Report 2012, February 2012.

Turkey has significant long term priorities to reshape its current energy mix by 2023 to provide sufficient energy to increased demand, and decrease energy dependency. The major change in the energy mix is the addition of nuclear energy and an increased share of renewables. Besides hydraulics and wood, a goal is maximum use of geothermal, wind and solar energy.

These priorities are as follow:

- ✓ ***Using 100% the local potential in coal and hydraulic resources***
- ✓ ***Exploiting the renewable energy sources at maximum level, while increasing the share of geothermal, wind and solar energy***

- ✓ ***Incorporating nuclear energy to produce electricity into the energy mix by 2020***
- ✓ ***Developing energy efficiency constantly and rapidly to come to the same level as Europe (www.energi.gov.tr, 2011a)***

Turkey's Energy Efficiency Strategy Document published in 25 February 2012 puts an energy intensity aim of at least 20.0% reduction of energy consumption per GDP by 2023 compared to 2011 and offers various measures as policies and actions (T.R. Ministry of Energy and Natural Resources, 2011).

Even though there is an increased demand for energy, the Turkish economy, a net energy importer country, relies heavily upon imported energy with over 70.0% energy dependency since 2003, dropping slightly to 69.3% in 2010 (Figure 21).

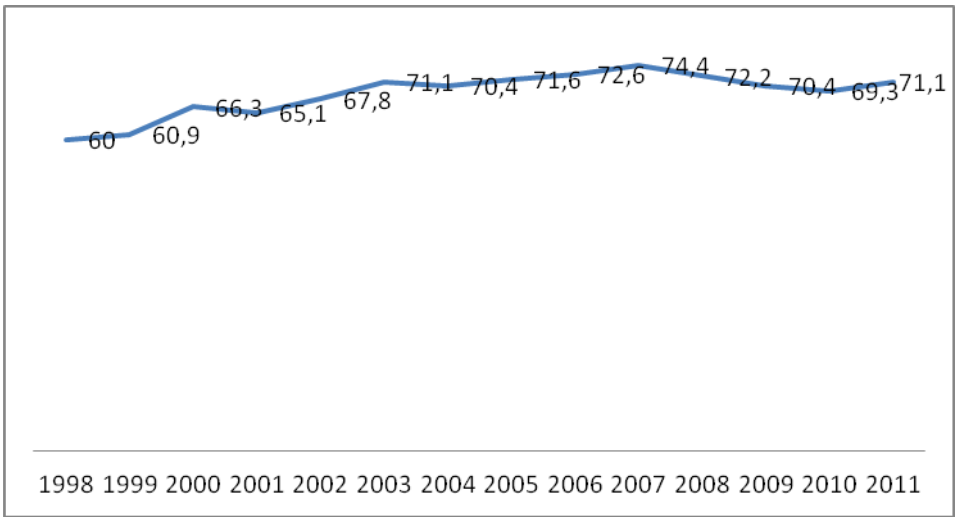

Figure 21. Turkey's Energy Dependence %Total (1998-2011)
Source: Eurostat, 2013.

According to data provided by the World Energy Council Turkish National Committee (WEC-TNC), Turkey imported 90 million toe as coal 15.0%, crude oil 36.0%, natural gas 36.0%, others 13.0% (www.dektmk.org.tr, 2013), while only 32.32 million toe of energy was produced in Turkey. Turkey relies heavily on foreign sources of energy, and almost 93.0% of the oil, 98.0% of the natural gas, and 90.0% of the coal were imported in 2009 (www.energy.gov.tr, 2011c). Based on the data published by BP Statistical Review of the World Energy 2011, slightly decreased

energy consumption by the negative effects of the global financial crisis increased 9.8% again in 2010, and Turkey consumed 0.9% of the world's primary energy (BP, 200b, p.40). Thus, Turkey's net energy import of $34 billion made almost half of Turkey's trade deficit of $71.6 billion in 2010. The share of the energy import in Turkey's total import was 21.0% in 2010 (www.eud.org.tr, 2011)and the energy import still continues to be ¼ of total imports of Turkey in 2013 (T.R. Ministry of Development, 2013a, p. 15). If the necessary precautions are not implemented, the energy dependency is expected to increase to 80.0% (BOTAŞ, 2010, p.20).

Another important reason for Turkey to develop an energy strategy and actively implement this strategy is the EU membership process. Turkey has been in accession talks since 2005, and the screening process of Chapter 15: Energy was finalized in 2006 by the European Commission. Of course, this relationship with the EU has many impacts on Turkey.

The EU Energy Acquis consists of rules and policies, basically on competition and state aids (including the coal sector), the internal energy market (opening up of the electricity and gas markets, promotion of renewable energy sources), energy efficiency, nuclear energy and nuclear safety and radiation protection (European Parliament, 2006, p.3).

Since 2000, Turkey has been working to pass new legislations to restructure its energy sector to make it compatible with the European energy sector. In fact, this legislative effort was necessary to have a competitive energy sector for the success of Turkey's energy policies. The new legislations since 2000 are the following (www.enerji.gov.tr, 2011a):

- ✓ *Electricity Market Law (2001)*
- ✓ *Natural Gas Market Law (2001)*
- ✓ *Petroleum Market Law (2003)*
- ✓ *LPG Market Law (2005)*
- ✓ *Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (2005)*

- ✓ *Energy Efficiency Law (2007)*
- ✓ *Law on Geothermal Resources and Mineral Waters (2007)*
- ✓ *Law on Construction and Operation of Nuclear Power Plants and Energy Sale (2007)*
- ✓ *Law (2008) on the Amendment of Electricity Market Law No. 5784 on Supply Security and Certain Other Laws*
- ✓ *Electricity Market Law (2013) No.6446*

Since March 2001, the EU has issued *4 Accession Partnership Documents* to set the priority areas for Turkey to align with EU's accession criteria. The latest Accession Partnership Document was published in February 2008.

In the first Accession Partnership Document issued in March 2001, short-term and medium-term recommendations of the EU to Turkey in the area of energy were to (Council of the European Union, 2001, p.6): *Put in place a programme for the adoption of the EU Energy Acquis; establish an independent regulatory authority for the electricity and gas sectors; grant the authority and the means to carry out its tasks effectively; prepare for the establishment of the internal energy market, notably the electricity and gas directives, and the opening up of the markets.* In the medium-term, Turkey was expected to: *Restructure energy utilities and open up further the various sectors; strengthen administrative and regulatory structures; complete alignment of national legislation with the EU Energy Acquis* (Council of the European Union, 2001, p.9).

In the latest Accession Partnership Document issued in February 2008, short-term and medium-term recommendations of the EU to Turkey in the area of energy were: First recommendation is to *continue with market liberalisation, and price reforms* (Council of the European Union, 2008); while, regarding the ability to assume the obligations of membership for Chapter 15: Energy, Turkey was expected to: *Continue alignment with, and implementation of, the Acquis on the internal gas and electricity market and on cross-border exchanges in electricity, also with a view to possible membership of the Energy Community Treaty; ensure the implementation of fair and non-discriminatory rules for the transmission of gas; continue to develop*

the capacities of the different regulatory authorities and ensure their independence; strengthen administrative capacity and continue alignment in the energy efficiency field, promote high-efficiency cogeneration, and develop renewable energy in transport, electricity and heating/cooling, including the setting of appropriate and ambitious targets and incentives; accede to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Council of the European Union, 2008). In the medium-term, Turkey was expected to: *Upgrade the country's infrastructure, in particular in energy and transport, in order to strengthen the competitiveness of the economy at large; ensure the establishment of a competitive internal energy market, in compliance with the electricity and gas directives; strengthen administrative and regulatory structures needed for a functional and competitive energy market; adopt a nuclear law which ensures a high level of nuclear safety in line with EU standards* (Council of the European Union, 2008).

In response to the Accession Partnership, the Turkish Government prepared its National Programme of Turkey for the Adoption of the EU Acquis (NPAA). Turkey has prepared 3 NPAAs since 2001, which are all aligned with the Accession Partnerships. Additionally, a comprehensive program that aimed at achieving harmonization with the Acquis during the 2007 and 2013 periods with a perspective of full membership to the EU was prepared after the meeting held on 10 January 2007 with high level participation of both EU and Turkish sides (www.abgs.gov.tr, 2011). A detailed road map with the legislative measures, secondary legislation and strategies, policies for Chapter 15: Energy was prepared as well as for other chapters in harmonization with the 9th Development Plan.

All of the documents issued by the Turkish Government were aligned with the EU's energy policy, even though there was some lateness and difficulties in the implementation phases. The implementation processes have been evaluated by the EU via the European Commission's Progress Reports published at the end of every year for Turkey. Energy issues and progresses were evaluated in Chapter 15: Energy in the Turkey 2010 Progress Report. But, 6 other Chapters also contain energy

related issues: Chapter 4: Free Movement of Capital; Chapter 8: Competition Policy; Chapter 17: Economic and Monetary Union; Chapter 21: Trans-European Networks; Chapter 25: Science and Research; Chapter 27: Environment.

According to comments of the Commission in the Turkey 2010, 2011 and 2012 Progress Reports, there has been good progress with regard to electricity, renewable energy and energy efficiency, as well as on security of supply. On the other hand, the Commission recommends further efforts in the fields of climate change, natural gas, nuclear energy, nuclear safety and radiation protection. In the 2013 Progress Report, even though limited progress was emphasized regarding the further alignment in the fields of environment and climate change (Commission of the European Communities, 2013c, p.71), for the first time, Turkey was considered overall at a rather advanced level of alignment in the field of energy (Commission of the European Communities, 2013c, p.37).

Indeed, climate change and nuclear issues are important steps to take for Turkey. Considering that the EU has a very ambitious target in decreasing carbon emission, as well as the most developed first emission trading scheme for carbon dioxide in the world (Ellerman and Buchner, 2007, p.66), the climate change issue is a real challenge for Turkey in the harmonization process. Furthermore, climate change is at the center of EU policies, not only in energy issues, but in all policies shaping the future of the EU such as Europe 2020 and Energy Road map 2050.

On the other hand, security of energy supply, and ensuring sufficient energy supply to the growing economy and the increasing young population are at the forefront of the Turkish energy policy (International Energy Agency, 2010d, p.9). In May 2010, Turkey adopted a national climate strategy until 2020 and in May 2011 the Climate Change Coordination Board adopted the first national climate change action plan to implement it (Commission of the European Communities, 2011j, p.101). According to the Turkey Progress Report SEC(2012) 336, even though some improvement has been made in general policy development regarding climate change, Turkey's position is not in line with the EU position on climate change, and further efforts are urgently needed. The reason behind the slow progress in climate

change is that usually, energy supply is a priority in developing countries like Turkey. However, the increased awareness in the environmental issues, global climate change, international agreements, and the development of environmental regulations has pushed developing countries to consider more environmental issues, and climate change in shaping their energy policies. Especially because Turkey is a fast developing country as well as an EU candidate country it has been searching ways for sustainable development by both considering environmental and energy issues (World Energy Council, 2010, p.159). In some cases, Turkey has been faced with some dilemmas between its national priorities and those of the EU. For instance, according to the Ministry of Energy and Natural Sources, making complete use of the potential of indigenous coal and hydraulic resources in the country is among the targets in 2023 (www.energi.gov.tr, 2011a). But coal is known as a fuel energy source causing high air pollution with high GHG emissions. The usage of coal is not feasible for the EU, unless decarbonizing technologies are available. This national energy target is not in line with the climate change policies of the EU.

Nuclear energy is an issue as well. Currently, nuclear energy has 13.4% share in the energy mix of Europe in 2008, which is expected to be 15% in 2030 in the business as usual scenario of the European Commission (Commission of the European Communities, 2011c, p.5). Nuclear energy usage in some EU countries is significantly high, even though public criticism of nuclear energy is strong in countries such as France, Germany, and Finland. According to the Finish Ministry of Employment and the Economy, nuclear power in Finland is the biggest single source of electricity production, where nuclear energy's share of the total supply of electricity was around a quarter in 2010 (www.tem.fi, 2011).

Moreover, some EU countries, such as Switzerland and Italy, have been reconsidering their nuclear energy policies (World Energy Council, 2010, p.22). The EU is aiming to keep at least this current nuclear energy share in its energy mix. The usage of nuclear energy depends on the member state energy policy. The Nuclear Illustrative Programme and An Energy Policy for Europe communications of the European Commission in 2007 stated that the role of the nuclear energy should be

developed further, but in conformity with Community law and the most enhanced framework for nuclear energy, as well as the highest safety and security standards set by the Euratom Treaty (Commission of the European Communities, 2007d, p.19). Additionally, nuclear waste management and decommissioning are two main issues for the EU. Thus, in this perspective, Turkey's new nuclear initiative concerns the EU. Turkey has progressed on issues concerning nuclear power plants since 2007 when the Law on Construction and Operation of Nuclear Power Plants and Energy Sale was in force. All Progress Reports of Turkey since 2007 have strongly recommended the needs for more compliance of the existing regulations concerning nuclear energy issues in Turkey with the EU Acquis (Commission of the European Communities, 2009b, p.61; Commission of the European Communities, 2008e, p.58; Commission of the European Communities, 2007e, p.50).

Turkey has progressed significantly in energy efficiency since 2005, and has made it a priority to adopt the energy efficiency framework law, which was adopted as a legal alignment to the EU Acquis in 2007. Reducing the high energy intensity of the Turkish economy and securing rapid and continuous improvement in energy efficiency in a way that parallels EU countries are among Turkey's priorities (www.energi.gov.tr, 2011a). In addition, the Energy Efficiency Strategy was published in February 2012 putting at least 20.0% decrease in energy intensity by 2023. Regulations on the energy performance of buildings and on eco-design requirements for energy-related products were established. A set of new communiqués were produced on eco-design implementations (Commission of the European Communities, 2012, p.71). In terms of energy efficiency financing, international financial institutions showed high interest, and projects on energy efficiency financing have started in Turkey (Commission of the European Communities, 2011j, p.74).

Half the countries in the world have an energy efficiency law, and most have implemented energy efficiency laws in the last 10 years (World Energy Council, 2013, p.36). Turkey is also one of these countries. The energy efficiency policy in Turkey has been fundamentally transformed since 2007 with the Energy

Efficiency Law put in force in 2007 and 2008 and the National Energy Efficiency Movement initiated by the Prime Minister in 2008. The vision of the Energy Efficiency Law is to make Turkey low energy intensity and high energy consumption per capita by using energy efficiently, as well as using energy sources and energy at a maximum level and benefit, reducing energy losses, decreasing the cost of the energy, as well as protecting the environment (Calikoglu, 2010, p.8; World Bank, 2011, p.88).

The Energy Efficiency Law formed the framework for several regulations and incentives for industrial facilities, buildings, services, power generation, electricity transmission and distribution networks, and provided the legal basis in Turkey for: *1) Establishment of administrative structure; 2) Mandate and authority of the General Directorate of Electrical Power Resources, Survey and Development Administration (EIE); 3) Requirements and responsibilities for the Energy Management; 4) Training and awareness, 5) Energy performance of buildings; 6) Minimum energy efficiency requirements; 7) Subsidies and support provided for promotion of energy efficiency; 8) Monitoring, 9) Fines and penalties for non-compliance* (Calikoglu, 2010, p.8; World Bank, 2011, p.88). However, the Energy Efficiency Law put in force in 2007 and 2008, should be harmonized with the 2012 Energy Efficiency Directive of the EU Commission of the European Communities, 2013c, p.37).

According to the General Directorate of Electrical Power Resources Survey and Development Administration (EIE), future plans about energy efficiency are listed as follow: *1) Improvement of energy efficiency strategy; 2) Expanding of scope of incentives and supports; 3) More comprehensive campaign to raise public awareness; 4) Strengthening of infrastructure for follow up, monitoring and assessment studies; 5) Strengthening of national and international cooperation; 6) Rehabilitation of existing buildings (Improving heat insulation); 7) Development of financial mechanisms such as third party financing, carbon trade etc. in cooperation with national and international bodies; 8) Introducing and promoting of eco*

buildings; 9) Promoting of investment for small scale renewable (Calikoglu, 2010, p.22).

The Strategic Plan 2010-2014 of the Ministry of Energy and Natural Resources considers energy efficiency as an opportunity which has high potential for an implementation area for Turkey (T.R. Ministry of Energy and Natural Resources, 2010, p.9). Indeed, the Report states that increasing energy efficiency is one of the main tools to improve the energy security of Turkey. (T.R. Ministry of Energy and Natural Resources, 2010, p.9).

Turkey published its first Energy Efficiency Strategy Paper in 2004. After 7 years of major transformations in the energy and energy efficiency fields, the Draft Energy Efficiency Strategy Plan of Turkey 2011-2023 was announced in August 2011 and published in the Official Journal on February 2012.The Strategy Plan emphasizes the importance of sustainable development, and the role of energy efficiency in this perspective to improve energy efficiency from energy production to the final energy consumption, preventing the waste of energy use, decreasing energy intensity both at the sectorial and national levels, which are all important components of the national energy policy.

Turkey's Energy Efficiency Strategy Document published on 25 February 2012 puts an energy intensity aim of at least 20.0% reduction of energy consumption per GDP by 2023 compared to 2011 through various actions (T.R. Ministry of Energy and Natural Resources, 2011): *1) Decreasing the energy intensity and energy losses in the industrial and services sectors; 2) Decreasing energy demands and carbon emissions of all buildings; as well as making sustainable environmental friendly buildings using renewable energy sources widespread; 3) Providing the market transformation of energy efficiency products; 4) Increasing efficiency in the production, transmission, and distribution of the electricity, as well as decreasing energy losses and GHG emissions; 5) Decreasing the unit consumption of fossil fuel of the motor vehicles; increasing the share of the public transportation, and preventing the waste of fuel usage in the urban transportation; 6) Using energy effectively and efficiently in the public sector; 7) Empowering the institutional*

structures, capacities, and collaborations; increasing the high technology usage and awareness raising activities; as well as developing financial means besides public sectors offering. Unfortunately, the Ministry has showed no progress on the draft of the energy efficiency strategy with specific targets (Commission of the European Communities, 2011j, p.74).

Turkey's ambitious targets and tremendous efforts still have much to achieve to increase energy efficiency in Turkey:

First, Turkey has higher energy intensity than that of the EU-27 (Figure 22), which means that Turkey is not using its energy as efficiently as EU-27. Plus, national development is mostly based on heavy industries with high energy consumption. Turkey's energy intensity is 25.0 to 33.0%, more than Germany and Italy, indicating potential for energy efficiency improvements (Eurostat EU-27 Energy Intensity, 2013). Additionally, energy intensity has a decreasing trend in the EU-27, while it has an increasing trend in Turkey (Figure 22). Even though the level of energy intensity was higher between 1995 and 2000 than that between 2001 and 2009, the upward trend and the rate of increase in Turkey's energy intensity are remarkable (Figure 22).

Second, Turkey has a 5.0% rate of increase in primary energy consumption, and as well as a 5.0% rate of increase in its GDP. In the developing countries this trend is normal, because as the countries grow, they consume much more energy. On the other hand, developed countries like EU-27 have a higher GDP growth rate than the rate of its energy consumption. Turkey needs structural changes and efficiency, which are relatively new concepts for Turkey, to change this trend, and have a higher GDP growth rate than its energy consumption rate (Turkey's Energy Efficiency Council & Energy Efficiency Association, 2010, p.33).

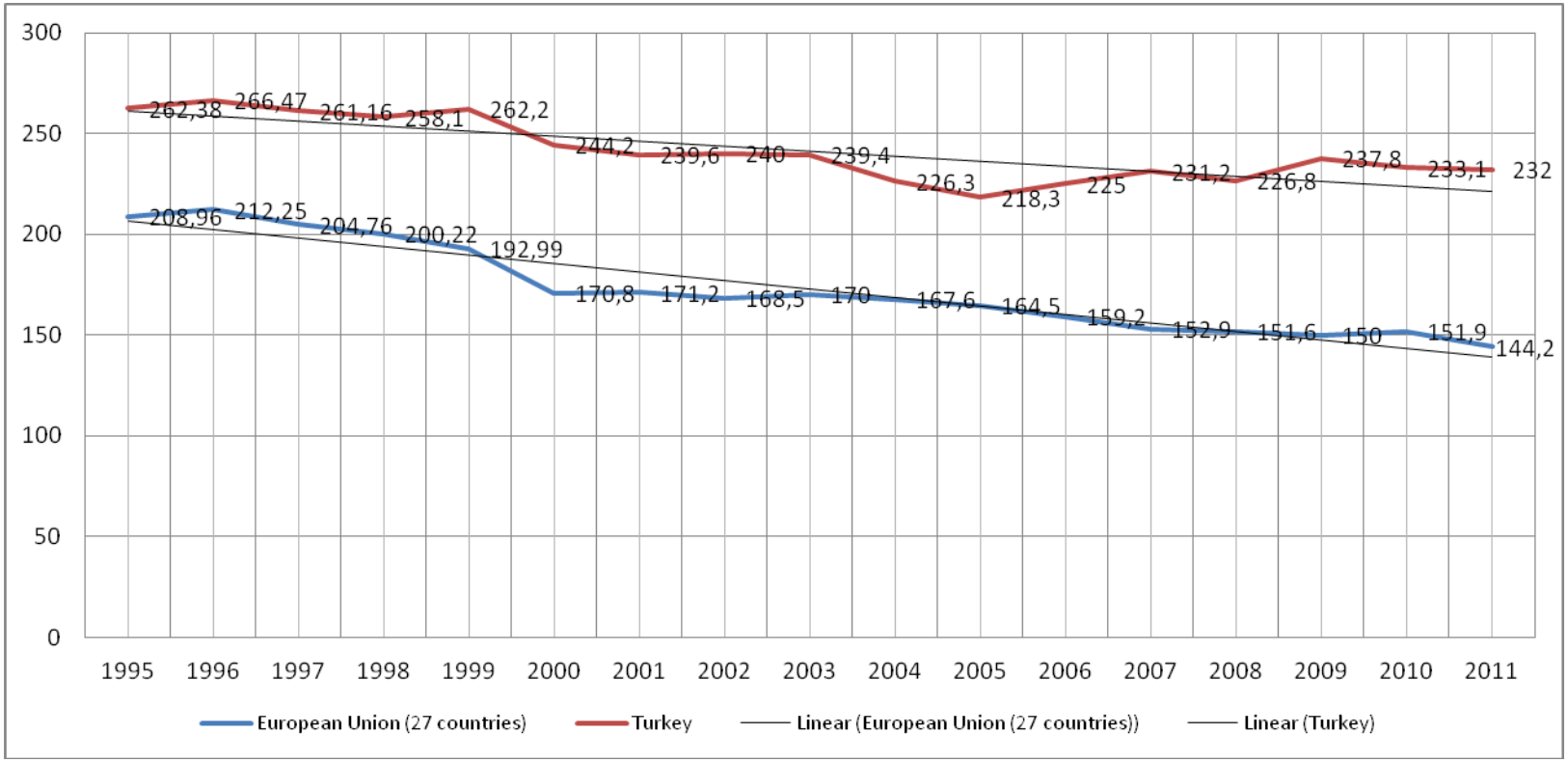

Figure 22. Energy Intensity of the Economy (EU-27 and Turkey, 1995-2011)

Source: Eurostat, 2013.

Third, while Turkey has been implementing major structural changes, the role of energy efficiency should not be underestimated. In the 10th Development Plans of Turkey, the necessary measures to for energy efficiency are emphasized and the "Energy Efficiency Development Program" aiming to decrease primary energy intensity of Turkey from 0.2642 TOE/$1000 in 2011 to 0.243 TOE/$1000 by 2018 and decrease energy consumption in the public buildings 10.0% from 2012 by 2018 is considered among the priority transformation programs (T.R. Ministry of Development, 2013, p.198).

Compared to other OECD countries, Turkey only started its energy efficiency initiative recently. The Energy Efficiency Law in Turkey was effected in 2007. The OECD benefited from energy efficiency improvements in Bulgaria and Romania, both of which applied for EU membership in 1995 and became EU members in 2007, and Poland and Hungary, both of which applied for EU membership in 1994 and became EU members in 2004. These countries were able to join all EU Programs to make their structural changes, apply energy efficiency programs, as well as increase public awareness of energy efficiency. Data confirms that Turkey also has a substantial energy saving potential to be captured (World Bank, 2011, p.10).

Additionally, the sectoral energy consumption in the households and services and industry is very high (Figure 23). Approximately 53.0% of the electricity is consumed in the households and service sector, and 47.0% is consumed in the industrial sector (Figure 24) making increased energy efficiency in the industry and transportation, and as well as improving energy efficiency in buildings priorities under the "Energy Efficiency Development Program" offered by the 10th Development Plan of Turkey targeting years between 20014 and 2018.

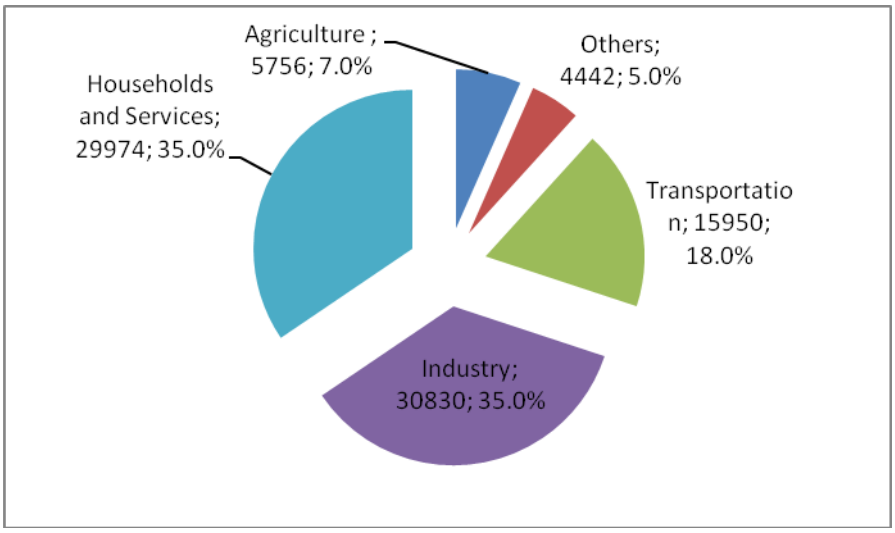

Figure 23. Sectoral Energy Consumption in Turkey / 100 toe and %
Source: www.energy.gov.tr, 2011 Turkey's General Energy Balance Sheet, 2013.

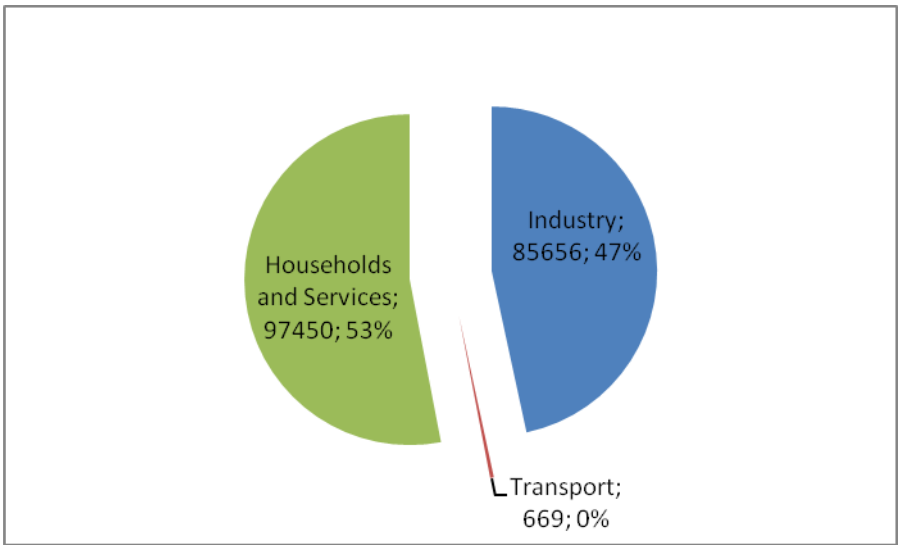

Figure 24. Sectoral* Electricity Consumption in Turkey / GWh
Source: Eurostat, 2013.
* This consumption stands for final energy consumption. This means that the consumption in industry covers all industrial sectors with the exception of the energy sector, like power stations, oil refineries, coke ovens and all other installations transforming energy products into another form. Final energy consumption in transport covers mainly the consumption by railways and electrified urban transport systems. Final energy consumption in households/services covers quantities consumed by private households, small-scale industry, crafts, commerce, administrative bodies, services with the exception of transportation, agriculture and fishing.

The electricity energy intensity has increased 1.83% per year between 1998 and 2008, which was mainly caused by consumption outside the industrial sector (T.R. Ministry of Energy and Natural Resources, 2011, p.2). Thus, taking measures to decrease electricity consumption for energy efficiency improvements is crucial, especially in building sectors where both residential buildings and public and commercial buildings offer a 29.0% electricity energy savings potential (Table 7).

Table 7
Summary of Energy Efficiency Potential of Turkey in Industry & Building Sectors

Sectors	**Saving Potential %**		**Saving Potential 1000 toe/yr**
	Electricity	Fuel	
Industry	**25**		**8015**
Iron and Steel	21	19	1402
Cement	25	29	1124
Glass	10	34	261
Paper	22	21	206
Textile	57	30	1097
Food	18	32	891
Chemical	18	64	2283
Others	n.a.	n.a.	729
Building	**30**		***7160***
Residential	29	46	5655
Public and Commercial	29	20	1505
Total	**27**		**15152**

Source: World Bank, 2011, Tapping the Potential for Energy Savings in Turkey, p.11.

Figure 25 and Table 8 show the distribution of energy end consumption by sectors from 1990 to 2006 These sectors were dominated by the housing and services sector in 1990 (37.0%) and consumption started to concentrate more on the industrial sector in 2006 (44.0%) (Figure 25; Table 8; T.R. Ministry of Energy and Natural Resources, 2006, p.10).

The industry and building sectors are the two main sectors offering high energy saving potential, and need energy efficiency measures. The energy savings

potential in the industry sector is 25.0% around 8 million toe per year while the saving potential in the building sector is 30.0%, over 7 million toe per year (Table 7).

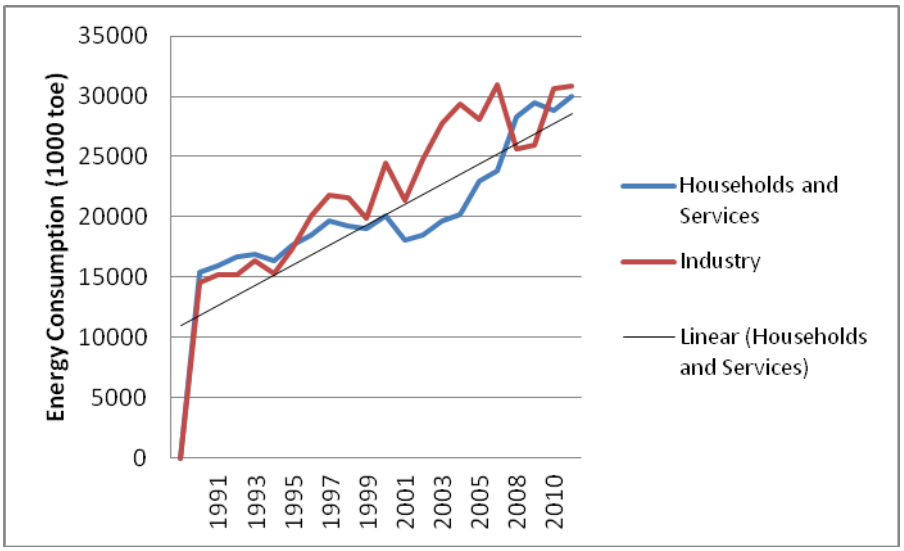

Figure 25. Comparison: Energy Consumption in Turkey in Industry and Households (1990-2011)
Source: www.energy.gov.tr, Turkey's General Energy Balance Sheets, 2013.

Transportation has 15.0% energy saving potential (www.energy.gov.tr, 2013).

The "Energy and Energy Efficiency Report of Turkey 2010" reports a 30.0% saving potential (Turkey's Energy Efficiency Council & Energy Efficiency Association, 2010, p.10). The energy savings potential in each sector is equal to t7.0% of the total energy consumption of Turkey (World Bank, 2011, p.11). The building sector offers the highest percentage of energy saving potential with 5.6 million toe in residential buildings and 1.5 million toe in the public and commercial sector. The percentage of energy saving potential in fuel is very high with 46.0% in residential buildings, while the saving potential in electricity is higher in public and commercial buildings with 29.0% (Table 7).

. If the current energy consumption of a building is 100.0%, a 25.0% energy consumption decrease is possible after the implementation of building energy efficiency systems and a 50.0% energy consumption decrease is possible after the implementation of renewable energy systems in the building (Figure 26).

Table 8
Comparison: Energy Consumption in Turkey in Industry and Households (1990-2011)

Year	Households and Services 1000 toe	Industry 1000 toe
1990	15358	14542
1991	15915	15181
1992	16714	15181
1993	16934	16333
1994	16333	15272
1995	17596	17372
1996	18466	20050
1997	19704	21790
1998	19278	21555
1999	18978	19873
2000	20058	24501
2001	18122	21324
2002	18463	24782
2003	19634	27777
2004	20252	29358
2005	22923	28084
2006	23860	30996
2008	28323	25677
2009	29466	25966
2010	28868	30628
2011	29974	30830

Source: www.energy.gov.tr, Turkey's General Energy Balance Sheets, 2013.

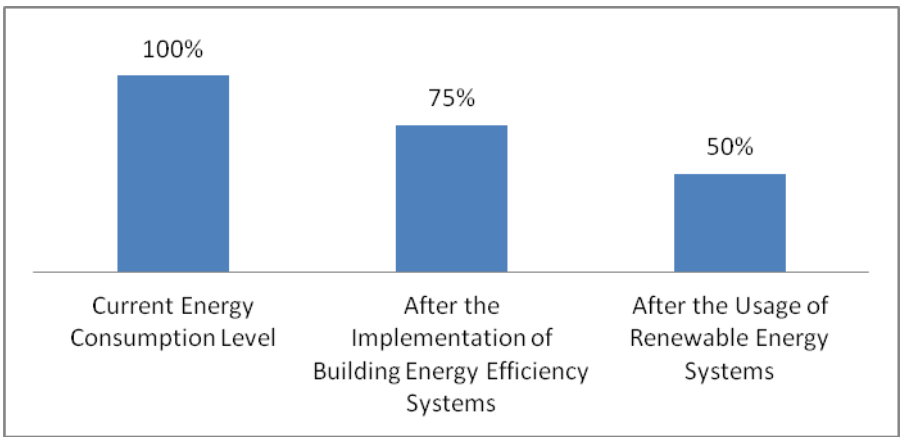

Figure 26. Energy Efficiency Saving Potentials of Turkey in the Buildings
Source: www.uevf.com.tr, 2011.

In Turkey, the building sector consumes various energy resources from a resource diversity perspective. Even though it looks as though 28.0% of the energy consumed in the building sector comes from renewable energy resources, 22.0%, particularly originates from wood, animal and vegetables mostly used in the rural areas (Figure 27).

In fact, geothermal energy is 5.0% and is mostly used for space heating; while solar energy is only 1.0%, and used for heating water. 49.0% of electricity consumption in Turkey comes from the buildings (Figure 27), so, it is not surprising that electricity is 25.0% of the energy used in the buildings.

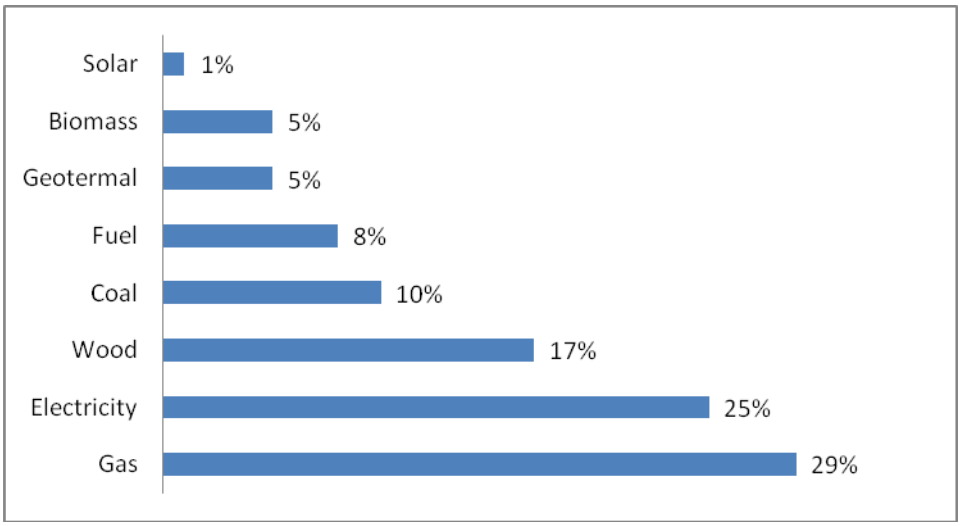

Figure 27. Building Sector Energy Consumption in Turkey
Source: Turkey's Energy efficiency Council & Energy Efficiency Association, 2010, Turkey's Energy and Energy Efficiency Working Report, p.60.

Gas, which entered into the Turkish Market in 1988, has the highest percentage of total energy consumed in buildings with 29.0%. As natural gas consumption has increased, the shares of coal and fuel have decreased to 10.0%; fuel is 8.0% (Figure 27). As described in the aims of the Energy Efficiency Strategy Plan 2011-2023, Turkey needs to decrease energy demands of buildings by energy efficiency measures, and promote renewable energy sources for more sustainable environmental friendly buildings (T.R. Ministry of Energy and Natural Resources, 2011, p.8).

According to the Minister of Environment and Urban Planning, there is almost 19 million existing housing stock in Turkey (TOKİ, 2011). Generally, heating, cooling and water heating account for 85.0% of home energy consumption in Turkey (World Bank, 2011, p.43), which is higher than the 50.0-60.0% (Figure 12) range in the EU. Therefore, thermal insulation is one of the main priorities for energy efficiency in the building sector. But there is a need to take a holistic approach in taking measures to improve energy efficiency. Lighting consumes 20.0% of the total electricity consumption in Turkey. Industrial buildings consume 10.0%, retail chains consume 30.0%, and offices consume 40.0% of their power consumption for lighting (Onaygil, 2011, p.10). The increased use of appliances, office equipment, and air conditioning in buildings, depending on whether they are residential or commercial, showed 6.0% residential, 14.0% commercial, and 8.0% public average electricity consumption growth between 2001 and 2007 (World Bank, 2011, p.24), This increase is the main reason for increased electricity consumption in buildings in Turkey in recent years. Air conditioning by itself takes 50.0% share of the electricity consumption in the world outside the electricity consumed in the industry (TOBB, 2007, p.3).

Turkey's energy efficiency strategy was published in February 2012, preparing Turkey for an energy efficient future; buildings are one of the main components of the aims of this strategic document. Based on the strategy document, legislation and secondary legislation will be revised accordingly to realize the aim of having sustainable buildings consuming less energy and using renewable energy sources. The sustainability concept and requirement will be implemented officially into the buildings in Turkey as follows:

- ✓ *Putting limits to the energy consumption and carbon emissions of the buildings;*
- ✓ *Implementing administrative sanctions to the buildings having carbon emissions over the limits stated in the legislation after 2017;*

- ✓ *Incentivizing insulation and efficient heating and cooling systems by putting discounted or higher property taxes in buildings which had the building licenses before the Energy Efficiency Regulation put in act;*
- ✓ *By 2023, at least ¼ of the building stocks in 2010 will be transformed to sustainable buildings;*
- ✓ *New buildings, such as commercial, luxury private, and integrated residential buildings having over 10.000 m² usage area, will be required to prove their sustainability depending on the municipality's development level, construction plan, land value, natural energy sources in the environment by having sustainability certificates issued on the national and international criteria after 2017;*
- ✓ *Increasing the usage of the onsite power generation implementations in the collective housings; usage possibilities of renewable energy sources, cogeneration or micro generation, central and regional heating & cooling, and heat pump systems in the collective housings will be analyzed and will be incentivized by the criteria set by the Ministry until the necessary revisions made in the BEP (T.R. Ministry of Energy and Natural Resources, 2011, p.10).*

The most comprehensive legislation in Turkey on energy performance in buildings, in parallel with EPBD in the EU, the Energy Performance Regulation in Buildings (BEP) was enacted by the Ministry of Public Works and Settlement in December 2008, setting the principles to calculate and evaluate overall building energy consumption. The Regulation specifies minimum requirements for heat losses, insulation, air circulation, heating and cooling systems, ventilation and air conditioning, hot water and its distribution, automatic controls, electrical installations and lighting, use of renewable energy and co-generation, maintenance, energy, identification certificate, and fines and penalties for non-compliance (The Republic of Turkey Official Journal 27075, 2008). The Regulation has been in force since December 2009, and was revised in April 2010. BEP will be revised again based on the new requirements from the Energy Efficiency Strategy Document. In addition,

ecodesign requirements for energy-related products were established, which is also a complementary directive for energy efficient products to use in the buildings.

In Turkey, the *Energy Performance Certificate* became mandatory on 01 January 2011 for all new buildings, which also had a positive effect in raising awareness about energy consumption and carbon emissions according to the Chair of Energy Efficiency Section in the Ministry of Environment and Planning (www.enerjienstitusu.com, 2011). The Certificate provides information to end users about the energy requirements, the renewable energy used, and carbon emission of the building as well as the building's energy classification for use during selling, renting or owner transferring. Additionally, the Certificate will be mandatory for existing housing stock by 2017, which is a big challenge for all. The majority of housing stock, especially those built before 2000, lacks necessary standards and is energy intensive. Just after the Energy Performance Certificates became mandatory, 1514 new buildings got their Certificates, while only 121 existing buildings got theirs by the end of the first month (www.milliyet.com.tr, 2011). During 2011, total of 8000 energy performance certificates were issued (Commission of the European Communities, 2012, p.61).

The system for certification for new buildings works when the application is made to get the construction permit to the municipality. The energy certificate of the building prepared by an energy certificate expert working in free consultancy companies, is required. Later, after construction and before getting its certificate of occupancy, the building is inspected to see whether it was constructed according to its energy certification.. On the other hand, the certificates for the existing housing stock will be organized by the energy efficiency services companies (ESCOs) in Turkey. But, in 2011, the number of ESCOs was limited and only 27 were available to give energy certificates for buildings.

The energy efficiency expert analyses all indications of the building, as well as heating and lighting systems by the request of the building manager. All the data collected from the buildings is entered into a program called BEP.TR to indicate the energy efficiency performance of the building by a letter from A to G. BEP.TR is

also used for grading the new buildings, and works as an important database for future policy development based on actual data. The calculation of the energy consumption and CO2 emission per m² is calculated by BEP HY, the calculation methodology. The buildings which are well insulated and heated by renewable energy sources such as wind, solar energy and geothermal, with a high energy efficient lighting systems are highly graded and get A. On the other hand, usually buildings which are not insulated get F or G, and insulated buildings could get C or D according to the experts. There is an expectation that building owners will install insulation in their buildings before getting a certificate in order to not fail or obtain a very low grade.

In the Strategy Plan, the EIE declares that the number of the certified energy managers will be at least 5000 and the number of ESCOs will be at least 50 for industry, and total 200 by 2015 (www.eyder.tk, 2011; T.R. Ministry of Energy and Natural Resources, 2011 p.17) Additionally, the criteria for certifying new ESCOs will be reassessed by the EIE.

The change by 2015 will also positively affect the number of certified existing buildings as there will be more eligible, experienced, and proficient ESCOs in Turkey to perform necessary studies for buildings, and certify them in various cities, not only in some regions (www.cevreorman.gov.tr, 2011). On the other hand, the Directorate of the Energy Efficiency in Buildings has been developing an infrastructure for energy performance certification implementation after its start in January 2011, and promotes energy efficiency implementations in the medium term. Moreover, improving energy efficiency in public buildings is also among the medium term goals of the Directorate to promote energy efficiency, as well as fight climate change (www.uevf.com.tr, 2011). Integrated strategies for energy efficient buildings both to improve energy efficiency and combat climate change are needed.

At present, Turkey is behind in complementary policy instruments for the certification system to promote energy efficiency in buildings such as financial incentives and mechanisms, information and communication activities, voluntary certification and label, and others.

In addition to the mandatory energy performance certificate in Turkey, there is no national voluntary certification scheme on low energy standards in buildings or passive house standards as in the most of the EU Member States. Only the Turkish Green Building Association promotes BREEAM, the UK green building certification, and LEED, the American green building certification in Turkey. There are currently 5 BREEAM certified, and 15 LEED certified buildings in Turkey (www.cedbik.org, 2011). The DGNB German Sustainable Building Council looks also for opportunities to be active in Turkey, as all European and other voluntary certification schemes consider Turkey as a growing market for their certifications and knowledge transfer. They all have different requirements for certification. The hardest one is the German certification with demanding criteria, while the second is BREEAM, and LEED is loose compared to the German certification scheme. Consequently, LEED and BREEAM are more active in Turkey as they have looser requirements to fulfill to get the certification. This will take some time for Turkey to develop its own national voluntary certification schemes for passive houses or low-energy standards.

Innovative financing incentives and mechanisms specific to energy efficient buildings exist in all EU countries; however, Turkey is at an early stage of developing such a mechanism. The government does not offer any financial incentives such as subsidies, zero loans or low interest rates to finance low energy buildings or lower taxes for energy efficient buildings" (Thomsen and Wittchen, 2008, p.25). Until now, even though there has been a high demand for tax incentives, or other financial incentives on energy efficient buildings by the different interest groups in the industry, and high pressure on the government to start such implementation, the government has been reluctant, and considers such tax redemption very sensitive issues, and has not listened to different stakeholders in the industry. However, in the Energy Efficiency Strategy Document 2011-2023, for the first time the government mentioned a higher tax implementation for commercial and service buildings over 10 thousand square meters which do not have sufficient insulation (T.R. Ministry of Energy and Natural Resources, 2011, p.10). It is a big step for the government to put such a financial incentive in the Strategy Document,

even though there is no implementation with specific targets yet in the market. Meanwhile, for the last two years, some local financial institutions have seen energy efficient buildings as an untapped market to create new financial products by active information and communication of the stakeholders in the industry, especially the industrialist business representative organizations producing construction materials important for energy efficient buildings. In addition, international financial institutions have started showing increasing interest in financing energy efficiency projects in Turkey (Commission of the European Communities, 2011i, p.74).

For instance, the Industrial Development Bank of Turkey (TSKB), the first private investment and development bank of Turkey, and Şekerbank, one of the major commercial and retail financial institutions in Turkey, have become more active in financing energy efficiency in buildings and creating specific financial packages by working with the industry. TSKB works with the industry to finance projects on energy efficiency. HVAC implementations are among the project areas for sectors such as commercial buildings and as well shopping malls. Şekerbank is the first financial institution to provide financing by "EKOkredi" on energy efficiency in buildings for the end users. EKOkredi was launched in August 2009 in the area of insulation with the collaboration of the Association of Thermal Insulation, Waterproofing, Sound Insulation and Fireproofing Material Producers, Suppliers and Applicators (IZODER). A financial institution and a sectorial business representative collaborated without any government support to develop this special financing package for the end users. This was an important step to show how information and communication activities between the stakeholders are important to start this kind of mutually beneficial collaboration. If IZODER had not communicated constantly with the financial institutions regarding the untapped energy efficiency potential in the Turkish building sector, and had not stayed informed with all the current trends and legal developments in the sector, it would have taken longer for the financial institutions in Turkey to discover this opportunity and act. Even though there are other banks which provide financing for energy efficiency projects, Şekerbank's EKOkredi has become a unique model in the building sector in terms of its business model similar to the successful ones existing in the EU Member States. Sekerbank

has become successful in developing a system to get the applications from the apartment buildings and the management of the building complexes, in addition to individuals. With the contribution of IZODER, the financing package became a full service package as the technical support on energy efficiency in accordance with the specifications required in the directives and regulations, the consultancy on implementing companies, and project control services were also provided to the credit users. Credit is provided with zero interest rate for 8 months with zero commission. Sekerbank and the insulation products producers' member of IZODER shared the cost of commission and did not reflect this cost to the end users in order to develop the market for energy efficiency in the buildings. EKOkredi has evolved since its first launch, and has started to provide credit for solar energy implementations, transformation of the energy systems to natural gas, and having an "A" class energy certificate. Şekerbank provides specific credit on energy efficiency in buildings as well for the commercial sector. At present, Şekerbank has become an expert in this untapped niche market, and gained prestige in the international arena. Thus, the Southeast Europe Energy Efficiency Fund, the "Green for Growth Fun" has chosen Şekerbank the first bank to credit in the region due to the Şekerbank's success in EKOkredi in June 20120. Based on this agreement, Şekerbank is supposed to utilize loans amounting to €25 million in financing 2,500 projects that have energy saving goals such as insulating buildings, improving heating and lighting systems, converting to natural gas, and using renewable energy on small scale and will ensure reduction in CO2 emission (www.sekerbank.com.tr, 2011).

Furthermore, the success of the EKOkredi Insulation triggered other collaborations of financial institutions with IZODER such as Ziraat Bank, and Denizbank, which launched an Energy Saving Credit for insulation purposes both for end consumers and small and medium sized companies in 2011.

Turkey also lags with instruments to promote energy efficiency in information and communication activities. So far, the only large scale communication activities targeted to the end users was television publicity about Şekerbank's EKOkredi Insulation. In addition, IZODER ran a large "Yalıtım

Yalıtımdır" campaign for years. However, until now, there has been no integrated communication activity with a holistic approach to promote energy efficiency in buildings. The government has made some attempts with communication activities to the public on energy efficiency in buildings under the umbrella of ENVER, and nominated2008 as "Energy Efficiency Year". The "National Energy Efficiency Movement" was launched with the collaboration of public and private stakeholders by Prime Ministerial Memorandum 2008/2 published on 15 February 2008 (The Office of the Prime Minister, 2008a). Different communication and information activities were planned to raise public awareness including a "Joint Action Proclamation" open to all stakeholders. With another Memorandum 2008/19 in August 2008, an announcement was sent to public institutions to change their current lighting into the more energy efficient systems (The Office of the Prime Minister, 2008b). The communication activities were not as successful as they were planned, but the Turkish Energy Efficiency Assembly (TEVEM) and Energy Efficiency Association (ENVERDER) were founded. Furthermore, the National Energy Efficiency Forum and Fair, which has been organized every January since 2009, became a successful platform to raise public awareness and unify all stakeholders under the same umbrella to discuss common issues in energy efficiency.

Another financing and communication initiative in the building sector was the campaign run by TOBB and Halk Bank with the support of all subsectors in construction to revitalize the sector after the global financial crisis. The campaign, "Renovate your Home Turkey", was launched in August 2009. However, the component on energy efficiency was lacking, and it could have been a very important communication tool to raise awareness on energy efficiency in the building. Furthermore, municipalities in Turkey are not still as active in energy efficiency in buildings as their counterparts in the EU Member States. They do not play any role in financial mechanisms, or in information activities. There are only campaigns run in collaboration with municipalities and paint companies to landscape the environment under urban transformation projects, not energy efficiency for buildings purposes. In Turkey, local authorities are one of the stakeholders closest to

the public. Unfortunately, the roles of the municipalities in the energy efficient buildings are underestimated. They should play more active and effective roles.

At present, there are a few projects specific to energy efficiency in buildings such as the "Sectoral Collaboration Project with regard to Financing Energy Efficiency in Buildings within the Framework of the EU Regulations and Legal Arrangements" run by the Association of Turkish Construction Material Producers (IMSAD) and other 47 partners in 9 EU and Western Balkan countries. This is a unique project in Turkey regarding financing energy efficiency in buildings; moreover, Şekerbank is an associate partner of this project. The other project, "Energy Efficiency in Buildings-Public Awareness Raising Project" was launched by the British Council with the collaboration of the Ministry of Environment and Urbanization. The project models the practices in the UK, which gives help for people to reach existing information about their own buildings and offers suggestions on effective renovation (www.britishcouncil.org, 2011). Another long run project, "Promoting Energy Efficiency in Buildings in Turkey" is headed by UNDP Turkey between 2011 and 2015 with a $17580000 total budget. The EİE will execute the project, while the Ministry of Public Works and Settlements, Housing Development Administration (TOKİ) and Ministry of National Education are other partners of the project. The project is financed by the Global Environment Facility (GEF) (www.undp.org.tr, 2011). The funding opportunities on energy efficiency in buildings in Turkey have increased in terms of numbers and sources.

Once the necessary legislation framework was secured, Turkey has been going through a process to have more integrated policies in energy efficiency, as well as energy efficiency in buildings regarding increasing institutional capacities in implantation, encourage collaboration between governmental institutions, as well as public, private, non-governmental organizations and higher education institutions, develop various means of financial tools to increase the energy efficient buildings implantation rate, raise public awareness on the importance of energy efficiency and facilitate market transformation to use energy efficient technologies.

The long-awaited law governing the generation of energy from renewable resources was a major step for Turkey. Even though a Law on the Use of Renewable Energy Sources in Electricity Generation was adopted on May 2005, the law does not set a target for electricity generated from renewable sources by 2010, as foreseen by the relevant EU Directive (European Parliament, 2006, p.8). Now, as the law was passed through the Turkish Parliament, more investment would be incentivized in Turkey to reveal the significant untapped potential for renewable energy sources. In 2012, Turkey produced 27.0% of its electricity from renewable energy sources as 3.0% wind and 24.0% hydraulics (World Energy Council, 2012, p.58). However, further efforts are needed.

Indeed, if a comparison between the first Progress Report of the European Commission SEC(2001) 1756 in 2001 were made with the last ones SEC(2010) 1327, SEC(2011) 1201 and SWD(2012) 336 , it would show that Turkey has made progress in energy issues, and has passed many laws.

An examination of the importance of energy, energy efficiency, and energy efficiency in buildings both in the EU and Turkey provides evidence that university campuses with all their buildings and thousands of consumers should give a high priority to making their buildings energy efficient and develop energy efficiency programs integrated with research, education, and the campus community. Many HEIs in the EU implement energy conservation infrastructural programs for buildings and awareness and behavior change programs on using energy efficiently in the campus buildings as a part of their campus sustainability programs.

Europe has around 4000 higher education institutions, with over 19 million students and 1.5 million staff (www.ec.europa.eu, 2011k). On the other hand, according to the data from the Higher Education Board, Turkey currently has 166 universities, with 62 of them private foundations, and 104 state universities (www.yok.gov.tr, 2011a; www.yok.gov.tr, 2011b). Considering the young population of Turkey, the number will keep increasing in the future. Istanbul, the leading city of Turkey with 17 million population, has 42 universities in its boundaries, 9 of the universities being state owned, and 33 of them private

foundation universities, almost half of the total private foundation universities in Turkey. There were 2,087,890 students registered in the HEIs in Turkey between the academic years 210-2011. There was a 70.67% increase in the number of students between 2002-2003 and 2010-2011 academic years.

The increasing number of universities with millions of students in Turkey puts a challenge in front of the higher education institutions in terms of sustainability and using energy efficiently. That is why establishing the sustainable campus concept in Turkey is crucial at this stage. Just the fact that the dorm capacity of the Higher Education Credit and Dorms Institution (YURTKUR) has increased 30.38% between the 2002-2003 and 2010-2011 academic years, and became 246,203 by 23 December 2010 (www.sabah.com.tr) is a striking issue why Turkish universities need to build sustainable campuses and use energy efficiently. Public universities are financed by the governments; thus, implementing "the sustainable model" is a key element for a university for guaranteed income and guaranteed savings without getting affected by budget cuts, fluctuations in the economy, possible energy crisis.(www.drcetiner.org, 2011). By being sustainable campuses and using energy efficiently, the private universities may be able to ask for less tuition or use the saved cost from using energy efficiently to increase education quality.

Schools, colleges and universities comprise more than 5.0% of all the buildings in the UK. The number of postgraduate students has increased 50.0% between 1997 and 2006, causing increased intensity and longer periods of use of facilities and buildings by 24 hours operation (Altan, 2010, p.7723).

In Turkey, the number of buildings in education, health, communication, social and cultural sectors is a small percentage of the total number of total buildings. However, a 70.67% increase in the total number of students between 2002 and 2011 caused a 10.0% increase in the total number, and a 56.0% increase in the area of the buildings between 2000 and 2007 (Figure 28; Figure 29).

Like in the UK, a significant increase in student numbers has been observed in Turkey. Existing buildings have become more crowded with this increase and new buildings have been constructed, causing increased energy demand in the buildings in university campuses.

The next section discusses existing sustainable campus ratings and networks. Indeed, energy consumption, energy efficiency and energy efficiency in buildings are components of these ratings. In addition, networks and initiatives provide collaboration opportunities to HEIs working on campus sustainability.

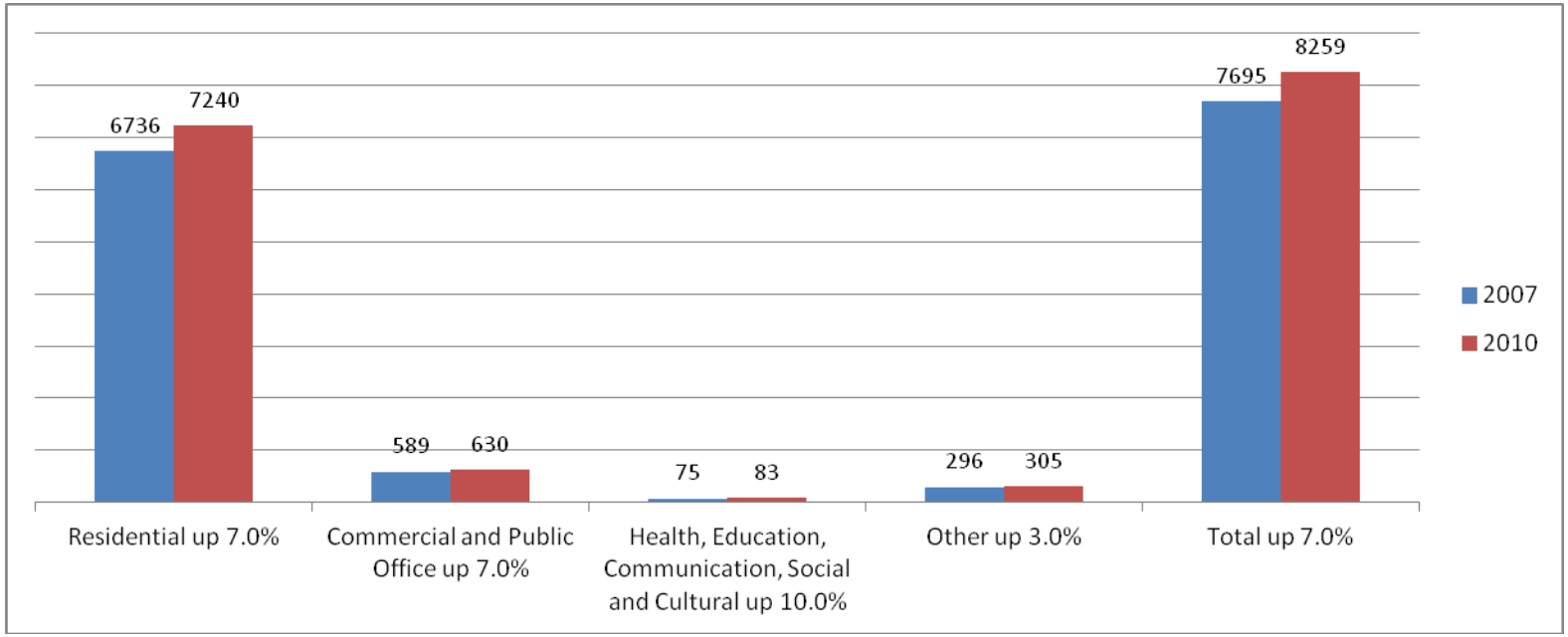

Figure 28. Number of Buildings in Turkey / 1000 (2000-2007) by Category
Source: World Bank, November 2011, Tapping the Potential for Energy Efficiency Savings in Turkey, p.52.

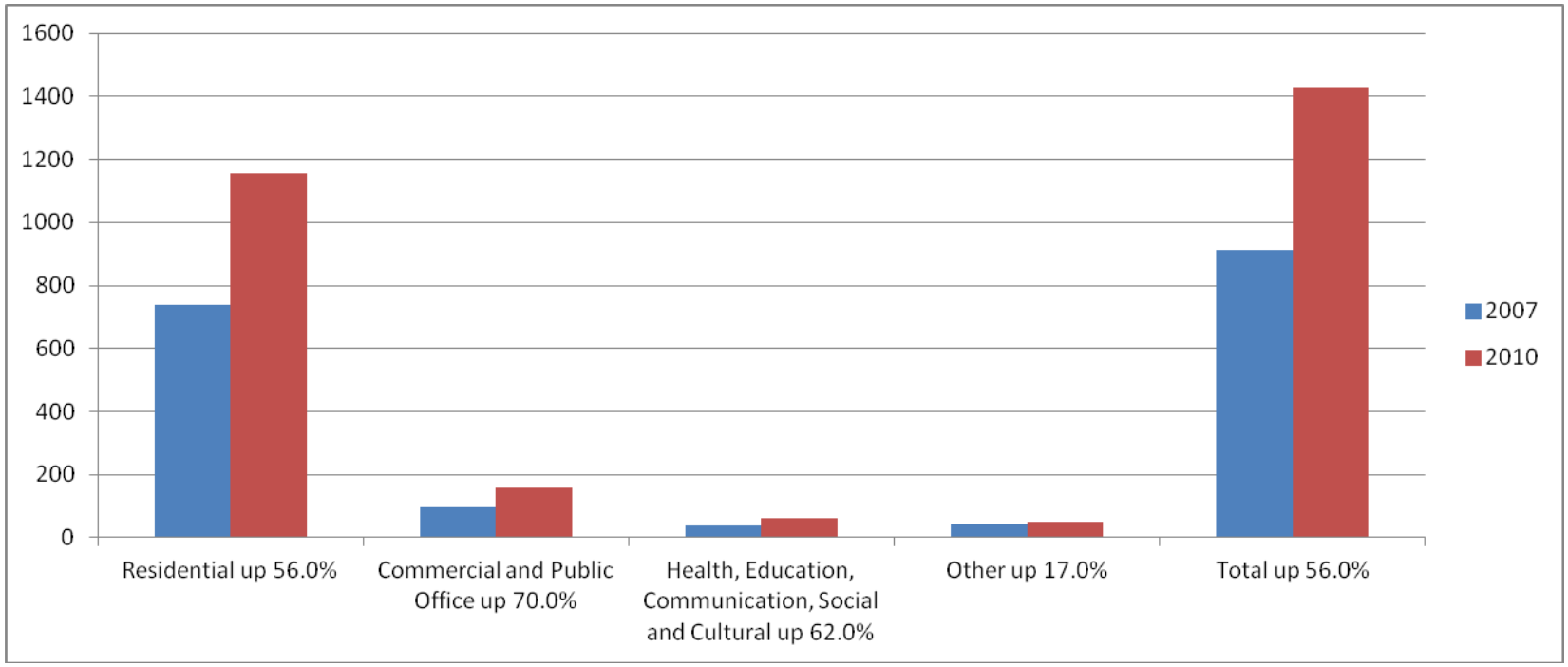

Figure 29. Area of Buildings in Turkey / Million m² (2000-2007)by Category
Source: World Bank, November 2011, Tapping the Potential for Energy Efficiency Savings in Turkey, p.52.

2.4 Sustainable Campus Ratings and Networks in the European Union and Turkey

Some ratings and networks in the World, EU and Turkey are provided to illustrate the voluntary schemes of campus sustainability of which universities are members. There are various local, national and international voluntary ratings, initiatives and networks to promote campus sustainability in the world especially in the North America and the EU. Universities show their commitment to be a sustainable campus by applying these ratings, and becoming members of these networks. Most of the leading universities in the world put “sustainability” in their core strategies and become examples to other universities.

There is no unique approach to rating HEIs on campus sustainability; each rating system rates universities based on their own criteria of campus sustainability.

Even though various sustainable campus ratings and networks exist in the world, especially in the U.S., only some major worldwide ratings and networks are examined in depth such as the International Sustainable Campus Network (ISCN), the Association for the Advancement of Sustainability in Higher Education (AASHE), the Sustainability Tracking, Assessment & Rating System (STARS) and Green Metric University Sustainability Rankings.

The ISCN is a prestigious network of which many worldwide leading universities are members; the ISCN has developed a Charter and a reporting scheme for its members. The AASHE is a major North American association working on sustainability among HEIs, and STARS is a major full scope campus sustainability rating system developed by AASHE. The Green Metric is a new rating system on campus environmental sustainability launched by the University of Indonesia.

The ISCN is a network of 10 European, 14 American, and 7 Asian leading universities. To be a member of this international network, chancellors of the universities sign a charter to show the university commitment to the three principles cited below (International Sustainable Campus Network, 2013, p.1):

Principle 1: To demonstrate respect for nature and society, sustainability considerations should be an integral part of planning, construction, renovation, and operation of buildings on campus.

Principle 2: To ensure long-term sustainable campus development, campus-wide master planning and target setting should include environmental and social goals.

Principle 3: To align the organization's core mission with sustainable development, facilities, research, and education should be linked to create a "living laboratory" for sustainability.

In parallel to signing the Charter, universities commit to prepare their campus sustainability report every year to be publicly announced from the ISCN web site. The report is based on the indicators of these three principals. This network requires detailed reporting for campus sustainability when compared to other initiatives; direct universities to have a holistic approach when considering campus sustainability.

The ISCN Report Guidelines support universities to establish some goals, start initiatives to be measured yearly; the performance of the university is reported under the topics cited below for each principal.

Principal 1 "Sustainability of Buildings in the Campus" is reported under topics such as resource use, waste, recycling, local emissions and non-compliance, research/IT facilities and sustainability, users, and building design aspects.

Principal 2 "Campus Wide Master Planning and Target Setting" is reported under topics such as institution-wide carbon targets and related achievements, master planning, transportation, food, social inclusion and protection, land use and biodiversity.

Principal 3 "Integration of facilities, research and education" is reported under topics such as topical integration, social integration, research & education projects on laboratory/IT facilities and sustainability, commitments and resources for campus sustainability.

Additionally, the ISCN Report Guidelines facilitate universities in preparing more comprehensive reports with targets, report topics and indicators of GRI and Sustainability Tracking, Assessment & Rating System (STARS) prepared by the Association for the Advancement of Sustainability in Higher Education, the AASHE. The GRI is a non-profit organization promoting economic, environmental and social sustainability by providing a sustainability reporting framework to companies and

organizations (www.globalreporting.org, 2013). The ISCN Reporting and STARS are specifically developed for HEIs by taking into consideration the needs and special structures. Some HEIs, for instance, in the case of the Swiss Federal Institute of Technology Zurich (ETH Zurich), Ecole Polytechnique Federal de Lausanne (EPFL), combine the GRI and ISCN Reports by following the guidelines of the GRI for more comprehensive reporting on campus sustainability while conducting ISCN Reporting (EPFL, 2011, p.1).

Another well-known association is the AASHE which has a mission to empower higher education to lead the sustainability transformation (www.aashe.org, 2013a). The AASHE accepts members among two year institutions, four year institutions, graduate institutions, businesses, system offices, NGOs, K-12 Schools, and government agencies from different parts of the world. However, their members are largely from the U.S.A. There are very few HEIs from Europe that are members of AASHE. The HEIs in Hong Kong that are members of ISCN are also members of AASHE. STARS, a self voluntary reporting framework for colleges and universities to measure their sustainability performances was developed by AASHE with broad participation and contribution from the HEIs (https://stars.aashe.org, 2013).

STARS developed a reporting and rating scheme based on 4 main categories: 1) Education and Research; 2) Operations; 3) Planning, Administration and Engagement; and 4) Innovation (AASHE, 2013, P.17).

The reporting on “Education and Research” category is based on co-curricular education, curriculum and research on campus. The reporting on “Campus Operation” covers buildings, dining services, energy, grounds, purchasing, transportation, waste and water sections. The third category, “Planning, Administration and Engagement”, consists of coordination & planning, diversity & affordability, human resources, and investment, and public engagement. The last category, “Innovation”, is a unique category that is not seen in other rating schemes. In order to get credit from the “Innovation” category, universities should find innovative solutions to sustainability challenges and demonstrate sustainability leadership (AASHE, 2013, P.298).

STARS created a table of credit for each category. Below, titles under the categories are listed that guide universities to rate themselves to be a sustainable campus:

Education and Research

Co-curricular is credited according to Student Sustainability Educators Programs; Student Sustainability Outreach Campaigns; Sustainability in New Student Orientations; and Sustainability Materials and Publications.

Curriculum is credited according to Sustainability Course Identification; Sustainability-Focused Courses; Sustainability-Related Courses; Sustainability Courses by Department; Sustainability Learning Outcomes; Undergraduate Program in Sustainability; Graduate Program in Sustainability; Sustainability Immersive Experience; Sustainability Literacy Assessment; and Incentives for Developing Sustainability Courses.

Research is credited according to Sustainability Research Identification; Faculty Engaged in Sustainability Research; Departments Engaged in Sustainability Research; Sustainability Research Incentives; Interdisciplinary Research in Tenure and Promotion.

Operations

Buildings is credited according to Building Operations and Maintenance; Building Design and Construction; Indoor Air Quality.

Climate is credited according to GHG Emissions Inventory; GHG Emissions Reduction.

Dining Services is credited according to Food Purchasing.

Energy is credited according to Building Energy Consumption; Renewable Energy.

Grounds is credited according to Integrated Pest Management.

Purchasing is Computer Purchasing; Cleaning Product Purchasing; Office Paper Purchasing; Vendor Code of Conduct.

Transportation is credited according to Campus Fleet; Student Commute Modal; Employee Commute Modal;

Waste is credited according to Waste Reduction; Waste Diversion; Construction and Demolition Waste Diversion; Electronic Waste Recycling Program; Hazardous Waste Management.

Water is credited according to Water Consumption; Storm water management.

Planning, Administration & Engagement

Coordination and Planning are credited according to Sustainability Coordination; Strategic Plan, Physical Campus Plan; Sustainability Plan; Climate Action Plan.

Diversity and Affordability are credited according to Diversity and Equity Coordination; measuring Campus Diversity Culture; Support Programs for Underrepresented Groups; Support Programs for Future Faculty; Affordability and Access Programs.

Human Resources is credited according to Sustainable Compensation; Employee Satisfaction Evaluation; Staff Professional Development in Sustainability; Sustainability in New Employee Orientation; Employee Sustainability Educators Program.

Investment is credited according to Committee on Investor responsibility; Shareholder Advocacy; Positive Sustainability Investments.

Public Engagement is credited according to Community Sustainability Partnership; Inter-Campus Collaboration on Sustainability; Sustainability in Continuing Education; Community Service Participation; Community Service Hours; Sustainability Policy Advocacy; Trademark Licensing.

Indeed, AASHE is a major association promoting sustainability in higher education, having its own STARS rating.

Besides older and well-established networks and ratings on campus sustainability such as the ISCN and the AASHE, there are also newly established international initiatives such as the Green Metric University Sustainability Ranking (http://greenmetric.ui.ac.id, 2013) launched by the University of Indonesia in 2010 to rank universities by assessing and comparing their campus sustainability efforts. In fact, recently, the Green Metric University Sustainability Ranking has seen an increasing interest in campus sustainability from the universities in the Far East.

Thus, the Green Metric could be seen as a response from an Asian University on the sustainability rating to other networks in Europe and in North America. The Green Metric is based on the philosophy of the three E's (Environment, Economics, Equity and Education) and collects a variety of data in 6 main categories on "Setting and Infrastructure; Energy and Climate Change, Waste, Water, Transportation and Education" (Universitas Indonesia, 2013, p.4) from the HEIs by global participation.

These 6 categories are based on the following indicators (Universitas Indonesia, 2013, p.5):

Setting and Infrastructure is graded according to open space area/total area, open space area/total people, area on campus covered in forested vegetation, area on campus covered in planted vegetation, non-retentive surfaces/total area and sustainability budget/total university budget.

Energy and Climate Change is graded according to energy efficient appliances usage, renewable energy usage policy, total electricity use/total people, energy conservation program, green building, climate change adaptation and mitigation program, and the GHG emission reduction policy.

Waste is graded according to recycling program for university waste, toxic waste recycling, organic waste treatment (garbage), inorganic waste treatment (rubbish), sewerage disposal, and policy to reduce the use of paper and plastic on campus.

Water is graded according to a water conservation program and wiped water.

Transportation is graded according to total cars entering/total people, total bicycles/total people, transportation policy on limiting vehicles on campus, transportation policy on limiting parking space, campus buses, bicycle and pedestrian policies.

Education is graded according to sustainability courses/total courses, sustainability research funding/total research funding, sustainability publications, sustainability events, sustainability organizations (student), and sustainability website.

Indeed, the Green Metric uses fewer and more simplified indicators which will take a shorter time and smaller efforts for universities to complete the on-line

survey to get a score on sustainability and to be ranked in the Green Metric at the end of each year. The Green Metric intends to revise the questionnaires and increase the indicators as the metric develops and collect world-wide data on campus sustainability to show how HEIs contribute to sustainability.

Even though there some ratings and networks having a holistic approach on campus sustainability in the world like ISCN, AASHE and STARS, most of them like the Green Metric, focus on environmental campus sustainability.

The next section focuses on EU and Turkey regarding the campus sustainability ratings and networks.

2.4.1 Sustainable Campus Ratings and Networks in the EU

The EU Member States have many networks, associations, conferences, assessment tools and awards related to or focused on campus sustainability (Table 9). In most of the EU countries, a governmental approach to sustainable development in the HEIs exists; for instance, France, Spain and Sweden. In France, the environmental law "Grenelle de l'Enviroment" was published in 2009. Article 55 is related specifically to the HEIs in France which states that institutions of higher education elaborate a "Green Plan" for campuses and that the universities and high schools can request a labelling on the foundation of criteria of sustainable development (www.eua.be, 2012). In Sweden, the Higher Education Act was changed in 2001 stating that the HEIS in Sweden shall promote sustainable development ensuring present and future generations a healthy and good environment, economic and social welfare and justice (www.eua.be, 2013). On the other hand, the Spanish government launched an initiative called Strategy University-2015 (SU-2015) to develop a framework of 4 key dimensions (missions, people, institutions, and environment) where campus is one of the sub categories. (Rubrialta and Delgado, 2010). In addition, the International Campus of Excellence (CEI) Program was established to make Spanish university campuses among the best in Europe with a sustainability focus the new concept of campuses.

Table 9
Some Examples of Sustainable Campus Networks, Associations, Conferences, Assessment Tools and Awards Related to or Focused on Sustainability in Some EU Members States

No	Networks, Association Related to or Focused to campus sustainability	Type	Organisation	Country	Year
1	COPERNICUS CAMPUS *http://www.copernicus-alliance.org/*	European network of 326 universities signing Copernicus Charta until 2005	European University Association	European wide	1993
2	COPERNICUS ALLIANCE *http://www.copernicus-alliance.org/*	New form of European network on higher education for sustainable development aiming to revitalize Copernicus Campus	Network	European wide	2009
3	Engineering Education for Sustainable Development Observatory (EESD-Observatory) *https://www.upc.edu/eesd-observatory*	Initiative to enable engineering education institutions to benefit fully from emerging research and learning about how best to integrate education for sustainable development	3 European Universities as Technical University of Catalonia, Delft University of Technology, Chalmers University of Technology and Alliance for Global Sustainability (AGS)	Spain, Netherlands, Sweden	2004
4	ECOCAMPUS Collaboration *http://aceee.org/files/proceedings/1998/data/papers/0507.PDF*	Collaboration of universities to create a European network of university campuses and research laboratories whose managers, academic staff and scientists, are deeply concerned by the in-house issues of sustainable development	14 universities in 7 countries	Denmark, Greece, Finland, France; Poland,	1996
5	The Environmental Association for the Universities and Colleges (EAUC) *http://www.eauc.org.uk/home*	Association for improving environmental performance of the HEIs in UK	Association	UK	2004

6	People and Planet *http://peopleandplanet.org/*	The largest student network in UK campaigning to end world poverty, defend human rights and protect the environment	Network	UK	1969
7	Fondaterra *http://www.fondaterra.com/va-english-version/welcome/*	Network of public and private multidisciplinary partners on the theme of sustainable development of territories.	Association	France	2004
8	Campus Responsible *http://www.campusresponsables.com/*	The first French network of HEIs committed to sustainable development	The French Agency (Graines de Changement)	France	2006
9	Strategy University 2015 (SU-2015) *http://www.oecd.org/edu/innovation-education/centreforeffectivelearningenvironmentscele/44721049.pdf*	Initiative launched by the Spanish Government to develop a framework of 4 key dimensions (missions, people, institutions, environment) where campus is one of the sub categories	Spanish Government	Spain	2008
10	Nordic Sustainable Campus Network (NSCN) *http://nordicsustainablecampusnetwork.wordpress.com/*	A network to strengthen the sustainability efforts already in action in the Nordic higher education institutes	Initiated by Aalto University, University of Copenhagen, University of Gothenburg, University of Oslo, University of Iceland	Nordic Countries	2012
No	**Conference Related to or Focused on Campus Sustainability**	**Type**	**Organisation**		**Year**
1	EAUC Annual Conference *http://www.eauc.org.uk/annual_conference*	Conference	EAUC	UK	Since 1996
2	EUA Annual Conference 2012 on the Sustainability of European Universities *http://www.eua.be/events/past/2012/EUA-Annual-Conference-2012/Presentations.aspx*	Conference	European Universities Association (EUA)	UK	2012

3	Higher Education for Sustainable Development: Moving the Agenda Forward *http://www.leuphana.de/unesco-chair/archiv/4th-international-conference-on-hesd.html*	Conference as a part of the annual UNESCO World Conference on Education for Sustainable Development	The Germany Commission for UNESCO; the International Centre for Corporate Social Responsibility of the Nottingham University Business School; the Copernicus Alliance and the higher education working group of the UN Decade in Germany, AG Hochschule	Germany	2011
4	Engineering Education for Sustainable Development International Conferences (EESD Conferences) *http://www-eesd13.eng.cam.ac.uk/conference*	Conference	The EESD-Observatory	Every year in a different country and university	Since 2004
5	16th Conference of the European Roundtable on Sustainable Consumption and Production (ERSCP) & 7th Conference of the Environmental Management for Sustainable Universities (EMSU)	International Joint Conference	Boğaziçi University	Turkey	2013
6	The I University Conference on Curricular Sustainability *http://www.uem.es/en/news/1834*	Conference	Universidad Europea together with the CRUE (Spanish Rectors' Conference) and the CADEP (the CRUE sector committee for Environmental Quality, Sustainable Development and Risk Prevention at universities)	Spain	2013
No	**Sustainability Assessment Tools**		**Organisation**		**Year**
1	Learning in Future Environments (LIFE) *http://www.thelifeindex.org.uk/*	Performance improvement and benchmarking system for social responsibility and sustainability of the HEIs	EAUC	UK	2013

2	People and Planet Green League *http://peopleandplanet.org/greenleague*	An independent league table for UK universities ranked by environmental and ethical performance	People and Planet Green	UK	2007
3	Green Plan Framework *http://www.eua.be/Libraries/EUA_Annual_Conf_2012_Warwick/FINAL_Sylvie_Faucheux.sflb.ash*	Strategic Tool for Institutions (A common approach developed by two major French institutions in response to the environmental law "Grenelle de l'Environment" Article 55 related to the HEIs in France	The French Council of University Presidents (CPU) and The French Council of Colleges (CGE)	France	2009
4	Self-Assessment Tool on Sustainable Development for Higher Education Institutions (EVADDES) *http://www.eua.be/Libraries/EUA_Annual_Conf_2012_Warwick/FINAL_Sylvie_Faucheux.sflb.ashx*	An auto-evaluation tool developed for sustainable campuses	Fondoterra	France	2010
5	International Campus of Excellence (CEI) *http://www.oecd.org/edu/innovation-education/centreforeffectivelearningenvironmentscele/44721049.pdf*	A program to make Spanish university campuses among the best in Europe (sustainability and promotion of a new concept of campuses is a part of the CEI)	SU-2015	Spain	2009
No	**Sustainability Related or Focused Awards**	**Type**	**Organisation**	**Country**	**Year**
1	Green rown Awards *http://www.eauc.org.uk/green_gown_awards*	Awards	EAUC	UK	2004

The CEI awarded funding and grants for the Spanish universities the first time in 2009, where sustainability, transformation of the campus, the development of an integral social model, and interaction with the territorial environment were the criteria (Rubrialta and Delgado, 2010).

European Universities gathered to support sustainable development in education in the early 1990s by signing the COPERNICUS University Charter for Sustainable Development in 1993, which is a response to the Rio Conference (UNCED) in 1992, and establishing the COPERNICUS CAMPUS.

The preamble of the Charter launched by the European Universities Association, states that education must become environmental education in the fullest sense of the term (Copernicus, 1994, pg.1). The Charter sets 10 principles of action on sustainable development in education. They are: 1) Institutional Commitment; 2) Environmental Ethics; 3) Education of University Employees; 4) Programs in Environmental Education; 5) Interdisciplinary; 6) Dissemination of Knowledge; 7) Networking; 8) Partnerships; 9) Continuing Education Programs; and 10) Technology Transfer.

In order to incorporate the Charter principals of sustainable development into the Bologna Process, the COPERNICUS-CAMPUS Sustainability Center at the Carl von Ossietzky University Oldenburg and the COPERNICUS-CAMPUS University Alliance for Sustainability prepared COPERNICUS-Guidelines in 2007 for Sustainable Development in the European Higher Education Area (Copernicus Campus, 2007 p.1; and Winkelmann, 2007 p.1). After the announcement of the Guidelines, 320 universities from 38 countries including universities from Turkey have signed the Charter since 1993; thus, the Guidelines support them for ***curricula*** development, institutional management, establishing services to the local/regional society, and having a responsible balance between economic, ecological and social/cultural aspects (Copernicus Campus, 2007 p.6). In 2007, the COPERNICUS-CAMPUS Initiative was re-launched by some partner universities, and became the COPERNICUS Alliance in 2010 with an updated version of the COPERNICUS Charter as COPERNICUS Charta 2.0 with new goals in 2011 (www.copernicus-alliance.org, 2013). This re-branded

initiative, COPERNICUS Alliance, became a European network on higher education to promote sustainable development among European Higher Education through advanced education and research for sustainability in partnership with society (www.copernicus-alliance.org, 2013). However, currently, the network has only 20 members, 9 of which are founding members. Leading universities in Europe known for their commitment in campus sustainability are not the members of the alliance yet.

In the EU, instead of the European level, HEIs are usually members of their regional and national networks, initiatives on campus sustainability and are rated bythose networks. Mostly, environmental campus sustainability, green universities, greening the campus are used in the European sustainable campus context. Among the EU countries, campus sustainability initiatives are most developed in the UK and provide examples of some of the main initiatives and ratings on campus sustainability in the UK such as Learning in Future Environments (LİFE), EcoCampus, the Environmental Association for Universities and Colleges (EAUC), and People and Planet Green League. For instance, the University of Nottingham, one of the important worldwide players of campus sustainability is a member of these U.K. based organizations, and accredited by them (www.nottingham.ac.uk, 2012).

Following is an analysis of LIFE and People and Planet Green League for the HEIs in the UK as campus sustainability rating examples from the EU:

LIFE was developed by the EAUC in 2011 to help colleges and universities to manage, improve and promote their social responsibility and sustainability performance (http://www.thelifeindex.org.uk, 2013a). There are 4 priority areas and 14 frameworks under these priorities as listed below (http://www.thelifeindex.org.uk, 2013b):

Leadership and Governance has 4 frameworks: leadership, staff engagement and human resource.

Learning, Teaching and Research has 3 frameworks: learning and teaching, research and student engagement.

Partnership and Engagement has 3 frameworks: community and public engagement, business and industry interface and procurement and supplier engagement.

Estates and Operations has 6 frameworks: biodiversity, sustainable ICT, utilities, travel and transport, sustainable construction and renovation and resource efficiency and waste.

The LIFE Team assesses colleges and universities in UK based on the above framework using documentary evidence, question responses during the site visit to the campus, and quantitative data provided by the university management.

The other well-known rating program in UK is People and Planet's Green League ranking UK universities based on their environmental and ethical performance. This ranking has been the initiative of the UK's largest student network campaigning on issues such as world poverty, human rights, and environment since 1969 (http://peopleandplanet.org, 2013a). Universities complete a comprehensive on-line survey with the methodology explained in the People & Planet Green League Guide.

The main criteria in the methodology are (http://peopleandplanet.org, 2013b):

1) Environmental Policy; 2) Environmental Staff; 3) Auditing & EMS; 4) Ethical Investment; 5) Carbon; 6) Ethical Procurement; 7) Sustainable Food; 8) Engagement; 9) Education; 10) Energy; 11) Waste & Recycling; 12) CO2 Reduction; and 13) Water.

The People & Planet Green League gives awards in 5 categories: student and engagement, carbon management and reduction, renewable energy, waste and recycling, and sustainable food to promote transition of UK universities to sustainable campus (http://peopleandplanet.org, 2013c).

In the EU, even though sustainable campus issued as a term, it mostly means green campus and universities are focused on environmental sustainability, not social and economic sustainability. Energy efficiency and renewable energy sources are important agenda items for the EU countries, and HEIs have also been supporting this agenda by maintaining green or sustainable campuses. This importance may be why rating systems and networks related to campus sustainability are also focused on the environmental aspects of sustainability.

2.4.2 Sustainable Campus Ratings and Networks in Turkey

Unfortunately in Turkey, sustainable campus ratings or networks at local or regional level do not exist as campus sustainability is in an early stage with only a few examples. There have been some attempts to build green campus networks, but they were not successful.

For instance, Ecofys, the lnternational Dutch company operating in Turkey on sustainable energy solutions and climate change issues, initiated “the Green Campus Project” aiming to reduce GHG emissions due to the inefficient use of energy at Turkish Universities. Initiated by Ecofys, the project was planned to be run by Sabanci University in Istanbul, the Middle East Technical University in Ankara, 19 Mayıs University in Samsun, Muğla University in Muğla, Erasmus University in Rotterdam (EUR), Delft University of Technology (TUDelft) and the Netherlands Institute for Higher Education in Ankara (NIHAnkara). These Turkish Universities aiming to build model green campuses convened; however, the project did not proceed as expected.

In summary, HEIs in the world and the EU have been in a learning process to report campus sustainability with a more comprehensive overview of the university’s goals, initiatives, activities, and road maps on sustainability. They start small with basic indicators on campus sustainability reporting and rating but achieve more over time. Every rating system has its own method and logic of prioritizing and classifying indicators on campus sustainability. There is no standard reporting or rating on campus sustainability. But once a university develops a strategy and a plan on campus sustainability, it is possible to prepare different reports for networks and apply to ratings on sustainability. Turkey has no rating systems, networks or associations regarding campus sustainability.

However, Bosphorus University hosted an international joint conference: The 16th ERSCP & 7th EMSU Conferences in June 2013 where environmental sustainability of the universities was one of the sub topics.

The next section presents examples on campus sustainability from the world and Europe in addition to a summary on the existing situation in Turkey.

2.5 Sustainable Campus Examples

Each campus has its own story of campus sustainability and a different approach to it. Some universities are successful in reinventing every dimension of the campus to be a living laboratory for students and consider campus sustainability as a competitive edge for the university. Therefore, this section provides examples of

sustainable campuses from the world, especially the U.S. and Canada and then examines the current situation in the EU and Turkey.

Universities in North America are giving top priority to campus sustainability. Three good examples from North America, Harvard University, Stanford University in the U.S., and the University of British Columbia (UBC) in Canada are discussed in this section.

Harvard University, U.S.

Sustainability at Harvard University has been driven by 3 university-wide commitments: sustainability principles, the GHG reduction commitment, and green building standards. In addition, the university has an office of sustainability that coordinates sustainability and responsible growth in the school. Sustainability principles were set at Harvard in 2004 driven by the concerns from the students and alumni about the future of the campus sustainability. Sustainability principles were prepared by a process commissioned by the president. These principles are

- *Promoting health, productivity and safety of the University community through design and maintenance of the built environment.*
- *Enhancing the health of campus ecosystems and increasing the diversity of native species.*
- *Developing planning tool to enable comparative analysis of sustainability implications and to support long-term economic, environmental and socially responsible decision-making.*
- *Encouraging environmental inquiry and institutional learning throughout the University community.*
- *Establishing indicators for sustainability that will enable monitoring reporting and continuous improvement* (Harvard University, 2013, p.1):

By executing these principles, Harvard became successful in enhancing institutional credibility, as well as fostering a green culture in the campus through planning, implementing, collaborating, and creating cultural change with long term commitment.

Harvard has been tracking and reporting GHG since 2000 through a yearly prepared GHG inventory report. Additionally, the university has started measuring its sustainability impact with its first sustainability report in 2012 by tracking and reporting key indicators on campus sustainability. The university puts a GHG reduction goal of 30% by 2016, below a 2006 baseline, including growth with a special focus on buildings as 40% of the school energy is used for heating and cooling. The sustainability report has the eight sections: Energy & Emissions, Green Buildings, Health &Wellness, Transportation, Waste Reduction & Recycling, Water & Operations, Community Engagement and Academics and Research.

Since 2006, the university has been gathering knowledge and data and has been building capacity to prepare the university-wide sustainability report. The schools at Harvard have already been preparing their own sustainability reports. An environmental performance section with indicators of green buildings, waste, water and transportation data have been put in the annual Harvard Fact Book.. In addition, as one of the signatories of ISCN, Harvard has been involved with external rating and reporting programs such as Daily Green, Princeton Review Green Honor Roll, and Sierra Club Cool Schools List.

Harvard has many programs with which to engage students, faculty, and staff in sustainability such as the “Student Sustainability Grant Program” to support small greening campus projects; the Green Office Program to start behavioral change among the staff for resource efficiency by providing check lists for energy, recycling, waste reduction, publications, kitchens and break rooms, transportation, and participation; the Green Tip of the Month with a poster series and email campaign showing green tips to implement in the buildings, classroom, dorms, offices, labs, and at home; the Green Building Tip for building managers and the campus community about green technologies, practices, materials and opportunities on the campus; Harvard Thinks Green to inspire the campus community with 10 minute lectures by leading faculty about big green ideas; Green Carpet Awards to communicate sustainability initiatives and honor the students, faculty and staff; the Council of Students Sustainability Leaders to create a networking platform, feedback mechanism, and as well as advancing sustainability principles (www.green.harvard.edu, 2013).

Stanford University, USA

Stanford University puts environmental sustainability at the core with7 priorities for campus sustainability (http://sustainablestanford.stanford.edu, 2013b):

Advance Sustainability Knowledge

- *Ensure that all Stanford graduates, regardless of degree received, understand how the work they do can contribute to creating a sustainable world.*
- *Achieve excellence in research that can help solve the complex problems involved in creating a sustainable world.*
- *Integrate environmental awareness into campus culture, and make sustainable practices a part of everyday life.*

Reduce GHG Emissions

- *Set GHG emission reduction targets, and dedicate resources to achieving them.*
- *Reduce energy use in existing buildings, and minimize energy use in new buildings.*

Foster Land Stewardship

- *Pursue land-use and planning strategies that foster the efficient use of Stanford's water, energy and other resources.*
- *Preserve and manage environmental resources to allow the functioning of natural ecosystems and the long-term persistence of native species.*
- *Preserve and manage heritage resources to retain their historical and archaeological value and maximize their usefulness for producing knowledge.*

Conserve Water Resources

- *Use water resources efficiently, minimizing total water demand by continuing to implement water conservation measures and incorporating infrastructure for future water-saving measures into new facilities.*

Create Environmentally Sound Buildings

- *Construct and renovate buildings to provide safe, productive indoor environments that use energy, water and other natural resources efficiently.*

Encourage Alternative Transportation

- *Reduce the number of drive-alone commuters, and avoid increasing the total number of trips taken during peak commuting hours.*

Minimize Waste

- *Conserve resources through reuse, recycling, source reduction and composting -- moving towards a zero waste campus.*

Purchase Sustainably

- *Incorporate considerations of sustainability into all aspects of campus purchases of products, services and food.*

Stanford promotes collaborative action for administrators, staff, faculty, and students on the campus to maintain that sustainability becomes a core value in everything they do (http://sustainablestanford.stanford.edu/, 2013c).

There are various levels of governance on the campus such as “Sustainability Working Groups” since 2006, “Sustainability Working Teams” since 2008 and the Provost’s Committee on Sustainability” since 2012. The Department of Sustainability and Energy Management which includes the Office of Sustainability is responsible for all sustainability initiatives. Encouraging sustainability as a core value, Stanford aims to spread sustainability at the operational, academic, and programmatic levels.

Stanford has been publishing “Sustainability at Stanford: A Year in Review” since 2008, which covers sustainability in campus operations, sustainability in academia, as well as programs run by the Office of Sustainability Programs. The programs of the Sustainability Office support evaluation and assessment, behavioural change and communications (Stanford, 2013 p.1). The office has also many publications on campus sustainability.

The university also has a comprehensive “Energy and Climate Plan” having published its first edition in 2009 and the second in 2013. In addition is a students’ guide to sustainability on the campus and guidelines for different purposes such as greening events on the campus, sustainable buildings at Stanford, Stanford space planning, and water conservation, reuse and recycling master planning. Another way of informing the community in the campus and giving them quick tips to use in their daily lives is Quick Fact Sheets. These fact sheets are gathered under various themes such as: alternative transportation, climate action, energy, food and dining, green building-new construction, green buildings-operations and maintenance, recycling, renewable energy, room temperature biological sample storage, student housing, sustainable demolition-terman engineering, sustainable information technology, transformation energy use, water conservation-planning and programs, water conservation-lake water program.

Like Harvard, Stanford is also the signatory of ISCN, and also has many awards and recognition from third parties for the efforts on campus sustainability.

Stanford divides the work on campus sustainability in 12 areas: climate action, land, water, building, purchasing, investing in sustainability, energy, transportation, sustainable IT, food, waste, landscape and grounds. Stanford’s drive is to be an environmental leader in teaching, research, and action (http://sustainablestanford.stanford.edu, 2013d).

The university has a comprehensive climate and energy action plan newly revised in 2013 with five stages: 1) knowing emissions inventory is necessary for an effective energy and climate plan by analyzing protocols for the emissions inventory, university emissions inventor, and campus growth and emissions trends; 2)

comprehensive planning process with guiding principles and balanced approach to minimize energy demand in new buildings, reducing energy use in existing buildings, and greening energy supply; 3) action 1: energy efficiency to reduce demand and increase efficiency which has been a central of the university sustainability mission, existing energy conservation initiatives, behavior based conservation programs, sustainable information technology initiatives, new energy conservation initiatives; 4) action 2: standards are needed as the majority of the CO2 emissions are generated in the buildings as heating, cooling, and electricity, new energy and water usage reduction targets, sustainable architecture strategies, space utilization, conservation innovation in building design and learning; and 5) action 3: supply by analyzing current system, looking for energy system innovation, and acting with new projects (http://sustainablestanford.stanford.edu, 2013d).

To conclude, Stanford is also another university successful in reducing its environmental impact, using resources efficiently, and creating a living laboratory for the students to show sustainability in action.

The University of British Columbia, Canada.

Campus sustainability at The University of British Columbia (UBC) means not only environmental sustainability but the campus is also considered a living laboratory with technological, environmental, economic, and societal aspects of campus sustainability through creativity and collaboration.

Sustainability at UBC has a history dating back to the 1990s when the university signed the Tailloires Declaration, a declaration for sustainability in operation, research and education in HEIs. Then, UBC became the first Canadian university having a sustainability policy as well as opening a campus sustainability office. The sustainability initiative at UBC is composed of 4 actions: 1) commit to pioneer approaches to sustainability; 2) integrate to reach across boundaries; 3) demonstrate to make UBC as a living laboratory; and 4) inspire to create a platform for change (http://sustain.ubc.ca, 2013a).

UBC has sustainability plans, annual reports, external benchmarks and policies to guide sustainability activities at the university. UBC plans on sustainability are as

follows: UBC Plans; Vancouver Campus Plan; Climate Action Plan; Sustainability Academic Strategy; Strategic Transportation Plan; Inspirations and Aspirations: UBC Sustainability strategy 2006-2010.

Additionally, UBC has various reports such as an Annual Operational Sustainability Report; Climate Action Plan Reports; a Carbon Neutral Action Report; Transportation Status Report.

UBC has a gold rating in STARS and ranked high on the College Sustainability Report Card.

The UBC has six policies providing the basis for sustainability practices on campus such as: 1) Sustainable Development; 2) Environmental Protection Compliance; 3) Hazardous Materials Management; 4) Pest Control; 5) Disposal of Surplus Equipment and Materials; and 6) Energy Policy for Classrooms and Offices (http://sustain.ubc.ca, 2013b)

UBC divides campus initiatives in nine sections: 1) climate and energy; 2) recycling and waste; 3) water; 4) green buildings; 5) purchasing; 6) food; 7) transportation; 8) green research; 9) social sustainability; and 9)economic sustainability.

UBC is one of the universities which met its targets regarding its GHG emission even though the building floor space has grown 35.0%, and student enrollment has increased 48.0%. At present, UBC has very ambitious GHG reduction targets: 33.0% decrease by 2015, 67.0% decrease by 2020, and 100.0% decrease by 2050. Consequently, the university invests in energy retrofits, alternative systems, and other engagement strategies (www.sustain.ubc.ca, 2013c).

2.5.1 Sustainable Campus Examples from the European Union

Similar to their North American counterparts, universities in Europe are also active in developing sustainable campuses (also meaning green campus). Most have put sustainability at the core of their ethos and university wide strategies. Good examples of them are Maastricht University, Tilburg University in the Netherlands, and the University of Copenhagen in Demark, the University of Nottingham, the University of East Anglia (UEA) in the U.K, Universidad Complutense de Madrid (UCM) and Universidad Politecnica de Madrid (UPM) in Spain.

These universities have special centers, departments, and offices responsible for education, research, management, and awareness raising activities on campus sustainability and are successful in implementing holistic approaches. European universities are competing with each other to be the most sustainable campus in Europe. For instance, the University of Nottingham has been recognized for its green credentials, taking second place in a league table of the world's most environmentally-friendly higher education institutions (www.nottingham.ac.uk, 2011b). Moreover, European universities publish detailed reports and environmental policy declarations, sign charters, become part of sustainable campus networks, and establish strategic aims, objectives and key performance indicators for campus sustainability.

Examples of sustainable campus universities in the EU are the following::

The University of East Anglia, the UK

The University of East Anglia (UEA) has been a leader in environmental research, training, commitment to becoming an exemplar of good environmental practice and, in particular of carbon reduction in the HEI sector (www.uea.ac.uk, 2013b). Sustainability at UEA includes economic sustainability, social sustainability and environmental sustainability. Sustainable development can only be achieved within a stable, unpolluted and biodiverse environment (www.uea.ac.uk, 2013c). The university has 20 years' experience in reducing the impact of the activities on the wider environment as detailed in the UEA Sustainable Way Guide (www.uea.ac.uk, 2013d). The university has an Environmental Management System (EMS) as a first action. UEA aims to develop a sustainability agenda on the campus. For this reason, the university has been working on developing a tangible vision of a sustainable university.

UEA has an environmental policy which is revised every year. As described in the Corporate Plan of the university in 2008, UEA is committed to become an exemplar of good environmental practice and carbon reduction in HEIs (UEA, 2008, p.3). UEA commits to (UEA, 2011, p.1):

Integrate environmental management into the day to day operations by establishing EMS certified to ISO14001 for all operations on campus, via the eco campus scheme.

Comply with and, where possible, exceed all environmental legislation and other requirements applicable to the university

Openly communicate, through sharing knowledge and regularly publishing reports on environmental commitments, action, and performance

Motivate and empower staff, students, and members of local community, and other stake holders to support the ongoing development, evaluation and implementation of this policy

Embed sustainability into teaching, learning, and research

Maintain and enhance the biodiversity of the estate

Minimize our consumption of non-renewable energy and gross emissions of GHGs

Minimize the production of waste through reduction, reuse and recycle

Minimize our consumption of non-renewable and environmentally sensitive resources by embedding integrated life cycle approaches in the decision making

Prevent ground and water pollution, and minimize emissions of air-borne pollutants

Manage environmental risks from accidents, incidents, and emergency.

The University has key documents on sustainable environmental management such as: the Eco-Campus Gold Award Certificate, UEA Environmental Policy 2013, UEA Environmental Reports by year, UEA Sustainability Management Structure, UEA Environmental Program, UEA Summary of Environmental Aspects & Impacts, UEA Initial Environmental Review, and UEA Sustainability Communication Plan (www.uea.ac.uk, 2013d).

Prof. Trevor Davies, Director of the Fudan-Tyndall Center describes UEA sustainability efforts as the following: *UEA has extensive real-world experience in implementing sustainable practices. Some of the buildings are regarded as the most energy efficient in the world. One was described in a Building Magazine as the "best building ever" (from an energy point of view) at the time. Later buildings have surpassed that standard. UEA is currently commissioning an Enterprise Centre which will be the lowest carbon building in Europe. It is a demonstrator not only in its operation, but in the way it is designed, procured and built. UEA operates its own power station, utilising the waste heat for area heating and cooling and are currently commissioning an advanced biomass gasification unit. When this commissioning is completed, per capita carbon dioxide emissions will have been reduced by 76% on a 1990 baseline. UEA manages a £30M low carbon innovation investment fund on behalf of the European Regional Development Fund and other investors. Besides the technological innovations, UEA is also experienced in behavioral innovations through, for example, the Carbon Crew which includes staff and students. UEA's campus sustainability plan integrates actions in a number of areas, including EMS, energy & climate, waste reduction, water, procurement, transport, built environment, biodiversity, and sustainability education* (Davies, 2013).

University of Nottingham, UK

Another leading university on campus sustainability is the University of Nottingham with the commitment of being a green university through teaching, conducting research and enhancing operational excellence. Environmental sustainability is part of the University's Strategic Plan. The University of Nottingham has developed an Environmental Strategy to be the leading green campus not just in Europe, but also in the world with four focuses:

Significant internationally recognized research strengths in the environment and sustainable energy fields

Course provision in sustainability and environment related areas and also in a number of modules for other areas of study

Our estates operations which are built upon a strong environmental ethos

The adoption of progressive environmental strategies in our capital projects where we have embedded sustainability into the heart of designs (www.nottingham.ac.uk, 2012).

The strategy has 11 components as waste and recycling, energy and water, travel and transport, procurement, campus development, awareness raising, training and communication, corporate governance, information services, landscape, teaching and learning, research.

Nottingham is aware of how volatile energy price fluctuations affect their annual energy cost which tends to increase every each year. The management would like to provide energy needed for the university in the most effective ways. Thus, they have invested in a number of invest-to-save schemes, which are financed through the Carbon Plan Program in the university. The savings made from energy consumption are put in the program to finance future projects.

Besides volatile energy price, another challenge for the university is that they are faced with an increase in the number of students, growth in the number and area of the buildings in the campus, and high energy intensive research. To cope with these challenges of increasing energy prices, high environmental impact of the use of energy, and increased population in the campus, the management is actively looking for green energy, which has already resulted a reduction in the energy related CO2 in the campus.

The University has set a strategy to improve the environmental performance of the buildings on campus, and the University's physical infrastructure by moving towards carbon neutral energy performance. Promoting renewable energy systems for the campus buildings are considered an important option.

The main objectives are to reduce energy consumption while ensuring the University's activities continue, raise awareness about the cost of energy, reduce the overall cost of energy, reduce energy waste, and reduce dependence on carbon with a

shift towards carbon neutral or low carbon energy sources. The University has also set key performance indicators such as energy consumption per m2 GIA (Gross Internal Area), energy emissions per m2 GIA, total emissions for energy – carbon reduction achieved, and percentage of renewable electricity (The University of Nottingham, 2010, p.7).

The university has expanded its campuses with the award-winning Jubilee Campus, which was built on a former industrial site with numerous sustainable technologies, including 450m² of photovoltaic cells, green roofs, a complex system of daylight reflection, intelligent lighting systems and materials from sustainable sources. The university has some key performance indicators for campus development and refurbishing such as building display energy certificates / energy performance certificates achieved and awards for sustainable construction / design (The University of Nottingham, 2010, p.10).

Nottingham has also shown its commitment in the area of corporate governance and completed Business in the Community's (BITC) Environmental Index in 2008 and the wider "Universities that Count" – BITC Environmental Index in 2009. The University is a corporate member of BITC (The University of Nottingham, 2010, p.12).

Tilburg University, the Netherlands

Tilburg University has been using green energy since January 2009. The University has a contract for 100.0% green electricity supply for three years with Eneco. Lightning New technology on TL-lamps is being applied when renovating. This system replaces the existing TL-lamps with energy efficient ones. First investigations have calculated a reduction of energy use and payback in three years. The University has a policy that renovating and refurbishing office space and other campus space should be executed on an energy efficient basis (www.tilburguniversity.edu, 2011). Additionally, Tilburg signed the Energy Efficiency Agreement MJA3 with 11 other higher education institutions in 2008. They aim to save 2.0% energy on a yearly basis, and reduce by 30.0% by 2020 from the 2005 level. In addition, Tilburg prepared the Annual Report

on Energy Use with an overview of energy streams composed of consumption and costs of electricity, gas, water.

The University of Copenhagen, Denmark

The University of Copenhagen is another university recognizing green responsibility in the University strategy. The University's first green action plan was published in 2009 in "Destination 2012". The goals related to energy consumption, CO2 emissions, and the campus developments are as follows:

The University of Copenhagen's energy consumption shall in 2013 be reduced to a level that is 20.0% below that of 2006, measured as energy consumption per man year for staff and students.

The University of Copenhagen's CO2 emissions from energy consumption shall in 2013 be reduced to a level that is 20% below that of 2006, measured as CO2 emission per man year for staff and students.

The University of Copenhagen will develop guidelines for physical planning and will account for the sustainability of all physical plans and projects.

The University of Copenhagen will make tools etc. available to others and communicate initiatives and experiences to the outside world. Among other initiatives, the University will participate in networks and enter into cooperation agreements with partners who can inspire and contribute to the University's realization of the goals set for Green Campus (www.ku.dk, 2011a):.

Sustainable and climate-friendly Campus development is one of the key priorities for the University. The University's energy consumption and CO2 emissions by 20.0% between 2006 and 2013 will be achieved significantly through initiatives for existing constructions that do not enable climate-friendly operation. Environmental and climate considerations should be integrated in new building projects from the very beginning. Environmental and energy-efficient solutions should be considered during planning and design processes. This also ensures that new buildings contribute to CO2 emissions as little as possible (www.ku.dk, 2011b). They have developed their own sustainable campus development initiatives for the future enlargement.

Most efforts in energy and climate are focused on existing buildings as the challenge for the University is having old buildings on the campus. Improving the climate screen, energy smart installations, energy efficient operation, energy smart conduct, energy smart projects, and energy smart purchasing are solutions for energy efficiency in the buildings. In addition, the University created pilot and demonstration projects such as the Green Light House in 2009 and another demonstration project for the energy renovation of an existing building in co-operation with Rockwool, the leading Danish insulation producer company (www.ku.dk, 2011c).

The University also gives high importance on global collaboration and engagement and collaborations by being part of the global networks, and has created a fund for student sustainability initiatives.

Maastrciht University, the Netherlands

Maastrciht University is another university leading with its green campus initiatives, and currently has been developing its new sustainability report with the Green Office at Maastricht. The projects at Maastricht are supervised under three areas: operations, education and research and community. The Green Office runs also a research project on sustainability in higher education within Europe (www.maastricht.nl, 2011).

Universidad Complutense de Madrid (UCM) and Universidad Politecnica de Madrid (UPM) , Spain

The Universidad Complutenese de Madrid (UCM) and Universidad Politecnica de Madrid (UPM) were awarded the project “Campus Moncloa: the Power of Diversity in 2009 by CEI (www.campusmoncloa.es, 2013a). One of the strategic objectives of the Moncloa Campus is to develop and implement a social responsibility and sustainability plan and manage social responsibility and sustainability on campus. The project started in 2009 and the target is set for 2015 to prepare UCM and UPM to act in accordance with the EU Sustainability Strategy (ESDS). 11 sets of specific objectives were developed:

- ✓ *Implement a management plan for social responsibility and sustainability of the campus*
- ✓ *Encourage socially responsible values on the campus*
- ✓ *Promote the participation and co-responsibility of all stakeholders involved*
- ✓ *Systematise the evaluation of activities and results achieved*
- ✓ *Regenerate the campus from a landscape, eco-planning, architectonic and social viewpoint*
- ✓ *Encourage environmentally friendly and healthy principles and life styles among students, teaching and non-teaching staff on campus*
- ✓ *Encourage the use of sustainable transport on campus*
- ✓ *Optimise energy use*
- ✓ *Reinforce a culture of risk prevention at work*
- ✓ *Promote development cooperation and volunteer training and participation*
- ✓ *Intensify the integration of the campus into the city of Madrid* (www.campusmoncloa.es, 2013b.)

The Moncloa campus has demonstrated some tangible progress on sustainability and social responsibility indicators of the project. Some of the quantitative improvements in percentages are listed below:

- ✓*The number of people involved in gender equality awareness activities increased 20.0% in 2012 and is expected to increase 35.0% from the initial status in 2009.*
- ✓*The number of students participating in collaboration programs for disabled persons in their centre increased 20.0% in 2012 and is expected to increase 60.0% from the initial status in 2009.*
- ✓*The number of bicycle parking spaces on campus increased 71.4% in 2012 and is expected to increase 128.7% from the initial status in 2009.*

- ✓ *The number of renewable energy facilities/buildings on campus increased 66.7% in 2012 and is expected to increase 166.7% from the initial status in 2009.*
- ✓ *The square meters of regenerated parkland increased 31.6% in 2012 and are expected to increase 84.2% from the initial status in 2009.* (www.campusmoncloa.es, 2013c)

Some qualitative results have been achieved as well in terms of a sense of belonging, designing a comprehensive campus from an urban and social perspective, improving the working environment, and a live campus: university life 24 hours a day (www.campusmoncloa.es, 2013c). The Moncloa Campus is a good example of a holistic approach for campus sustainability with social, economic and environmental aspects of sustainability.

To conclude, due to the EU SDS first adopted in 2001 ensuring economic growth, environmental protection and social integration, carbon reduction, renewable and energy efficiency targets, university campuses in the EU Member States have also responded to these strategies and targets as important stakeholders. However, economic and social aspects of the sustainable campuses are not emphasized at the same level as environmental campus sustainability.

2.5.2 Sustainable Campus Examples from Turkey

The sustainable campus concept is new in Turkey and no holistic approach exists. The sustainability efforts in the universities are not combined, and mostly scattered. For instance, establishing solar energy equipment for water heating in one of the dorms on a campus, or distributing a sustainable campus flyer is considered enough to consider the campus as sustainable. There are only a few individual greening initiatives and campus sustainability has not been mentioned yet. Turkish universities could be more active on campus sustainability and should take their roles to raise students' awareness of sustainability. Regardless of their majors and career goals, students should graduate as individuals who are aware of a sustainable lifestyle. By this time, the 21st century, universities should have achieved more. Unfortunately,

sustainability is not the priority of Turkish Universities. Usually, efforts are gathered on greening the campus, mostly in the area of campus operations.

As the EU continues to give top priority to environment and energy efficiency in its future goals and the harmonization of EU Acquis to Turkish Law on environment, energy efficiency continues, Turkish universities will be forced to put sustainability into the core of their strategies. At present, many EU based consultancy companies are looking to Turkey as a new market for their green, energy efficiency products, and services. Now, universities are also a new segment for them to sell their products and services.

Turkey has a few examples of universities that are greening their universities. For instance, Özyeğin University, one of the newly established private Turkish universities, built its new campus in Çekmeköy, a green campus, which is the first campus in Turkey with a LEED certificate. The major public university, Bosphorus University, builds new buildings within the green building standard on its campus. In this regard, the first male dormitory received a LEED certificate during a major retrofitting and the new student dorm has its own solar energy central providing 30.0% of the total energy consumed in the dorm building. One of the new foundation universities, Piri Reis University, is the first BREEAM certified university campus in Turkey. Both Özyeğin and Piri Reis are certified green campuses due to their buildings. Bartın University is planning to make their new campus a green campus producing its own energy where the graduate profile will be green-friendly generations with high environmental awareness (www.bartin.edu.tr, 2011).

Unfortunately, a holistic approach toward being a model of sustainability, a sustainable campus, is lacking in all of these initiatives. The challenge that Turkish universities face should be both providing students a healthy and sustainable quality of life and preparing them as responsible citizens to the environment, a so- called green citizenship.

Indeed, universities start recycling, turning off the lights, then ask “what is next?” to shift the university to a more comprehensive approach to campus

sustainability. When the capital becomes a constraint in going further in investing in sustainability, using energy efficiency, triggering behavior change and inspiring and engaging the community become new opportunities to continue sustainability efforts. Campus sustainability and campus greening are used interchangeably in many universities. Universities in the world are trying to decrease their environmental impact while being leaders in environmental sustainability in teaching, research and practicing. Few universities integrate the social aspects of sustainability to environmental sustainability efforts on the campus such as in the case of Cornell and UBC. Cornell has a long-standing commitment to diversity, fairness, and inclusion (www.sustainablecampus.cornell.edu, 2013). "People" is one of the focus areas of Cornell campus sustainability with other environmental sustainability focus areas. And UBC has a holistic approach for campus sustainability in all directions such as environmental, economic and social sustainability. Indeed, even the other example universities in this study have leadership programs for staff, students, faculty, well designed human resource programs and engagement programs with the local communities They do not consider these efforts in campus sustainability as social aspects but only emphasize environmental sustainability.

One of the most innovative ways of promoting campus sustainability is green office calculators to drive behavioral change to use resources efficiently in the university and certify the offices based on campus sustainability initiatives such as in the cases of Harvard, Boston University, California State University, the University of Colorado, and the University of Southern California. These are all successful internal green rating initiatives for greening the university offices. The Carbon Crew Program of UEA asks the support of the individual campus community by doing carbon footprint pledges which could be tracked by this program to help the university reduce its CO2 emissions by 35.0% by 2015.

The next section reviews sustainable campus literature, presents examples to illustrate the studies conducted in sustainability with a focus on the need in Turkey.

2.6 Sustainable Campus Literature Review

In this section, literature on campus sustainability is reviewed; and some chosen articles on sustainable campus practices are summarized. In general, articles, research papers, doctoral thesis range from strategies, approaches, assessment methodologies on campus sustainability to specific campus sustainability practices, initiatives and cases in education, curriculum, community engagement, dining, transportation, landscaping, campus development, waste, recycling, energy, renewable, energy efficiency, carbon footprint and procurement.

Sustainable campus related articles have been not only published in education related journals, but also in other thematic journals on sustainability, waste, clean technologies, energy, building design, construction, transportation, anthropology, food, etc.

In this section, some campus sustainability related or focused chosen articles, research papers and dissertations are examined. First, some general articles and research papers on strategies, approaches, assessment methodologies on campus sustainability are listed. Second, articles and research papers about case studies related to or focused on campus sustainability developed for a specific university are listed. Third, some doctoral dissertations related to or focused on campus sustainability are provided.

In the research paper "Overcoming Barriers to Campus Greening: A survey Among Higher Education Institutions in London, UK", Dahle and Neumayer (2001) from the London School of Economics and Political Science, UK, run a survey among the HEIs in London to assess how far the relevant institutions have reached with respect to greening within the areas of energy and solid waste management and what the interviewees consider to be the most important barriers to further green their campuses, and how such barriers can be reduced, or possibly overcome.

Balsas (2003) from the University of Massachusetts argues that college campuses, due to their pro-active education ambiance, are privileged places to communicate sustainability and to help reshape society's transportation patterns. In his paper "Sustainable Transportation Planning on College Campuses", he studies various

options on sustainable transportation in campus sustainability by reporting the results of a survey of eight pre-selected bicycle and pedestrian friendly campuses.

Alshuwaikhat and Abubakar (2008) from the King Fahd University of Petroleum & Minerals, Saudi Arabia, do not study with a specific case but propose a framework of a more suitable approach to achieving campus sustainability that could remedy the limitations of the current environmental management practices in universities and ensures more sustainability through the integration of three strategies, namely: University Environmental Management System (EMS); public participation and social responsibility; and promoting sustainability in teaching and research.

Altan (2008) from the University of Sheffield, UK, conducted a survey among 60.0% of the HEIs in the UK to provide an insight into energy efficiency intervention studies, and focus on issues arising in UK HEIs in his paper "Energy Efficiency Intervention in UK Higher Education Institutions."

In the article "Renovation for Sustainability", Sullivan and Horwitz-Bennett (2010) study sustainability design movement and green buildings agenda during the renovations among the American universities.

Lozano (2011), Suwarta and Sari (2013) and Yarime and Tanak (2012) work on the sustainability assessment of the universities in their research papers.

Lozano (2011) from the University of Leeds, UK, in the research paper "The State of Sustainability Reporting in Universities", reviews and assesses the state of sustainability reporting in universities by analysing performance level of 12 universities sustainability reports using the "Graphical Assessment of Sustainability in Universities" tool. Lozano suggests that university leaders should be more responsible to provide information on the social and educational dimensions.

Yarime and Tanak (2012) from the University of Tokyo review 16 sustainability assessment tools used worldwide in the research paper "The Issues and Methodologies in Sustainability Assessment Tools for Higher Education Institutions: A Review of Recent Trends and Future Challenges." The authors conclude that most of

the assessment tools focus mainly on the environmental impact of university operation and issues related to governance and suggest that comprehensive, long-term and integrated assessment of research, education and outreach on sustainability at higher education institutions is needed.

Some food and dining related research papers are “Sustainable Campus Dining: How Campuses Are Targeting Sustainability and Engagement through Dining Services Initiatives” (Celeste, 2013) and “Campus Sustainability Food Projects: Critiques and Engagement” (Barlett, 2011) study sustainable food and dining options which become popular in most of the sustainable campuses. They show how sustainable food and dining become economic, environmental and social parts of the campus sustainability.

Suwarta and Sari (2013) from the University of Indonesia introduce the development and improvement of UI GreenMetric in their research paper “Evaluation UI GreenMetric as A Tool to Support Green Universities Development: Assessment of the Year 2011 Ranking.”

Second, there are various articles, research papers published by the staff or faculty of the related HEI to share their experiences with others by developing sustainability case studies of their institutions. There are also books where editors collect stories and case of campus sustainability from different universities. There are university cases from different countries such as Australian National University (ANU) and University Technology of Sydney (UTS) from Australia; Florida Gulf Coast University, University of Florida, University of Michigan (UM), Ball State University, Cape Cod Community College from the USA; University of Northern British Columbia from Canada; Margaret University College in Edinburgh, University of Southampton (UoS), Lancaster University from the UK; University of Maribor from Slovenia, University of Bordeaux and Lille Catholic University from France.

Below some articles, research papers and books are examined based on the countries:

Some Examples from Australia

Mcmillan and Dyball (2009), a research fellow and a lecturer studied ANU by using an active research methodology in their article "Developing a Whole University Approach to Educating for Sustainability: Linking Curriculum, Research and Sustainable Campus Operations." They argue that universities can optimise their role as agents of change with regard to sustainability by adopting a "whole-of-university" approach to sustainability. In the article, Mcmillan and Dyball (2009) explore teaching, learning and operational benefits arising from student involvement in campus sustainability initiatives at ANU.

Another University from Australia, UTS is used as a case study in this article "Campus Sustainability: Climate Change, Transport and Paper Reduction" by Atherton and Guirco (2011). This paper aims to detail the design of a campus climate change strategy, transport strategy and paper reduction strategy at UTS.

Some Examples from the USA

Various departments such as the Center for Energy Research, Education and Service, Department of Marketing, Council on the Environment and Green Initiative Coordinator from the Ball State University in Indianapolis, USA come together for the paper "Greening of the Campus: a Whole-System Approach." Koester, Eglin and Vann (2006) take Ball State University as a case study and present the whole-systems approach used at Ball State University to institutionalize its ongoing greening of the campus, which involve academic content, administrative policies, and facilities management practices.

Gross (2007) from the Cape Cod Community College, Massachusetts, USA, recognized as a green campus leader among national and regional universities, shares the experience of the institution changing from green campus to becoming sustainable campus by committing to economic and social development that does not cause damage to the environment and natural resources.

The University of Florida is used as an example by Scott (2006) in his article "In Search of the Sustainable Campus" to show the difference between merely appearing sustainable and actually taking the difficult actions to become so. The University of Florida is presented as a case study of how the process of sustainability can develop ups and downs.

Another university in Florida, Florida Gulf Coast University is offered as a case study for advancement of sustainability practices by Wohlpart, Shepard and Concoran (2009) in their article "Born in Hope and Controversy: The Challenges of Infusing Sustainability in the Campus Operations and Curriculum at Florida Golf Coast University." The university is located in the environmentally sensitive Southwest Florida. Wohlpart, Professor and Associate Dean of the College of Arts and Sciences, Shepard, Vice President of Administrative Services and Finance, and Blaze, Professor in the College of Arts and Sciences share the challenges of the environmental impact of the University, and how the University deals with it.

UM becomes a case study by Marans and Edelstein (2010) regarding the behaviours, attitudes and levels of understanding among faculty, staff and students in efforts to design programs aimed at reducing energy use in UM buildings. For this paper" The Human Dimension of Energy Conservation and Sustainability: A Case Study of the University of Michigan's Energy Conservation Program", Institute of Social Research and Energy Conservation Liaison, Planet Blue Program at UM collaborate. This is an important case to see how the involvement of the campus community makes different in achieving campus sustainability targets.

"The Green Campus" by Simpson (Ed.) (2008), and "Sustainability on Campus: Stories and Strategies for Change" by Barlett and Chase (Ed.) (2001) provide various cases from the American universities.

Some Examples from Canada

Symth, Freiden and Booth (2010) from the University of Northern British Columbia in Canada use the university as a case study in this paper "Reducing Solid Waste in Higher Education: The First Step Towards "Greening" A University Campus."

The aim of the study is to determine the amount and composition of waste generated within key campus operational areas and to provide recommendations to senior university administration on strategies for waste minimization, higher rates of recycling and composting and improving the overall sustainability of the campus waste management program. In addition, various educational and policy techniques to promote campus community waste minimization behaviours in the long term, are discussed. This case also shows the importance of engaging the campus community in campus sustainability activities.

Some Examples from EU Member States

the UK

Armstrong, Darrall and Grove-White (1997) from Lancaster University and the University of Sheffield in UK work together in the article " Maximizing the Local Economic, Environmental and Social Benefits of A University: Lancaster University", where they do in-depth study of the local economic, social and environmental impacts of Lanchester University between 1991 and 1992 periods. The authors share the lessons drawn from the Lancaster University experience which could be generalized for other universities aiming to maximize their local benefits and minimize their local cost impacts.

Woodman (2006), Project Administrator at Queen Margaret University College in Edinburgh, published an OECD Paper, Program on Educational Building, on "Queen Margaret University College's Sustainable, Community Campus." The paper uses Queen Margaret University's sustainable development plans from green travel, energy and water usage and buildings as a case study. Examples of how the sustainability targets are identified and achieved are given as the university is relocated to new campuses.

Zhang and others (2011) from the School of Civil Engineering and the Environment, and Estates and Facilities Management from UoS work together in this paper "Greening Academia: Developing Sustainable Waste Management at Higher Education Institutions." One of the largest universities in the Southern England is given

as an example for waste management, where at each stage, the approach taken to the development of infrastructure, service provision and behaviour change is explained, taking into account the political, economic, social, technological, legal and environmental factors.

In another article "A Renewable Solution for Highfield Campus of UoS," Kalan and others (2011) look for the sustainable energy generation in a university campus. The University uses electrical energy provided from the national grid and heat energy by burning natural gas. The researchers share the results of the project proposed to the university administration to achieve a more sustainable way of heat and electricity energy generation to improve environmental impact of the University.

Slovenia

The University of Maribor in Slovenia is the focus of a case study by Lukmana, Tiwaryb and Azapagicb (2008) in the article "Towards Greening a University Campus: The case of the University Maribor, Slovenia." Lukmana, a faculty member from the University of Maribor, and Tiwaryb and Azapagicb, faculty members from the University of Manchester assess the environmental performance of the Engineering Campus of the University of Maribor on a life cycle basis as HEIs have considerable impact on the environment. They use a LCA software package, and propose an option combining 70.0% recycling, 29.0% incineration and 1.0% landfill to make the Engineering Campus the most economically and environmentally sustainable.

France

Bonnet et al.(2002) from the Ecocampus European Collaboration, a group of universities in the EU counties working on energy and environmental issues in the university campuses, examine the University of Bordeaux, France in the article "Analysis of Electricity and Water End-Uses in University Campuses: Case-Study of the University of Bordeaux in the Framework of the Ecocampus European Collaboration." Bonnet et al.(2001) define and implement a tool allowing addressing the diversity of activities and end-uses when analysing energy demand and environmental impact on a campus for sustainable development of the university.

The Catholic Institute of Lille, another French University, is used as a case study by Olszak (2012), an Associate Fellow at the Lille Catholic University, in the article “Composite Indicators for A Sustainable Campus Design Rational and Methodology: The Case of the Catholic Institute of Lille.” Olszak focuses on the implementation of the sustainable development principles in the university campuses by first defining major principles that the Lille Catholic University holds to establish its own sustainable development indicators. Second, he works on the formula used for creating composite indicators for a sustainable campus and later, he highlights some of the possible actions that could be implemented in the campus to improve some of the scores of the indicators (Olszak, 2012, p. 573).

Spain

Bruno et al.(2004) from the Technical University of Catalonia (UPC) in Spain studied methodological and strategic results of the first two years of the implementation of the second environmental plan (2002-2005) at UPC and as well as the benefits and difficulties of new strategies adopted in the article “"Advances in Education Transformation Towards Sustainable Development at the Technical University of Catalonia, Barcelona.”

Third, some campus sustainability doctoral theses are examined from the US.

Shriberg (2002) from the University of Michigan studies sustainability in HEIs in U.S. by examining how colleges and universities can better lead a successful change effort towards sustainability in the doctoral thesis “Sustainability in U.S. Higher Education: Organizational Factors Influencing Campus Environmental Performance and Leadership.”

Velazquez (2003) from the University of Massachusetts Lowell develops a state of the art model that offers a highly structured framework for visualizing the sustainable university system in the doctoral thesis “Sustainable Universities Around the World: A Model for Fostering Sustainable University Programs Effectiveness.” Universities could use this model to improve the effectiveness of their potential or

current sustainability initiatives through the identification of strategies, opportunities, and institutional barriers in their institutions (Velazquez, 2003).

Moore (2004) from UBC, a Canadian university putting campus sustainability at the core of its mission, reports on an in-depth case study of UBC to examine how the educational component of the Sustainable Development Policy adopted in 1997 by the university is being addressed in the doctoral thesis "Recreating the University from Within: Sustainability and Transformation in Higher Education."

Savanick (2004) from the University of Minnesota proposes that higher education institutions are small urban areas and should display the properties developed in urban ecology in her doctoral thesis "Campus Ecology: Bridging the Gap Between Campus Sustainability Efforts and Urban Ecology." This study views the campus as a dynamic ecological system, which could be an effective tool for environmental education and civic engagement within a campus sustainability effort.

Becker (2007) from the University of Southern California (USC) reviews best practices, processes and practices at USC which are sustainable and prepares a three year plan as a roadmap for developing a formal sustainability program at USC which capitalizes on the academic and administrative programs already in place at the university. The doctoral thesis "Environmental Sustainability Plan for the University of Southern California" looks at campus sustainability by distinguishing environmental sustainability and social or economic sustainability. At this stage, HEIs are on different levels of sustainability

Scheck (2007) from Stony Brook University like Nika (2008) argues that the shift to widespread worldwide sustainability forces HEIs to embrace a different learning and living paradigm, and some U.S. colleges and universities are actively embracing this change. In addition, describes universities as uniquely situated to lead effort because universities besides their teaching mission have impact on their immediate environment and surrounding communities. Scheck (2007) compares and contrasts the various approaches universities take to become sustainable in the U.S. including the Stony Brook University in her doctoral thesis "Sustainability in Higher Education."

Nika (2008) from Northwestern University argues that environmental sustainability initiatives in organizations across the world has arisen due to the global warming and HEIs are ideal places to initiate sustainable practices as these institutions are all generally based on the mission of providing education, research, and public service in and to society. In addition, HEIs, morally and ethically should react more to a global problem and be the part of a solution. Nika (2008) assesses the environmental climate and effectiveness of sustainability initiatives at Northwestern University, focusing on one of the major campus stakeholder groups "students" in the doctoral thesis "Creating a Green Community: Understanding Student Environmental Behaviours for Increased Campus Participation at Northwestern University."

Erickson (2010) from the University of Vermont argues that education has played a role in bringing awareness regarding environmental issues; however, this has not resulted in all the needed behavior changes. The researcher examines peer to peer sustainability outreach programs across the U.S., a new kind of campus activism combining psychological theories with outreach and marketing techniques in the doctoral thesis "Peer to Peer Sustainability Outreach Programs: The Interface of Education and Behavior Change."

These theses indicate that the field of campus sustainability efforts have become an area of interest and research for doctoral students supported by various administrative and educational units of their universities. In addition, they all justify the need for their research in the campus sustainability field by arguing that universities, because of their inherent mission to provide education and research, as well as their size and impact on their immediate environment and surrounding communities, should be important players in the worldwide sustainability efforts.

The amount of current literature shows that researchers from different countries both in the world and the EU and from various domains have research interests in the field of campus sustainability. In addition, there are a lot of research papers where the campus of a university is taken as a case study. Worldwide literature related to or focused on campus sustainability is developed with in depth studies.

Existing doctoral and master theses in Turkey are reviewed with the same key words “sustainable campus, green campus, sustainable university and green university” used to review sustainable campus related or focused literature in the world and EU. However, sustainable campus theses are not encountered. On the other hand, there are various studies at the doctoral and master level focusing waste management, landscape, green design, energy related topics such as energy efficiency in buildings, renewable such as wind and solar energy in the university campuses. Some chosen examples from the doctoral and master theses are listed below:

Dinçsoy (2007), Şahin (2008), Yalçın (2010), Çamlıbel (2011) and Başaran (2013) studied university campuses in their doctoral theses regarding greener curriculum application towards sustainability in the University of Middle East Technical University, solar energy potential of the Faculty of Ankara University in Haymana, energy efficiency solutions for existing buildings of Boğaziçi University Kilyos Campus, and wind-pv hybrid power system and application in Adnan Menderes University’ Campus. On the other hand, Şimşek (1999), Tuna (2006), Erdoğan (2009), Yüksel (2009), Gürdal (2010), Demir (2012) and Tığlı (2013) studied university campuses regarding waste management in 9 Eylül University, green design approach in the landscape of the university campuses, relation between university performance and sustainability in university campus’ landscape design and planning, comparison of ordinary schools, eco-schools in terms of their environmental education, wind tribunes for energy usage in the Dumlupınar University Central Campus, green school’s effects on environment, health and education, and as well as hazardous waste in the university campuses and Ege University.

No other doctoral theses were encountered developing a holistic approach to campus sustainability guiding Turkish universities in this new territory. This doctoral thesis “Campus Sustainability in the EU and Turkey: Developing a Holistic Approach to Campus Sustainability in Turkey” focuses on studying campus sustainability criteria in the EU, and Turkey and develops a case study by studying a university campus in Turkey with a holistic approach to campus sustainability.

3 AN EXAMPLE OF DEVELOPING A HOLISTIC APPROACH TO CAMPUS SUSTAINABILITY IN TURKEY: A CASE STUDY OF KOÇ UNIVERSITY

Turkish universities are at the stage of the environmental sustainability in operations of their campuses. The Koç University (KU) Rumelifeneri Campus, in Istanbul, Turkey, is used as an example of a sustainable campus in Turkey to guide universities on how to develop a holistic approach to campus sustainability in Turkey. Because Turkey is at the early stages of environmental sustainability development, it is crucial to demonstrate a case with a holistic approach to campus sustainability to be an example for other Turkish universities. KU is chosen as an example because of the willingness of collaboration from the senior management and already existing programs and units that could easily support developing a holistic approach to campus sustainability.

There are three stages in this section:

- ✓ Providing background information about KU
- ✓ Analyzing the current situation at KU regarding campus sustainability
- ✓ Developing KU campus sustainability strategic plan and road map in a holistic approach

The methodology used in defining the current situation at KU is based on semi-structured interviews and various meetings with key people from staff, management, and faculty, real data collection from different departments and categorization, and evaluation and reporting of all the data collected through various processes.

The evaluation is discussed under five headings that reflect KU's sustainable campus criteria: Environmental Sustainability in Campus Operations, Education and Outreach on Sustainability, Research Outlook and Sustainability, Development and Implementation of Campus Sustainability Policies, and Social and Economic Aspects of Campus.

Environmental Sustainability in Campus Operations: Environmental sustainability in campus operations at KU contains six sections such as Resource Use of

Electricity, Natural Gas and Water; Waste and Recycling, Carbon Foot Print, Transportation, Procurement, Sustainable Campus Development, and Food and Dining

Education and Outreach on Sustainability: Available courses, programs and outreach activities

Research Outlook and Sustainability: Research opportunities, projects and centers related to social, economic and environmental sustainability

Development and Implementation of Campus Sustainability Policies: Current sustainability related policies and their implementations

Social and Economic Aspects of Campus Sustainability: In most of the sustainable campuses presented in the theoretical part of the thesis economic sustainability is not explored and only some universities give attention to social sustainability on campus. Social and economic sustainability on the KU campus are analyzed together with a focus on social sustainability.

The section will explain how this process and interaction with the campus community triggered the awareness among management, faculty and students, and present some findings and suggestions to guide the study for the next step, which is developing a sustainable campus strategic plan and road map in a holistic approach for KU.

The methodology was conducted in nine steps to develop KU Sustainable Campus Strategic Plan and Road Map:

Research on Campus Sustainability Strategy Development was conducted by studying example universities and others to understand how these universities developed their campus sustainability strategies.

Existing KU Documents and International Principles that KU is signatory are analyzed to include them into the campus sustainability principle and commitments.

Based on the findings during the first and second steps, *Draft of the KU Campus Sustainability Principle and Commitments* was prepared.

Draft Strategic Plan and Key Operational Areas for KU were decided based on the research conducted among example universities, rating systems, and key findings at the current situation analysis for KU.

Face to Face Interviews and Various Meetings for Campus Sustainability Strategic Plan were conducted with 13 key people to discuss Draft of KU Campus Sustainability Principle, Commitments, Strategic Plan and Key Operational Areas.

Revision based on Feedback is conducted for Campus Sustainability Principle, Commitments and Strategic Plan. Important key points to further the study are made on *Sustainability versus Responsibility Framework, Priorities and Capacities of KU, and Road Map* after getting feedback for revisions. In addition, 16 Key Operational Areas are grouped under five main sections based on feedback and comments:

Section 1: Campus Operations: Energy (Electricity and Natural Gas); Water, Carbon Foot Print; Waste and Recycling; Carbon Footprint; Transport; Procurement; Campus Development; Food and Dining, Efficient Use of Resources

Section 2: Education, Outreach and Community Engagement: Curriculum; Outreach Programs, Community Engagement

Section 3: Research on Sustainability

Section 4: Campus Community: Diversity & Affordability; Human Resource

Section 5: Development and Implementation of Sustainability Policies and Efforts: Sustainability Governance; Coordination and Planning

In addition, Objectives and Key Performance Indicators are set for each operational area.

The KU Sustainable Campus Road Map was prepared. During the interviews and meetings to develop KU Campus Sustainability Strategic Plan, some data was also provided to a road map. Each key operational area, short, medium and long term road maps with possible activities and programs were identified.

Semi-Structured Interviews and Various Meetings for Campus Sustainability Road Maps were conducted to get feedback on the developed road maps.

Revision Based on Feedback was made to finalize the road map and if necessary in the strategic plan. The KU Campus Sustainability Strategic Plan and Road Map is now ready to be presented to the President.

3.1 Background Information About Koç University

KU was established in Istanbul in 1993 as a non-profit foundation university. The university has one main campus in Rumelifeneri Yolu in Sariyer, and other campuses in different locations such as West Campus located near the main campus, where some of the dorms are located, the School of Nursing in Nisantasi, the Research Center for Anatolian Civilizations in Beyoglu, and the Istinye Campus. For this study, only the KU Rumelifeneri Yolu Campus was used as a case study. KU has approximately 5000 students, 500 staff and 456 faculty members, 7300 alumni and offers 13 doctoral, 24 master and 22 undergraduate programs within its 7 colleges and 4 graduate schools. Except the School of Nursing, the College of Administrative Sciences and Economics (CASE), College of Social Sciences and Humanities (CSSSH), the College of Sciences (CS), the College of Engineering (CE), the Law School, the School of Medicine (SoM), the Graduate School of Sciences and Engineering (GSSE), the Graduate School of Business (GSB), the Graduate School of Social Sciences and Humanities (GSSSH) and the Graduate School of Health Sciences (GSHS) are physically located on the main campus.

KU main campus is located on a sprawling 250000 m² combining modern outdoor facilities with six academic, administrative, residential, recreational buildings and green areas. The Campus has a dormitory capacity of 1500 students and housing capacity for 150 faculty. The Student Center is open 24 hours where facilities include cafeterias, canteens, cafes, a hair dresser, a full-service bank, ATM machines, a supermarket, dry cleaning, a bookstore, a post office, and 24-hour computer labs.

KU Campus has reached its optimal growth level regarding campus population and campus development. A major growth of campus population or campus development is not foreseen in KU's plans. Therefore, every measure taken regarding campus sustainability will improve 10250.56 tons of carbon footprints of the university as a baseline year 2012.

Administrative offices operate under the Dean of Students, the Office of the General Secretary, Research and Project, the Registrar's Office, Computer Information Technologies, the Library, the Office of the Comptroller, Human Resources (HR), the

Office of International Programs (OIP), Corporate Relations and Development, Communications Office and Director of Construction. KU has a President and Vice President for Academic Affairs, a Vice President for Research and Development, six Deans and four Directors responsible for administration, education, and research. Eight pillars comprise university governance at KU: the Chairman, the Board of Trustees, the President, the Board of Overseers, Coordination Committees, and the Vice President for Academic Affairs, the Vice President for the Research and Development Office, and the Office of the General Secretary. KU is owned by the Koç Foundation, and is endowed by the Foundation.

KU signed the United Nations Global Compact (Table 10) in 2007. In addition, the Business School has been a participant of the Principles for Responsible Management Education (PRIME) (Table 11) since 2008, and has been preparing the Sharing Information on Progress (SIP) Report on the implementation of the Principles for Responsible Management. The UN Global Compact and PRIME are two important principles internationally accepted.

Table 10
The 10 Principles of the United Nations Global Compact

Human Rigths
Principle 1: *Businesses should support and respect the protection of internationally proclaimed human rights*
Principle 2: *Business should make sure that they are not complicit in human rights abuses*
Labour
Principle 3: *Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining*
Principle 4: *The elimination of all forms of forced and compulsory labour*
Principle 5*: The effective abolition of child labour*
Principle 6: *The elimination of discrimination in respect of employment and occupation*
Environment
Principle 7: *Businesses should support a precautionary approach to environmental challenges*
Principle 8: *Undertake initiatives to promote greater environmental responsibility*
Principle 9: *Encourage the development and diffusion of environmentally friendly technologies*
Anti-Corruption
Principle 10: *Businesses should work against corruption in all its forms, including extortion and bribery*

Source: www.unglobalcompact.org, 2013

The physical environment in this study is Rumelifeneri Yolu Campus and all the faculties are located on this campus. The existing commitment of the university to campus sustainability is a signatory of two important international initiatives promoting environmental, social responsibilities, and a more inclusive and sustainable economy.

Table 11
The Principles for Responsible Management Education

Principle 1: Purpose: *We will develop the capabilities of students to be future generators of sustainable value for business and society at large and to work for an inclusive and sustainable global economy.*
Principle 2: Values: *We will incorporate into our academic activities and curricula the values of global social responsibility as portrayed in international initiatives such as the United Nations Global Compact.*
Principle 3: Method: *we will create educational frameworks, materials, processes and environments that enable effective learning experiences for responsible leadership.*
Principle 4: Research: *We will engage in conceptual and empirical research that advances our understanding about the role, dynamics, and impact of corporations in the creation of sustainable social, environmental and economic value.*
Principle 5: Partnership: *We will interact with managers of business corporations to extend our knowledge of their challenges in meeting social and environmental responsibilities and to explore jointly effective approaches to meeting these challenges.*
Principle 6: Dialogue: *We will facilitate and support dialog and debate among educators, students, business, government, consumers, media, civil society organizations and other interested groups and stakeholders on critical issues related to global social responsibility and sustainability.*

Source: www.unprme.org, 2013

3.2 Current Situation Analysis at Koç University Based on Sustainable Campus Criteria, and Awareness Raising among the Management, Faculty and Students

A current situation analysis at KU based on campus sustainability criteria is the first stage to develop a campus sustainability strategy as well as a road map and goals for KU with a holistic approach. As a result of the current situation analysis, awareness on campus sustainability among management, staff, faculty and students was raised to some extent due to the interaction with these target groups during the study. A working methodology as described in Figure 30 was conducted to analyze the current situation. The ensuing studies were conducted in five steps.

3.2.1 Semi-Structured Interviews, Various Meetings with Key People

Semi-structured interviews and various meetings were conducted to evaluate the current situation at KU.

Before starting the interviews, the management and academic structure of the university was analyzed to decide how to structure the interviews, with whom to start,

Figure 30: Work Flow Used for Current Situation Analysis at KU
Source: This Methodology was developed for KU during the Investigation and Evaluation

and of course, how to get further support from the interviewed people for the next steps of this study. As people were very busy, only 14 semi-structured interviews were scheduled between May and June 2012 but, since June 2012, other opportunities have been created to talk with the rest of the key people at the university.

The first meeting was actualized with the General Secretary to brief him, raise his awareness on campus sustainability, and get his support to proceed. Indeed, learning and gathering information on technical, operational management, and capacity of KU regarding campus sustainability in terms of environmental sustainability was the best way to start.

Some meetings were made with the General Secretary between May 2012 and June 2013. The General Secretary appointed the Technical Manager and Assistant Facilities Manager to be responsible for the campus sustainability initiative at KU during this study.

The Technical Manager of the campus became one of the leading figures supporting the campus sustainability initiative in terms of providing operational and technical data and offering general guidance. As most of the data and knowledge are scattered at the university among various people, it was important to learn from a key person, in this case, the Technical Manager, with whom to talk to get what information and data before structuring and starting the interviews. In each university, names of the departments, their responsibilities, and of course management and academic structure of the university could be different. At KU, to get the relevant date and information, 14 semi-structured interviews were conducted with the following key people:

- ✓Dean of the College of Sciences
- ✓Dean of the College of Engineering
- ✓Founding Dean of the Medical School
- ✓Director of the Graduate Programs in Business and Executive Education
- ✓Director of the Graduate School of Social Sciences and Humanities
- ✓Director of Construction, Director of CIT
- ✓Director of Communications

- ✓Director of International Programs
- ✓Facilities Manager
- ✓Assistant Facilities Manager
- ✓Technical Manager
- ✓Procurement Manager
- ✓Security Chief
- ✓Director of TÜPRAŞ Energy Research Center

Interviews were conducted between 30 and 50 minutes, and recorded with permission. During the interviews, basic information was gathered through these two questions:

- What is your general attitude and level of interest regarding campus sustainability?
- What data and information can you provide on campus sustainability regarding your field of responsibility at the university? Do you run or plan any activity, programs which could support campus sustainability?

Semi-structured interviews further triggered the interest of the participants about campus sustainability and they all mentioned they would be supportive of a campus sustainability initiative at KU.

3.2.2 Real Data Collection and Categorization

Besides interviewing and talking with key people, real data available at the university was collected, and categorized based on the campus sustainability criteria. Some real data and reports are open to the public from the KU web site, some are available only to KU staff through shared folders and others can be collected from various departments at the university.

In order to use all of these data, information and reports to evaluate the university on campus sustainability and prepare a report it was necessary to ask permission from the senior management for the next steps. One of the outputs of this

thesis is to develop the campus sustainability strategy of KU which will be public when the thesis is published.

At this stage, the President of the school was informed through a short meeting, and as well as an informative email about this thesis and its purpose of using KU as an example of a sustainable campus.

The President was very positive in supporting this thesis which develops a holistic approach to campus sustainability at KU with the support of the Office of the General Secretary. The President responded by e-mail dated 12.08.2012, and forwarded his message to the General Secretary, the Vice President Responsible for Research and Development, the Dean of the College of Engineering, the Senior Faculty Member working on environment and energy, and the Director of the International Programs. The text of the email is as follows:

Dear Ms. Ongan,

Thank you for your message. I congratulate you for offering and thinking such as thesis topic. Indeed, I think this is a very good idea.

Our university is ready to support you in all means. Please, progress this study in collaboration of the General Secretary.

Best wishes, Umran İnan

After informing the President, and getting his support, data and information were collected.

Data collection and access to data could be also a challenge in a university campus; however, in the case of KU, the Office of the General Secretary and its departments have been collecting and analyzing all technical data about the campus since 2001. The General Secretary provided these data regarding campus operation on environmental sustainability:

- ✓2001-2011 main campus water consumption data
- ✓2001-2011 main campus electricity consumption data
- ✓2001-2011 main campus fuel consumption data

- ✓Direct GHG emissions of the main campus
- ✓GHG emissions from energy consumption
- ✓Consolidated GHG emissions
- ✓Waste documentation and information inventory
- ✓Waste inventory
- ✓Regulations that the university are obeying in campus operations
- ✓Power of the devices in the campus
- ✓Cost of HVAC and lighting in TL
- ✓Environmental policy of the university

Other reports and data from various departments were collected such as:

- ✓Overseers Report, KU Annual Activity Reports; Sharing Information and Progress (SIP) Report for the PRIME
- ✓Various presentations about the activities of the departments
- ✓KU web site

3.2.3 Evaluation & Reporting on the Current Situation on Campus Sustainability

All findings from semi-structured interviews, various meetings with key stakeholders at KU, and data and information gathered from various sources were collected to evaluate and report on KU on campus sustainability.

Having the background information about KU in the mind, the current situation analysis is run in five main components of the campus sustainability as listed in Figure 31 to understand how to develop a holistic approach within KU.

3.2.3.1 Environmental Sustainability in Campus Operations

Environmental sustainability in campus operations is the first step of evaluation and reporting. In general, campus operations related to campus management are divided

in seven main sections as listed in Figure 32. In every university campus, campus operations could be grouped in different ways based on the departmental divisions.

Management of the campus at KU is provided by departments under the Office of the General Secretary, the Director of Construction, and Computer Information Technology (CIT). They are responsible for the main technical operations that make KU operationally "sustainable campus" as listed in Figure 33. In this study, campus operations are grouped in seven main operational areas to evaluate and report on the KU Campus. Except Sustainable campus development which is under the Director of Construction, and CIT which is under the CIT Director, resource use, waste and recycling, transport, procurement, food and dining, management of the facilities in the campus belong to the Office of the General Secretary.

Management of the campus at KU has its own unique challenges, as the university is a big community. Additionally, half of the students live in the dorms, and most of the faculty members live in faculty housing in the campus. Hence, the campus needs 24 hour service.

Below, resources, waste and recycling, carbon footprint, transport, procurement, sustainable campus development, and food and dining are evaluated and reported to understand the current situation on campus sustainability at KU.

3.2.3.1.1 Resource Use of Electricity, Natural Gas and Water

Resource use was examined through electricity consumption, natural gas consumption, water use, and energy and water costs and savings achieved at the KU Main Campus.

Electricity in the campus is provided through electricity purchased and electricity produced by the cogeneration in the campus by consuming natural gas. Hence, electricity consumption and natural gas consumption are important indicators for KU as resources. Resource use is the responsibility of the Technical Services, Office of General Secretary. The main issues to be considered are: Energy use per floor area or total, possibly per type of building at KU, direct energy consumption, indirect energy

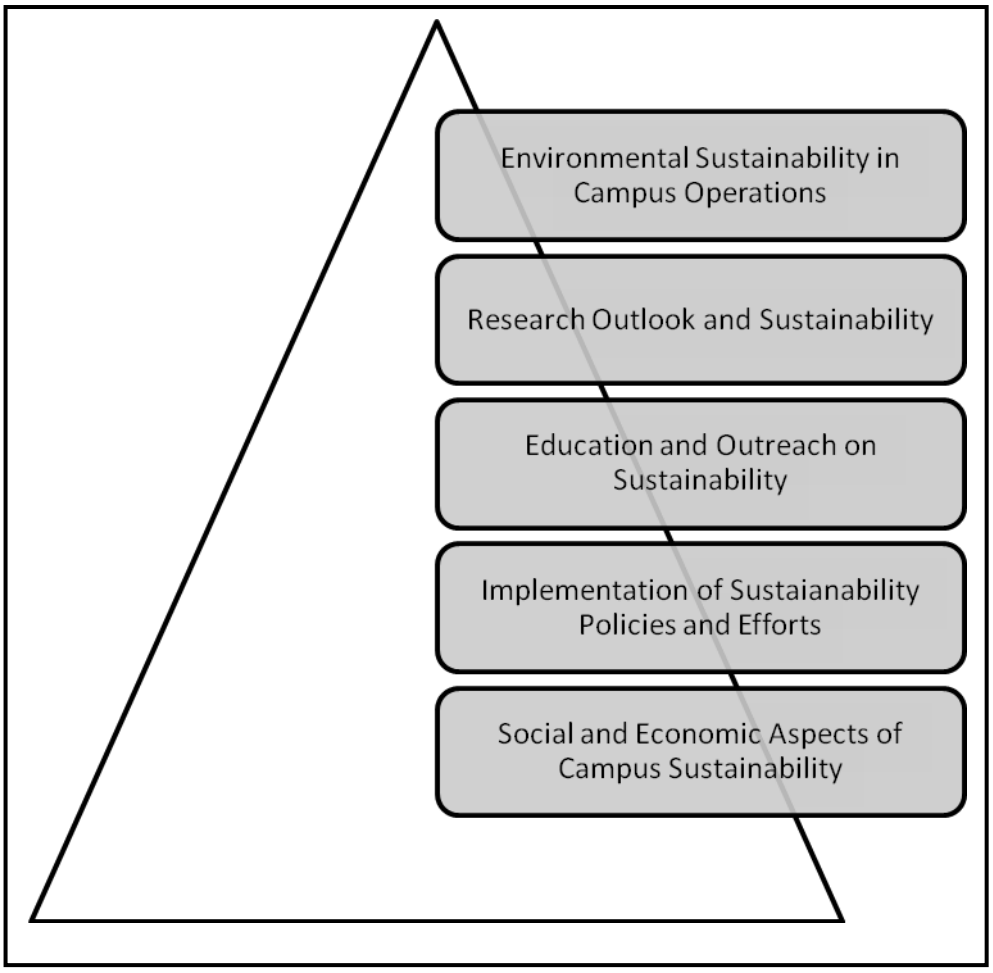

Figure 31: Sustainable Campus Components

Source: It was decided to run KU's Current Situation Analysis under these topics after studying rating systems and some example universities such as Harvard University, Stanford University, University of British Columbia, Boston University, Cornell University, UEA, and University of Nottingham at the Theoretical Study.

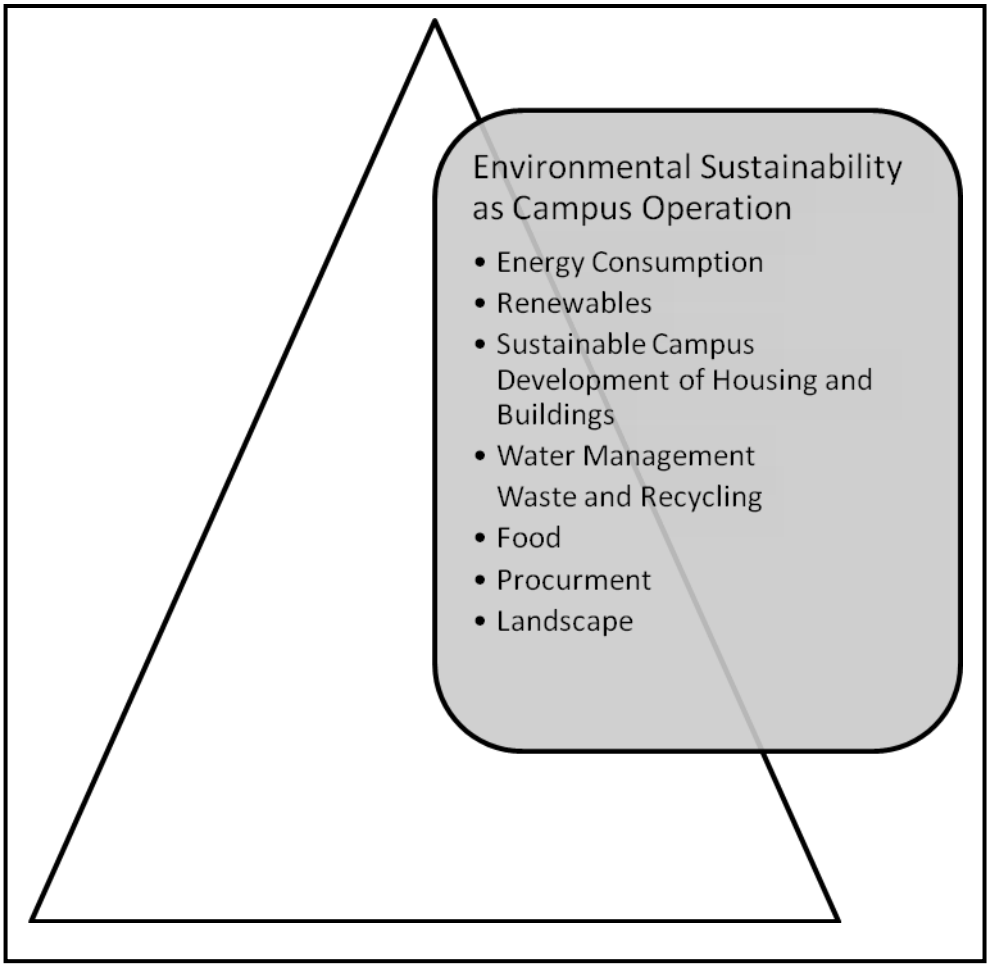

Figure 32: Environmental Sustainability in Campus Operations

Source: Developed after studying rating systems and some example universities Such as Harvard University, Stanford University, University of British Columbia, Boston University, Cornell University, UEA, and University of Nottingham, and many others t the Theoretical Study.

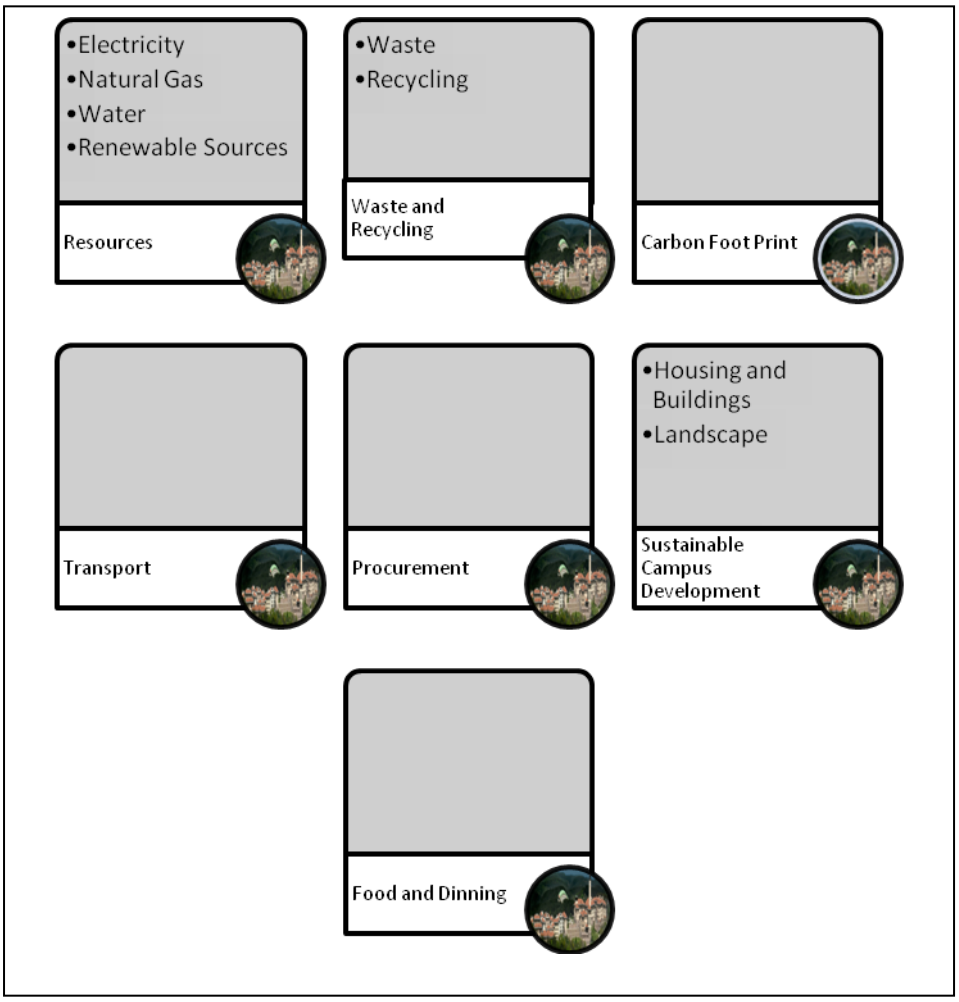

Figure 33: Environmental Sustainability in Campus Operations at KU

Source: KU's Existing Campus Operations under Different Departments are Grouped under these Topics to Study Environmental Sustainability in Campus Operations at KU after Studying Rating Systems and Some Example Universities such as Harvard University, Stanford University, University of British Columbia, Boston University, Cornell University, UEA, and University of Nottingham At the Theoretical Study.

consumption, electricity consumption, natural gas consumption, energy saved by conservation, indirect energy conservation results, renewable energy, water use (Total water consumption, Recycling and reuse of water), energy and water costs and savings achieved.

Until now, KU has been having an increasing energy demand in natural gas, electricity and water as shown in Table 12, due to the fact that school has been growing with the newly opened SoM, new labs requiring new technological equipments, increased number of research projects, new renovations, increased number of events in the campus. In two years, the SoM will move into a new research and training hospital in another location which means that all related energy cost from the SoM will not exist anymore. In addition, the size of the school as population has almost reached its optimum level. In this regard, the energy consumption of the campus is almost at maximum levels.

Electricity consumption has increased Figure 34 shows that electricity consumption per day has been increasing especially in 2010 and 2011. A comparison of electricity consumption in the same months of 2011 and 2012 shows an increase in electricity consumption in 2012. There are some reasons behind this increase in electricity consumption as listed in Figure 35 based on the order of importance.

Electricity consumption could be decreased only by 3.0%, if some energy saving measures could be applied. Enhancing the technology of existing automation systems and replacing current HVAC systems with more energy efficient ones can decrease energy consumption in the campus. Of course, this overhaul needs planning and a budget for the coming years. Existing equipment having moveable components have 15 years of life time so they will be changed by priority starting from 2013 based on the feasibility studies in 2012.

There are 13 main buildings in the campus as listed in Table 13 consuming electricity, natural gas and water.

Table 12
Resource Consumption of Natural Gas, Electricity and Water at KU (2005-2012)

Year	Total Natural Gas Consumption m^3	Total Electricity Consumption kWh	Total Water Consumption m^3
2005	808438	11694948	151726
2006	583874	12024906	169832
2007	272454	12068652	137364
2008	281486	12065754	130855
2009	341957	12453534	133499
2010	388527	13472167	136894
2011	636469	13935447	163275
2012	581786	14482000	157000

Source: Data is calculated by KU Technical Services.

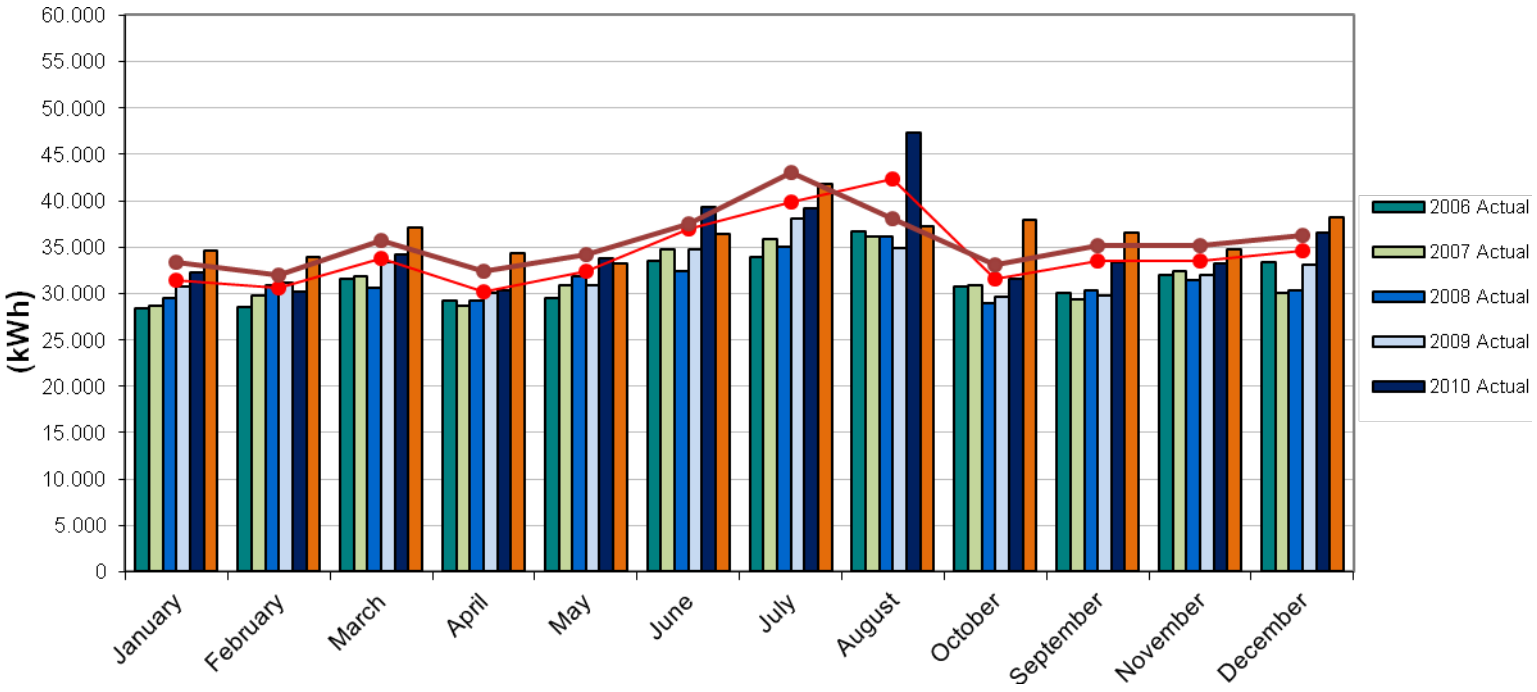

Figure 34. KU (Except Faculty Housing and Companies) Electricity Consumption per Day
Source: Data is provided by Calculated with KU Technical Services.

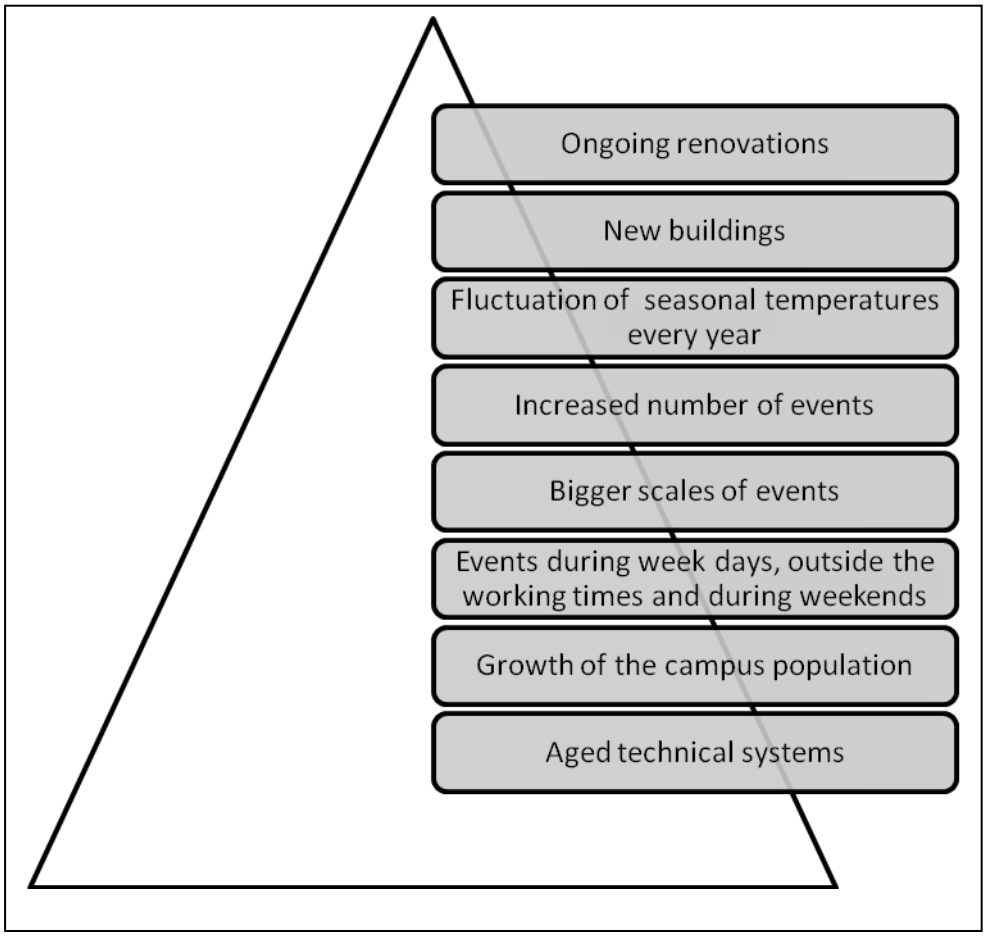

Figure 35. Facts Behind the Increased Electricity Consumption at KU Campus

Source: Based on the Interview with the KU Technical Manager, and Facility Manager.

Table 13
Buildings at KU Main Campus

- ✓ ***Dorms***
- ✓ ***Henry Ford Buildings (Guest Housing)***
- ✓ ***Faculty Housing***
- ✓ ***Rector Residence***
- ✓ ***Kinder Garden***
- ✓ ***Health Center***
- ✓ ***Library***
- ✓ ***Rectorate Building***
- ✓ ***Sport Center***
- ✓ ***Student Center and Tower***
- ✓ ***Waste Water Treatment Facility***
- ✓ ***CASE Faculty Building***
- ✓ ***CSSSH Faculty Building***
- ✓ ***CE Faculty Building***
- ✓ ***CS Faculty Building***
- ✓ ***SoM Faculty Building***

Source: Data is Provided by KU Technical Services.

Energy consumption in the buildings of the CE consuming 11.18% and CS consuming 10.17% of the total electricity used in the campus has been increased due to the new addition of the SoM and Koç University Tüpraş Energy Center (KUTEM) as new users from the same power distribution unit (Figure 36). Dorms, the Sport Center, Administrative Buildings, Faculty Houses, the Library and Rectorate buildings are under the 150.000 kWh/m²/year energy consumption limits. On the other hand, the CE and CS Buildings are generally at the 150.000 kWh/m²/year energy consumption limit. However, the Student Center Building is over the 150.000 kWh/m²/year energy consumption limit consuming 20.78% of the total electricity used in the campus due to the high number of electrical equipment, and difficulty in preventing factors causing energy losses (Figure 36).

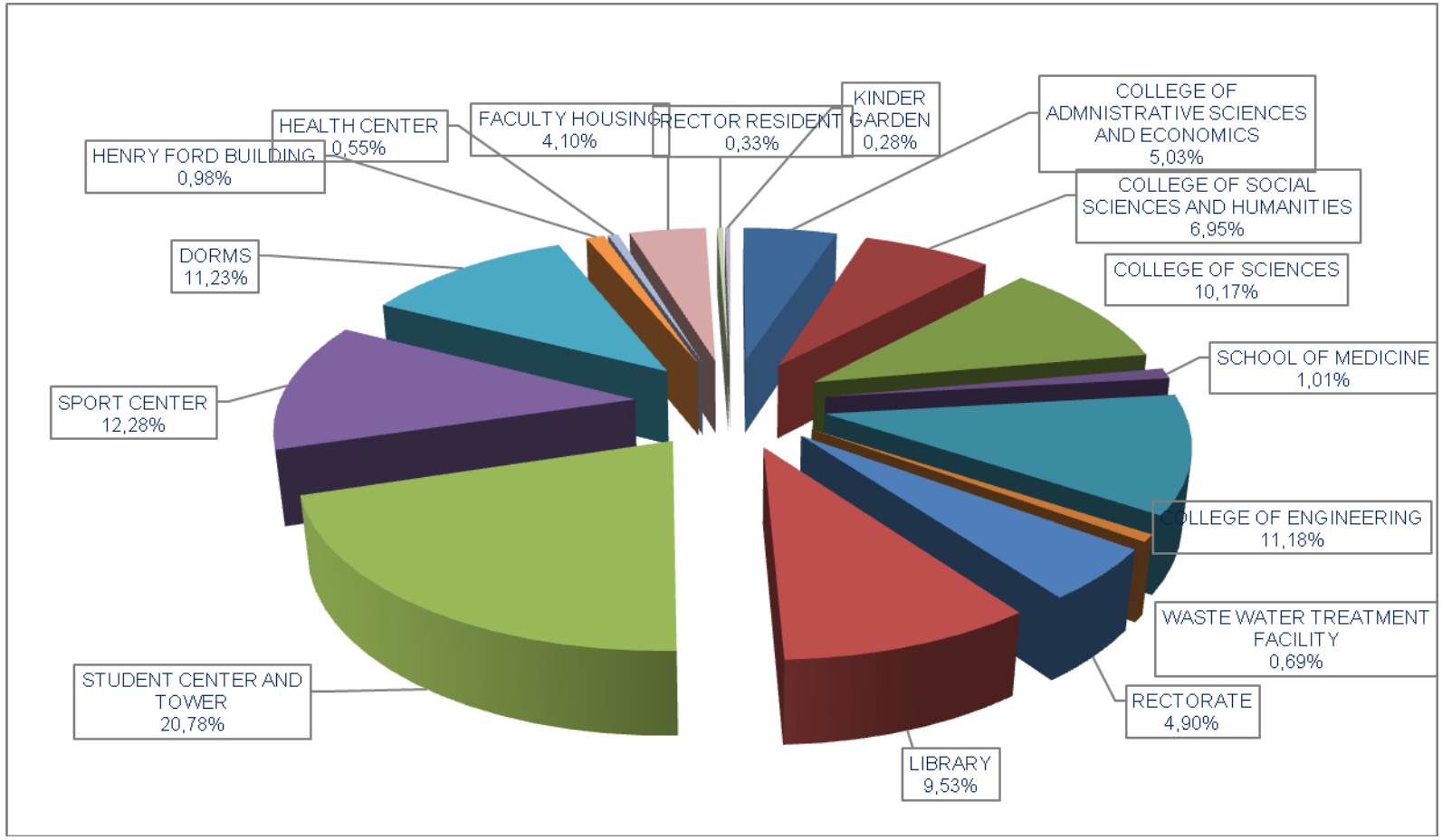

Figure 36. % Electricity Consumption at KU Campus in the Buildings during 2012 / 14482999 kWh
Source: Calculated with KU Technical Services.

Fuel consumption per day in the campus has been also increasing and fluctuating year by year due to the yearly temperature differences as shown in Figure 37 and Figure 38. Students' dorms where 1550 students live, consume 44.10% and the Student Center, which is open 24 hours, consume 10.19% of the natural gas consumed in the campus (Figure 39).

There are some challenges of managing a university campus. For instance, "Heating" is a real challenge in the campus because of the fact that it is located on the north-south axis. Even in the same location, the temperature differs due to the south north effects.

The CE building is the most affected building because of its location in the north while the CS building is less affected. However, the College of Social Sciences and Humanities (CSSSH) building is the least affected building with no heating and cooling problems because of its internal location.

Heating is operated through a centralized system in the campus and adjusted according to the average heat to use the energy efficiently in the campus which might cause complaints. For example, there are always complaints from the library both in the winter and summer. When people in the CE building want more heat, those working in the Rectorate Building complain about the heat. When the outside temperature is measured in 7 different locations in the campus, 4 different temperatures are observed at the same time.. Heating systems should be turned down when the temperature is above 15° C. However, there are different temperatures at the same time within the campus; for example, 13° C, 15° C and 17° C. Especially during the transition periods between the seasons, this problem occurs more, which puts a burden on the energy management in the campus. During transition months from April to May and from September to October drastic temperature decrease are seen every year as shown in Figure 40.

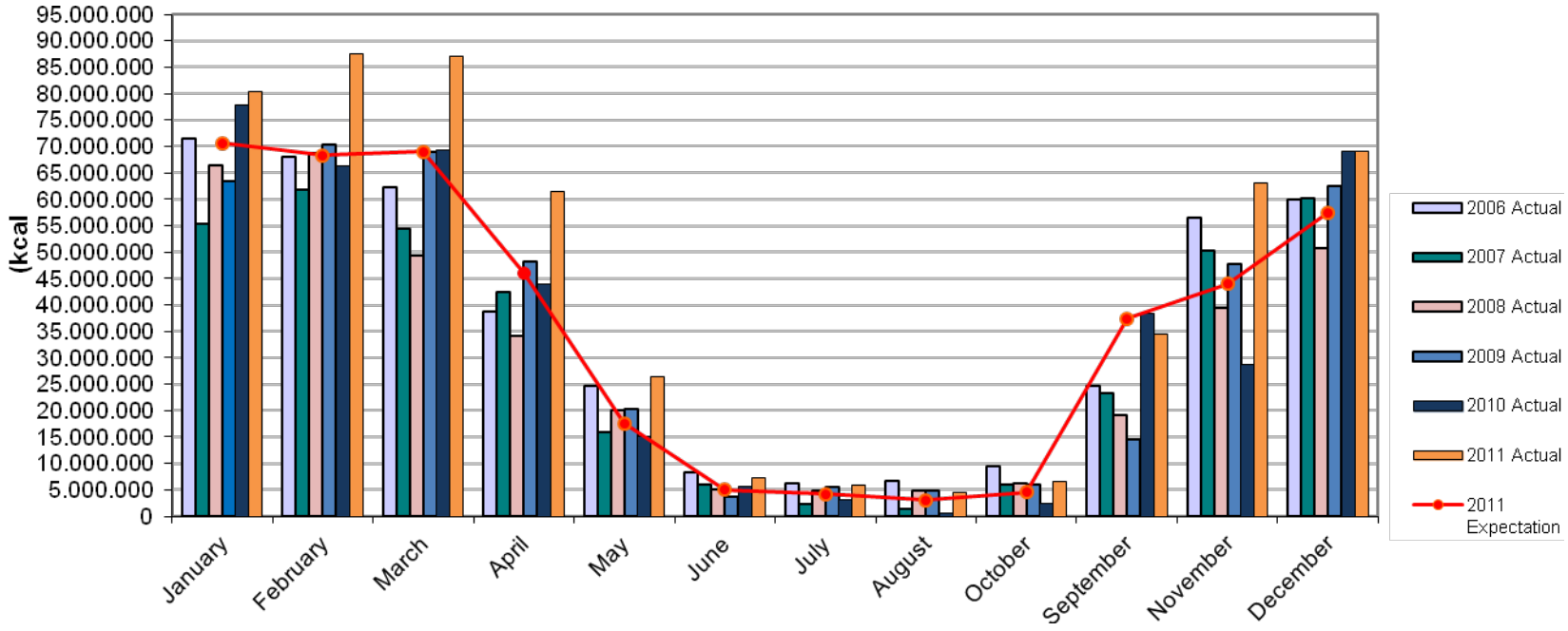

Figure 37. KU Fuel Consumption per Day

Source: Data is provided by the Calculated with KU Technical Services.

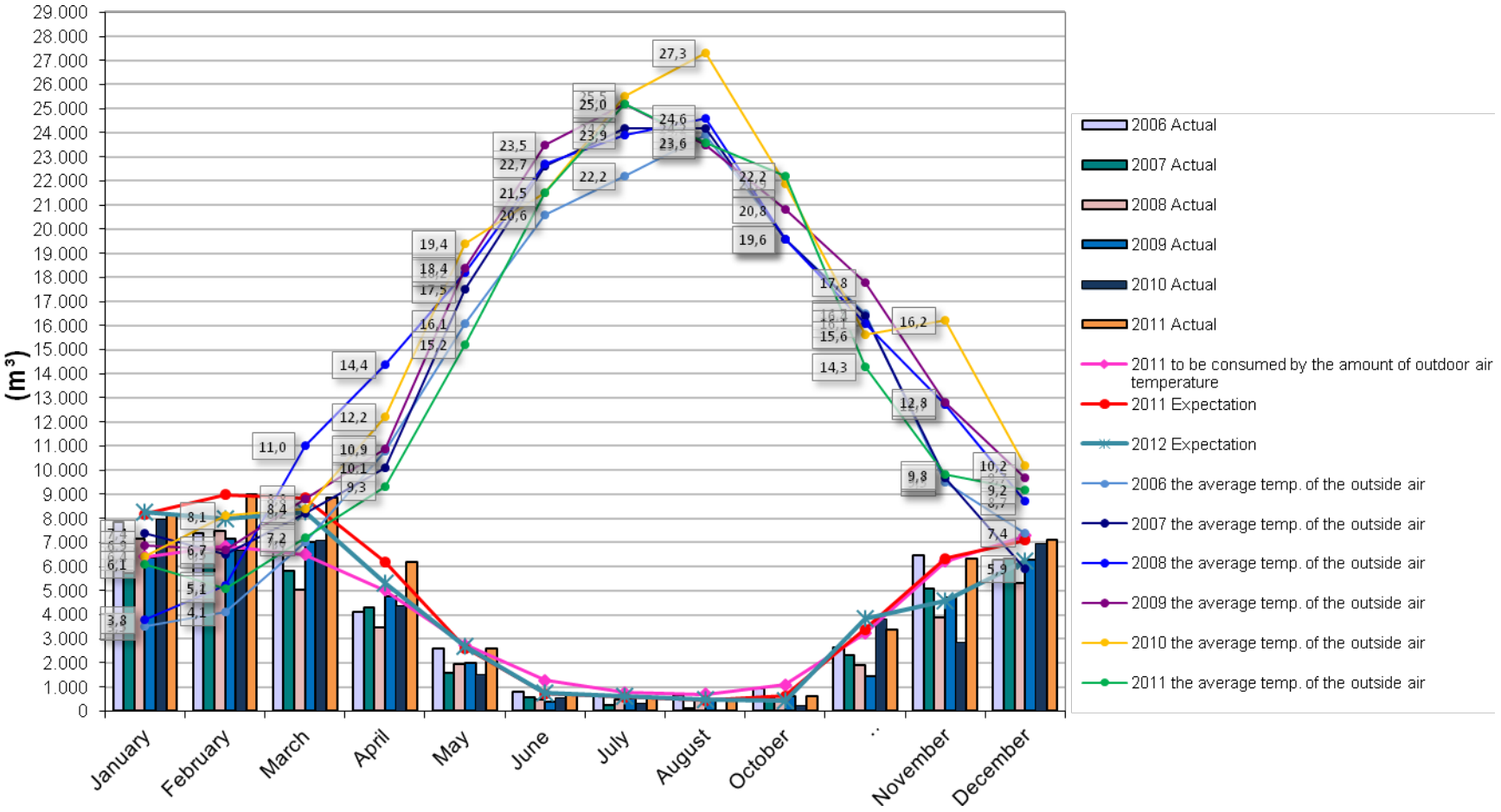

Figure 38. KU Fuel Consumption including Irrigation per Day (IGDAS+ENTEK)

Source: Data is provided by the KU Technical Services.

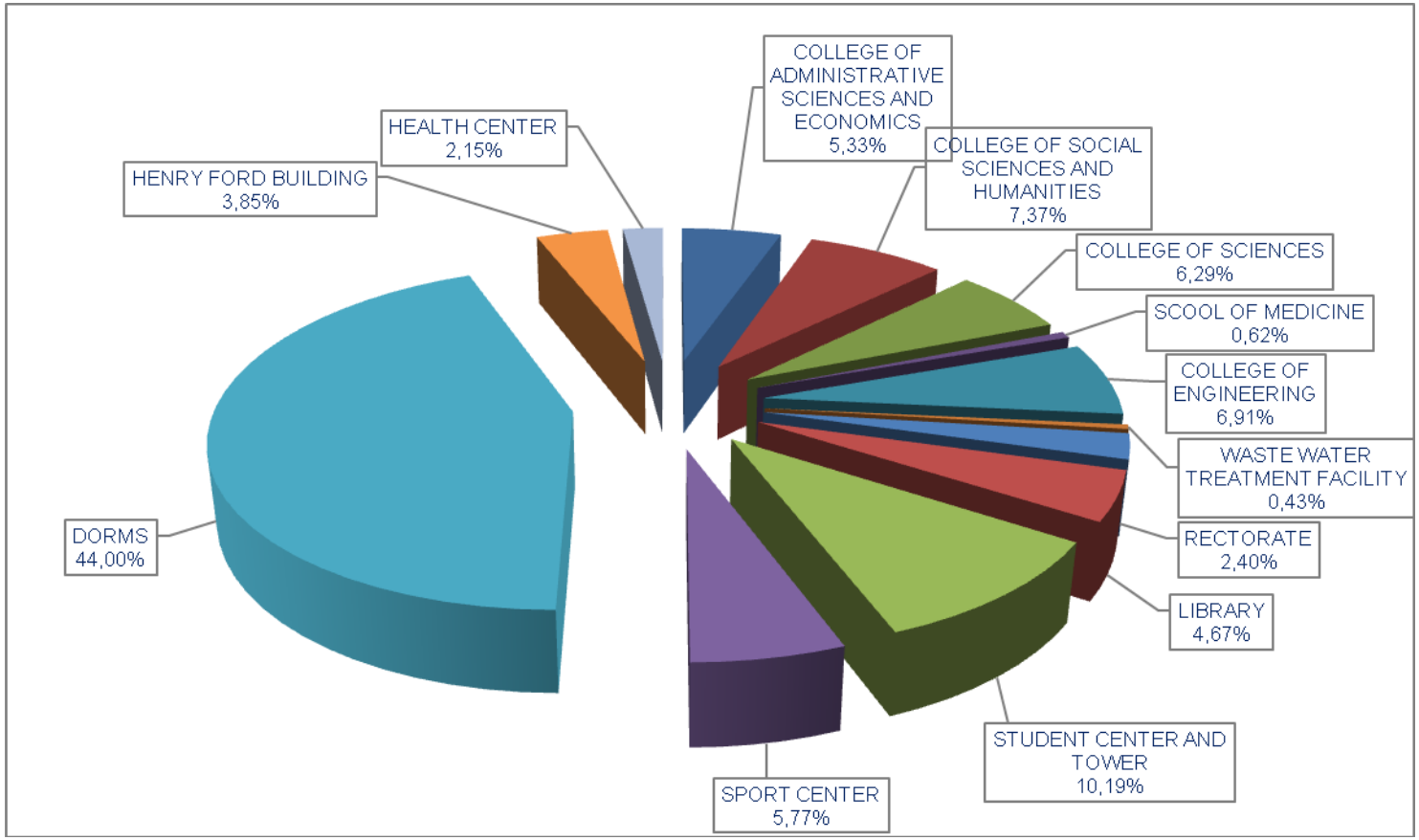

Figure 39. % Natual Gas Consumption at KU Campus in the Buildings during 2012 / 15650000 kWh
Source: Calculated with KU Technical Services.

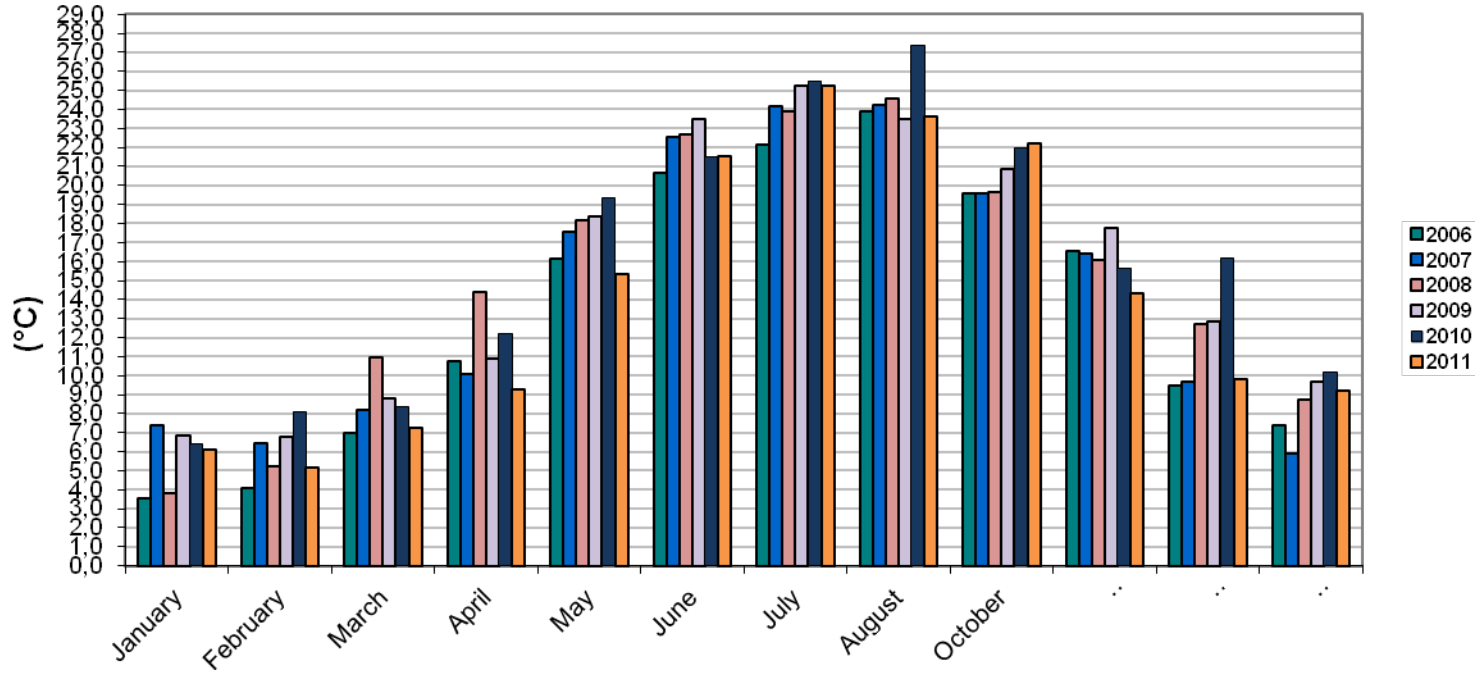

Figure 40. KU Main Campus Average Air Temperature

Source: Data is provided by the KU Technical Services

In addition, during the semesters, 1550 students live in the dorms, and some of the faculty members, some with families, live in the faculty residence. . Thus, heating is important both during the day time and night time temperature difference between day and night times as 13-14° C to 22-23° C.

Main infrastructural initiatives have been initiated to overcome increased energy demand such as:

- ✓ ***The cogeneration facility which has been in operation since 2005***
- ✓ ***Energy infrastructure renewal at KU main campus***

The cogeneration facility was constructed in 2004 and put in operation in 2005 to provide electricity and hot water on campus. The facility enabled the university to have low cost heating through boilers (2 units of boilers with capacity of 49 t/h waste heat) and water needed to cool the power engines (2 units of DEUTZ TCG 2020 V12 gas power engines with 1.15 MW). As a result, this cogeneration facility has 3 million kcal/hour capacity of hot water on campus. Power engines have 41.7% efficiency in electricity production, and 44.0% thermal efficiency, creating 85.7% efficiency in total. KU has been able to provide 95.0% of yearly electricity need and 65.0% of the heat needed to produce hot water in dorms and heating of the campus. As a consequence, there is a financial gain for the university to provide more scholarships and as well as 65.0% decrease in the GHG emissions of the university.

Both electricity and heat are produced together procuring a saving of natural gas consumption, as well as a decrement of CO2 equivalent of 1 tree per hour by not using natural gas for water heating. Yearly electricity production capacity is 20000000 kWh, from which 14000000 kWh is used in the campus and 6000000 kWh is interconnected to the electricity system used for electricity consumption of 320 dwellings. This excess electricity produced by the facility is sold to the system by AES ENTEK, the electricity production company of the Koc Group. The cogeneration facility secured KU to reduce its carbon emission equivalent of 1 tree

per hour or heating 534 dwellings in a year and decreased the electricity transmission lost by direct electricity production within the campus. This measure helps Turkey's energy strategy of progressively decreasing energy dependency.

Energy Infrastructure Renewal on the KU Main Campus is an important investment project as the energy systems are ageing and need to be renewed soon. The main challenge here, besides budget, is to invest in the right technologies to satisfy future demand. In this regard, a five year investment plan for the campus has already been prepared to renew current energy technologies and automation systems with more energy efficient equipments based on the lifetime of the current equipment and energy data collected on campus.

In addition, there is a spare part problem of existing automation systems as these parts are not produced anymore. Companies usually produce new technologies, and would prefer selling new products to customers instead of selling spare parts. It is a critical investment decision for KU to make the need assessment within the campus, plan and invest in the right technologies. The renewal period started in 2012 and automation systems in the building of the CS were in the renewal process as planned.

Detached materials from the buildings are used as spare parts for other automation systems in other buildings until they are also renewed. This energy infrastructure renewal in the campus will increase energy efficiency through the replacement of more energy efficient technologies through the renewal period.

University management has been constantly looking into new options and doing feasibility studies to decrease energy usage, carbon emissions and reducing the energy cost in the campus.

In this regard, KU has been investigating its best options to work with ESCOs to do critical energy investment on campus. During 2012, a preliminary analysis of investment feasibility was conducted by the licensed ESCO in Turkey. It was seen as a pilot project for Turkey, working with an ESCO company for a campus energy efficiency development. In the business model, ESCO was provided the investment cost through bank credit. The cost of investment was to be recompensed by the energy efficiency that the investment was supposed to provide to the campus. Koc University could start benefiting after 11 years from the start of the investment. So, in this model, the investment is barred by the ESCO, and no capital has been spent by the university. Of course, the investment decision of the kind of energy projects on campus based on the needs of the university is critical. For instance, the university already has a cogeneration facility, where the excess electricity produced is sold to the system by ENTEK. Selling the excess electricity produced by the facility is not very profitable. The facility is run by natural gas. However, the natural gas prices have been increasing in Turkey; likewise, the electricity prices have been rising at a slower pace, causing a higher cost of input and lower selling price. In this case, the electricity production cost of the facility has been increased as it is 90.0% based on natural gas. In addition, BEDAS buys electricity at nights at a lower rate due to the lower demand during nights, which makes operating the facility at nights unprofitable. As a result, increasing the capacity of the electricity production by replacing the existing system with a tri-generation system within the university is questionable. It requires a high investment cost, and 8-10 years of return on investment. So, the right energy investment decisions are very important.

However, the government announced new changes in the regulations in June 2012, stating that facilities producing their own energy and working 80.0% efficiency will not pay the energy fund and will only pay 2.0% tax. Before this change, energy funds and taxes were added to the energy unit price, increasing the unit price of electricity. Government officials are also aware that increasing taxes or raising energy prices are not a solution anymore to reduce high energy consumption of Turkey. So, they are also trying to ease energy investments, and changing the wrong implementations of the past. This new change in the regulations put the

trigeneration on the agenda of the university as an economic alternative to decrease the 4.5 million TL electricity bill by almost 1.250 million TL, and as an environmental alternative to produce three forms of energy “electricity, heating and cooling.”

The current cogeneration system cannot provide 80.0% efficiency; renewing the current engines to build trigeneration system is needed. Actually, the government offers a subsidy to the 80.0% efficient systems by this recent change in regulation. However, there is also the actual investment cost of the system. The feasibility studies were done to see the installation cost, as well as return on investment, which is foreseen as two years. In practice, there could be some distortion based on the brands used, and the labor cost. Another cost to consider is the handover cost of the cogeneration system from ENTEK, which is not included in the current feasibility studies. Actually, the university probably will not save anything for five years even though energy saving is achieved. But, after five years, both energy savings and as well as a drastic decrease in energy cost could be realized. This investment could also result in a major decrease in carbon emissions of KU in the coming years.

New technologies have been developing very fast, making a big challenge for institutions to do the right investment in right technologies. Currently, there are more second hand wind tribunes waiting to be sold than those of the second hand cars in Turkey. So, waiting or acting on a decision for the new investment should be optimized, and done very consciously. The most important challenge is to make the feasibility and project planning right. After a critical investment planning, implementation will not create a challenge in practice.

Renewable energy investment is also another option for providing some percentage of the energy needed on campus. However, the location of the campus is not suitable for renewable energy. The region where the campus is located does not get enough wind to produce electricity with wind tribunes. The other option is of course solar energy, where the actual investment cost has been decreasing in recent years with the availability of better quality and cheaper photovoltaic solar panels. Also, the return on investment period has become shorter. However, the campus has

its own constraints for using solar energy for electric generation. The campus is located in a forest area, and there is not enough land to install the solar panels on the ground. On the other hand, roofs and facades of the buildings on campus are inappropriate for solar panel installation due to the architectural design and integrity of the campus. As a result, architectural design and land scarcity on campus are the two main constraints against using solar energy for energy production.

Energy efficiency on campus is supported by three ways in a technical infrastructure. The replacement of existing equipment by more energy efficiency technologies in old buildings will be done in a period of time depending on the lifetime of the current equipment in use. So, the five year energy infrastructure renewal plan at KU main campus is an important tool to make the campus more energy efficient.

However, the university management prefers waiting for a period of time to start investing in some new energy efficient technologies until they become more cost effective such as LED lighting technology. Now, Technical Services has started to use LED armatures in renovations and new buildings and when this technology becomes available in a more cost effective condition, to be used in the university. The most important thing is using the right technologies at the right time.

Investing in energy efficient technologies requires cautious decision-making and awareness of maintenance issues. Even small errors in investment calculations could easily cause big detriments in the future. On the other hand, working with an ESCO can be a way of subsidy provided for the investment but wrong investment decisions could easily deteriorate the benefits of the beneficiary.

In addition, maintaining current equipment is important for increasing optimal energy efficiency. The Technical Service Team has been working hard to decrease the number of delinquencies and keep them at a minimum level. Even though the campus has grown, the average number of delinquencies in the last five years has been decreased by the good maintenance of the equipment. The result is a 1-2/1000 decrease in the total energy consumption in the campus. Indeed, the most

important thing in the technical arena is to increase the life and efficiency of the existing equipment by maintenance instead of constantly planning new technology investments.

Further, new buildings and renovations on campus have been done in accordance with the current energy efficiency in buildings directive in Turkey, and the highest energy efficiency standards as possible are applied within the existing architectural design by the Construction Directorate.

Another resource used on campus is of course water which has an increasing trend on campus as shown in Figure 41 as the campus population has been increasing. Water use on campus was 136894 m^3 in 2010, 163275 m^3 in 2011 and 157000 m^3 in 2012 (Table 12). The increase of water consumption between 2010 and 2011 is related to the increased campus population, and events on campus; however, the decrease of water consumption between 2011 and 2012 on campus is due to water saving in garden irrigation. A part of the waste water is used for irrigation. Due to the shortage of rain water during the summer, and a higher need for irrigation, the current water supply is not enough. In addition, the population of the campus decreases drastically during summers, so there is little waste water. There are 110000 m^2 grass land on campus, where 500 ton water is needed for irrigation. A total of 200 tons of water is provided from waste water, and 300 tons is bought from outside. Even though 3500 m^3 water could be stored, this is consumed in three to four days. Especially during summer, due to the lack of rain, the water cannot be stored for irrigation. Of course, 47.26% of the total water used on campus is consumed in the dorms, and 23.57% is consumed for garden irrigation. In addition, faculty housing consumes 8.87% of the water as there are around 300 habitants (Figure 42).

A new project on campus called “Waterless Cleaning Project” is related to cleaning and water consumption. Cleaning on campus is outsourced. With the contractor, a new project has started to decrease the usage of water for cleaning, as well as to use chemicals harmless to the environment.

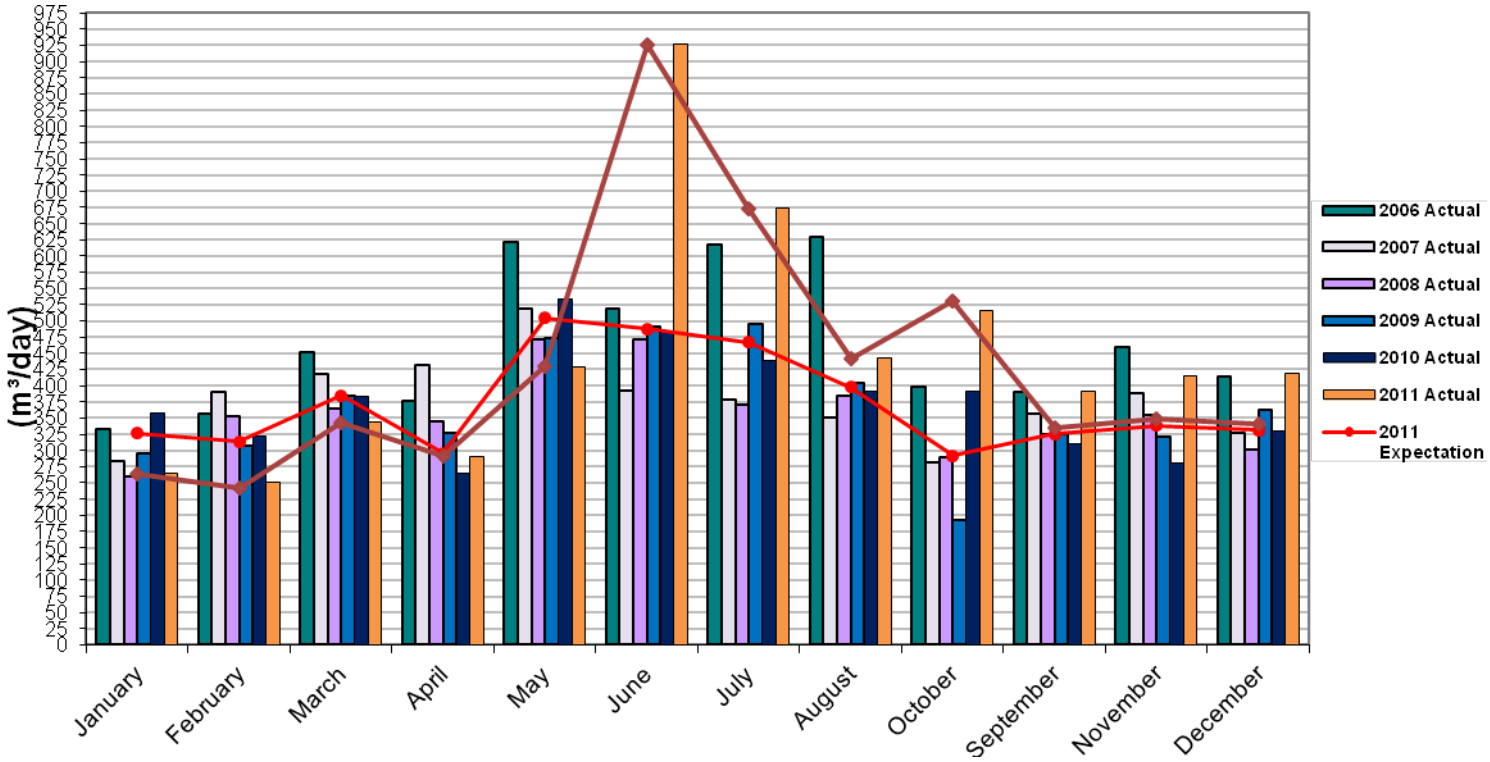

Figure 41. KU Average Water Consumption Including Irrigation

Source: Data is provided by the Calculated with KU Technical Services.

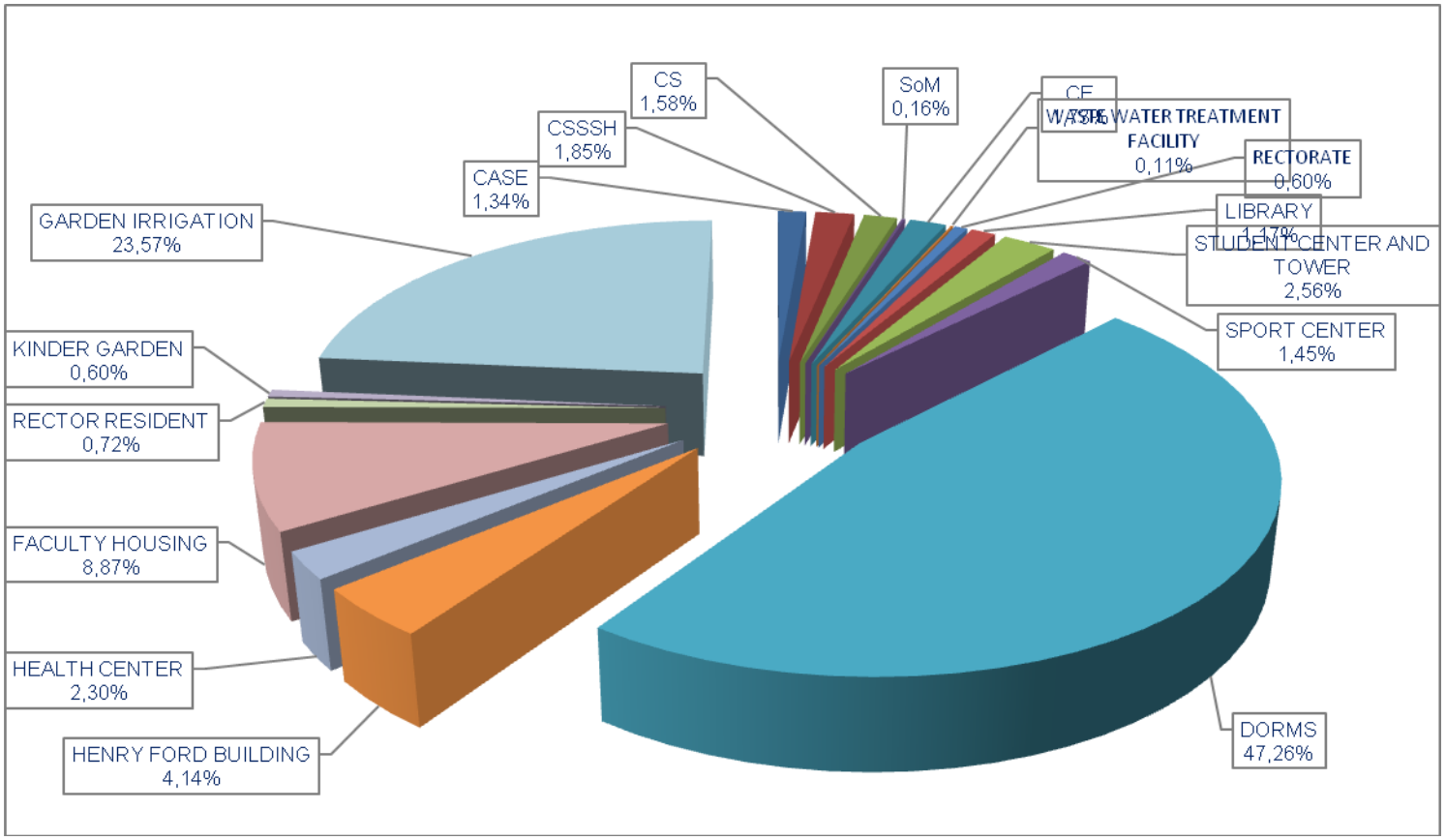

Figure 42. % Water Consumption at KU Campus in the Buildings in 2012 / 157000 m³
Source: Calculated with KU Technical Services.

Information technology (IT) is another source of energy consumption on the campus. The CIT Director reports directly to the President. CIT is responsible forthe management of IT at KU. So far, they have been aware of Green IT developments in the world, and have been working on some projects to make IT more energy efficient and having less environmental impact on the campus. In the IT sector, Restriction of Hazardous Substances Directive (RoHS) compliance status has been in existence for the last 10 years, requiring using components without lead and hazardous materials in IT equipment. So, hazardous waste from IT equipment has decreased to a minimum level. In Green IT, centrally managed consolidated and virtualized systems consume less energy. As a result, the system has less carbon emission and needs less cooling. Consequently, CIT has been running two main projects regarding IT equipment: a major Consolidation Project and a Client Virtualization Project, besides adding new technologies to the existing ones on the campus.

Server consolidation has been successfully realized to save energy with the purchases made two years ago. Currently, around 110 servers are on a virtual platform, working via three hosts. The system only needs 15-20 units of energy instead of 110 units of energy to function. Secondly, KU has a wide data network. A major consolidation of the active switch equipment has also been done; as a result, none of the unused equipment are open any more, and only equipment in use are powered up. On the other hand, nonconsolidated servers are gathered in Blade servers, easing management and saving energy. The IT strategy at KU does not permit putting servers according to demand, and lose space and energy but instead consolidate them by central management to save energy and space. KU has five computer labs and over 200 desktop computers. These computers have also been virtualized to increase their performance and user satisfaction, but also having an energy saving effect. Other areas are the Data Centers at KU: the Data Center for Academic use and the Central Data Center. Generally, data centers are places where the most energy is consumed and the most hazardous waste to the environment is produced in the IT world.

Therefore, cooling systems in data centers are extremely important, where there should be a balance between the heat release and cooling capacity. Air conditioning systems used in KU's data centers are extremely sensitive and energy efficient equipment. As a result, minimum energy is used from these big data centers. In addition, within the KU Green IT framework, data centers use cooling gases, FM 200, which are not harmful to the environment and do not release any carbon dioxide.

3.2.3.1.2 Waste and Recycling

Waste and recycling are important components of greening a university. In HEIs such as KU, waste differs from medical waste, lab waste, and infirmary waste to home waste. Waste management is done through the Office of the General Secretary. Technical Service is responsible for home waste and Facilities Management is responsible for all other wastes such as medical, lab, and infirmary solid waste.

The Facilities Management General Secretary has implemented some main initiatives regarding environmental management on the campus have been for the last two years at KU. . These initiatives are:

- Revising the waste management system
- Developing a sustainable environmental policy
- Increasing the environmental standards at the university

Revising the waste management system is one of the main initiatives as the school has been growing in population, adding new schools such as the SoM, and programs requiring new laboratories. The main campus has different kinds of wastes including chemical waste, medical waste, medical waste with sharp edges from the laboratories, paper, glass, batteries, fluorescence, accumulators waste, and household waste, which are all collected properly and regularly within different systems existing on the campus. In addition, there is a huge amount of IT equipment waste which also needs special treatment.

KU has a “Waste Collection Center (WCC)” where all kinds of waste from the university is stored, and the contracted companies are servicing regularly to collect the waste produced in the university from one central location. The WCC has two containers: red containers for medical waste and orange containers for hazardous waste. The WCC has existed on the campus for years, but has not been used effectively until recently. The waste management system on campus has been revised and all necessary steps have been taken. At present, the WCC has new environmental planning with a concrete area to store all kinds of waste until the companies collect them. Different waste produced on the campus are collected and disposed of according to the following processes:

The CE, the CS and the SoM have 78 laboratories producing different waste. In addition to the existing labs, KU also has a new animal lab producing hazardous waste. Hazardous chemical wastes produced by the labs are stored in special barrels until they are full, then they are brought to the WCC to be collected every 3 months and disposed of by a special contractor. The newly built SoM necessitated establishing medical waste management from the labs. Medical wastes from the labs are collected, stored in the WCC until the special contractor comes twice every 15 days to collect and dispose the waste. There are special boxes for sharp edges medical waste, which is not appropriate to be put in normal garbage bags. These boxes are collected from the labs when they are 2/3 full and put in the container to be removed by the local municipality based on the special contract between the university and the local municipality. Household waste is collected daily from the WCC, while paper waste is collected twice a week from the indoor parking area by the municipality. Cafeteria waste oil and packaging waste also has a disposal process. The Facility Services Department set up a system in which fried oil waste is brought to the WCC to be collected by the contractors twice a week. Again, food and drink packages are also brought to the WCC in similar systems like other paper, glass, and can wastes. Battery waste is collected, and disposed of every three months by the Association of Battery Manufacturers and Importers (TAP) from the WCC. Boxes for used batteries are provided by TAP and located in all buildings around campus and in some office rooms as well. . Glass waste is not a kind of waste that

accumulates much on the campus. It is collected regularly from the WCC by a special contractor. Both accumulator and fluorescence waste is collected by a special contractor while accumulator waste is sold to the contractor, making a small profit for the university.

There is a huge amount of IT equipment waste which needs special treatment. This waste is accumulated in the IT warehouse to be sold to a contractor once or twice a year. The CIT Directorate and Procurement Department work closely for the disposal of this waste. Every year, an inventory list and serial numbers of the waste equipment are provided to the Procurement Team who finds the right contractor to buy from KU and recycle these waste products. As a strategy, the CIT Directorate has been careful to provide laptops for individual use, as laptops have components hard to recycle. A PC only has one small watch battery, while a laptop has a big battery which is hard to recycle. Every individual need is carefully analyzed before giving a laptop for personal use. Usually, laptops are preferred for mobility. The usage of laptops and PCs provided by the CIT Directorate to users is optimized in the school. There are almost 2000 laptop users on campus including all students.

There is an important project called the “Paperless Campus Project” which has been coordinated by the Facility Services Department and HR. The aim is to decrease the usage of paper to a minimum level on the campus. Some departments such as Procurement and the CIT Directorate have been able to cease paper use in their operation. The Procurement Department no longer prints the purchase order mails coming from users. There is no more print archive in the office. All contracts and prosecutions are computerized at the CIT Directorate.

The other important new project regarding environmental protection is the “Waterless Cleaning Project” which has two affects: 1) Detergents, cleaning materials and chemicals are harmful to the environment by polluting the water. So, Johnson Diversey has installed waterless cleaning. This process protects the environment from pollution as there is no water used. The products used for cleaning, have the least environmental impact, and are recommended by all

environmental inspectors. 2) The Waterless Cleaning Project uses recycled boxes and plastics.

Developing the "Environmental Policy" at KU is also another important initiative by the Facilities Management. KU has a unique location, being in a green area. Since its architectural planning, the management at KU has given a special interest to the campus environmental management in every aspect. Therefore, revising the existing environmental policy prepared by the General Secretary and enlarging it through a campus sustainability policy should be a new mission.

Existing principles of the Environmental Policy at KU are listed below:

- ✓ *Applying all national environmental regulations*
- ✓ *Supporting the environmental sustainable development by measurable targets in the campus*
- ✓ *Determining environmental dimensions, and as well defining the types of environmental impacts and damages caused*
- ✓ *Decreasing the pollution and waste at a minimum level; and disposing of the hazardous waste by decreasing their environmental impact at a minimum level*
- ✓ *Setting the goals and targets, revising them each year, and as well as announcing the progress achieved*
- ✓ *Constantly enhancing the environmental management system in the campus*

As an effort to increase environmental standards at KU and show the commitment of the management the first time, ISO 14001 Environmental Management Standard was adopted by a higher education institution in Turkey, which is KU. It is another important initiative run by the Facilities Management and can be an example to other universities in Turkey. ISO 14001 is well known among the industries as Turkey has accepted many directives related to the environment. However, getting ISO 14001 by KU is a unique initiative to raise environmental awareness among other universities.

3.2.3.1.3 Carbon Foot Print

Campus wide carbon emissions are calculated every year by the Technical Services Department. In 2009, KU had 9.111 tons; in 2010, 9644 tons; in 2011, 10640 tons; in 2012, 10250.56 tons total GHG emissions equivalent to CO2 as shown in Table 14. At present, there is no carbon reduction target and baseline at KU. Procurement, waste and transport activities are not included in the carbon calculation. Based on GHG Protocol Standards provided by AASHE (Table 15), the carbon foot print of the campus is calculated every year based on Scope 1 Emissions except the combustion fuels by institution-owned cars, tractors, buses, and other transportation devices and Scope 2 Emissions. Scope 3 Emissions, other indirect emissions not covered in Scope 2 Emissions such as air travel, commuting, extraction, production and transportation of purchased materials and fuels including food, outsourced activities, and solid waste disposal are not put in the calculation of the carbon footprint of the KU campus.

As an example, carbon emissions for 2012 at KU were calculated for this thesis with the guidance of the Technical Manager to show the method of calculation.

The 1st step was to calculate total energy used in 2012, which was 2457.575 toe (Table 16):

- ✓ ***Direct energy usage from natural gas, diesel fuel***
- ✓ ***Indirect energy usage from electricity purchased in the campus***

Ratios used in toe calculations were provided by the Law of Increasing the Energy Resources and Efficiency of Energy Usage published in the issue 28097 of the Official Gazette on October 27th 2011.

The 2nd step was the calculation of GHG emissions caused by direct energy usage for 2012. Table 17 shows that direct GHG emissions during 2012 at KU was 2708.13 tons from natural gas and diesel consumption to produce energy with the cogeneration system on the campus.

Table 14
KU Campus Wide Carbon Emissions (2009-2012)

DIRECT GHG EMISSIONS* 2009			INDIRECT GHG EMISIIONS ** 2009		TOTAL GHG EMISSIONS EQUIVALENT TO CO2
GHG Emissions Caused by Burning (ton)	GGHG Emissions Caused by Cars (ton)	Total Direct GHG Emissions Equivalent to CO2 (ton)	GHG Emissions Caused by Energy Consumption (ton)	Total Energy Caused GHG Emissions (ton)	(ton)
3048		3048	6063	6063	**9111**
DIRECT GHG EMISSIONS* 2010			**GHG**		**TOTAL GHG EMISSIONS EQUIVALENT TO C02**
GHG Emissions Caused by Burning (ton)	**GHG Emissions Caused by Cars (ton)**	**Total Direct GHG Emissions Equivalent to CO2 (ton)**	**GHG Emissions caused by energy consumption (ton)**	**Total Energy Caused GHG Emissions (ton)**	**(ton)**
3087		3087	6557	6557	**9644**
DIRECT GHG EMISSIONS* 2011			**INDIRECT GHG EMISIIONS ** 2011**		**TOTAL GHG EMISSIONS EQUIVALENT TO C02**
GHG Emissions Caused by Burning (ton)	**GHG Emissions Caused by Cars (ton)**	**Total Direct GHG Emissions Equivalent to CO2 (ton)**	**GHG Emissions caused by energy consumption (ton)**	**Total Energy Caused GHG Emissions (ton)**	**(ton)**
3859		3859	6781	6781	**10640**
DIRECT GHG EMISSIONS* 2012			**INDIRECT GHG EMISIIONS ** 2012**		**TOTAL GHG EMISSIONS EQUIVALENT TO C02**
GHG Emissions Caused by Burning (ton)	**GHG Emissions Caused by Cars (ton)**	**Total Direct GHG Emissions Equivalent to CO2 (ton)**	**GHG Emissions caused by energy consumption (ton)**	**Total Energy Caused GHG Emissions (ton)**	**(ton)**
2708.13		2708.13	7547.43	7547.43	**10250.56**

Source: Data is provided by the KU Technical Services. Data for 2012 is Calculated together with the KU Technical Services for this Study.
*When Direct GHG are Calculated CO2, CH4 and N2O are Calculated Equivalent to CO2.
**When GHG Emissions Caused by Energy Consumption are Calculated, only CO2 are Considered.

The 3rd step was the calculation of GHG emissions caused by indirect energy usage for 2012. Table 18 shows that 15237241 kWh of electricity was purchased for consumption during 2012 at the KU Campus. This electricity consumption caused 7542.43 ton GHG emissions during 2012 (Table 18).

The 4th step was preparing the consolidated report of the GHG emissions for KU. Total GHG emissions were 10250.56 tons during 2012 for KU (Table 19). Approximately 2708.13 tons of GHG emissions were caused by direct energy consumption while 7542.43 tons of GHG emissions were caused by indirect energy consumption during 2012 (Table 19).

Table 15
GHG Protocol Standards

Scope 1 Emissions

Scope 1 emissions are direct GHG emissions occurring from sources that are owned or controlled by the institution. Scope 1 emission sources include:

- Combustion of fuels to produce electricity, steam, heat, or power using equipment in a fixed location such as boilers, burners, heaters, furnaces, incinerators
- Combustion fuels by institution-owned cars, tractors, buses, and other transportation devices

Scope 2 Emissions

Scope 2 emissions are indirect GHG emissions that are a consequence of activities that take place within the organizational boundaries of the institution, but that occur at sources owned or controlled by another entity. Scope 2 emission sources include:

- Purchased electricity
- Purchased heating
- Purchased cooling
- Purchased steam

Scope 3 Emissions

Scope 3 emissions are all indirect emissions not covered in Scope 2. Scope 3 emission sources include:

- Air travel
- Commuting
- Extraction, production, and transportation of purchased materials and fuels, including food
- Outsourced activities
- Solid waste disposal

Source: AASHE, Stars Technical Manual.

Table 16
KU Energy Usage (2012)

KU Direct Energy Usage Value (2012)						KU Indirect Energy Usage Value (2012)				KU TOTAL ENERGY USAGE VALUE (2012)
Natural Gas	1368326.22 m³		*Ratio* 0.825		1128.869 toe	**Electricity (Purchased)**	15237241 kWh	*Ratio* 0.086	1310.403 toe	**2457.575 toe**
Diesel Fuel	21.620 ton	*Density* 0.830	*Quantity* 17.944	*Ratio* 1.020	18.303 toe					
TOTAL	**1147.172 toe**					**TOTAL**	**1310.403 toe**			

Source: Calculated with the KU Technical Services.

Table 17
KU GHG Emissions Caused by Direct Energy Usage (2012)

Fuel Type	Energy Consumption			GHG EMISSIONS									
				CO_2			CH_4			N_2O			TOTAL (TON)
	Consumption (unit)	Conversion Factor TJ/unit	Consumption (TJ)	Emssion Factor (ton/TJ)*	Carbon Oxidation	Emission Quantity CO_2 (ton)	Emssion Factor (ton/TJ)	Emission Quantity (ton)	Emission Quantity CO_2 (ton)	Emssion Factor (ton/TJ)	Emission Quantity (ton)	Emission Quantity CO_2 (ton)	
Diesel (kg)	**21620**	0.000043	0.923	74.10	0.990	67.719	0.003	0.003	0.058	0.0006	0,001	0.172	67.95
Natural Gas (m^3)	**1368326**	0.000035	47.254	56.10	0.995	2637.720	0.001	0.047	0.992	0.0001	0,005	1.465	2640.18
TOTAL GHG EMISSIONS CAUSED BY DIRECT ENERGY USAGE / TON			2708.13										

Source: Calculated with KU Technical Services.

Table 18

Fuel Type	Energy Consumption	GHG EMISSIONS		
		CO_2		TOTAL (ton)
	Consumption (kWh)	Emission Factor (ton/kWh)	Emission Quantity (ton)	
Electricity Purchased	15237241	0.000495	7542.43	7542.43
GHG EMISSIONS CAUSED BY DIRECT ENERGY USAGE / TON			**7542.43**	

Source: Calculated with the KU Technical Services.

Table 19
KU Consolidated GHG (2012)

Business Unit	**Organization**	**City**	**District**	**Location**	**GHG Caused by Direct Energy Usage (ton)**	**GHG Caused by Energy Consumption (ton)**	**TOTAL GHG EMISSOINS EQUIVALENT CO2 (ton)**
University	KU	İSTANBUL	SARIYER	RUMELİ FENERİ	**2708.13**	**7542.43**	**10250.56**

Source: Calculated with the KU Technical Services.

3.2.3.1.4 Transportation

The KU Campus is not a city campus. Even though it is well connected to the city centers through public transportations, private transportation methods such as using private cars are also preferred. Daily circulation of all kinds of vehicles including private cars, public buses, university shuttles, service vehicles, taxis and minibuses into the campus is between 3000 and 35000 vehicles in a day. There are 1343 internal and external parking capacities in the campus, where the majority is for external parking.

Parking lot space could be used for other purposes on the campus if there was not such a high demand for the parking lot spaces. Even in the current capacity, the parking lot is not enough and after 10:00, it is very hard to find a parking place on the campus when the school is open. Additionally, there is no car sharing habit among the students. This is an important factor that could decrease the number of private individual cars on the campus.

Almost half the students and some of the faculty live on the campus. As the campus is very centralized, and relatively small, students, staff, and faculty walk inside the campus. There are bicycle points on the campus. Usually, some exchange students and international faculty use bicycles as commuting by bicycle is in their home cultures.

The General Secretary started a car rental service for students called “mobilism”, where students can rent a car for a short period of time such as one hour depending on their needs.

There is no transportation department, but the security and facility management under the Secretary General are responsible for the transportation in the campus.

3.2.3.1.5 Procurement

Procurement is under the responsibility of the Procurement Department reporting to the General Secretary. All purchasing on the campus is done through the

Procurement Department. Technical specifications are provided by the departments requesting the purchase. In order to have more energy efficient and greener products and services, purchases are very important.

Purchases are divided in two categories such as products having complicated technical specifications, and others having no detailed technical specifications such as office products. For instance, the Construction Directorate and Technical Services set their own technical specifications, and provide these specs to the Procurement Department to do the necessary purchase. They also go for tenders, where the Procurement Department facilitates the process. These specs already require energy efficiency, quality and higher standards. The same process is applied to the Facilities Management. They do tenders for the food and dining services on the campus. The specs are provided to the Procurement Department to run the tender process. Other products and services needed in the campus are furniture, IT equipment, stationary and office supplies, lab materials, and other materials necessary for the faculties. Major IT equipment also has technical specs provided to the Procurement Department and the Green IT concept has been in consideration by the CIT Department.

There is a common purchasing platform, ZER, which contracts globally for all Koç Companies to buy their IT equipment, other major products, services and stationary and office equipment. KU is also a member of this platform. The Procurement Department at KU does not play any role in spec setting for the available products on this platform. The other small purchases are decided on by the departments at KU and specs are provided to the Procurement Department. To conclude, there is no intervention on specifications for what people need to buy. Users set their own specifications to purchase a product.

At the current stage, the Procurement Department works on main arrangements to make the internal processes more efficient and functional before taking any active steps towards green procurement. For instance, the Procurement Department no longer prints the purchase order mails coming from the users. There is no print archive in the office any more. The next step will be to start cost saving

projects which promote the use of more energy efficient or green products and services.

3.2.3.1.6 Sustainable Campus Development

Sustainable campus development – housing and buildings and as well as landscape are under the main responsibility of the Construction Directorate reporting directly to the President. KU has a unique location, being in a green part of Istanbul, but at the same time being accessible to city life. This is not always possible in a big city like İstanbul, which is why, sustainable campus development is a much more important concept for KU to live in harmony with the green that surrounds the campus. |An image of the campus is like that of a green swimming pool with a blue sky roof, where the Black Sea and sky come together in one line making the big ships fly in the infinite blue. Once someone enters the campus from the first gate, it is nearly impossible not to be affected by the beautiful landscape, and the harmony of the campus buildings with this landscape. Respect for nature and the forest has been started with the architectural design, and can be seen in every implementation in the campus.

The KU main campus is located on 250000 m² acreage having modern outdoor facilities with sixty academic, administrative, residential and recreational buildings. The Campus has a dormitory capacity of 1550 students and 150 units of faculty housing. Library, auditoriums, and other facilities including cafeterias, canteens, cafes, a hair dresser, a full-service bank, ATM machines, a supermarket, a dry cleaner, a bookstore, post office, and 24-hour computer lab exist in the campus. There is also a big Sports Center with a multi-purpose indoor facility having a capacity of 2000 spectators. Outdoor sports facilities include an Olympic-sized soccer field, swimming pool, ice skating rink, tennis courts and a basketball court. The green area is 216524 m² including courtyards and roads, while grassland is 110000 m², the indoor area is 153000 m², and the building base area is 33277 m² on the campus.

Approaches regarding user participation in campus development, indoor air quality, building design aspects, campus wide master planning and land use and biodiversity at the KU campus are explained below:

The Construction Directorate gives a lot of importance to stakeholder participation in the campus planning and development of the university. Integrated design while renovating or developing the campus based on the needs becomes crucial. Users on the campus are students, faculty and staff. The first thing in architectural planning is talking with users to spot their needs. Later, after every department submits need lists, the Construction Directorate prepares a program relevant to their needs, which is the first base of architectural planning. However, in every step of planning, there is high interaction between the users and the team to revise the plans by adding new things and changing necessary things according to comments. Hence, user participation in the campus development at KU is at the heart.

Technical Services works together with the Construction Directorate on regulating indoor quality. Indoor air quality should be at a high level for all users. However, saving energy should not be at the expense of the health of people in the school. There is one important standard for indoor air quality, which is that the carbon dioxide level should be less than 800 ppm. At the KU campus, the level of carbon dioxide is 800 ppm all over the campus.

Sustainable building standards have been applied to every project on campus. These projects require universal technical specifications. The KU Campus has been designed by a well-known architect, Mojan Khadem but the architectural implementations have been realized by an American Architectural Group, ARUP, having partners from the UK. Sustainable design standards are very high in both the USA and the UK. Likewise, all international and national standards to protect buildings from fire, earthquake, and to make them more energy efficient and sustainable have been applied at the KU Campus. For instance, with the changing regulatory environment in Turkey because of the EU harmonization process, buildings have been reassessed with the each new or revised directive.

The same architectural design and implementations have been applied for new buildings and renovated buildings on campus without exception to maintain architectural consistency and integrity. The BEP Directive has been applied in every new building and necessary renovations on the campus. Moreover, the most possible energy efficient technologies will be used in line with the architectural design.

Solar panels on the roofs of the buildings are not appropriate with the current architectural design integrity. However, even though there are some limitations of using renewable energy sources on the campus due to the architectural design integrity, the campus itself has been designed and constructed using all natural products where possible. Additionally, all construction materials such a natural woods and stones used on the campus have long term use flexibility and are harmless to the green landscape. For instance, pvc material has never been used on the campus.

The Construction Directorate has been aware of the life-cycle costs of a building and product, which is why using products which can be recycled is high in construction. For instance, materials taken from their existing places are used in other renovations on the campus. Additionally, using quality products with high standards in the construction is important for the Construction Directorate to increase the usage longevity of the products. To give an example, instead of changing carpets every two years, carpets were changed after 10 years of use and not because they were old, but because of the hygiene standards. Another example is the natural wood products used all over the campus. If the necessary routine maintenance is made, the life of the natural wood products is 50 to 100 years. That is why the Construction Directorate gives a lot of importance to the maintenance program on the campus. Besides the ongoing maintenance and renovations throughout the year, major maintenance is applied each summer on the campus.

To conclude, long term use flexibility, life-cycle costs, quality product approaches and the routine maintenance program of the Construction Directorate secure energy and cost savings in the long run to make the campus more sustainable and green.

Landscape integration of building design has been realized successfully by the architect from the beginning. The architect has carefully planned all the needs that can evolve through the years. Greening the inside of the campus in harmony with the surrounding green has been always one of the main focuses of the management. In 2011, big trees in pots were located in every faculty courtyard throughout the campus to make the internal courtyards greener. The dominant green landscape has been always respected and protected with the highest care and standards.

Campus wide master planning was developed from the beginning with future development projections. Green areas and buildings were proportionate and 15.0% of the area was planned for buildings; the rest stayed a green area.

An important feature of the Campus plan is that users' social inclusion and integration are facilitated. All buildings are linked to each other by a courtyard, where there are many passages to facilitate people seeing each other, sitting, talking and having time together. The physical conditions of the campus facilitate user encounters during their daily work routines. For instance, the KU Square is located in the center of Rectorate Building, the Library and Student Center which are the main buildings mostly used by people. Students' dorms were also planned within the same social integration logic, where there are many small courtyards among the dorms to facilitate students' interactions with each other. In addition, social integration and interaction have been considered in internal building plans by designing wide and spacious corridors on each floor. Students are able to interact and socialize even in short two minute breaks between the courses outside of the classrooms. During the spring fests, almost 8000 people come together at the Student Square, and nobody complains because of crowding.

To conclude, there are corridors and internal courtyards inside the buildings and faculty courtyards which lead people to the Koç Square outside of the buildings. Meanwhile, the Student Square is the biggest green land used for festivals and graduation ceremonies. There are various stages of social interaction carefully planned and designed for the KU Campus.

KU has been very caring about biodiversity and protective of the green landscape. KU has an agreement with the Forest Management Authority giving a 24 hour communication opportunity for the KU Team and Forest Authority Team to protect the green area surrounding the campus. KU has a fire crew and a fire truck, which can be used in any danger in the green area. The KU Team is allowed to watch over the surrounding with the Forest Authority Team. Respecting and protecting the green area surrounding the campus with its biodiversity have been a priority since the start of the campus. Strong special water jet systems were installed to points on the buildings close to the green areas to protect the green from fires in the buildings. In addition, in every corner of the campus, there are routes which can provide pressured water in case of fire emergencies. KU is surrounded with green, but there is no real interaction with the green itself to protect it. Getting inside the green area is forbidden because of the rules set by the Forest Authority., There are 15 gates on campus allowing the Forest Authority Team to pass between the campus and the green area to do their daily controls.

3.2.3.1.7 Food and Dining

Food on the campus is under the responsibility of the Facilities Management. There is one supermarket, Migros, one main dining hall, a restaurant open to faculty and guests, and several cafeterias that provide food and catering on the campus. Three initiatives guide preparation and hygiene: food safety & providing the best quality of food with the cheapest price possible, food hygiene, natural agriculture and having a new kitchen on campus.

Food safety and providing the best quality of food with the cheapest price possible is an important strategy of the Facilities Management. Besides the faculty members and staff, there are almost 5000 students on campus and 1550 of them stay in the dorms. Hence, all food suppliers on campus are only allowed to use approved brands listed in their contracts to sell food. The Food Manager systematically controls the consignment documents and storage rooms of every cafeteria on campus to control the brands used and the expiration dates of the products used in food preparation. Companies serving food on campus have been chosen very carefully.

Food safety is another important area that the Facilities Services Department is responsible for. The contractor, Johnson Diversey, does systematic safety checks in all food preparation and selling points every two months and prepares an independent hygiene report of cafeterias to KU management.

Natural agriculture and the new kitchen on the campus are two important outreach programs developed and run by the Secretary General. More information is provided in the education and outreach section of the current analysis of KU campus.

3.2.3.2 Education and Outreach on Sustainability

Education and Outreach are important tools to reach students and integrate them to campus sustainability programs.

The "Creative Teaching and Participatory Learning" program is an important teaching and learning method in HEIs. KU has been using the "Creative Teaching/Participatory Learning" philosophy. The Koç Office of Learning and Teaching (KOLT) is dedicated to supporting students, TAs, and faculty at KU. It is the goal of KOLT to continually improve the learning environment at KU so that the students can achieve their full potential in their academic lives (http://kolt.ku.edu.tr, 2013).

The KU undergrad curriculum offers a wide range of core courses on social and environmental responsibility. At present, all students regardless of their majors have to take social and ethic courses as electives. Indeed, approximately 20 core courses on social issues and ethics ranging from City and Society, Migration and Globalization to Human Rights, Environmental Ethics and Media Ethics .are offered to all undergraduate students. The majority of the core courses are offered through the CSSH.

Students studying engineering or science already learn about environment, energy and sustainability through their departmental courses. On the other hand, a pool of core courses by the CS has been developed for students having other majors.

Five or six core courses by the faculty have been offered to the students having other majors. Of course, science and engineering students can also take these courses if they have an interest, but they are not obliged. Among these core courses, are two related to environmental sustainability and energy that have been offered for years at KU: the Sustainable Energy Course and the Energy and Environment Course. Furthermore, a new course "A Balance Sheet on Energy" has been added to the pool of core courses open to all KU undergrad students. This is an important course as students are able to examine different energy sources to learn their advantages and disadvantages to be used as energy alternatives to solving the global energy problem. Other research centers work on gender, migration, and offer open courses in relation to social sustainability such as International Organizations and NGOs, International Migration in a Global World, Woman Discrimination and Human Rights.

Meanwhile colleges and schools at KU are also offering area elective and elective courses in various topics again on social, economic and environmental aspects of sustainability.

The number of courses related to sustainability will increase step by step. Additionally, the newly opened KUTEM provides a center for faculty who would like to work more on environmental sustainability and energy related topics and will offer courses. For instance, KUTEM plans to organize workshops for awareness raising on environmental sustainability supported by real demonstrations on campus such as using the existing cogeneration facility and its data, a solar panel, a hybrid minibus instead of a fuel run car for demonstration purpose. These workshops are examples of how to combine education and demonstration on campus to educate students in sustainability.

In addition, other courses such as "Corporate Social Responsibility"," Social Entrepreneurship," and "Creating Social Impact through Collaborative Project Management: Experiential Learning" have been offered by the College of Administrative science and Economics (CASE) and the Graduate School of Business (GSB) in collaboration with the Koç University Social Impact Forum (KUSIF), the

Office of International Programs. KUSIF has developed a new track “Community Engagement and Leadership Track” for undergrad students.

Moreover, KU has been growing and the SoM recently opened. Medical students also take the core curriculum with other students. However, due to the time limit of their heavy curriculum, currently, the medical students are not able to profit from the core courses related to sustainability. After students complete their third year in the medical program, they will start internships at health institutions and be involved in different public health programs during the summer. Besides core courses on sustainability, internships and different kinds of programs have the potential of introducing the sustainability theme to medical students. For instance, first year medical students have internships not just in health institutions such as private hospitals, but also second grade public hospitals, and first grade family health care centers, and local policlinics to learn the health system conditions of Turkey on a full scale. Public health especially issues such as environment, water, air pollution, sanitary sewerage, food topics are taught in the 3rd year and students learn in practice different aspects of public health by internships in the 4th and 5thyears. Specific programs related to the topics of public health are on the agenda of the SoM for the coming years. KUSIF and SoM collaborate on a public health course to develop a more interactive course for students with a component of community engagement field study in the local area by partnering with the Sarıyer Community Health Center. Students are able to develop their leadership skills and learn more by real life practice within the course, while the local community also benefits from the projects and research that are developed and implemented by the students.

Te GSB has been very active in integrating sustainability into its all programs. For the last five years, the social component of sustainability has been emphasized in all the GSB programs. For instance, a course on “Corporate Social Responsibility” is offered as a required course in the Executive MBA Program and the sustainability topic is studied much broader in the full time MBA Program. The GSB has a strategic agreement with the United Nations Development Program (UNDP) in Turkey, and collaborate in many projects. UNDP representatives give

seminars on different topics related to sustainability every fall semester. “Social innovation” is an important topic that the curriculum teaches to the students. After the fall semester, students take the “New Venture Development” course in which business plans with more social content is encouraged. As a result, students learn how to develop strong profitable business plans, but at the same time provide social contribution to the society. Other programs offered through the GSB are CEMS MIM and KOÇ MIM which are international management master programs. The notion of sustainability has already been embedded in the curricula of the both programs from the start. In addition, CEMS emphasizes “Responsible Global Leadership” in the program as a whole. On the other hand, topics about “Ethics” have been emphasized in the Koç MSc. in Finace Program with a partnership with the Chartered Financial Analysts (CFA) Institute, as KU is the first CFA Institute Program Partner in Turkey and in the region.

The GSB emphasizes the importance of sustainability programs in all presentations, promotional materials, and during interviews with prospective candidates. In addition, students accepted to the programs promise that they accept business ethics principles, and will behave with business ethics. So, student awareness on sustainability in different dimensions starts from the beginning, and continues with the curriculum on social aspects of the sustainability and seminars with well known speakers. As a result, students who had no involvement with sustainability topics in their business environment gain awareness, or students who have already some interest in sustainability topics are encouraged to progress and learn more during their academic lives at GSB. Sustainability is an area in which the GSB is interested in taking further steps with different collaborations.

Besides core courses on social sustainability, the CSSH offers many courses on social issues such as sociology of development, social movements, introduction to sociology: community service.

Another strong and well reputed graduate school at KU is the GSSH, where many courses related to social sustainability are offered at the graduate level. The GSSH has been successful in developing interdisciplinary programs as in the case of

“Design, Society and Technology”. An interdisciplinary graduate program on “Sustainability” could be an option for the GSSSH for the future.

The OIP is also active in developing international summer programs on sustainability. At present, the OIP Team develops an international summer program on sustainability with the existing courses for both Turkish and international students for the coming summers.

Koç also offers many outreach programs on campus, some of which are the following: The Zero Waste Program, the Natural Agriculture Program, the New Kitchen on Campus “Cool Cook Program”, the Radio Program “Leaders of the Social Change Talk: From Business world to Civil Society”, real life implemented projects developed within the courses such as Academic and Life Skills: Transition to Professional Life (both education and outreach) and Creating Social Impact through Collaborative Project Management: Experiential Learning (both education and community engagement through field studies by developing sustainable local projects with local partners), awareness raising projects such as Peace in Hands Project “Peacemakers’ Initiative: Turkish People and the Armenian Community”; Idea Challenge Competition to find solutions to social problems and other programs developed by the Student Clubs are examples of outreach programs at KU. Within the last two years, the number and scope of the outreach programs related to sustainability have increased.

The Zero Waste Program is a waste recycling program started in September 2012 by the General Secretary at KU. The aim of the program is to raise awareness on waste and recycling among students, staff and faculty and increase the rate of recycling on campus by behavioral change. This is one of the main outreach programs on campus on environmental sustainability. The General Secretary collaborated with student clubs and ALIS 350 course project group for Zero Waste to improve the program.

Communicating environmental sustainability to the campus community and collaborating with stakeholders on campus have become important for the General

Secretary to improve waste management on campus. In addition, the amount of battery, paper and glass waste collected each year on campus is reported to the Ministry of Environment and City Planning by entering the related data on their web site.

In addition to the Zero Waste Program, communicating the labeling system necessary for hazardous chemicals storage to the faculty members or communicating how to use the new recycle boxes for batteries, papers, cans and glasses to the students, staff and faculty is an important step to make successful environmental implementations on the campus. In the case of the new labeling system for hazardous chemical storage, the General Secretary communicated through intensive meetings and collaborated closely with the faculty members to get their support and feedback to make an effective waste collection process. Likewise,, the General Secretary collaborated with the Student Council and prepared posters to communicate with the students to raise awareness for new recycle boxes in the campus. When the recycle boxes were first put on the campus, it was common to find glass waste in the paper recycle box; however, after a while with the right communication, there have been fewer problems in the right usage of the recycle boxes within the campus. After the first implementation phase, the Zero Waste Program started in September 2012 with its own challenges to reduce waste on the campus and educate the campus community in the right usage of the recycling boxes. So, to some extent, awareness raising and effective communicating of the environmental management programs to the campus community have become a part of the plans of the General Secretary. Even though the Zero Waste Program was not found effective at the end of the two semester implementation on the campus and was cancelled, General Secretary plans to run new programs based on the experiences.

ALIS 350 Course / Academic and Life Skills: Transition to Professional Life is a unique course promoting campus sustainability with the projects that the students in the class develop and run with the KU offices during the course. Some projects in the class are foreseen to be continuous such as Zero Waste, so every semester a

project group worked with the General Secretary on Zero Waste Program during the two semesters on the campus.

Another new course is *Creating Social Impact through Collaborative Project Management: Experiential Learning* having both an academic and field study component developing sustainable local projects with local partners. Field studies of the course are supported by KUSIF.

The natural agriculture program and the new kitchen on the campus are important initiatives at KU. Even though organic products and food are not sold in the cafeterias due to their high prices, this natural agriculture program and the new kitchen projects offer new windows for KU in the areas of innovation and sustainability in food and dining. The land for agriculture has already been prepared for the use of children coming to KU for summer school. These children grow vegetables on this land. During other seasons, this land is planned to be used by the faculty members living on the campus. The gardeners could support and train the faculty and their families in how to grow vegetables that they need. The natural agriculture project will be improved in the coming years based on the first implementation experience during summer 2012. On the other hand, a new special kitchen was constructed for children in the summer program to teach them how to cook the vegetables that they grow. The kitchen is used for special cooking courses during the winter season's "Cool Cook Program" open to students, staff, faculty and outside participants. Similar to natural agriculture in the campus, the kitchen project will be developed based on the experiences on hand. More sustainable food related programs could be implemented in the Cool Cook Program.

The radio program, "Leaders of the Social Change Talk: From Business World to Civil Society" with the collaboration of KUSIF, GSB and Tuvana Foundation for Educating Children (TOÇEV) was started at KURadyo to raise awareness on social problems, volunteerism, leadership, social innovation, social impact creation. This is an important initiative that will grow further.

The Peace in Hands Project, “Peacemakers’ Initiative: Turkish People and the Armenian Community” funded by the Dutch Consulate Matra Fund, and implemented by KUSIF and OIP is a good example of how to develop an outreach program, collaborate with other units of the university, and raise funding.

To encourage student interest and participation in community problem solving and entrepreneurship, KUSIF, Incubation Center, and the OIP came together to create and sponsor a set of “Idea Challenges”. The value of the Idea Challenge is as follows: increasing awareness for local social problems and issues, sparking interest in entrepreneurship and social entrepreneurship on campus, fostering creative problem solving and out-of-the-box thinking, bringing students and staff from all disciplines together around important social issues, encourage the formation of multi-disciplinary teams, and enable the implementation of innovative solutions.

There are also various programs developed by the Student Clubs that could be listed as outreach programs.

3.2.3.3 Research Outlook and Sustainability

Research opportunities, projects and centers are important in increasing the competitiveness of the institution on social, economic and environmental sustainability fields. Campus sustainability encourages institutions to conduct research related to or focused on sustainability (www.aashe.org, 2013b).

First, it is important to understand in which domains of sustainability the institution works and is producing more research outputs, publications, and fund raising. In addition, it is important to understand whether the HEI promotes innovation in the sustainability area, encourages multidisciplinary research on environmental, economic and social aspects of sustainability through internal and external collaborations or develops stronger links between campus operations and research.

KU's core competency has been its commitment to research, and of course its success as being one of the leading research universities in Turkey. Faculty at KU are well-known by their research achievements, and research topics are much diversified at KU. KU faculty is evaluated with their high value research projects and publications. At present, 17 projects worth of 52 million TL are active by the colleges and research centers (Figure 43). But no data is available about projects related to or focused on sustainability. At present, although there is no specific research focus on sustainability, KU has centers on working different aspects of sustainability such as TÜSİAD-KU Economic Research Forum, the KU Social Impact Forum, Globalization and Democratic Governance, the KU Research and Application Center for Gender and Women's Studies, the Migration Research Program at KU, the Social Policy Applications and Research Center, KUTEM

Each research centers conduct research in their domains. However, "sustainability" as a main topic is not often mentioned as the priority. For instance, many collaborative and interdisciplinary research projects have been conducted by KU Faculty in engineering and science which have direct and indirect effects on environment and energy; however, sustainability is not mentioned in the project names.

Among the Research Centers at KU, KUTEM is analyzed as a case study. The opening of the energy center at KU will be a step forward for more visible environmental sustainability related research projects. KUTEM has been newly founded by TÜPRAŞ and KU, concentrating on fossil fuels, bio-fuels, and solar fuels. The Center started its funding program to seed projects related to energy within the faculty members and post doctoral students at KU. This will be an important funding mechanism to promote energy related projects at KU, as well as increasing awareness on environmental sustainability on campus. At present, a total of five projects are funded, such as "Energy Efficiency Map of Turkey". The center will facilitate the increase of energy related research, as well as increase the number of courses and programs on energy and environment. Meanwhile, the Center could

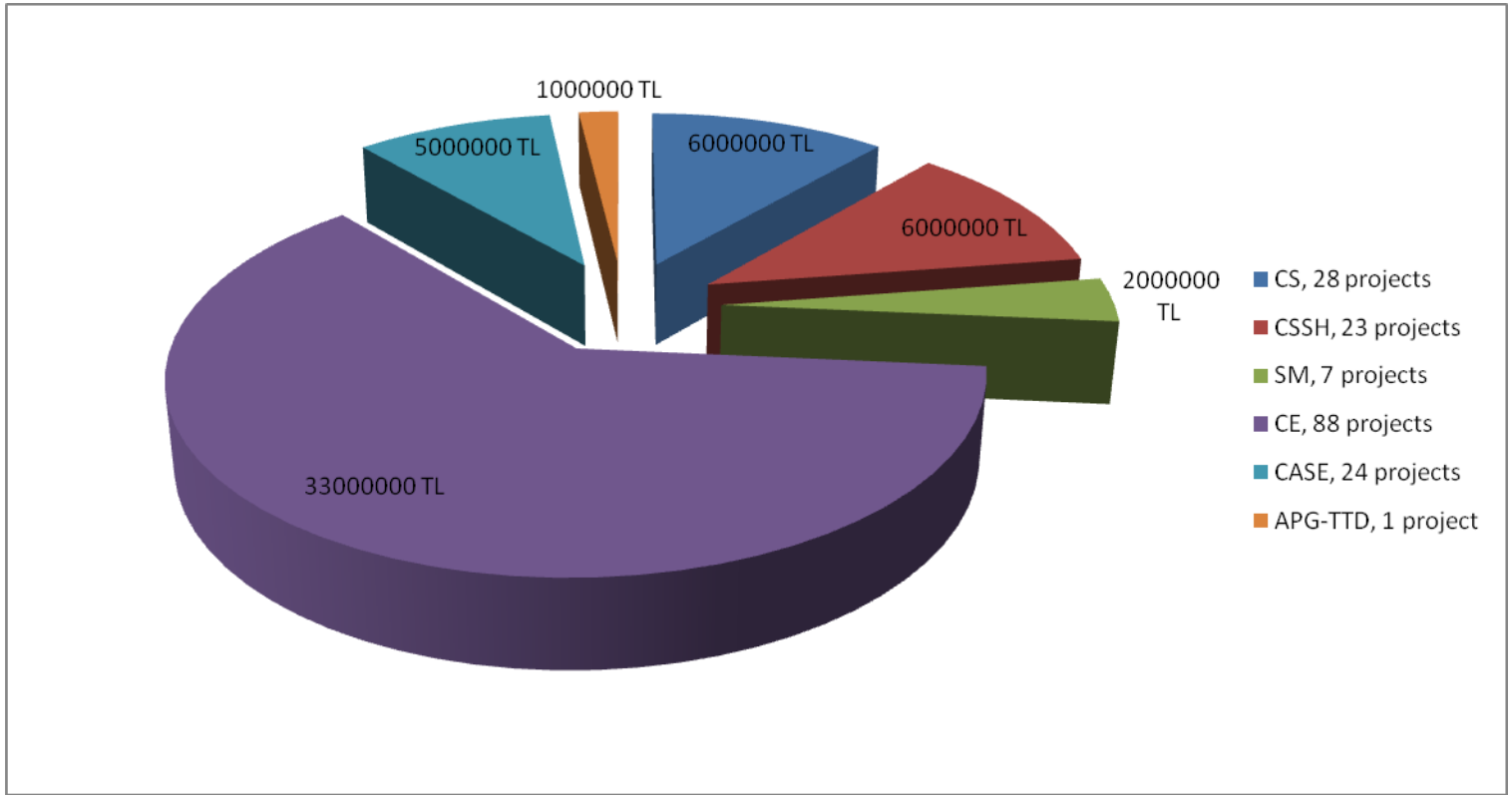

Figure 43. Number and Budget (TL) of Active Projects at KU
Source: Data is provided by the VPRD Project Office.

be an attractive platform to develop projects with third parties in the private sector and governmental institutions.

Combining research, implementation, and learning experience is possible through research collaboration with the private sector, and implementing this research on campus. For instance, the center already has some research projects on its agenda which could be implemented in the campus buildings to make them more energy efficient such as: 1) Some implementations of nano insulate; 2) Photo-catalytic, self cleaning coating; 3) Research on near-infrared reflecting paints; 4) Research on ventilation systems.

Another research opportunity to promote sustainability research projects at the undergraduate level is the “Summer Research Program for Undergraduates” at KU where faculty members announce their research projects and interested students apply online to these projects. If they are chosen, they are offered free accommodation, and the program is tuition free to them to promote research among the undergraduate students. Doing research with senior researchers is a life time experience for students interested in doing research. There are some energy, environment, migration related research projects among the research projects offered in this program. However, there has been no sustainability topic project offered to students.

3.2.3.4 Development and Implementation of Campus Sustainability Policies

Departments at KU develop their own policies in campus sustainability and implement them.

The Human Resource Directorate published the KU Code of Ethical Conduct and Practice Principles on 15.07.2013, which is an important document to enhance social sustainability in the campus.

The General Secretary Departments have already developed an environmental policy, an energy management policy, and implementation plans;

however, these are internally developed policies and plans, and not communicated to the campus community. There is neither university wide coordination nor monitoring committee to develop and implement sustainability policies on the campus. At present, only the General Secretary Departments are involved in policy development or policy implementations in environmental sustainability of the campus. In addition, the Director of Construction has also its own rules, policies and plans in regard to construction on the campus.

3.2.3.5 Social and Economic Aspects of Campus Sustainability

KU has been increasing its engagement with the public through different programs on social and economic sustainability and with departments on campus.

KU gives the highest importance to corporate responsibility and ethical values. The KU Code of Ethical Conduct and Practice Principles, showing an institutional commitment to make the campus socially more sustainable, were published on 15.07.2013, and are referenced in the Regulations of Higher Education, the Core International Human Rights Treaties, the United Nations Global Compact, and KU Administrative Staff Personnel Regulations.

Other initiatives and programs exist in different departments at KU such as:

The third party engagement of GSB reflects the positive social impact potential of the University. In addition to being one of the leading education institutions in business administration, the GSB has a vision and mission of contributing to society through engagement with public institutions and NGOs. For instance, the GSB has been providing business administration courses and seminars to the local authority, Sariyer Municipality in durations of five weekends. This certification program has improved the skills of the municipality management. At present, the GSB has a protocol with Sariyer Municipality to provide different academic programs based on their needs.

The GSB has also been supporting NGOs by collaborating with the private sector. The GSB partnered with the International Capacity Building Alliance Project (ICBA) in 2010, which is a worldwide project of Novartis. Since November 2012, KUSIF has also been involved in the program to increase its social impact. The ICBA project focus is to enable and encourage the creation of a sustainable partnership between non-profit organizations in given priority countries and business schools. Prestigious business schools around the world intend to increase development solutions for patient groups under the subject of "Corporate Social Responsibility". The GSB offers training to patient associations in Turkey in two-month intervals with three modules: strategy and strategic management, project management, marketing and social communications, financial resources management, fund raising, quality management and human resources management. The GSB has allocated human resources, time and provided an infrastructure such as its seminar rooms for the private sector and civil society involved social impact projects.

The GSB is committed to developing more programs to increase its social impact by collaborating with different departments at KU.

There are two important international focused programs at KU developed and implemented by OIP:

The Global Social Venture Competition, GSVC, organized by the Haas School of Business at UC Berkeley is the largest student driven business plan competition, where KU is one of the three Outreach Partners. The GSVC provides mentoring, exposure, and prizes for social ventures. In this regard, GSB and OIP put together a collaborative effort to be an active player at GSVC, and aim to be a Regional Partner in the near future.

KUGlobalAid is another important student led social responsibility and service learning international initiative, which is supported by OIP. KUGlobalAid's first mission was in Bosnia and Herzegovina (BIH), where a group of students developed a service learning project. The project included a visit to BIH with a collaboration of a civil society organization operating at BIH, a photograph

exhibition and a documentary to raise public awareness among the students and public about what happened in BIH. This international service-learning initiative will grow in activities in the coming future.

Volunteering Activities in social responsibility have been led by the Volunteers' Club, founded in 2001, and operating under the Dean of Students. The Club has 250 active members from KU students and outside, has projects and programs in different areas, and came in second in the Social Responsibility category of the Most Active Club Contest held by the University in 2010.Through Student Clubs, KU has high public engagement with local and national communities in Turkey (www.ku.edu.tr, 2013).

Additionally, the newly established social impact forum, KUSIF, is important in increasing social impact of the university through community engagement programs. KUSIF develops capacity building programs for the local community groups in Sarıyer through public schools, civil society, cooperatives and governmental organizations in the local community. The campus community could be a part of these community engagement programs.

A major scholarship program "Anadolu Scholarship" has been running since 2011 by the Corporate Relations and Development Office. This scholarship program is an example of diversity, affordability, equity and inclusion among Koç students and offers scholarships to successful Turkish to study at KU.

Even though research is highly valued at KU, community services and collaborations with non-profit organizations have also become part of the annual faculty evaluations. The annual evaluation process tracks community service of faculty through their consulting activities to private, public, and non-profit institutions, seminars and workshops, and positions in private, public, and non-profit institutions. The evaluation process also incorporates non-academic publications and presentations at non-academic meetings and conferences, contributions to popular media, and honors and awards for non-academic contributions (www.unprme.org, 2013).

Economic sustainability is a consequence of the campus sustainability activities to demonstrate that the campus uses its resources efficiently so that the budget could be saved for other vital activities such as research and education. For instance, using recycled papers for printing is both economic and environmental.

3.2.4 Awareness Raising among Management, Faculty and Students

The start of this thesis helped to build awareness on campus sustainability among faculty, staff, management, and students; because the first time, this thesis encouraged the management, staff, faculty and students to work together for campus sustainability, and promote development of campus sustainability strategy at KU.

KU has a Coordination Committee and an Academic Council, which have not been informed about campus sustainability at this stage. However, there has been individual interaction with the management and deans in these groups during this stage of the thesis. The highest rank in management informed about campus sustainability is the President of the University.

Awareness raising is an ongoing process and should be followed by behavioral change on campus. The initiation of this thesis has had some positive impacts on campus sustainability awareness raising such as:

ALIS 350 Course projects were designed to support campus sustainability initiatives in the campus with collaboration of ALIS Team, KU offices and research centers. Through ALIS 350, various small scale campus sustainability projects were started.

Many faculty, staff and students were contacted during the study and interested faculty members, staff, and students on campus sustainability were identified. This interested community on campus sustainability has started to communicate among each other and develop small initiatives. This became a first level of awareness on campus sustainability as the attention of this interested community is triggered to unify their efforts under campus sustainability.

For instance, during the current analyses of the KU Campus, many faculty members were contacted to explain what they offer on sustainability during their courses. Even though courses may not be directly related to sustainability such as some management and marketing courses, this thesis started awareness among interested faculty to integrate sustainability into their courses. Another example is how this community started to develop small initiatives. For instance, a lecturer of the ALIS 350 course has been responsible for the Zero Waste Project Group for two semesters. This project became one of the project offerings of the course every semester as the General Secretary is pleased to get the support of a project group in the course. Even though campus sustainability was not the main interest of the lecturer after this course project, she applied for the Climate Leaders Training Program of the Climate Leadership Corps, and was accepted. In addition, she suggested the training possibility to other interested community on the campus and one student who is an active member of the environmental club and the Managing Director of KUSIF also applied and was accepted into the training program. After the training program, this small group met to discuss how to raise awareness on climate change problem among the campus community. They plan to talk with the faculty and do presentations on climate change in some selected courses. In addition, they plan to work on a carbon free event guide for clubs. Whether they realize these plans, or do others, the most important thing is how awareness has been triggered by the start of this thesis on campus sustainability and followed by small actions to promote campus sustainability.

Potential partners to collaborate on campus sustainability inside and outside of the university were identified. For instance, a project “Promoting sustainable campus strategies among HEIs in Turkey” was prepared, and an application was made to the UK Prosperity Fund of the British Embassy in Turkey with the partnership of KUTEM at KU and the Tyndall Center for Climate Change Research at UEA. Even though the project was not funded, this thesis raised awareness of the interested partners to collaborate on campus sustainability.

3.2.5 Key Findings and Suggestions for Koç University Campus Sustainability

KU Campus was chosen as a case study to examine the current situation on campus sustainability on environmental, social and economic aspects of sustainability. Findings of the study have conceptualized suggestions to be offered, which may be helpful to develop the campus sustainability strategy of KU and its road map.

The current situation analysis indicated that even though there have been not concerted actions or a holistic approach regarding campus sustainability, different departments both administrative, academic, and student clubs in the university have already been engaged in many good implementations. The main aim of an approach should be to unify these existing initiatives and implementations as each of them is an important component of sustainable campus and develop a common working platform under “campus sustainability” to develop a campus sustainability culture at the university. Additional coordination and a concerted action are needed to unify all current efforts. Thus, all of these efforts will be synergized, and create more awareness, impact, and trigger further actions on the campus to create a campus sustainability culture.

Especially, the management under the Office of the General Secretary has been engaged in the environmental sustainability of campus operations. One important finding from this thesis is that KU has been successful in developing and implementing environmental sustainability in campus operations. Operationally, KU has invested in human resources and put enough funding in campus operations to make the campus more sustainable. For the next level of campus sustainability, the KU management has already made feasibility studies regarding energy use in the campus which is one of the most important campus operations of campus sustainability. But, investments on energy for the next level of campus sustainability with an ESCO require very high budgets and a return on investment is after 10 years. Hence, without working with an ESCO, the KU management will continue its routine investments on renovating the existing systems with more energy efficient

ones and maintaining the existing equipment on the campus. For other components of the campus operations such as waste, transport, food, procurement, campus development, investments will continue. However, investments in operations should be supported by the involvement of the campus community through awareness on campus sustainability and behavioral change to make KU a living lab and a true sustainable campus.

The next step should be to increase the interaction between the operations and the campus community to develop campus sustainability culture to save campus resources. In addition, the Office of the General Secretary could learn from best practices of KU partner universities. The OIP could support the Office of the General Secretary to start communication with partner universities, and initiate campus sustainability collaborations.

Indeed, the Office of the General Secretary has already discovered the benefit of working with the Dean of Students to raise awareness on campus sustainability programs and increase the participation of the students in these programs such as in the case of Zero Waste which was supported by the ALIS 350 Course group project, and the environmental student club operating under the Dean of Students. However, the General Secretary Departments need to initiate collaboration with other departments in the school. In addition to the Zero Waste program, similar programs on campus sustainability could be developed. For instance, energy efficiency, transportation could be priorities:

Technical Services could work with the Dean of Students, the Communication Office, and KUTEM to develop energy efficiency outreach programs in the campus or the Office of the General Secretary could work with student clubs to develop and implement outreach programs for campus transportation such as promoting public transportation and encouraging ridesharing at KU.

The email from the President is a good example of how the senior management could encourage the campus community to change their behavior and contribute in campus sustainability actions. Continuous communications and

awareness raising activities by all means are needed. In order to achieve this, there is a need to develop and implement more outreach programs in the campus on efficient resource use.

This below email dated July 19 2011 was shared by the President to all students, staff, and faculty and shows how the university could benefit from efficient resource use (in this case, energy efficiency); and give more scholarship to students with the money saved through campus sustainability:

Dear Members of KU,

The main campus of KU, along with the other additional campuses, has been equipped with automation systems aimed at maximizing energy conservation. For example, the lighting and ventilating of classrooms, as well as the lighting of the hallways is done through centralized programming. The lighting, heating and cooling of offices rely on motion sensors and in the lack of any movement for more than 15 minutes, the automation system turns off all of these functions. Many similar organization and conservation methods are also present in our system. Furthermore, with the cogeneration system built on the main campus in 2005, both our electric needs are met and the fumes released from the chimneys of this campus are recycled into hot water, consequently significantly saving in the consumption of natural gas.

Overall we spend a total of 3600000 TL for electricity every year on our campuses. Approximately 800000 TL of this amount goes to internal lighting, 950000 TL to cooling, and 1100000 TL to the ventilation systems. Considering this, it is apparent that, regardless of the automation system that is already in place, we can still achieve better conservation rates in numbers.

The simplest things you can do include manually turning off the lights and heating/air conditioning while leaving offices instead of leaving this job to the motion sensors, the last person to leave a meeting room turning off the lights, calling 3020 (Call Center) when you see lights that are on in an unoccupied location that that is controlled by central programming, and keeping the windows and doors closed while the air conditioning is working. With the individual efforts of all our faculty and students, saving even only 5.0% in energy costs would be equivalent to 6

student scholarships, which is a notable gain for both our establishment and students.

We thank you in advance for your active support in this matter. You can direct all your questions on the subject to our Technical Director Mr. Tunga Cankurtaran.

Best wishes and regards,

Umran S. Inan

The President's communication to the campus community demonstrates that KU has invested in energy efficiency systems; however, campus operations should be supported by the campus community through awareness and behavioral change to increase the campus resource efficiency.

Another tool to raise awareness on campus sustainability is campus sustainability demonstration projects at KU. Some campus sustainability demonstration projects could be easily developed with the relevant stakeholders in the university. For instance, KUTEM already has some research projects on its agenda which could be implemented in the buildings at KU to make them more energy efficient. Campus demonstration projects are important complementaries of other outreach programs as they provide visual learning to students through real implementations.

KU has competitive graduate programs at the master's and doctoral levels. One of the strengths of KU has been to develop interdisciplinary programs at the graduate level. Sustainability as a subject involves interdisciplinary work across disciplines such as social sciences, humanities, business administration, economics, international relations, science, engineering, and law. KU could develop programs at the graduate level on sustainability. At the undergraduate level, the sustainability theme should be taught across the curriculum in every classroom with different aspects. Even though there are many core courses and elective courses at the undergraduate level on different aspects of sustainability, sustainability as a main umbrella should be promoted. For instance, in a research methodology course, a

sustainability theme should be part of the course while teaching how to do a project, or a global strategy course could integrate a module on corporate sustainability. In addition, in some relevant courses, students could do some work or develop a project for campus sustainability as a part of the course project requirement.

A big opportunity exists in promoting research on sustainability through a summer undergraduate research program at KU as many foreign students are coming during the summer to participate in the research program.

Currently, there is no holistic approach on campus sustainability and present activities on campus sustainability are not communicated enough to the campus community.

Sustainability should be integrated into the University's strategy to create a holistic approach to develop a campus sustainability culture at KU. In this regard, developing sustainable campus strategy and a road map should be a priority. In this way, all units on the campus will be aware of this strategy, plan, and act accordingly. For instance, there are simple things, which do not need big budgets but, require awareness and coordination, that could be done in short and medium terms. Having a university wide sustainability strategy, road map, and coordination and monitoring mechanism will support every unit of the campus for the same aim of making the KU Campus more sustainable.

Effective campus sustainability communication is another important finding from the current analysis of the KU campus. At present, campus community is not guided on what to do, or how to do to support campus sustainability. Crrent students of y and z generations at KU especially are more conscious about environment and sustainability issues. They are generally open to do more when necessary platforms and tools are offered to them. Using them as models, KU should communicate the sustainability mission effectively to faculty, staff, and students. With a KU sustainable campus mission, students will be encouraged not only to protect the campus but also to do more for their campus sustainability and as well as for their future.

The current situation analysis at KU, based on campus sustainability criteria, awareness raising in the management, faculty and students were analyzed. Additionally, some findings and suggestions on campus sustainability based on the current situation analysis at KU were shared. The next important step is to set sustainability commitment and principles, and afterwards, develop a sustainable campus strategic plan and road map for KU.

3.3 Developing Sustainable Campus Strategic Plan and Road Map with a Holistic Approach to Campus Sustainability

For KU, campus sustainability should be beyond green as the university already has strong commitments on environmental, social and economic aspects of sustainability as reported from the current situation analysis. In this part of the thesis, a sustainable campus strategy and a road map for KU will be presented. Even though some units need to make more effort to integrate campus sustainability in their departmental goals and projects, each unit has been engaged in many projects and programs regarding sustainability of the campus within their areas of expertise and operations. In addition, the term “Global Responsibility” already exists in the vision and mission of the University. However, what is lacking is the holistic approach on campus sustainability, where all units work together, and create synergy and more actions to support KU to be a more sustainable campus. KU needs a campus sustainability strategy and a road map to implement this strategy. In this part of the thesis, after setting sustainability commitment and principles for KU, a campus sustainability strategic plan and a road map to implement this strategy will be presented. In order to develop this campus sustainability strategy and the road map, a working methodology as described in Figure 44 was developed. The following studies were conducted at KU:

1st step, *Research on Campus Sustainability Strategy Development* was conducted by studying example universities and others to understand how these universities developed their campus sustainability strategies.

2nd step, *Existing KU Documents and International Memberships* were analysed to include them in the campus sustainability principle and commitments.

3rd step, based on the findings during the first and second steps, and the current situation analysis, *Draft of the KU Campus Sustainability Principle and Commitments* was prepared.

4th step, the *Draft Strategic Plan and Key Operational Areas for KU* were identified based on research conducted among example universities, rating systems, and key findings at the current situation analysis for KU.

5th steps, Semi-Structured Interviews and Various Meetings for Campus Sustainability Strategic Plan were conducted with 18 key people to discuss Draft of KU Campus Sustainability Principle, Commitments, Strategic Plan and Key Operational Areas.

6th step, *First Revision Based on Feedback* was conducted for the Campus Sustainability Principle, the Commitments and Strategic Plan. Important key points for the study were made on *the Sustainability versus Responsibility Framework, Priorities and Capacities of KU, and the Road Map* after getting the feedback for revision. In addition, 16 Key Operational Areas were grouped under five main sections as below based on the feedback and comments:

Section 1: Campus Operations: Energy (Electricity and Natural Gas); Water, Carbon Foot Print; Waste and Recycling; Carbon Footprint; Transport; Procurement; Campus Development; Food and Dining, Efficient Use of Resources

Section 2: Education and Outreach: Curriculum; Outreach Programs, Community Engagement

Section 3: Research on Sustainability

Section 4: Campus Community: Diversity & Affordability; Human Resource

Section 5: Development and Implementation of Sustainability Policies and Efforts: Sustainability Governance; Coordination and Planning

In addition, Objectives and Key Performance Indicators were set for each operational area.

7th step, *the KU Sustainable Campus Road Map* was developed. During the interviews and meetings to develop the KU Campus Sustainability Strategic Plan, some data was also provided to develop a road map. For each key operational area, short, medium and long term road maps were created. In addition, programs in other

universities were investigated to see which possible activities and programs which could be relevant to KU.

8th step, *Semi-Structured Interviews and Various Meetings for Campus Sustainability Road Maps* were conducted in this step.

9th step, *Second Revision Based on Feedback* was made to finalize the road map and if necessary in the strategic plan. The KU Campus Sustainability Strategic Plan and Road Map is ready to be presented to the President.

3.3.1 Research on Campus Sustainability Strategy Development

To develop a sustainability strategy for KU, an examination of how other universities in the world developed their campus sustainability strategies was initiated. Research on methodology used, campus sustainability strategy documents, plans, commitments, principles of example universities studied in the theoretical part of the thesis and some others such as Harvard University, Stanford University, University of British Columbia, Maastricht University, Tilburg University, University of Copenhagen, University of Nottingham, UEA, Boston University, California State University, University of Colorado, University of Southern California, Cornell University, and University of California Merced was conducted .

3.3.2 Analysing Existing Documents and International Memberships

After studying other universities' approaches and documents, the KU vision, mission, internal documents, and international networks with which KU is the signatory were examined. The main documents used to develop the KU Campus Sustainability Commitment and Principles are as follows:

- ✓KU Vision and Mission
- ✓KU Environmental Policy
- ✓Newly published KU Code of Ethical Conduct and Practical Principles

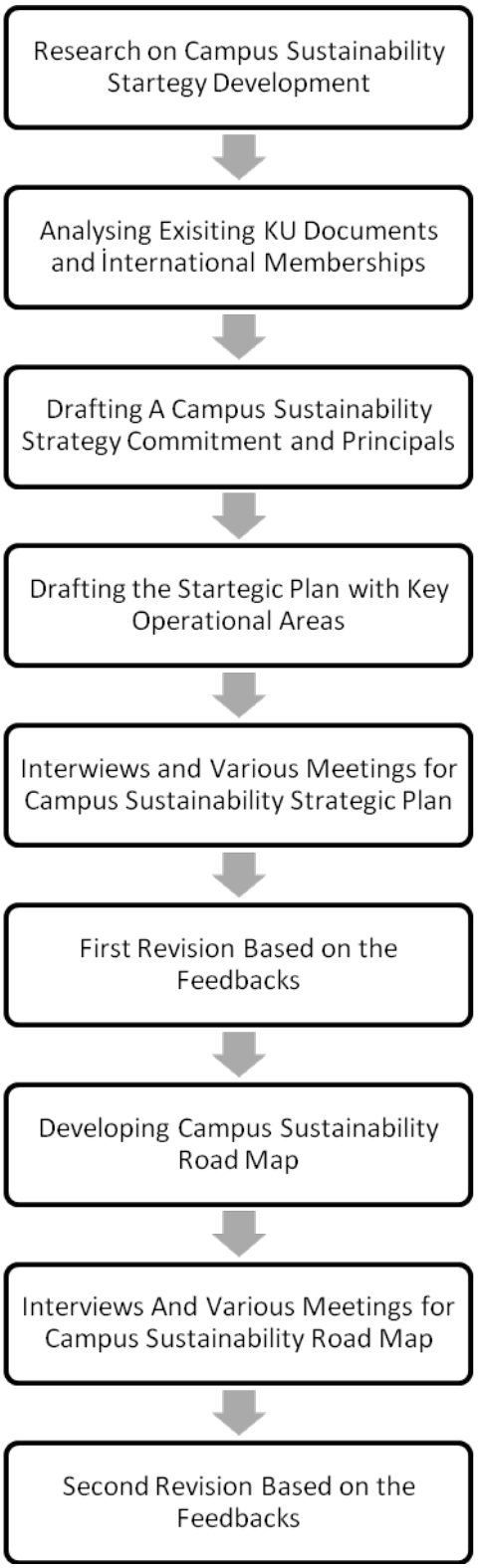

Figure 44: Work Flow Used for KU Sustainable Campus Strategic Plan and Road Map

Source: This Methodology was Developed for KU for this Study.

- ✓Principles of UN Global Compact and Principles for Responsible Management Education (PRIME) that KU committed to these principles by signing them

Indeed, KU campus sustainability principle and commitments already exist in these documents to create a holistic approach.

3.3.3 Drafting Campus Sustainability Principle and Commitments

The campus sustainability principle and commitments was drafted in five stages:

The KU Mission and Vision (Table 20) was used to draft the KU Campus Sustainability Principle and Commitments as KU Mission and Vision is the highest university statement as shared so far.

The most important thing in drafting KU Campus Sustainability Principle and Commitments was that the KU HR published the KU Code of Ethical Conduct and Practical Principles on 15.07.2013, having many references for campus sustainability.

The KU Environmental Policy developed by the Office of General Secretary was an important document to show KU's commitment on improving its environmental impact. The KU Environmental Policy was referenced in the current situation analysis of KU.

The Principles of the UN Global Compact and PRIME with which KU is the signatory shows KU's commitment to sustainability. These principles were already listed in the current situation analysis of KU.

In addition to all activities and effort existing in the university as discussed in the current Situation analysis, the foundation of KUSIF in November 2012 is an important commitment for KU to create positive social impact.

Table 20
KU Mission Statement

The principle mission of KU is to cultivate Turkey's most competent graduates, well-rounded adults who are internationally qualified; who can think creatively, independently and objectively; and who are confident leaders. Concurrently, research conducted at KU contributes to scientific development on an international scale and bolsters technological, economic and social development. KU consistently strives to advance knowledge through its efforts and to serve Turkey and humanity as a model of institutional excellence. *As a "Center of Excellence", KU facilitates the coming together of young students who possess superior skills with esteemed faculty members who possess superior knowledge and experience. Through KU's liberal-arts-inspired pedagogy and plethora of extra-curricular enrichment opportunities, students acquire the intellectual courage to inquire and question while developing the character necessary to serve as custodians of democratic values and freedom. Guided by the highest standards of academic and interpersonal development, the institution collectively imparts the critical thinking necessary to analyze knowledge, the creativity to nurture and surpass this knowledge and the curiosity for lifelong learning.* *From its curricular programs to the architectural design of its buildings, KU's student-oriented approach engenders a uniquely nurturing, yet competitive, environment. Graduates of KU become leaders in their professions and, true to Mustafa Kemal Atatürk's principles, contribute to the betterment of society. Combining traditional academic paradigms with innovative programming and successfully attracting top-tier students, faculty members and research programs, KU aims to "raise the bar" for higher education in Turkey.*

Source: www.ku.edu.tr, 2013.

3.3.3.1 Draft KU Campus Sustainability Principle and Commitments

As a result of the research conducted, the KU Campus Sustainability Principle and Commitments document was drafted to be shared with the key people at KU for feedback:

The KU Campus Sustainability Principle and Commitments

As a "Center of Excellence", KU is committed to add value to sustainable growth, and bears global responsibility to be an exemplar of a Living Laboratory for the environmental, social and economic aspects of campus sustainability through its human resources, education, research, engagement, and campus operation.

To be an example for campus sustainability, KU is committed to:

- ✓ Integrating sustainability into teaching, learning, research, operation and campus culture
- ✓ Reducing the use of resources and the operating costs
- ✓ Improving its environmental impacts
- ✓ Increasing its social impacts
- ✓ Establishing governance model and indicators for sustainability to monitor, report and improve campus sustainability

The KU Campus Sustainability Principle and Commitments are based on the University Code of Ethical Conduct and Practical Principles. KU signed United Nations Global Compact in 2007.The KU Business School has been a participant in the Principles for Responsible Management Education since 2008, and has been preparing a Sharing Information on Progress (SIP) Report on the implementation of the Principles for Responsible Management.

The KU Code of Ethical Conduct and Practice Principles published on 15.07.2013 are referenced in the Regulations of Higher Education, the Core International Human Rights Treaties, the United Nations Global Compact, and KU Administrative Staff Personnel Regulations.

Some clauses of this Code of Ethical Conduct and Practice Principles address campus sustainability and are shown in Table 21.

In addition, KU was the first university in Turkey having ISO 14001 Environmental Management Standard, an existing Environmental Policy (Table 22) developed by the Office of the General Secretary has been enhanced with a larger vision of a campus sustainability approach and integrated into the Campus Sustainability Strategic Plan.

KU Campus Sustainability Principle and Commitments were developed in a holistic approach embracing environmental, social and economic aspects of sustainability. In addition, establishing sustainability governance within the university is embedded in

Table 21
Some Clauses Related to Campus Sustainability from the KU Code of Ethical Conduct and Practice Principles

4.1 University/Employee Relationship

KU aims to be the most preferred, honorable university for any related person and stakeholder, composed of the most successful and efficient academic members and professionals adding value to sustainable growth.

- ✓ To provide equal facilities and opportunities for the training, instruction and advancement of the staff,
- ✓ To award effort and success with fair and competitive wage policies, efficient and objective performance evaluation system and practices,
- ✓ To increase attachment and commitment of the staff to the University by providing equal opportunities in promotion and rewarding,
- ✓ For employment, to seek only appropriate qualifications as eligibility criterion, to provide equal opportunities without discrimination,
- ✓ To provide clean, healthy and secure working conditions to staff
- ✓ To respect human rights

4.2 Relations with the Stakeholders of KU

- ✓ To represent and raise the prestige of "KU" in the eye of public,
- ✓ As a university, to have a sense of responsibility about social issues.

b. Social Responsibility

- ✓ To design, support and carry out studies contributing to scientific, economical, social and cultural development,
- ✓ To show awareness to social matters and to support society in its advancement.

c. Relations with Students

- ✓ To raise awareness among students of ethical values of the University and ensure that they respect those values
- ✓ To observe equal opportunities among students

d. Relations with Suppliers

- ✓ To maintain the ethical values of the University within and during the relations with suppliers

f. Global Responsibility

Environmental Protection

To improve and enable efficient implementation of environment policies of the KU,

Global Compact

To act for the benefit of our country and earth in accordance with the principles in the areas of human rights, labour, the environment and anti-corruption set by the United Nations Global Compact and to show exemplary corporate citizenship through our staff and suppliers.

Source: KU Code of Ethical Conduct and Practice Principles.

Table 22
KU Environmental Policy

✓ Applying all national environmental regulations; ✓ Supporting the environmental sustainable development by measurable targets in the campus; ✓ Determining environmental dimensions, and as well defining the types of environmental impacts and damages caused; ✓ Decreasing the pollution and waste at a minimum level; and disposing of the hazardous waste by decreasing their environmental impact at a minimum level; ✓ Setting the goals and targets, revising them each year, and as well as announcing the progress achieved; ✓ Constantly enhancing the environmental management system in the campus

Source: KU Environmental Policy, Office of the General Secretary.

the commitments. The challenge after developing a strategic plan is how KU Campus Sustainability Principle and Commitments will be implemented.

3.3.4 Drafting the Strategic Plan with Key Operational Areas

The purpose of the KU Strategic Plan for Campus Sustainability is to outline key operational areas this strategy to enhance environmental, social and economic sustainability on the campus.

Besides example universities in campus sustainability, rating systems and initiatives such as AASHE Stars, Green Metrics, ISCN and People and Planet Green League were examined to understand how they group operational areas, and how they measure performance by defining key performance indicators for each operational area in the strategic plan.

To develop a strategic plan, in addition to profiting from all example universities and rating systems, two main sources were mostly used in developing the format, operational areas and key performance indicators. These two sources were:

- ✓ "Environmental Strategy 2010 Report" of the University of Nottingham
- ✓ "STARs Technical Manual" of AASHE

As the format of the KU Strategic Plan, the format of the "Environmental Strategy 2010 Report" of the University of Nottingham was used. Each operational area in the strategic plan has objectives and key performance indicators.

The STARs Technical Manual is mostly used for the key operational areas and grouping them under main sections as well as identifying key performance indicators..

By taking into consideration KU's current situation analysis and using all other sources, a draft strategic plan for KU was developed as shown in Figure 45.

A total of 16 key operational areas (Figure 45) are foreseen under six sections where environmental, social and economic sustainability of campus are emphasized:

Section 1: Environmental Sustainability in Campus Operations
Section 2: Education and Outreach
Section 3: Research on Sustainability
Section 4: Social Sustainability in the Campus
Section 5: Economic Sustainability in the Campus
Section 6: Development and Implementation of Sustainability Policies and Efforts

For each operational area, objectives and key performance indicators specific and relevant to KU were identified and drafted based on previous research.

After possible objectives and key performance indicators for each operational area were developed, a full scope of the KU Campus Sustainability Strategic Plan based on the KU Campus Sustainability Principle and Commitments can be discussed with the key people in the campus during interviews. The objectives and key performance indicators for each operational area were shared during the first revision section after conducting interviews and various meetings to get their feedback and input.

3.3.5 Semi-Structured Interviews and Various Meetings for Campus Sustainability Strategic Plan

Most universities used in this study have working groups and committees to develop sustainability programs. For the current study, best way to develop the strategic plan and the road map was to conduct semi-structured interviews with key people at KU from various levels..

The first round of interviews and meetings was important to see the approach of the key people who will indeed internalize these objectives, and embed them into their departmental objectives. This was the first time higher senior decision makers of the university such as Vice President responsible for Research and Development and the Vice President responsible for Academic Affairs were interviewed for their opinions.

Semi-Structured Interviews and consecutive meetings and e-mailings were conducted with the following 18 key people in the university:

- ✓Vice President Responsible from Research and Development
- ✓Vice President Responsible from Academic Affairs
- ✓Dean of Students
- ✓Dean of College of Administrative Sciences and Economics
- ✓Director of Construction
- ✓General Secretary
- ✓Human Resource Director
- ✓Director of Corporate Relations and Development
- ✓Director of Communication
- ✓Technical Manager
- ✓Project Coordinator, Construction Directorate
- ✓Assistant Facilities Manager
- ✓Assistant Manager for Food and Dining
- ✓Procurement Manager
- ✓Organizational Development Consultant, HR
- ✓Director of International Office

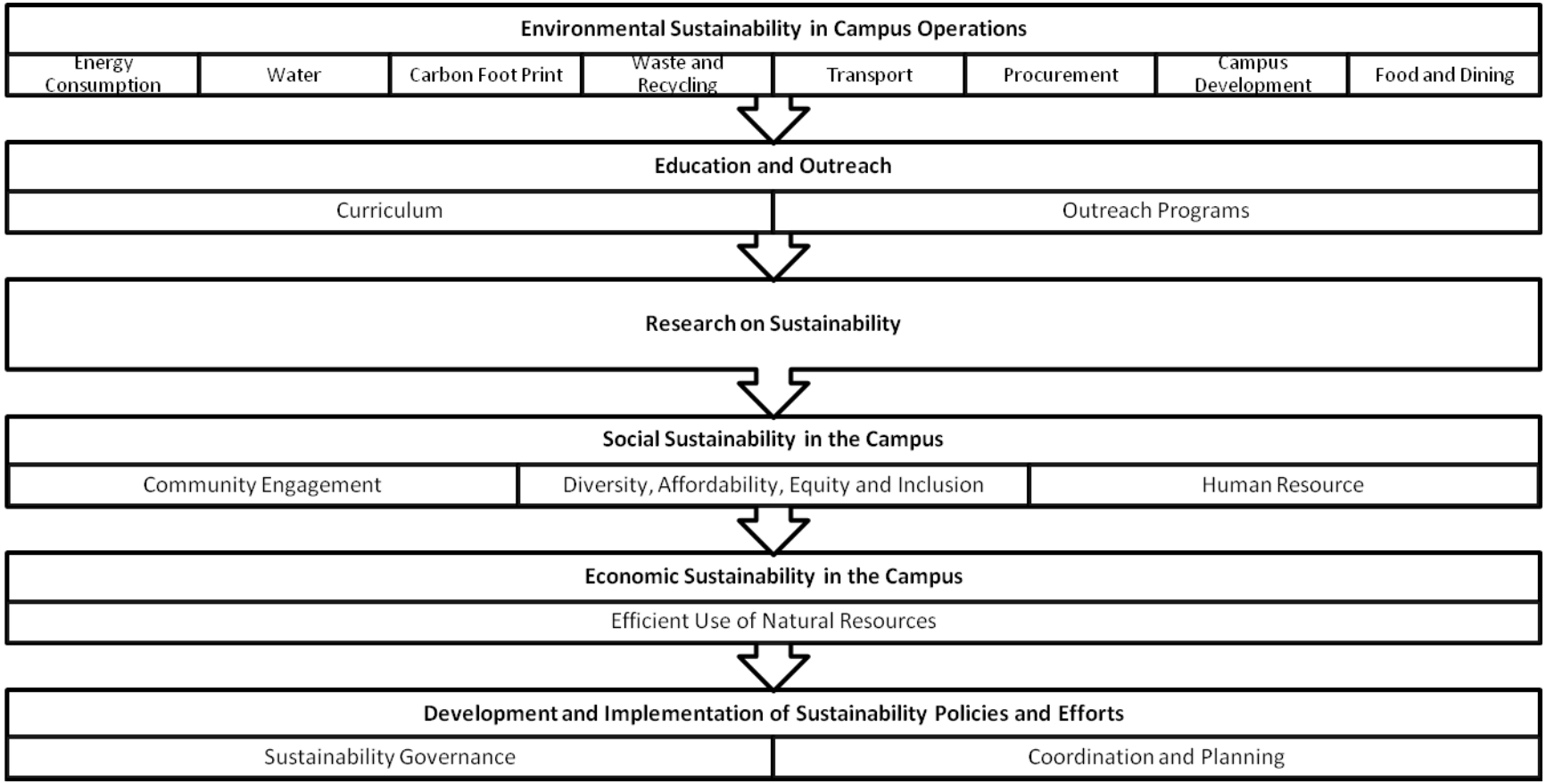

Figure 45: Draft KU Sustainable Campus Strategic Plan

Source: This Strategic Plan Is Developed for KU During the Study Based on the Structure of KU after Analyzing Example Universities, Rating Systems, and as well as KU Current Situation Analysis.

- ✓Managing Director of KUSIF
- ✓International Coordinator for Strategic Advancement

Indeed, some departments are directly involved in operational areas, while some will be important players developing and implementing the road maps (departments in action), while others will be the supporters of the objectives and activities. Every department has a role while developing or implementing the sustainability campus strategy.

3.3.6 Revision Based on the Feedback

Each semi-structured interview and meeting added new perspectives to this study, and all input was included in the revision of the strategic plan. Revisions were conducted in four steps:

Three important remarks about the campus sustainability strategy of the University were made related to the Sustainability versus Responsibility Framework, Priorities and Capacities, and Road Maps to be developed.

The KU Campus Sustainability Principle and Commitments were revised based on the feedback.

The Strategic Plan was revised by renaming the main six sections and regrouping key operational areas under these sections.

Objectives and key performance indicators for each 16 key operational areas were identified based on the feedback.

3.3.6.1 Important Remarks to Develop KU Campus Sustainability Strategy

At the end of these interviews and meetings, some important points as listed below became clear about the approach of the university on campus sustainability:

- ✓Sustainability versus Responsibility Framework
- ✓Priorities and Capacities
- ✓Road Maps

Sustainability versus Responsibility Framework

The Vice President responsible for Academic Affairs pointed out sustainability versus responsibility framework. This is a choice that the higher level management should make after this study is finished.

By signing international principles of the UN Global Compact and PRIME, and publishing the internal code of ethical conduct, KU emphasizes being a responsible institution and equipping its students with the highest sense of ethics, social awareness & responsibility and good citizenship. Many courses on ethics and social issues are offered on campus making the responsibility framework more appropriate for KU.

In this regard, sustainability could be considered under a responsibility framework. Additionally, campus sustainability could be defined for KU with the environmental aspect of the campus sustainability.

This thesis provides a perspective for campus sustainability which includes social, environmental and economic aspects of campus sustainability; in other words, what is available at KU. In addition, this strategic plan was prepared based on the most comprehensive rating systems and networks globally, the AASHE Stars Technical Manual and the ISCN Charter and Reporting Guideline, which include social and economical aspects of sustainability besides environmental sustainability in campus sustainability.

Based on the feedback from the Vice President responsible for Academic Affairs, key operational areas were regrouped under different sections (Figure 46) instead of being grouped as environmental, social and economic campus sustainability.

, The KU Campus Sustainability Principle was revised emphasizing responsibility.

Being a living laboratory was removed from the principle as KU considers being a living laboratory constraining itself under the campus borders, but instead KU sees itself offering a wide range of possibilities beyond the campus borders for its students to experience sustainability.

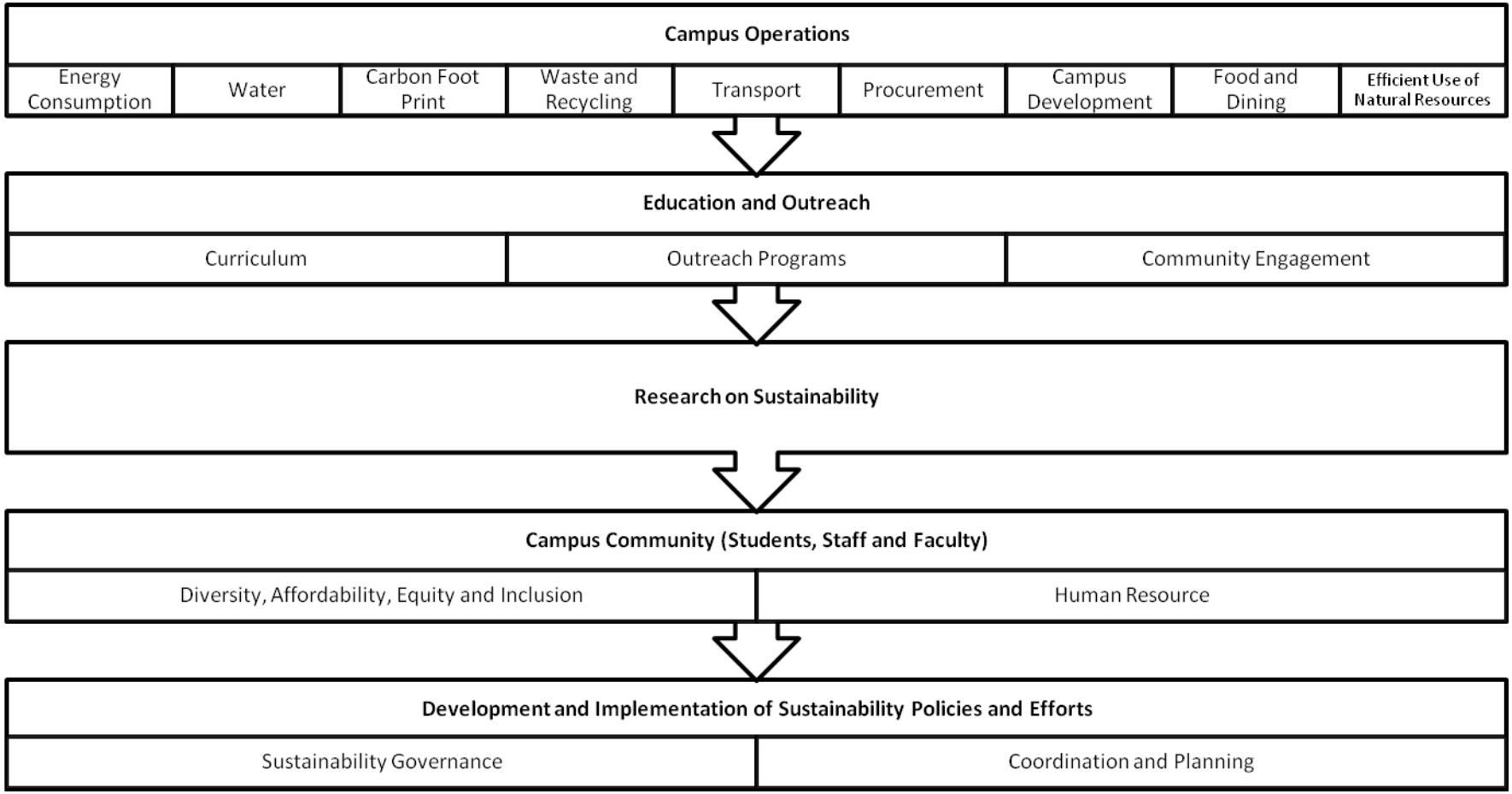

Figure 46: Revised KU Sustainable Campus Strategic Plan
Source: Revised Strategic Plan is Developed for KU as a Result of the Interviews and Meetings Conducted with Key People at KU.

Priorities and Capacities

Every university has its unique operational structure and needs which define directions for campus sustainability that the university follows. Some operational areas and programs are a priority for some universities, while for other universities, the same operational areas and programs cannot be the first priority due to other priorities and limitations. For instance, food sustainability could be a long term objective for a university, while for another university this could be short term objective. The destination of being a sustainable campus that some universities would like to go is the same; however, the journey could be different for them because they have different available resources, operational structures and needs.

Road Map

While interviewing and meeting with key people for the strategic plan, information about the road map for key operational areas was also collected which clarified how the road map for each operation area could be structured. Based on the priorities and capacities, some road maps of the operational areas are more detailed, while others should need more work and investigation beyond this thesis, depending on how much further the university would like to go in this specific area.

3.3.7 Revised Campus Sustainability Principle and Commitments

With the feedback from the Vice President responsible for Academic Affairs, the KU Campus Sustainability Principle and Commitments were revised thus:

KU Campus Sustainability Principle and Commitments

As a “Center of Excellence”, KU is committed to add value to sustainable growth and bears global responsibility to be an exemplar for the environmental, social and economic aspects of campus sustainability through its human resources, education, research, engagement, and campus operation.

To be an example for campus sustainability, KU is committed to:

- ✓ Integrating sustainability into teaching, learning, research, operation and campus culture
- ✓ Reducing the use of resources and the operating costs
- ✓ Improving its environmental impacts
- ✓ Increasing its social impacts
- ✓ Establishing governance model and indicators for sustainability to monitor, report and improve campus sustainability

Next, based on the revised KU Campus Sustainability Principle and Commitments, and feedback from the interviews the strategic plan was revised.

3.3.8 Revised Strategic Plan with Main Sections, Key Operational Areas, Objectives and Key Performance Indicators

After the feedback and input from the interviews with key people at KU, 16 key operational areas were regrouped under five main sections (Figure 46):

Section 1: Campus Operations
Section2: Education and Outreach
Section 3: Research on Sustainability
Section 4: Campus Community (Students, Staff and Faculty)
Section 5: Development and Implementation of Sustainability Policies and Efforts

Section names were changed after getting feedback from the Vice President of Academic Affairs that the “Responsibility Framework” is more appropriate for KU.

The key operational area “Efficient Use of Resources” was put under campus operations (Figure 46) as the efficient use of resources is mostly result of the campus operations. Another change is that community engagement was put under Education and Outreach (Figure 46) as the interviews clarified that community engagement has a more relevant place under Education and Outreach (Figure 46).

Based on feedback and input during the interviews and meetings, drafted key operational areas, objectives and key performance indicators were re-examined to see whether they are realistic or not. Some of them were revised and additions are made.

In this section, objectives and key performance indicators for each of the 16 key operational areas under five sections are listed as the final version of the Strategic Plan of Campus Sustainability at KU.

3.3.8.1 Campus Operations

Campus Operations are divided into nine operational areas: Energy Consumption, Water, Carbon Foot Print, Waste and Recycling, Transport, Procurement, Campus Development, Food and Dining, and Efficient Use of Resources (Figure 46). Objectives and key performance indicators of each operational area is discussed below.

3.3.8.1.1 Energy Consumption

Electricity and Natural Gas are the main energies consumed on the campus. Energy consumption objectives and key performance indicators were discussed with the Technical Manager, the Office of the General Secretary, responsible for campus energy consumption.

In order to achieve some of the objectives, Technical Services should work with other units in the campus such as the Dean of Students, HR, Student Clubs, the Event Coordinator, the Construction Directorate, and Research Centres especially KUTEM.

Objectives

- ✓ Efficient use of energy (< 150 kWh/m²/year)
- ✓ Following the new technologies, and doing feasibility studies to renew the existing technologies to save energy while giving fast and uninterrupted service to the campus community

- ✓ Reduce the overall cost of energy
- ✓ Raise the awareness on the cost of energy
- ✓ Reduce energy waste
- ✓ Ensure that energy consumption and low carbon energy are considerations in the procurement
- ✓ Minimise pollution
- ✓ Encourage academic research and implementation to increase energy efficiency in the campus

Key Performance Indicators

- ✓ Energy consumption per m² Gross Internal Area (GIA)
- ✓ Energy emissions per m² GIA

In 2012, total energy consumption from natural gas, diesel fuel and electricity was 2439.272 TEP. The total indoor area of the campus is 153000 m². **0.015 TEP/m²** (2439.272 TEP/153.000 m²) which is **174.45 kWh** is energy consumption per m² in the campus. In 2012, GHG caused by energy (energy used by purchased electricity) was 7542.43 tons. **0.049 tons of GHG/m² GIA** (7542.43 tons of GHG/153000 m²) was emitted in the campus.

3.3.8.1.2 Water

Water use in the campus is again under the responsibility of the Technical Manager. Objectives and key performance indicators of key operational area "Water" regarding water use and water conservation measures was discussed with the Technical Manager.

In order to achieve some of the objectives, Technical Services should work with other units in the campus such as the Dean of Students, HR, Student Clubs, Event Coordinator, and Facilities Management.

Objectives

- ✓ Use water resources efficiently

- ✓ Reduce water consumption by implementing water conservation measures
- ✓ Reduce water costs

Key Performance Indicators

- ✓ Water Consumption per m^2 GIA
- ✓ Water Consumption per person GIA

In 2012, 149797 m^3 of water was consumed on the campus. **0.97 m^3 water per m^2 GIA** was consumed while **24.96 m^3 water per person** was consumed on the campus.

3.3.8.1.3 Waste and Recycling

Objectives and key performance indicators of the key operational area "Waste and Recycling" was discussed with the Assistant Facilities Manager, the Office of the General Secretary. However, construction waste sent to a landfill is under the responsibility of the Construction Directorate. Construction waste related to the objective and performance indicator is under the key operational area "Waste and Recycling", but the performance will be conducted by the Construction Directorate.

The Facilities Management should work with many stakeholders on the campus to achieve its objectives, especially, the Construction Directorate, Laboratories, HR, the Dean of Students, Student Clubs, Faculties, the Event Coordinator are important stakeholders in the campus to work with for this purpose.

Objectives

- ✓ Minimise the production of waste through reduction, reuse and recycling
- ✓ Enhance constantly the environmental management system in the campus
- ✓ Apply all national environmental regulations
- ✓ Determine environmental dimensions, and as well define the types of environmental impacts and damages caused

- ✓ Decrease the pollution and waste at a minimum level; and dispose of the hazardous waste by decreasing their environmental impact at a minimum
- ✓ Encourage the use of 'recycled' products where appropriate
- ✓ Work with the Construction Directorate to minimise the amount of construction waste sent to landfill
- ✓ Reuse of construction materials and furnitures

Key Performance Indicators

- ✓ Waste reduction over time per person (calculated by the AASHA Stars technical Manual Waste Reduction calculation methodology)
- ✓ Recycled waste proportion %
- ✓ Construction waste sent to landfill
- ✓ Continuation of reuse of construction materials and furniture (at present the reuse rate is 70.0%; but this percentage could decrease as the construction materials and furniture get older.)

3.3.8.1.4 Carbon Footprint (Energy, Waste, Transport, Procurement)

The Carbon Footprint of the campus was calculated by the Technical Manager based on the yearly consumed energy data. On the campus, the total indoor area is 153000 m² where energy is used. Besides energy, carbon caused by waste, transport and procurement should be included in the carbon footprint of the university.

The most important contribution to the key operational area "Carbon Footprint" will be the creation of a carbon reduction culture in the university, which is not present right now, through the Communication Office, Student Clubs, the Dean of Students and HR. Other departments under the General Secretary responsible for transport, waste, the Event Coordinator and the Procurement Management should also be involved in carbon footprint related objectives to improve the carbon footprint of the university.

Objectives

- ✓ Set targets for GHG emissions
- ✓ Create a carbon reduction culture
- ✓ Reduce energy use in existing buildings and minimize energy use in new buildings

Key performance Indicators

- ✓ GHG Reduction to baseline
- ✓ Carbon emissions per person
- ✓ Energy emissions per m² GIA

In 2012, total GHG emissions equivalent to C02 in the campus was 10250.56 tons. The total campus community is 6000 people. **1708 tons of GHG emissions equivalent to CO2 is emitted per person** on the campus.

3.3.8.1.5 Transport

Transport on campus is under the responsibility of the Office of the General Secretary. The objectives and key performance indicators for the key operational area "Transport" was discussed with the Chief of Security and the Assistant Facilities Manager.

Objectives

- ✓ Encourage alternative transportation such as public transportation, student and staff shuttles
- ✓ Reduce single occupancy car use
- ✓ Minimise the amount of intercampus travel undertaken by car (Batı Campus-Rumelifeneri Campus or Faculty Housing)

Key performance Indicators

- ✓ Percentage of single occupancy care use
- ✓ Number of staff and students using public transportation and campus shuttles

3.3.8.1.6 Procurement

Procurement Management is not the decision maker for buying products or services, but the provider of the decided products or services. Decisions are departmental based, where KU staff and faculty submit requests to the Procurement Management providing alternatives and prices to make the purchase. Procurement objectives promote and encourage the purchase of environmental products and services and incorporate the consideration of sustainability in the contracts.

The objectives and key performance indicators of the key operational area "Procurement" was mainly discussed with the Procurement Manager. However, the Technical Manager, the Construction Director, the Project Coordinator of the Construction Directorate and Assistant Facilities Managers also provided their feedback on the purchase of products and services as they do their own purchases with the support of the Procurement Management.

Objectives

- ✓ Promote and encourage the purchase and the use of 'recycled', energy efficient, environmental and socially preferable products and services where appropriate
- ✓ Incorporate consideration of "sustainability" in the contracts where appropriate
- ✓ Encourage the purchase from local producers where appropriate

Key performance Indicators

- ✓ Improvement Report (for the first two years)

Even though purchasing decisions do not depend on the Procurement Management where each department makes its own purchasing decision, Procurement Management could play an important role in guiding and encouraging the campus community to purchase environmentally and socially preferable products and services where appropriate.

3.3.8.1.7 Campus Development and Landscape

The objectives and key performance indicators of the key operational area "Campus Development and Landscape" was discussed with the Construction Director, the Project Coordinator of the Construction Directorate. Landscape of the campus and new buildings are developed by the Construction Directorate, but of course, maintenance is done by the Facilities Management.

Objectives

- ✓ Protect the human health of building occupants by monitoring and protecting indoor air quality
- ✓ Include environmental targets for the design, construction and occupation of new buildings and renovations
- ✓ Consider opportunities to improve environmental performance to be sought as part of the regular maintenance schedules and refurbishments of buildings
- ✓ Continue to manage our grounds with due regard to the environment
- ✓ Protect the existing natural landscaping and as well as diversify the plants in our sites
- ✓ Protect the existing forest fauna
- ✓ Foster greater partnership with other organisations to promote sustainable grounds practice
- ✓ Incorporate environmental sustainability into the purchases of goods and services where ever appropriate

Key performance Indicators

- ✓ < 800 ppm Carbon dioxide level for indoor quality
- ✓ Awards for sustainable construction, design and landscaping
- ✓ Green area per person (green area m^2/person)
- ✓ Number and diversity of plants in the campus

The current acreage of the KU Rumelifeneri Campus is 249801 m^2. The total acreage of the buildings on campus (base area) is 33277 m^2; green area on

campus (including the courtyards and roads in the campus) is 216524 m² (249801 m² – 33277 m²). The campus population is around 6000 people (students, faculty and staff). The green area per person on the campus is 36.08 m²/person (216524 m² / 6000).

3.3.8.1.8 Food and Dining

Food and Dining is under the responsibility of the Assistant Facilities Manager, Office of the General Secretary. Objectives and key performance indicators of the key operational area "Food and Dining" was discussed with the Assistant Facilities Manager responsible for Food and Dining.

The objective "Composting food waste" is put under the operational area "Food and Dining" and to be worked with the Assistant Facilities Manager Responsible for Waste and Recycling. The Facilities Management already gives high importance to food safety and hygiene on the campus. However, sustainable food practices are a new territory for them and should be investigated further as sustainable food practices are not always economic.

Objectives

- ✓ Promote sustainable food practices
- ✓ Provide food safety and hygiene
- ✓ Provide the best quality of food with the cheapest price possible
- ✓ Composting food waste whenever possible
- ✓ Promoting lessening of food waste created by our food preparation and consumption

Key performance Indicators

- ✓ Sustainable food options
- ✓ Percentage of food waste composting
- ✓ Percentage of food waste reduction

3.3.8.1.9 Efficient Use of Natural Resources

Economic sustainability is embedded in all campus operations. Environmental sustainability brings efficient use of resources and cost savings while decreasing the environmental impact of the campus. The entire campus community is responsible for the efficient use of natural resources, but mainly campus operations are responsible for the efficient use of our natural resources.

Objectives and key performance indicators of the operational area "Efficient Use of Natural Resource" was discussed with the departments of the Office of the General Secretary and the Construction Directorate. In addition, the Human Resource Director also shared her feedback as one of the objectives is to provide a healthy and sustainable balance between human capital, natural capital and financial capital of the university.

Objectives

- ✓ Raise the awareness of the cost of energy
- ✓ Use energy, water and other natural resources efficiently
- ✓ Reuse of construction materials and furniture
- ✓ Provide a healthy and sustainable balance between human capital, natural capital, and financial capital of the university

Key performance Indicators

- ✓ Energy consumption per m^2 GIA
- ✓ Water consumption per m^2 and per person GIA
- ✓ Continuation of reuse of construction materials and furniture (at present the reuse rate is 70.0%; but this percentage could decrease as the construction materials and furniture get older.)
- ✓ Report on employee satisfaction evaluation

3.3.8.2 Education and Outreach

Education and Outreach is the second main section of the strategic plan. Under this section are three key operational areas: Education, Outreach and Community Engagement (Figure 46). Below, the objectives and key performance indicators of Education, Outreach and Community Engagement are discussed. Education and Outreach require the collaboration of different stakeholders on campus. In addition, the Communication Office plays a critical role in all outreach activities to support the creation of a sustainable campus culture through effective communication on the campus.

3.3.8.2.1 Education

Objectives and key performance indicators of the operational area "Education" was discussed with the Vice President Responsible for Academic Affairs. Previous discussions with Deans and Directors to understand the current situation at KU helped to set the objectives of the operational area "Education". Additionally, the Dean of Students, the Director of International Programs, and the International Coordinator for Strategic Advancement provided their feedback on the objectives and key performance indicators.

The OIP through international programming and the Dean of Students through new courses and student clubs have the ability to contribute to these objectives.

Each faculty has their own academic committees so, how the faculties will be involved in these objectives are the decisions for each faculty academic committee.

Objectives

- ✓ Understand sustainability more fully within current programmes and curriculum
- ✓ Incorporate environmental, social and economic sustainability into the programmes and curriculum

- ✓ Encourage and support the development of sustainability culture within teaching and learning
- ✓ Develop sustainability immersive experience among students within and outside the campus

Key performance Indicators

- ✓ The numbers of students on sustainability related modules, courses
- ✓ The number of sustainability focused and related modules, courses
- ✓ Sustainability courses/total courses
- ✓ Sustainability immersive programs offered during the past three years
- ✓ Survey result of sustainability literacy of the students (knowledge of sustainability topics)

3.3.8.2.2 Outreach

The operational area as "Outreach" requires the collaboration of many units on campus. The main units that should be involved are KUSIF, the Dean of Students, Student Clubs, the Office of the General Secretary, and the Human Resource Directorate. Objectives and key performance indicators of the operational area was discussed with the Director of Communication, the Dean of Students and the Human Resource Director. In addition, whenever it is necessary, faculties could support these objectives.

Objectives

- ✓ Foster a culture of responsible good citizenship with the highest sense of ethics among all staff and students to integrate sustainability into all levels of the campus culture
- ✓ Raise visibility, understanding and awareness of sustainability issues within the campus community, and communicate the achievements to all internal and external stakeholders
- ✓ Develop outreach programs for the campus community
- ✓ Encourage active participation of the campus community in the outreach programs

Key performance Indicators

- ✓ Communication tools developed to foster campus sustainability such as materials and web site.
- ✓ Number of sustainability events and organizations, and other sustainability learning experiences outside the classrooms for students and staff
- ✓ Increased sustainability literacy and participations in the campus community (measured through surveys each year)

3.3.8.2.3 Community Engagement

Through the operational area "Community Engagement", KU has a channel to give back to the community. The objectives and key performance indicators were mainly discussed with KUSIF Executive Board Members and the Dean of Students. KUSIF and Student Clubs are the most important channels to give back to the community. Other units of the KU could collaborate with KUSIF and get their support to develop and engage in community engagement programs.

Objectives

- ✓ Give back to the community through engagement, community service, and partnership
- ✓ Encourage the campus community to take action creating positive change in the community

Key performance Indicators

- ✓ Current partnerships and/or partnerships that were active during the past three years
- ✓ Current intra-campus collaborations and/or collaborations that were active during the past three years

3.3.8.3 Research on Sustainability

Objectives and key performance indicators of the main section “Research” (Figure 46), which is one of the important components of campus sustainability, was discussed with the Vice President responsible for Research and Development. In addition, the Director of International Office and the International Coordinator for Strategic Advancement provided feedback as OIP promotes international research collaboration.

Creating stronger links between campus operations and research was discussed with the Director of KUTEM, as that program already has some research on energy efficiency that could be implemented as a pilot in the campus.

Objectives

- ✓ Promote innovation in the sustainability area
- ✓ Encourage multidisciplinary research on environmental, economic and social aspects of sustainability through internal and external collaborations
- ✓ Create stronger links between campus operations and research

Key performance Indicators

- ✓ Research funding for sustainability related research/ total research funding
- ✓ Sustainability publications (sustainability should be defined)
- ✓ External collaborations
- ✓ Research collaborations with the campus operations

3.3.8.4 Campus Community (Students, Staff and Faculty)

As one of the main sections of the KU campus sustainability, the campus community strategic plan is composed of two key operational areas (Figure 46): Diversity, Affordability, Equity and Inclusion and Human Resources.

The HR Directorate published the KU Code of Ethical Conduct and Practice Principles in July 2013. This is an important document for the main section “Campus Community”.

Below, objectives and key performance indicators of these two key operational areas are discussed.

3.3.8.4.1 Diversity, Affordability, Equity and Inclusion

Objectives and key performance indicators of the operational area “Diversity, Affordability, Equity and Inclusion” was discussed with the Human Resource Director, the Organizational Development Consultant and the Dean of Students. In addition, the Director of Corporate Relations and Development gave her feedback as her office is responsible for the Anadolu Scholarship, which brings hundreds of successful students to KU through their scholarship.

The campus community has been diversifying with an increased number of full time international students, exchange students, international staff and faculty, disabled students and staff, and students coming from different parts of Turkey with a scholarship.

Objectives

- ✓ Promote a culture of diversity, affordability, equity and inclusion among the campus community
- ✓ Develop affordable programs accessible to all
- ✓ Promote and manage effectively diverse student body, faculty, and staff

Key performance Indicators

- ✓ Percentage of disabled staff
- ✓ Percentage of disabled students
- ✓ Percentage of woman among staff and faculty
- ✓ Percentage of woman among management
- ✓ Percentage of scholarship offered to students

- ✓ Report on support programs offerings and status on underrepresented groups in the campus
- ✓ Report on affordability and access programs, policies, and practices

3.3.8.4.2 Human Resources

The HR Directorate already has a set objectives and key performance indicators to make KU campus socially sustainable through the KU Code of Ethical Conduct and Practice Principles, published in July 2013. Treating and remunerating staff responsibly and fairly, and as well as offering benefits and other assistance that serve to respectfully and ethically compensate staff are already part of HR strategy. Plus, KU Akademi has already been providing staff training.

A new addition to these objectives could be incorporating sustainability with more special topics on environmental and social sustainability into the programs of HR.

Objectives

- ✓ Incorporate sustainability into the human resources programs and policies
- ✓ Treat and remunerate staff responsibly and fairly
- ✓ Offer benefits, and other assistance that serve to respectfully and ethically compensate staff
- ✓ Develop faculty and staff training and development programs in sustainability.

Key performance Indicators

- ✓ Training budget spent to staff training on sustainability
- ✓ Training hours per person on sustainability related topics
- ✓ Recruitment satisfaction survey (to candidate and manager)
- ✓ Employee satisfaction survey
- ✓ Compensation status and offerings
- ✓ Employee satisfaction evaluation conducted
- ✓ Program status and offerings of the staff professional development in sustainability

- ✓ Program status and offerings of sustainability in the new employee orientation

3.3.8.5 Development and Implementation of Sustainability Policies and Efforts

"Development and Implementation of Sustainability Policies and Efforts" is the last main section of the KU campus sustainability strategic plan. The section is composed of two key operational areas (Figure 46): "Sustainability Governance" and "Coordination & Planning".

These two key operational areas are important to establish governance model and indicators for campus sustainability, to monitor, report, and improve campus sustainability.

Below, objectives and key performance indicators of operational areas "Sustainability Governance" and "Coordination & Planning" are discussed.

3.3.8.5.1 Sustainability Governance

Objectives and key performance indicators of the key operational area "Sustainability Governance" was discussed with the HR Director, the Communication Director, the Vice President responsible for from Academic Affairs and the Office of the General Secretary.

Objectives:

- ✓ Motivate and empower the campus community to support the development, implementation, and evaluation of campus sustainability policies
- ✓ Work towards integrating sustainability into all strategies, plans and policies as they come up for renewal

Key performance Indicators

- ✓ Signing ISCN Charter and Higher Education Sustainability Initiative (HESI); and prepare sustainable campus progress report to be publicly published

- ✓ Rating by the internationally recognized campus sustainability institution

3.3.8.5.2 Coordination and Planning

Objectives and key performance indicators of the key operational area "Coordination and Planning" was discussed with the HR Director, the Communication Director, the Vice President responsible for Academic Affairs and the Office of the General Secretary.

Objectives

- ✓ Set goals and targets for campus sustainability, revise them each year, and announce the progress achieved
- ✓ Set the coordination, planning, evaluation and reporting structure for campus sustainability

Key performance Indicators

- ✓ Sustainability committee composition and practices, office status, and/or coordinator position status.
- ✓ University documents having references on sustainability
- ✓ Sustainability plan and revisions

The proposed strategic plan to be a sustainable campus was developed with objectives and key performance indicators of 16 operational areas. Implementation of the strategic plan is the next step by developing a road map with possible activities and programs.

3.3.9 Campus Sustainability Road Map

After developing the KU sustainable campus strategic plan, the next step is to prepare a road map to implement the strategic plan. The campus sustainability road map will be the guide for actions to be taken in short, medium and long terms to actualize the strategic plan. Steps 7, 8 and 9 were conducted to develop the road map.

7th step, *KU Sustainable Campus Road Map*

8th step, *Semi-Structured Interviews and Various Meetings for Campus Sustainability Road Maps*

9th step, *Second Revision Based on Feedback*

In this thesis, actions in the campus sustainability road map are grouped as short (1year), medium (2 years) and long term (3 years):

Actions to be taken in short term are mostly the actions that could be realized in short term with the available resources, or have already been in progress by the departments on campus.

Actions to be taken in medium term are mostly the actions that could be realized in medium term, which need some time to work on and coordinate with other departments. To implement medium term actions, the strategic plan should be accepted and understood within the KU campus community.

Actions to be taken in long term are mostly the actions that could be realized in long term, which need senior management commitment in finances and human resources to the campus sustainability strategic plan. In this thesis, the intention is to develop and propose a general road map that can guide departments to develop their own detailed road maps for sustainability. The road maps of some of the main sections are more detailed because there are more actions that could be possibly taken without a financial or human capital burden, there is a higher interest from the departments or more data is provided to develop a road map.

Road maps for each of the 16 key operational areas were developed and discussed with the key people on campus (Table 23). Indeed, the strategic plan development process also provided input into the road maps as key people identified possibilities and capacities of their departments to engage in the road maps. Suggestions for possible activities were made, and these activities were put in the road maps after discussing the feasibility of implementing them with the stakeholders on campus.

Table 23
KU Campus Sustainability Road Map

Activities or Programs for KU Campus Sustainability Road Map	Short Term	Medium Term	Long Term
1. Campus Operations			
Energy Consumption			
Ongoing Maintenance and Renovation Program	x		
Energy Conservation Initiatives	x		
✓ ***LED Program***	x		
✓ ***Motion Sensors Program***	x		
Energy Conservation Outreach Program	x		
Solar Energy and Wind Energy (Renewable Demonstration Project with KUTEM)		x	
Green Office Certification and Award Program		x	
Energy Efficiency Research Implementation Program		x	
New Technology Program			x
✓ ***Transition to Trigeneration***			x
✓ ***Usage of Water-Cooled Chillers***			x
✓ ***Solar and Wind Energy Sources for On-Site Energy Production and Usage***			x
LEAD or BREAM Certificates			x
Water			
Grey Water System	x		
Water Saving Shower and Faucets Aerators	x		
Waterless Cleaning and Eco-labelled Cleaning Products	x		
Central Potable Water System		x	
Water Saving Outreach Program “Trayless Dinig”			x
Waste and Recycling			
Waste and Recycle Progress Program	x		
Zero Waste Program	x		
Green Office Certification and Award Program		x	
Waste-to-Energy Production			x
Carbon Footprint			
Carbon Neutral Event Guide	x		
Carbon Footprint Reduction Program	x		
KU Carbon Calculator	x		
Climate Action Plan		x	x

Transport			
Campus Bike Program	x		
KU Car-Sharing Program	x		
KU Carpool Program	x		
KU Sustainable Campus Fleet		x	x
KU Sustainable Campus Fleet Demonstration Program		x	x
Procurement			
EconGreen Program	x		
Consideration of Sustainability in the New Contracts		x	
Supporting the Local Economy through Local Purchasing		x	
Consideration of Sustainability in the Contract Renewals			x
Campus Development			
Energy Efficiency during Refurbishment and Renewals	x		
Energy Architecture		x	
Monumental Trees		x	
KU Arboretum		x	x
LEED and BREEAM Certificate			x
Food and Dining			
Feasibility Study	x		
Food Composting Program		x	
Local Food Sourcing Program		x	
Sustainable Food Lessons		x	
Sustainable Food Program			x
Trayless Dining			x
Efficient Use of Resources	x	x	x
Energy Conservation Initiatives (LED Program, Motion Sensors, etc.)	x		
Energy Conservation Outreach Program	x		
Grey Water System	**x**		
Water Saving Shower and Faucets Aerators	**x**		
Waterless Cleaning and Eco-labelled Cleaning Products	**x**		
Waste and Recycle Progress Program	**x**		
Carbon Neutral Event Guide	**x**		
Carbon Footprint Reduction Program	**x**		
Campus Bike Program	**x**		
KU Car -Sharing Program	**x**		
EconGreen Program	x		
Energy Efficiency during Refurbishment and Renewals	x		
Campus Sustainability Outreach Days	x		

Campus Sustainability Fact Sheets and Guides	x		
Campus Sustainability Procedure and Reporting	**x**		
Sustainability Task Force	**x**		
Sustainability Plans, Yearly Objectives and Road Maps	**x**		
Green Office Certification and Award Program		x	
Central Potable Water System		**x**	
Consideration of Sustainability in the Contracts		x	
Energy Efficiency Research Implementation Program		**x**	
Energy Architecture		x	
Food Composting Program		x	
Sustainability Literacy Survey to Campus Community		x	
Student Club Related to Sustainability		x	
Sustainability Orientation and Trainings for Students, Staff and Faculty		x	
Campus Sustainability Office		**x**	
New Technology Program			**x**
Water Saving Outreach Program “Trayless Dinig”			**x**
Waste-to-Energy Production			**x**
Climate Action Plan			**x**
KU Sustainable Campus Fleet			**x**
Sustainability Fund for Students			x
Institutional Cultural Development Program			**x**
2. Education, Outreach and Community Engagement			
Education			
Sustainability Curriculum Integration Coordination and Workshop	x		
Support Unit to Sustainability Projects	x		
Campus Sustainability Project Integration	x		
New Courses or Modules Related to or Focused on Sustainability		x	
Sustainability Immersive Programs		x	
✓ ***International Summer Sustainability Program***		x	
✓ ***Sustainability Field Experience***		x	
Graduate Programs Related to or Focused on Sustainability			x
Outreach			
Sustainability Improvements in ELC for Kids	x		
Campus Sustainability Outreach Days	x		
Campus Sustainability Fact Sheets and Guides	x		
KUTEM and Koç High School Outreach Program	x		
Pilot Sustainability Literacy Survey	x		
Sustainability Literacy Survey to Campus Community		x	
Student Club Related to Sustainability		x	

Student Sustainability Orientation		x	
Sustainability Orientation for Exchange Students		x	
Green Job and Internship Program		x	
Sustainability Fund for Students			x
Community Engagement			
Project Development and Youth Projects Program	x		
Community Engagement and Leadership Track Course on Social Impact Creation	x		
Sarıyer Urban Collaboration	x		
Impact Through Education	x		
SWOT Team	x		
KUSIF Social Impact Small Grants		x	
Sarıyer Mentorship Program			x
3. Research			
Sustainability Research Identification and Faculty Engaged in Sustainability Related or Focused on Sustainability	**x**		
Sustainability Summer Research Program	**x**		
International Research Collaboration Program on Sustainability		**x**	
Campus Sustainability Demonstration Projects with KU Research Centers		**x**	
Technology Transfer Office (TTO) Sustainability Projects			**x**
4. Campus Community			
Diversity, Affordability, equity and Inclusion			
Training Programs	**x**		
New Staff Orientation	**x**		
Support Programs for Underrepresented Groups in the Campus	**x**		
Scholarship Programs		**x**	
Institutional Cultural Development Program			**x**
Measuring Campus Diversity Culture in the Campus			**x**
KU without Barriers			**x**
Human Resource			
Koç İnsan	**x**		
Fringe Benefits	**x**		
Koç Academy	**x**		
Trainings and Orientation for New Staff (Ethical Issues)	**x**		
Health and Wellness Program	x		
Trainings and Orientation for New Staff (Environmental Sustainability)		x	
Performance Evaluation		x	
Institutional Cultural Development			x

5. Development and Implementation of Sustainability Policies and Efforts			
Sustainability Governance			
Campus Sustainability Procedure	x		
Campus Sustainability Road Maps	x		
Campus Sustainability Report	x		
Membership to Networks		x	
Sustainability Integration into Documents			x
Coordination and Planning			
Sustainability Task Force	x		
Sustainability Working Groups	x		
Sustainability Student Leaders	x		
Sustainability Plans and Yearly Objectives, Road Maps	x		
Campus Sustainability Office		x	

Source: KU Sustainability Road Map is Prepared Specific to KU Needs, Capacity, Priorities and Structure Based on the Interviews, Various Meetings, and Researches on Sustainable Campus Implementations in Example Universities and Others in the World.

The main idea is to use the existing sources more efficiently while improving their environmental impact and creating more social impact. Many proposed activities will provide new ways of doing business on the campus without having additional budget or human resources. While other activities will need the commitment of the higher level management, as they require a budget and commitment to sustainability to improve the environmental impact of the university.

3.3.9.1 Campus Operations

Campus Operations are divided in 9 operational areas: Energy Consumption, Water, Carbon Foot Print, Waste and Recycling, Transport, Procurement, Campus Development, Food and Dining, and Efficient Use of Resources (Figure 46). Short, medium and long term road maps with possible activities and programming of each operational area are examined.

3.3.9.1.1 Energy Consumption

Energy consumption is a key operational area, which is also a major contributor to the carbon foot print of the university. Continuous investments in the

Maintenance and Renovation Program the Energy Conservation Initiatives such as the LED Program, and the Motion Sensors Program have been implemented by the Technical Services to decrease the cost of energy and use energy efficiently. Most importantly, among Turkish universities, KU is one of the few universities having a cogeneration facility.

However, what are lacking are outreach programs to raise awareness on the cost of energy and energy efficiency among the campus community. In addition, KUTEM is a very important asset for the university that could collaborate with the Technical Services to develop campus demonstration and research projects. In addition, the Green office Certificate and Award Program could be an important way to raise awareness on energy efficiency and encourage behavioural change of the campus community. Consequently, The Energy Conservation Outreach Program, Solar Energy and Wind Energy Demonstration Projects, and the Energy Efficiency Research Implementation Program are prioritised, and need other units to collaborate with the Technical Services.

Short Term

Ongoing Maintenance and Renovation Program

Automation systems are renovated every year based on the yearly plan. This renovation program provides 5.0% energy saving to the campus.

A priority of expiration and renovation time feasibility for all technical equipment to maintain has already been made. Expiration of technical equipment was decided based on international standards and producers' suggestions. Technical Services developed a maintenance program.

Existing technical equipment are changed based on the number of problems caused during operations; equipment changes are postponed through routine maintenance. If the repair cost of the equipment is 40.0% of the price of the equipment, then renovation of the equipment is planned.

Maintenance and Renovation Programs are two important continuing programs which are budgeted yearly and executed.

Energy Conservation Initiatives

LED Program

Led armatures are used in all renovations and in new buildings.. Every year, it is possible to see new technology armatures with increased quality and a cheaper price. The LED Program is planned and budgeted yearly and existing armatures are gradually changed on the campus.

Motion Sensors Program

Motion sensors for energy conservation have already been implemented on campus. Motion sensors are used especially in toilets and corridors of the dorms as well as faculty buildings. In new buildings, motion sensors are used in mostly common areas.

Energy Conservation Outreach Program

Besides continuous infrastructure investment in the campus for energy conservation, some energy conservation outreach programs could be planned to encourage the campus community to make better energy efficiency choices as energy use is important to improve the environmental impact of KU. The program could raise the awareness on the cost of energy as well as support behavioral change through education. This program could start as a pilot in one of the faculty, and could be scaled to the campus based on the experience and measurable results. This program could also be an important component of creating a carbon reduction culture on the campus.

An “Energy Conservation Outreach Program” could be developed in five steps in collaboration with the Dean of Students, the Faculty in the pilot, the newly opened Energy Student Club, and HR.

- ✓ Decide which the building / buildings to start
- ✓ Design education and promotion modules for the users of these buildings
- ✓ Train the trainers and establish a team
- ✓ Start the program
- ✓ Measure the results
- ✓ Based on the results, evaluate the program and scale it in the campus

Medium Term

Solar Energy and Wind Energy Renewable Demonstration Project with KUTEM

KUTEM and Technical Services could work together for some demonstration renewable projects in the campus. This will require a budget allocation from the Office of the General Secretary. Both KUTEM and Technical Secretary are already engaged in collaboration. These demonstration projects could be used to raise awareness on renewable energy, and be part of the courses offered on energy at KU.

Green Office Certification and Award Program

This could be an important internal program for the staff and faculty on campus to promote energy efficiency and encourage behavioral change. This program should be designed based on the specific structure of the KU Campus together with all General Secretary Departments with the support of other stakeholders in the campus.

Similar programs have been implemented at Boston University, California State University Long Beach, University of Colorado, University of Southern California, and Rice University.

Indeed, the certificate program could only cover energy usage, or other areas such as waste and recycling, purchasing of office supplies, participation in green events and networking, food and beverages, transportation, and IT,. depending

on how other departments of the Office of the General Secretary are involved. The program could be easily designed and implemented with the existing available human resources within KU by collaborating with other units, and does not require a financial investment.

Every year HR organizes the Annual Award Program of the Green Office Award for departments, faculty and staff based on several criteria and categories. The Green Office Award could be given through HR to an office during the annual award program.

Energy Efficiency Research Implementation Program

The Energy Efficiency Research Implementation program could be run in collaboration with Technical Services, the Construction Directorate and KUTEM for energy efficiency implementations on campus.

KUTEM already has some research projects on its agenda which could be implemented in the buildings at KU to make them more energy efficient such as: 1) Some implementations of nano insulatation; 2) Photo-catalytic, self cleaning coating; 3) Research on near-infrared reflecting paints; 4) Research on ventilation systems.

Long Term

New Technology Program

New Technologies are always followed and feasibility studies are conducted by Technical Services.

Transition to Trigeneration

During the summer of 2012, the feasibility of transition to trigeneration was made for waste heat recovery, but, the Trigeneration Project was cancelled. The return on investment for the Project is 11 years due to the need for renewing the cogeneration power engines because the number of breakdowns of the engines has increased.

However, transition to trigeneration should be reconsidered for the long term investment by taking into consideration the societal cost and improved environmental impact of the university. The existing cogeneration facility provides 35.0% financial saving, and as well as provides 65.0% of the heat needed to produce hot water in dorms and heating of the campus.

Usage of Water-Cooled Chillers

Three out of the 24 compressors of the existing air-cooled chillers were renewed. During the process, the feasibility of transitioning to water-cooled chillers was made. Even though water-cooled chillers consume less energy, they have a higher maintenance cost. The return on investment of transitioning to water-cooled chillers was calculated as 18 years, and was not seen feasible for the Campus.

Solar and Wind Energy Sources for On-site Energy Production and Usage

Technical Services has already accomplished some feasibility studies for the usage of wind and solar energy sources on campus. Feasibilities are based on the economic return on investment. However, with the higher level management commitment to campus sustainability, improving the environmental impact of the campus should be included in feasibility studies and the decision making processes of these renewable energy investments on the campus.

Technical Services reported that the wind potential of Sarıyer District, Sarıyer area is not appropriate for the use of wind tribunes to produce energy. The return on investment of wind turbines on campus is up to nine years.

The return on investment with Chinese brands of solar panels is five years, while with Israeli and German brand solar panels the return on investment is almost eight years. In addition, the main constraint in using solar energy is the campus building architecture. Previous studies should be reconsidered with the intent of improving the environmental impact of the campus.

✓ ***Initial cost of investment***

✓ ***Studying usage possibilities***

Long term investment of new technology to decrease the cost of energy and use energy efficiently on campus should continue by searching new technologies and doing feasibility studies.

LEAD or BREAM Certificate

At present, the LEAD and BREEAM certifications are very costly. Although the existing buildings on campus could use LEAD or BREEAM for building management the cost of investing these certificates does not look reasonable.

But in the long term, LEAD or BREEAM certification for building management could be used for existing as well as for new buildings.

3.3.9.1.2 Water

Water is an important natural resource to be consumed efficiently on campus. Water is under the responsibility of the Technical Services. Activities which could be in short, medium and long term road maps are listed in Table 22.

Short Term

KU has been implementing some water conservation measures for a while. Actions recently taken are as follows:

Grey Water System

The grey water system; i.e., using waste water from washing hands, showers and baths, is already in place on the KU Campus and used for irrigation. Daily water capacity from grey water and rains is around 600 m^3 per day. The storage capacity of waste water is 3500 m^3. However, during the summer, as the rain amount is lessening, and the population of the campus community is decreasing, recycled water is not enough for irrigation, considering that there are 110000 m^2 grass land in the

campus. The grey water system could be improved to use more recycled water on campus.

Water Saving Shower and Faucets Aerators

Technical Services has changed all faucets and showers on campus with water saving showers and faucet aerators to reduce water consumption. This water conservation measure reduced 35.0% of water consumption on campus.

Waterless Cleaning and Eco-labelled Cleaning Products

Cleaning on the KU campus is outsourced. The contractors use waterless cleaning options wherever possible and eco-labelled cleaning products. This program should continue with necessary improvements.

Medium Term

Central Potable Water System

As a new initiative, KU Technical Services conducted a feasibility study to cancel the usage of gallon bottled waters, and use central potable water system on the campus. At present, all internal kitchens on campus use gallon bottled waters. Only, in the main dining hall is tap water filtered and used as potable water. However, even though the return on investment is six years, maintenance and management costs are increasing, and the most important health related risks are increasing as the control of the central potable water system is not manageable for the Technical Services. Therefore, the project has been postponed.

With the commitment of the higher management to campus sustainability, this project could be reconsidered as it improves the environmental impact of the campus. The capacity of the Technical Services could be improved to implement and manage the central potable water system on campus.

Long Term

Water Saving Outreach Program "Trayless Dining"

Like waste and recycling, energy efficiency and water saving should be also communicated to the campus community, and some measures should be taken to implement efficiency actions. Indeed, in most of the universities committed to campus sustainability, trayless dining, where trays are removed in the dining halls, and cafeterias, is a common implementation. The KU dining hall is appropriate for initiating a trayless dining program to save water by not washing thousands of trays each day. However, trayless dining is not the first priority to implement. It is better to establish a campus sustainability culture first. Otherwise, the campus community could react negatively and the program may not be successful.

3.3.9.1.3 Waste and Recycling

In addition to infrastructural investment in waste and recycling at KU, the General Secretary should focus on measures and improvements to minimise waste generation, maximize recycling and minimise unnecessary consumption wherever possible by collaborating with the other units of the General Secretary. Waste and recycling as key operational areas also need outreach programs on campus to raise awareness and encourage behavioural change. Especially minimizing unnecessary consumption needs behavioural changes, which is why outreach programs could be prioritised as long term in the road map.

Short Term

Waste and Recycle Progress Program

At KU, all sorts of waste is collected, removed, and recycled by third parties. However, targets should be set for waste reduction and recycling. Construction waste sent to the landfill should also be coordinated with the General Secretary and Construction Directorate, and measures to decrease construction waste to the landfill should be taken together. Additionally, GHG emissions caused by

waste transportation and processing operations should also be considered in the carbon footprint calculation of the university.

Besides waste management at KU, measures to increase recycling rates and reducing waste should be made in the short term. Waste and recycling progress to measure waste and recycling rates and to take necessary cautions to decrease waste and increase recycling on campus is important.

Zero Waste Program

The Zero Waste Program started in September 2012 and was implemented for two semesters by the General Secretary, but was cancelled. Experiences from this outreach program showed that outreach programs should be coordinated with the other units in the campus, well communicated to the campus community, and behavioural changes are not easy to achieve unless a campus sustainability culture is in place.

The Zero Waste Program should be revised and relaunched as a part of the campus sustainability outreach programs.

Medium Term

Green Office Certification and Award Program

The certification program will be implemented with other General Secretary Departments and the Dean of Students. The Green Award will be given through HR to an office. This program is explained in the energy consumption section. Waste and Recycling should also be part of this certification.

Long Term

Waste-to-Energy Production

After waste sorting, waste on campus could be used in the cogeneration or trigeneration to produce energy. A feasibility study could be done on using waste for energy production.

3.3.9.1.4 Carbon Footprint

Operational area "carbon footprint" is supported by the activities of other operational activities in the road map. Projects and programs in operational areas such as energy, water, waste and recycling, procurement, food and dining are important to reduce the carbon footprint of the campus. But there could be some specific projects and programs under this operational area.

Energy efficiency programs should especially be promoted for improved campus carbon footprint.

Short Term

Carbon Neutral Event Guide

Most of the universities committed to campus sustainability prepare carbon neutral, green or sustainable event guides for the campus community. Considering that the numbers of events and the sizes of the events and programs on the KU campus have been increased in the last three years, a carbon neutral event guide could be an important tool to increase awareness on climate change, create a carbon reduction culture, and encourage behavioral change.

- ✓A Carbon Neutral Event Guide could be prepared with the coordination of Student Clubs, Facilities Management, Procurement Management, Event Management, and KUTEM
- ✓The preparation of the guide could be supported by the ALIS 350 course as a student group project
- ✓The campus community could see all the available options and steps for creating a carbon neutral events
- ✓The guide should be revised every year based on the experiences and newly available possibilities to make the events carbon neutral
- ✓It can be a good tool to guide the campus community for carbon neutral events

Carbon Footprint Reduction Program

"How can I help to reduce the carbon footprint of my campus?"

A carbon footprint measures the total GHG emissions caused directly and indirectly by a person, organization, event or product (www.sustain.ubc.ca, 2013d). As the projects and programs develop in other key operational areas, the campus community should be informed about how they could be involved in these projects and programs and how these activities improve the carbon footprint of the university.

The campus community's individual preferences will make a change toward improving the university carbon footprint.

KU Carbon Calculator

The KU Campus community individual preferences could make a difference in improving the university carbon footprint. A simple carbon calculator program could be developed. The campus community could register for this program by giving a carbon reduction commitment, and marking individual targets. A carbon calculator will keep track of individual carbon footprints of people registered in this program. In addition, whenever possible, the carbon calculator should be used to show the campus community their impact on the environment and how they can improve their carbon footprint.

Medium Term and Long Term

Climate Action Plan

In the medium and long terms, a climate action plan should be prepared as the projects and programs are developed in other key operational areas to decrease the carbon footprint of the university.

3.3.9.1.5 Transport

Transportation is a key operational area for KU campus sustainability that should be studied in depth and reconsidered in terms of sustainable transportation.

Short Term

Campus Bike Program

An important part of sustainable transportation is to encourage cycling on the campus, across campus and around the campus although using a bicycle is not a common way of commuting on or around the KU campus.

Although cycling is uncommon, there are bicycle points on the campus. The Bicycle Club could play an important role in a bicycle program. By promoting bicycle as transportation, students and faculty living on the main campus could use bicycles to commute. In addition, there are students living in the Batı Capus, who could use bicycles to come to the main campus. By promoting a safe bicycle program, some percentage of the campus commuters may use bicycles instead of cars or the shuttle. Safety is very important in such a program, as our roads are not very appropriate for bicycles. Some key points to establish a bicycle program are the following:

- ✓Safety in bicycling could be taught by the Bicycle Club
- ✓Some free or rented bicycles could be provided by the General Secretary
- ✓Bicycle road could be constructed to the main road to the campus by collaborating with the local or metropolitan municipality

KU Car-Sharing Program “Mobilism”

The General Secretary has outsourced a car rental service for students called “mobilism”, where students can rent a car for short period of time such as one hour depending on their needs. This is an ongoing car sharing program offering a rent a car service to the KU campus community. There are two car points on KU – the main campus and the Batı campus, where the campus community could register in the mobilism program and use the cars. This program will improve mobility, reduce the parking lot problem and give the campus community the opportunity to access cars.

This program supports sustainable commuting on the KU campus but should be complemented with other sustainable commuting programs.

KU Carpool Program

Reducing single-occupancy car use to commute to the KU campus should be a priority for the KU campus sustainability commitment to reduce the carbon footprint and parking lot demand. Even though there are 1343 internal and external parking capacities inside the school, the existing parking space is not enough. This parking lot space could be used for other purposes such as green areas, recreational areas, or an arboretum which is in the plans of the Construction Directorate. In order to reduce single occupancy car use, a carpool program should be initiated and supported by the General Secretary.

A carpool program, commonly used in campus sustainability transportation programs, is a program in which the campus community shares cars to commute to the campus.

Medium and Long term

KU Sustainable Campus Fleet

Alternative fuel vehicles could be added to the campus fleet. Shuttles, small vehicles operating on campus and between the campuses could be electric, hybrid, biodiesel or bioethanol and biodiesel blended engine fuels vehicles. A feasibility study for possible options could be considered on how to develop s sustainable campus fleet.

Sustainable Campus Fleet Demonstration Program

KUTEM and the newly opened Energy Club could work with the General Secretary to develop some demonstration projects and programs. Some alternative-fuel vehicles demonstration projects could be also part of the sustainability education program at KU.

3.3.9.1.6 Procurement

Procurement is one of the campus operations which has a high potential for improvement through short term measures to support KU campus sustainability.

Short Term

EconGreen Program

Products and services that could be both environmentally sustainable and economic could be determined to guide and encourage the departments to purchase these products and services. There are common products and services that every department uses, and the usage of environmentally sustainable products could make a difference in the campus. Small changes could trigger big changes.

Paper, Promotional Materials such as brochures, posters, banners, catalogues

Using recycled papers could make a big difference. With the coordination of Waste Management, the Communication Office and Procurement Management, the use of recycled paper in printing and promotional materials could be encouraged.

Liquid Hand Soaps used in the restrooms and kitchens

Chemicals mixing with water and going to nature are products which could give the most damage to nature. The easiest start could be the liquid hand soaps used in the toilets and kitchens. In addition, food contractors on campus could be encouraged to use environmental products in their kitchens to wash dishes.

Medium Term

Consideration of "sustainability" in the New Contracts

Consideration of "sustainability" could be incorporated in the new contracts where appropriate.

Supporting the Local Economy through Local Purchasing

The Purchasing Management could prepare a list of local producers from which the campus community could purchase items. At present, many departments do some local purchases. The Purchasing Management can research which local producers and businesses KU works with and which others could be added to this list.

KU could support sustainable agriculture and fishing in Sarıyer by encouraging purchases from fish and agricultural cooperatives in Sarıyer.

In addition to food, with the coordination of the Communication Office and KUSIF, locally produced promotional materials could be used at KU. For instance, there is a Micro Credit Center supported by the Sarıyer Municipality where many local women take micro credits for their businesses. Local women could be reached through the Micro Credit Center or some women cooperatives in Sarıyer.

These possible local options could be promoted to KU Community through the Purchasing Management and Event Management.

Long Term

Consideration of "Sustainability" in the Contract Renewals

Most of the KU contractors already use environmental friendly products. For instance, cleaning products are eco products, all construction materials have the CE mark, and waste is collected through third parties. However, consideration of "sustainability" could be incorporated in the contract renewals where appropriate. Especially with the food and dining contracts, the percentage of buying from local producers could be discussed and encouraged.

3.3.9.1.7 Campus Development

Campus development is a key operational area as KU has 250000 m² acreage and 216500 m² of it is a green area,. Growing monumental trees and developing an arboretum with the Faculty of Forest, Istanbul University are two exemplar programs that could create a positive impact on KU campus sustainability.

Short Term

Energy Efficiency during Renovations and Refurbishment

New systems and technologies are used for energy efficiency (LEED lightings and HVAC systems) during renovations and refurbishments. The Construction Directorate works closely with Technical Services during renovations and refurbishments on campus.

Medium Term

Energy Architecture

In harmony with the existing architectural design and structure, all possible energy efficiency solutions should be assessed in existing and new buildings within the energy efficiency in architecture. Especially for new buildings, major energy savings could be achieved with efficient architectural planning and design.

Monumental Trees

Some special trees could grow to monumental sizes if the necessary environment is provided such as appropriate climate conditions, enough space to grow, and of course letting these trees grow. The KU Campus is appropriate for growing monumental trees both as space and climate. The Construction Directorate is responsible for the landscape of the campus, and is planning to grow monumental trees such as plane trees and walnut trees. KU has many international partner schools, some having very green campuses. The Construction Directorate could learn best practices in growing monumental trees from the partner universities.

Medium and Long Terms

KU Arboretum

KU aims to protect the existing landscape while diversifying the plant varieties on campus. Olive trees and rosebays which are not part of the natural environment have been planted on campus. Approximately 100 trees were relocated

from the construction of the new research and training hospital and replanted on campus. There is no artificial planting; the aim is to create the continuation of the forest into the campus, and let the natural forest plants grow along the border of the campus.

In this regard, KU aims to develop an arboretum on campus with the Faculty of Forestry, Istanbul University, which is also located in Sarıyer. The Faculty of Forestry already has an arboretum in Sarıyer, the Atatürk Arboretum. Partnering with the Faculty of Forestry, Istanbul University is an important initiative for promoting sustainable campus grounds practices.

Besides greening the campus, indeed, arboretums are botanical gardens with a collection of trees which are used for research, display and educational purposes. In addition, working and studying on such a campus increases satisfaction and have a positive impact on the psychology of the campus community. Likewise, an arboretum on campus is another way of engaging with the local community, opening the doors of the campus to people who would like to see the arboretum.

Long Term

LEAD or BREAM Certificate

LEAD or BREEAM certifications for building management could be used for existing buildings and for new building construction.

3.3.9.1.8 Food and Dining

Food and Dining is a key operational area in which the cost of sustainable food procurement is an obstacle in implementing sustainable food and dining. Food Management aims to provide good quality food at the best possible price. While providing food to the campus community, equity, affordability, quality and hygiene are priorities.

Short Term

Feasibility Study

Food Management, with the support of the Procurement Management and Event Coordinator, could work on the feasibility of possible sustainable food and dining improvements. KU has many events requiring food service each year. The event coordination team could also provide sustainable food options for the events on campus.

Medium Term

Food Composting Program

As KU has a large green area, and a garden in which to grow vegetables, food composting could be a good program to initiate for campus sustainability. A food composting program, from garbage to garden, could be an exemplary program supporting a Zero Waste Program and campus commitments to reduce the carbon footprint. Food composting could be a collaboration with the waste management program.

Local Food Sourcing Program

KU could support local production and sustainable agriculture and fishing in Sarıyer by buying from fish and agricultural cooperatives in Sarıyer. The Event Coordination Team, Food Management and Procurement Management should work together to explore possible options of using locally produced foods at KU.

Sustainable Food Lessons

KU has a kitchen and the Cool Cook Program. A sustainable food theme should be included in the cook program both to raise awareness and show how to implement sustainability in our daily lives.

Long Term

Sustainable Food Program

Based on the feasibility study, KU Food Management could start implementing some sustainable food programs with the collaboration of dining and cafeteria contractors.

Trayless Dining

Trayless Dining has already been established as a long term goal for the key operational area “Water”. Trayless dining should be implemented by the Food Management and the Dining Contractor to reduce water usage in the dining hall.

3.3.9.1.9 Efficient Use of Resources

Efficient use of resources is the result of sustainable campus measures and improvements. Activities related to efficient use of resources are embedded in the road map of other key operational areas.

3.3.9.2 Education and Outreach

The Education and Outreach section is divided in 3 operational areas: Education, Outreach, and Community Engagement. Short, medium and long term road maps with possible activities and programming of each operational area have been identified.

3.3.9.2.1 Education

Education is an important operational area for campus sustainability. Integration of sustainability across the curriculum could be realized in the medium term, and should be considered as a continuing process.

Short Term

Sustainability Curriculum, Integration Coordination and Workshop

Peer learning is a good way to learn new things. With the support of KOLT, sustainability curriculum integration coordination and workshops could be organized for the KU faculty.

Support Unit to Sustainability Projects

Faculty should be supported when they implement sustainability related projects within and outside the campus. KUSIF could provide sustainability projects for the faculty to get help and support for planning, organization, implementing, and tracking the projects.

Campus Sustainability Project Integration

Campus sustainability projects could be developed as a part of the existing courses at KU. As a course project requirement, students could work on campus sustainability project development and implementation. Examples are the ALIS 350 Course projects. **Medium Term**

New Courses and Modules related to or focused on Sustainability

It may be easier for faculty to develop new modules on sustainability within their courses with the support of KOLT and KUSIF. On the other hand, more courses could be available especially on environmental sustainability as electives. Depending on the course, some new articles, topics, speakers, projects on sustainability could be added to the existing courses.

Sustainability Immersive Programs

International Summer Sustainability Program

International program on sustainability open to both international and KU students should be developed by OIP with the support of other units.

Sustainability Field Experience

Sustainability field experiences and research in the field at local and international levels should be tied to some courses.

Long Term

Graduate Program on Sustainability

Interdisciplinary graduate programs could be developed related to or focused on sustainability.

3.3.9.2.2 Outreach

Outreach as a key operational area is important to effectively communicate campus sustainability to the campus community and beyond the campus. The Communication Office is the key for outreach activities to support campus community. For instance, some outreach activities like Zero Waste was not well communicated to the campus community. Green Office Certification and Award, Zero Waste, Carbon Footprint Calculator, Energy Conservation Outreach Program are some outreach programs that could be developed and implemented by the related departments and supported by the Communication Office.

Outreach is a key operational area that needs collaboration among all units on campus.

Short Term

Sustainability Improvements in ELC for Kids

ELC for Kids at KU is an important platform to implement sustainability related themes. Presently, part of the program teaches recycled arts and crafts. . The program could be revised to add some green and sustainability approaches and implementations.

Campus Sustainability Outreach Days

Important weeks and days related to sustainability should be celebrated on the campus. Some examples are listed below:

Energy Efficiency Week (January)

Energy efficiency week could be celebrated through activities and competitions on campus to raise awareness on energy and energy efficiency.

Earth Day (April)

Earth Day could be celebrated through activities and competitions on campus to raise awareness on energy, climate change, waste, and campus sustainability.

Campus Sustainability Fact Sheets and Guides

Campus sustainability fact sheets and guides on waste, energy efficiency, water, procurement, greening offices, green events, community engagements, carbon footprint, food, transport, human resource, equity, and diversity are needed to give tips and guide the campus community on how to support KU campus sustainability. These fact sheets and guides could be an important tool to raise awareness on campus sustainability and involve the campus community in implementation of activities. Short videos, statistics, feedback, improvements, achievements on campus sustainability should be included in fact sheets and guides.

KUTEM, Technical Services and Koç High School Energy Outreach Program

KUTEM and Technical Services support the Koç High School green house project. This is an important step as an outreach program. After getting experience with Koç High School, KUTEM could engage in some outreach activities with the local high schools in Sarıyer. Other research centers could also involve some outreach programs developed in Sarıyer.

Sustainability Literacy Survey

Developing the Survey and Running the Pilot

A needs assessment was conducted with the students to understand their perception and levels of campus sustainability literacy. Operational areas of Education, Outreach and Human Resources require sustainability literacy surveys to be completed by the campus community. As a part of this thesis, a survey was developed to measure the sustainability literacy of students. The survey formed the basis for a pilot program which was conducted with 60 Koç students. The survey was developed and administered in collaboration with the new course initiated by the Dean of Students, ALIS: Academic and Life Skills: Transition to Professional Life. One of project groups, "Path Finders", in the course was interested in working on preparing a survey on sustainability perception and literacy among the students. During the course period between February and June 2013, detailed research was conducted about available surveys run on campus sustainability in other universities. Survey questions were prepared with the support of the faculty teaching the course. A pilot survey with 60 students at KU was run by the project group. The project group and the faculty teaching the course analyzed the pilot.

The AASHE database was used with the support of Rice University, U.S.A., and universities which have already prepared similar surveys on campus sustainability to prepare the survey questions for KU. Questions regarding awareness, attitudes, values and literacy were developed as listed below, and adjusted to KU:

- ✓ *Colby College, Environmental Attitudes Student Survey*
- ✓ *Macalester College, Environmental Studies Assessment Reports*
- ✓ *Meredith College, 2011 Sustainability Assessment*
- ✓ *North Carolina State University, Student Sustainability Attitude Survey*
- ✓ *Stanford University, Sustainability Practice Survey*

- ✓ *State University of New York College of Environmental Science and Forestry, Sustainability Literacy Assessment*
- ✓ *Tulane University, Evaluating Campus Awareness of Global Climate*
- ✓ *University of Connecticut, Student Survey Spring 2004 - Environmental Issues*
- ✓ *University of Delaware, Spring 1999 Environmental Attitude Survey Administered to Students, Faculty, and Staff*
- ✓ *University of Maryland, Sustainability Literacy Assessment*
- ✓ *University of Nevada, Las Vegas, 2009 UNLV Campus Sustainability Survey Report*
- ✓ *University of South Carolina, Sustainable Universities Initiative Student Survey Preliminary Results*
- ✓ *Waubonsee Community College, Analysis of the 60-second Sustainability Check-up survey 2009*
- ✓ *Wichita State University, Survey on Environmental Awareness Results and Review*

The survey (Annex 1) consists of three sections and 29 questions related to environmental sustainability, social sustainability on campus, and sustainability in general. The survey format and questions can be revised based on the pilot test and administered to more students via an on-line survey.

The findings of the pilot survey by Path Finders are as below: The first four questions were related to exposure for sustainability activities in the class and outside the class, and participation in events. The following 10 questions were behavioral questions related to environmental sustainability. These are the most reliable questions for conclusive results. Nevertheless, a comparison of results based on sex, faculty and ages showed that the results were similar between men and women.

Two thirds of the participants were female. Half of the students who participated were in their third year of undergraduate instruction and almost half studied in CASE programs, while most of the other students studied in CSSH or CE programs.

Part 2 of the survey had 15 questions to measure the knowledge of the participants on sustainability.

One of the most interesting questions concerned the choices by which students prefer to behave sustainably (Annex 1, Question 16). Using energy efficiently got the most hits among the participants of the survey, closely followed by recycling and, as the third choice cumulatively, reserving resources for future generations. The results also showed that re-using was a less interesting option for the survey participants. In the revised survey, re-use of shopping bags could be changed to re-use of products.

Question 17 (Annex 1) asked the participants about the reason why they recycle. Almost 82.0% said that they recycle because recycling decreases the amount of habitat loss due to resource extraction, and fortunately, nobody chose the option that recycling was not an efficient way to deal with waste. Their answers indicate that they are participating recycling (sustainability) in their lives. Therefore, they are aware of the importance of sustainability.

For most of the participants, approximately78.0%, recycling products is the best way to care for sustainability (Question 20 Annex 1). However, reducing consumption of products or reusing products is not a priority. Therefore, even though the participants are aware of the importance of sustainability, they are not knowledgeable about the ways of implementing sustainability in their daily life, and they only know about recycling, however, reusing products and reducing consumption of products are also important.

An important question (Question 23, Annex 1) asked about the environmental impact of different common practices. The majority ranked flying from Washington to China first, then keeping a cell phone charger plugged into an electrical outlet for 12 hours, third, producing one quarter-pound hamburger, and producing one chicken sandwich. However, producing one quarter-pound hamburger, and producing one chicken sandwich have much more environmental

impact than that of keeping a cell phone charger plugged into electrical outlet for 12 hours.

Question 25 (Annex 1) asked about the level of engagement of the students with their local community and how they support it. Almost 78.0% of the participants said that they support the local economy, or they chose the best option they would do, by buying from the farmer‘s market and stores that sell locally produced goods.

Question 15 asked the students about their motives behind their engagement in environmental practices. Approximately 77.0% answered that they believe this behavior will make the world a better place. Almost 80.0% did not choose the option of because you were taught by your community or school. These responses indicate a need for more focus on the environment and sustainability at schools.

Question 19 (Annex 1) asked students their opinion of the most significant drivers in the loss of species and ecosystems around the world. The majority of the participants, 85.0%, think that the conversion of natural space into human developments is the largest driver.

Question 29 (Annex 1) asked students if they know which box to throw trash in. In general, garbage should go in which box confuses people. Participant responses are as follows:

Recyclables	45 paper/ 42 plastic
Non-Organics	41 plastic/ 31 glass
Organic	57 food/ 8 paper

At the end of the survey, students were asked their suggestions about activities that the university should organize to increase awareness of a sustainable campus. The participants mostly answered the Zero Waste Campaign is not enough by itself, and should be supported by other activities. The student comments were

mostly on waste and recycling as the Zero Waste Program is the main outreach program on environmental sustainability on campus. Some student comments are the following:

"Definitely not putting environmental stickers to everywhere, instead seminars could be organized for students of all levels other than freshmen, their instructors should recommend students to attend."

"Recycle bins! Tell students at the end of each month about the outcomes of the sustainability program within university. Green peace desks can also be useful to provide information."

"Use the recyclables and teach the students about the consequences. Using statistics, short videos but not by printing on the desks."

The pilot survey was successfully implemented. The survey format should be revised and presented to the Communication Office, General Secretary, and Dean of Student, and HR to be given to all students.

Sustainability Outreach Seminars and Outreach in the Class

Sustainability themed seminars related to campus sustainability should be developed. UNIV 101 seminar course is an important platform to reach freshman students with a sustainability outreach seminar. But seminars focused on sustainability for higher level students should be organized as well. Visionary speaker series on sustainability as sustainability outreach seminars could be organized every week, and could be coordinated by KUTEM and KUSIF.

Outreach programs should be supported in the classes. Faculty members should be sensitive about discussing campus sustainability events or programs during their classes to raise awareness and encourage students to participate to outreach activities.

Medium Term

Sustainability Literacy Survey to Campus Community

.The pilot survey was conducted among 60 KU students. Similar surveys should be developed and administered among the campus community to understand the level of awareness and literacy of campus sustainability and to assess recommendations.

For students:

- ✓ Revising the survey questions
- ✓ Administering the survey to all students with the support of the Communication Office

For Staff and Faculty:

- ✓ Developing and administering regular sustainability surveys

Student Club related to Sustainability

At present, even though there are several cubs on different topics of sustainability such as an environmental club, an energy club, and an equity club, there is no specifically sustainability focused student club. Establishment of such a club will support campus sustainability activities in the campus.

Student Sustainability Orientation

The Dean of Students is responsible for students orientation programs. Campus sustainability should be included in student orientation programs. Student sustainability advisors should be chosen and trained to orient newcomers.

Sustainability Orientation for Exchange Students

Exchange students and international students should be also oriented on campus sustainability.

Green Job and Internship Program

The Career Office could develop and coordinate a "Green Job and Internship Program" with the support of other units. This could be an important way of guiding KU students to green jobs and internships.

Long Term

Sustainability Student Fund

The Sustainability Student fund, maintained by the Dean of Students could support campus sustainability initiatives, practices and implementation by the students.

3.3.9.2.3 Community Engagement

Community engagement starts with local impact. The Sarıyer District, where the main campus is located, is important for campus sustainability activities. Student clubs, the Dean of Students and KUSIF are important stakeholders for engaging the campus community with the local community in Sarıyer.

Short Term

Project Development Program and Youth Projects

Project development and management workshops should be planned for KU students and student clubs. Faculty, staff and outside sources could give project cycle training and workshops as students learn how to develop and run projects in real life. In addition, EU youth project development could be supported to raise funding for possible projects.

Community Engagement and Leadership Track and Course on Social Impact Creation

KUSIF has developed a track program "Community Engagement and Leadership Certification" for undergraduate students. In addition, a course on social impact creation and project management was developed for KU students

This track and the course are two platforms to involve KU students to local project development and management to create social impact in Sarıyer. The course will be based on project development with the local implementation partners such as the municipality, NGOs and cooperatives.

Sarıyer Urban Collaboration

KUSIF develops local projects with local partners where campus resources are used in these projects. Local groups especially needing capacity building in Sarıyer will be defined. Faculty, staff, and students will be involved in the local projects to support communities in Sarıyer such as public schools, agriculture and fishery cooperatives, civil society. In this way, the Sarıyer Urban Collaboration will become an important platform for engaging the campus community with the local community who need help and support.

Impact through Education

The Impact through Education Program was developed by KUSIF to work with the public high schools in Sarıyer. This program uses campus resources to create social impact within the public high schools in Sarıyer. Further planning will be made by KUSIF to implement this program. In the short term, this program will be structured and implemented.

SWOT Teams

KUSIF has built SWOT Teams among students to run research and preliminary studies about Sarıyer. The SWOT Team has published its first report "What Sarıyer is About". In the short term, the SWOT Team model should be structured further, and other reports and preliminary studies on local projects will be run. This is an important way of engaging students with the local community and problems of Sarıyer.

Medium Term

KUSIF Social Impact Small Grant

Some projects will require small funding to implement. KUSIF should develop a small social impact grant to fund small scale projects developed by the students. Students could develop projects and apply for this grant. In this way, they will learn how to develop, run projects, and apply for grants.

Long Term

Sarıyer Mentorship Program

Together with the Dean of Students, the GSB and KUSIF, the Sarıyer Sustainability Program could be developed to better engage students, faculty and staff with Sarıyer projects. More collaboration and communication is needed for the success of the community engagement projects. Graduate students could be mentors for local social projects to NGOs, social entrepreneurs and cooperatives.

3.3.9.3 Research on Sustainability

Research as a key operational area requires interdisciplinary work. The Vice President for Research and Development (VPRD), faculties and research centres are the main researchers at KU.

Short Term

Sustainability Research Identification and Faculty Engaged in Sustainability Research

KU has many research centers and faculty working on different topics of sustainability. Sustainability research identification should be continued and faculty engaged in sustainability research should be identified in the short term.

At present, an international coordinator for strategic advancement has been running a preliminary study to spot faculty working on different components of sustainability.

Sustainability Summer Research Program

Research topics related to or focused on sustainability should be included in summer research programs for undergraduate students and high school students.

Medium Term

International Research Collaboration Program on Sustainability

Increasing the number and the quality of international research collaborations is very important for KU to keep up its research competitiveness. The OIP and VPRD could support faculty for travel and accommodation to develop research collaborations with international partners on some important topics of sustainability so that KU can be more internationally active and competitive.

Campus Sustainability Demonstration Projects with KU Research Centres

KU Research Centers could develop some campus sustainability implementation projects with relevant units on campus. For instance, KUTEM should work with the General Secretary for solar and wind energy project demonstrations, and energy efficiency implementation on KU campus.

Long Term

Technology Transfer Office (TTO) Sustainability Projects

Projects to find solutions on sustainability related problems could be prioritised by TTO.

3.3.9.4 Campus Community

The Campus Community is students, staff and faculty. The Campus Community section contains two key operational areas: Diversity, Affordability, Equity and Inclusion, and Human Resources.

3.3.9.4.1 Diversity, Affordability, Equity and Inclusion

The key operational areas of Diversity, Affordability, Equity and Inclusion require coordination and input from various departments on campus. HR, the Communication Office, the Corporate Relations and Development Office, and the Dean of Students play an important role in road map implementation. KOÇKAM could also support some implementation on gender issues on campus with HR. They could work together to develop some campus sustainability programs.

Short Term

Training Programs

Awareness raising on-line training programs on ethical issues in a working environment will be launched by HR in order to train KU staff periodically on ethical issues.

New Staff Orientation

Trainings on ethical issues will be the part of new staff orientation program and be planned and implemented by HR.

Support Programs for Underrepresented Groups in the Campus

KU is committed to creating equal accessibility for any academic, residential, and campus-life related services to all students, through the Office of Disability Services. As the number of disabled staff and students increase on campus, improving the campus infrastructure and support programs to disabled staff and students are at the core of the Committee of Occupational Health and Safety, which was established on April 2013.

Medium Term

Scholarship Programs

KU has strong scholarship programs. The Scholarship Office and Corporate Relations and Development oversee different scholarship programs. In the medium term, the number of scholarships should be increased in order to improve accessibility and affordability of education at KU for low income students.

Long Term

Institutional Cultural Development Program

The Institutional Cultural Development Program will be developed as a first step to foster an inclusive and welcoming campus culture.

Measuring the Campus Diversity Culture in the campus

HR will develop an assessment method to measure diversity, equity and inclusion on campus to support the improvement of the institutional cultural development program.

KU without Barriers

More programs for disabled students, staff and faculty could be developed.

3.3.9.4.2 Human Resources

Human Resources at KU has been restructured both as infrastructure and new staff during the last years. Capacity of developing and implementing HR programs related to or focused on sustainability has been improved.

Short Term

Koç İnsan

Koç İnsan was established in 2012, and is now on-line. Koç İnsan is an important tool for incorporating sustainability into the HR programs and policies as

performances, progresses of staff are followed through this system. The short term goal is to manage the system's efficiency and the staff's adaptation to the new system.

At present, personal development plans of their staff are integrated into all managers' objectives. In addition, the staff is able to put a "contribution to social responsibility" section into their yearly work aims.

Fringe Benefits

Benefits already exist, and are described in the HR policy. HR will provide more flexible fringe benefits in the short term.

Koç Academy

Koç Academy, also having online trainings, has been newly launched at KU. This is an important tool to enhance the personal development of staff. The short term goal is to maintain the well functioning of the system and adaptation of the system among KU staff. This is an important tool for staff professional development in sustainability.

Trainings and the Orientation Program for New Staff

Trainings on ethical issues will be offered to staff, and these trainings will be also a part of the orientation program for new staff.

Health and Wellness Programs

Occupational Health and Safety trainings have just started, and will continue.

Medium Term

Diversifying Trainings and Orientation Programs

Training on environmental sustainability will be added to the trainings possibilities and orientation program for new staff. Koç Academy will be an important tool to offer on-line and in hand sustainability related trainings to staff.

Performance Evaluation

A social responsibility option is already integrated into the performance evaluation of the staff. In the medium term, the staff participation to the social and environmental outreach programs at KU should be promoted by the collaboration of stakeholders by HR, KUSIF and Communication Office. Staff should be encouraged to participate to these programs by HR.

Long Term

Institutional Cultural Development Program

An Institutional Cultural Development Program should be developed to equip faculty and staff with the tools, knowledge, and motivation to adopt behavior changes that promote sustainability.

3.3.9.5 Development and Implementation of Sustainability Policies and Efforts

The last section of the strategic plan, Development and Implementation of Sustainability Policies and Effort contains two operational areas: Sustainability Governance and Coordination and Planning. It is important to establish sustainability governance on campus to coordinate, plan and monitor all sustainability activities.

3.3.9.5.1 Sustainability Governance

Short Term

Campus Sustainability Procedure

A working group should be established to work with HR to develop a procedure for campus sustainability coordination, planning, evaluation and reporting.

Campus Sustainability Road Maps

Each department on campus could integrate sustainability into their departmental objectives. HR should support them in this process.

Campus Sustainability Report

KU could start reporting on campus sustainability.

Medium Term

Memberships in the Networks

KU could be a member in prestigious campus sustainability networks such as the International Sustainable Campus Network.

Long Term

Sustainability Integration into Documents

Whenever possible, KU units should add sustainability into all major documents. This revision will take time.

3.3.9.5.2 Coordination and Planning

Unless effective coordination and planning is done, campus sustainability will not work in the long term. Establishing Coordination and Planning as a key operational area among campus community is important.

Short Term

Sustainability Task Force

A Sustainability Task Force should be established from the administration staff, faculty and students to set goals and targets for KU sustainability framework. The committee should have co-chairs from management and academics. Sustainability requires coordination of all units on campus.

The Sustainability Task Force should report directly to the President. Decisions of Sustainability Task Force could be discussed and shared during the Coordination Committee meetings every month.

Sustainability Working Groups

Theme based sustainability working groups should be established whenever the Sustainability Task Force needs further work such as planning, implementation, and evaluation.

Sustainability Student Leaders

Students are the major players in coordination of campus sustainability. With the support of the Dean of Students, sustainability student leaders should be chosen every year to work on the campus sustainability projects.

These students should be trained, oriented and have an agenda of campus sustainability implementations.

Sustainability Plans

With the guidance of the Sustainability Task Force, units in the university should start preparing sustainability plans for their departments.

Medium Term

Campus Sustainability Office

Universities committed to campus sustainability open campus sustainability offices to coordinate and plan all sustainability measures and implementations on campus. This could be also possible at KU in the medium term

4 RESULTS AND DISCUSSIONS

This section presents key results for KU on campus sustainability. A KU Campus Sustainability Improvement Table was prepared, and eight key suggestions to further KU campus sustainability were made as the outcome of the KU case study. Key suggestions on campus sustainability for other Turkish universities and academia will be offered. There are eight key suggestions as the outcome of this study. In addition, campus sustainability methodology that Turkish universities and academia could use is developed based on the experience of the KU case study.

4.1 Key Results for Koç University on Campus Sustainability

As an outcome of the KU campus sustainability case study, a KU Campus Sustainability Improvement Table was prepared (Table 24) and eight key suggestions to further KU campus sustainability were made.

The KU Campus Sustainability Improvement Table was prepared based on the available campus sustainability rating systems in the EU and the world and other sustainable campuses. Additionally, specific conditions and priorities of KU related to campus sustainability were presented. The sustainability improvement table was developed for KU; however, it can be enhanced with the contribution of other colleagues working in this area, and be an example model for other Turkish universities and academia willing to work on campus sustainability.

The table shows the improvement necessary in every operational area to enhance campus sustainability at KU. Rating indicators of each operational area were developed based on available rating systems, operational objectives and key performance indicators already prepared for the KU campus sustainability strategic plan. Each operational area is rated over 100 points, which are shared among the rating indicators. KU is evaluated based on the each indicator. As a result, it is possible to see how the KU campus could be improved to be made more sustainable.

This process is shown in Table 24.The following are the points that KU has earned for each campus operations:

The operational areas of Energy Consumption has 90 points, Water Usage has 70 points, Waste & Recycling has 70 points, Carbon Footprint has 85 points, Transportation has 45 points, Procurement has 60 points, Campus Development has 90 points, Food & Dining has 60 points and Efficient Use of Resources has 70 points.

The operational area of Education has 75 points, Outreach has 65 points, and Community Engagement has 75 points.

KU has 70 points on sustainability research outlook.

The operational area of Diversity, Affordability, Equity and Inclusion has 70 points and Human Resources has 80 points.

The operational area of Sustainability Governance has 60 points and Coordination and Planning has 60 points.

Energy Consumption, Carbon Footprint, Campus Development all have 90 points. Transportation is below 50 points, while Procurement, Food & Dining, Outreach, sustainability Governance and Coordination and Planning are below 70 points, around 60 and 65 points, all which need improvement to enhance campus sustainability on campus.

The results form the following profile on KU campus sustainability (Figure 47):

KU needs a holistic approach to campus sustainability. Even though different departments, both administrative, staff, academics, and student clubs in the university have already been engaged in various campus sustainability implementations, the main aim should be to unify those initiatives and implementations as each of them are an important components of a sustainable campus and develop a common working platform under “campus sustainability” with

concerted action and communication. Thus, all of these efforts will be synergized and create more awareness, impact, and trigger further actions on campus to create a sustainability culture.

Campus sustainability principles commitments should be adopted by the higher level management of the university. In order to implement these campus sustainability commitments, a campus sustainability strategic plan with key operational areas, objectives and key performance indicators should be prepared. Short, medium and long term road maps with activities and programs for each operational area have been proposed for the implementation of strategic plan. In this thesis, possible proposals were suggested for campus sustainability for KU.

Even though there could be some minor changes, the KU Campus has reached its optimal growth level regarding campus population and campus development. A major growth of campus population or campus development is not foreseen in KU's plans.

Taking in consideration that the KU Campus will preserve its existing situation regarding campus population and campus development, every sustainability measure and improvement to be taken on campus will support KU to improve rapidly its sustainability.

Currently, KU has a good situation regarding campus sustainability, and could progress rapidly in being a sustainable campus. Actions to be taken in the short term road map of the strategic plan are important for rapid sustainability improvements on campus.

Some sustainability measures and improvements could be implemented by the decision of directorates within the existing budget and human resources of the department, or with low cost. In most cases, directorates have been responding positively in planning and initiating these possible sustainability measures and improvements.

Some high budgeted sustainability measures and improvements need the commitment of the higher management to campus sustainability. High budgeted sustainability investments should be considered as long term investments and decisions should be based not only on economic costs of the investments and economic returns on investment, but also, creation of positive social impact and improvements in the environmental impact of the university. Trigeneration investment and using renewable energy sources on campus should be reconsidered by the higher management of the campus if these investments secure a substantial decrease of the carbon footprint of the campus.

Universities committed to campus sustainability put climate action plans at the heart of their campus strategic plans, and give priority on sustainability related investments and measures to decrease the campus foot print.

Creating a campus sustainability culture within the campus community will have a tremendous effect on the success of KU sustainability measures and implementations. A campus sustainability culture will secure behavioral change in the long term within the campus community to support sustainability measures and engage in the implementation of these measures.

KU shows a willing commitment to take further campus sustainability measures in infrastructure, human and financial resources.

As a result, the KU Campus Sustainability Improvement Table suggestions could be a starting point for KU senior management to further campus sustainability efforts, and be the first sustainable campus in Turkey.

Table 24

KU Campus Sustainability Improvement Table

KU Campus Sustainability Improvement Table			
1. Campus Operations			
Energy Consumption	**Possible Points**	**KU Points**	**Explanations**
Existing Infrastructure and Investment	70	70	Existing infrastructure is well developed and necessary investments are planned. However, investment decisions should not be based only on the return on investment, but improved environmental sustainability of the campus or positive social impact creation should be also considered. Trigeneration investment should be reconsidered.
Use of Clean Technologies	20	15	KU is one of the few universities having a cogeneration in its campus. However, further investments regarding the usage of the renewable energy and clean technologies could be reconsidered such as solar and wind energy sources for on-site energy production and usage; waste to energy production; and usage of water cooled chillers.
Collaboration with Academic Research and Campus Implementations	10	5	KUTEM and Technical Services should further the existing collaboration for more campus sustainability implementations.
TOTAL	**100**	**90**	Energy Consumption is one of the strongest campus operations in the campus which needs further development regarding awareness on the cost of energy among the campus community, more collaboration with academic research, and more demonstration renewable energy projects in the campus.

Water	**Possible Points**	**KU Points**	**Explanations**
Using Water Resources Efficiently	50	35	Water is an important natural resource to be consumed efficiently in the campus, and it is under the responsibility of the Technical Services. In 2012, 149797 m^3 of water is consumed in the campus: 0.97 m^3 water per m^2 and 24.96 m^3 water per person. KU could be able to decrease the water consumption per person by conservation measures and use water resources more efficiently. At present, a part of the waste water is used for irrigation. Due to the shortage of rain water during summer, and higher need for irrigation, the water is not enough. In addition, the population of the campus decreases drastically during summers, so there is very few amount of waste water. There are 110000 m^2 grass land in the campus, where 500 ton water is needed for irrigation. 200 ton of water is provided from waste water, and 300 ton is bought from outside. Even though, 3500 m^3 water could be stored, this is consumed in 3 to 4 days. Especially, during summer, due to the lack of rain, the water cannot be stored for irrigation. Of course, 47.26% of the total water used in the campus is consumed in the dorms, and 23.57% is consumed for garden irrigation. In addition, faculty housings consume 8.87% of the water as there are around 300 habitants (Figure 42). For instance, as there are 1550 students living in the campus, the first focus could be how to use water much more efficient in the dorms?
Reducing Water Consumption by Implementing Water Conservation Measures	**50**	**35**	Grey water system, using waste water from washing hands, showers and baths, is already in place in KU Campus to be used for irrigation. Daily water capacity from grey water and rains is around 600 m^3 per day. The storage capacity of waste water is 3500 m^3. However, during the summer, as the rain amount is lessening, and population of campus community is decreasing, recycled water is not enough for irrigation, considering that there are 110000 m^2 grass land in the campus. Grey water system could be improved to use more recycled water in the campus.Technical Services has changed all faucets and showers in the campus with water saving showers and faucets aerators to reduce water consumption. This water conservation measure reduced 35.0% of water consumption in the campus. At KU, cleaning in the campus is outsourced. The contractors use waterless cleaning options where ever possible and as well as eco-labelled cleaning products. This program should continue with necessary improvements. As a new initiative, KU Technical Services had a feasibility study to cancel the usage of gallon bottled waters, and use central potable water system in the campus. At present, all internal kitchens in the campus are using gallon bottled waters. Only in the main dining hall, tap water is filtered to be used as

			potable water. However, even though return on investment is 6 years, maintenance and management costs are increasing, and the most important, health related risks are increasing as the control of the central potable water system is not manageable for the Technical Services. The project has been postponed.With the commitment of the higher management to campus sustainability, this project could be reconsidered as it improves environmental impact of the campus. The capacity of the Technical Services could be improved to implement and manage the central potable water system in the campus. In most of the universities committed to campus sustainability, trayless dining, where trays are removed in the dining halls, and cafeterias, is a common implementation. KU dining hall is appropriate to initiate trayless dining program to save water to wash thousands of trays in one day. However, trayless dining is not a first priority to implement, it is better to establish a campus sustainability culture ahead. Otherwise, campus community could react negatively and the program could not be successful.
TOTAL	**100**	**70**	The usage of water as an important natural resource in the campus should be reconsidered and strategized to be an important operational part of the campus sustainability by measuring water consumption m² GIA, water consumption per person GIA, changes in water consumption per person, and % total of water consumption from grey and rain water, etc. Furthermore, outreach programs should be developed for water
Waste and Recycling	**Possible Points**	**KU Points**	**Explanations**
Waste Management	50	50	There are some main initiatives regarding the environmental management in the campus that has been planned and put in operation for the last two years at KU by the Facilities Management, General Secretary. These initiatives could be summarized as: revising the waste management system; developing a sustainable environmental policy; and increasing the environmental standards at the university. KU is the first university having ISO 14001 Environmental Management Standard. Besides, KU has an environmental policy in action. As the school has been growing in population, new schools such as the SoM, and programs require new laboratories. Main campus has different kind of wastes including: chemical waste, medical waste, medical waste with sharp edges from the laboratories, paper, glass, batteries, fluorescence, accumulators waste, and household waste, which are

			all collected properly and regularly within different systems existing in the campus. In addition, there are huge amount of IT equipments waste, which also needs special treatment. KU has “Waste Collection Center (WCC)” where all kind of waste of the university is stored, and the contracted companies are servicing regularly to collect the waste produced in the university from one central location. Infrastructure of waste management is successfully set.
Measurement and Waste Related Programs	50	20	First of all, waste generation data should be yearly monitored, evaluated and reported to put waste reduction targets. And second, programs to minimize the production of waste through reduction, reuse and recycle should be implemented. At present, the focus is usually on the recycle part, but reduction and reuse also should be emphasized and encouraged through integrated waste programs. As the infrastructure is already present, with the contribution of some additional human resource, and collaboration of other stakeholders in the campus community, measurement and waste related programs could be easily started and implemented. At KU, all sorts of waste is collected, removed, and recycled by third parties. However, targets of waste reduction, and recycle should be set. Construction waste sent to landfill should be also coordinated with the General Secretary and Construction Directorate, and measures to decrease construction waste to landfill should be taken together. Besides, GHG emissions caused by waste transportation, processing operations should also be considered in the carbon footprint calculation of the university. That is why, besides waste management at KU, measures to increase recycling rates and reducing waste should be taken in the short term. For these reasons, waste and recycling progress program to measure waste and recycling rates is crucial. In addition, necessary cautions should be taken to decrease waste and increase recycling in the campus. Zero Waste Outreach Program started in September 2012 was implemented 2 semesters by the General Secretary, but was cancelled because it was considered ineffective. Experiences from this outreach program showed that outreach programs should be coordinated with the other units in the campus, and well communicated to the campus community due to the fact that behavioral changes are not easy to achieve unless a campus sustainability culture is in place. Zero Waste Program should be revised and relaunched as a part of the campus sustainability outreach programs.
TOTAL	**100**	**70**	Overtime waste reduction per person, recycled waste proportion percentage should be evaluated;, monitored and necessary measures should be taken. Outreach programs creating awareness and as well as resulting behavioral change in the long run among the campus community should be developed. For

			instance, integrated waste programs should be planned.
Carbon Footprint	**Possible Points**	**KU Points**	**Explanations**
Existing Carbon Footprint	80	80	Carbon Footprint of KU caused from energy is 10250.56 tons in 2012. Considering that the campus community is 6000 people, 1708 tons of GHG emissions equivalent to CO2 is emitted per head in the campus. One of the Sustainable Campuses in the world, University of Nottingham's average carbon emissions per head is 1777 tons of GHG emissions equivalent to CO2 (www.peopleandplanet.org, 2013d).
Climate Action Plan with A Baseline and Reduction Targets for Emissions	20	5	Even though, the carbon footprint of the university is under the limit and regarding energy usage which has the highest impact to increase the carbon footprint, there is no climate action plan with baseline and reduction targets for emissions. KU climate action plan could be easily developed and implemented with the commitment of the KU Senior Management.
TOTAL	**100**	**85**	There is no need to increase the installed capacity of CHP with the existing growth objective of KU. At present, cogeneration 65.0% of the heat needed to produce hot water in dorms and heating of the campus. This shows that carbon footprint caused from direct energy usage is not expected to increase. However, waste amount could increase due to the increased number of students, staff, faculty and activities in the campus. On the other hand, it is possible to decompose waste through existing waste management system in the campus, and use waste to produce energy possibly through CHP. At present, GHG emission caused by waste is not included in the carbon footprint of the campus. While developing programs to minimize the production of waste through reduction, reuse and recycle; waste could be used for waste to energy production, being an important tool to improve carbon footprint of the university. If the campus community grows, indirect energy usage such as electricity and water usage could increase. Another way to improve the KU carbon footprint could be solar energy sources on-site energy production and usage for the existing buildings. At present, direct and indirect energy usage is not expected to grow. So, existing carbon footprint of the university is not expected to increase. At present, the current carbon footprint of KU is at the highest level that it could reach. That is why, every measure that KU Management will take, will have an immediate positive impact to

			improve the carbon footprint of KU.
Transport	**Possible Points**	**KU Points**	**Explanations**
Campus Fleet	15	5	Daily circulation of all kind vehicles in the campus is between 3000 and 3500. Staff and student shuttles are outsourced, so the next contract could also include fleets which are more environmental. Besides, KU owned cars use fuel, diesel fuel or lpg. Investment decision is made based on economic reasons; however, campus fleet investments should also consider environmental performance of the campus. Alternative fuel vehicles could be added to the campus fleet. Shuttles, small vehicles operating in the campus or within the campuses could be electric, hybrid, biodiesel or bioethanol and biodiesel blended engine fuels vehicles. A feasibility study for possible options could be considered on how to develop a more sustainable campus fleet.
Availability of Public Transportation and Shuttles for the Campus Community	30	30	Public transportation and shuttles for the campus community are available. However, the usage could be increased through outreached programs related to campus transportation. The presence of metro station nearby to the campus is important to link the campus to the city.
Sustainable Transport Programs	40	10	General Secretary has outsourced a car rental service for students “mobilism”, where students can rent a car for short period of time such as one hour depending on their needs. This is a supporting program to sustainable commuting of KU campus sustainability, but should be complemented with other sustainable commuting programs. Campus bike program, carpool program, and other programs related to discourage individual car use among the campus community.
Collaboration with Academic Research and Campus Implementations	15	0	KUTEM and General Secretary collaboration for the campus implementations should be emphasized such as some alternative- fuel vehicles demonstration projects.
TOTAL	**100**	**45**	Transport is one of the campus operations which need extra attention to improve carbon footprint of KU and increase the quality of life in the campus. Reducing single-occupancy car use to commute to KU campus should be priority for KU campus sustainability commitment to reduce carbon footprint and parking lot demand. Even though there are 1343 internal and external parking capacities inside the

			school, the existing parking space is not enough. This parking lot space could be used for other purposes such as green area, recreational area, or arboretum which is in the plans of the Construction Directorate.
Procurement	**Possible Points**	**KU Points**	**Explanations**
Purchase of Recycled, Energy Efficient and Environmental, Socially Preferred Products and Services	60	45	Purchases could be divided into two categories such as products having complicated technical specifications, and others having simple specifications such as office products. Departments such as Construction Directorate, Technical Services, Facilities Management and CIT provide specs requiring energy efficiency, quality and higher standards. However, there is a potential to encourage campus community to purchase environmentally and socially preferable products and services where ever appropriate. There is a high potential of improvement in the area of products and services where no complicated specs are required.
Local Purchasing	10	2,5	Local purchasing is important to both supporting local economy and improving carbon footprint of KU by decreasing transport related GHG emissions. Even though there are departments purchasing locally, there is no coordinated action. Especially, agriculture and fishery cooperatives could be important for local purchasing strategy of KU.
Sustainability Consideration in the Contracts	30	12,5	Most of the contractors use already environmental friendly products. For instance, cleaning products are eco products, all construction materials have CE mark, and waste is collected through third parties. However, consideration of "sustainability" could be incorporated in the contract renewals where appropriate. Especially with the food and dining contracts, the percentage of buying from local producers could be discussed and encouraged.
TOTAL	**100**	**60**	Even though purchasing decision does not depend on the Procurement Management, where each department makes its own purchasing decision, this department could play an important role in guiding and encouraging the campus community to purchase environmentally and socially preferable products and services where ever appropriate. There are common products and services that every department uses, and the usage of environmentally products could make a difference in the campus.

			Communication Office could play an important role in purchasing environmentally and socially preferable products and services. Procurement is one of the campus operations which offer high potential to improve environmental impact of KU and as well as create social impact locally.
Campus Development	**Possible Points**	**KU Points**	**Explanations**
Consideration of the Environmental Sustainability and Social Inclusion in the Campus Development	40	40	Campus development is an important key operational area as KU has 250000 m² acreage and 216500 m² of it is green area (including courtyards and roads). Campus wide master planning was developed from the first beginning with future development projections. Green areas and buildings were proportionate; and 15.0% of the area is planned for buildings, and the rest stayed green area. Environmental targets for the design, construction, and occupation of new buildings and renovations are already considered and monitored for the environmental sustainability of the campus. In addition, opportunities to improve environmental performance are part of the regular maintenance schedules and refurbishment of buildings. Due to the architectural design integrity, solar panels could not be used on the roofs. This is one of the drawbacks of the existing campus architecture. But, the campus itself has been designed and constructed by using all natural products where possible. Additionally, all construction materials used in the campus have long term use flexibility; and are harmless to the green landscape such a natural woods and stones. An important feature of the campus plan is that users' social inclusion and integration are facilitated. All buildings are linked each other by a courtyard, where there are many passages to ease people seeing each others, encountering, sitting, talking and having time together.
Protection of the Existing Forest Fauna and Natural Landscape	40	40	Construction Directorate is extremely careful about protecting the existing the forest fauna, natural landscape and aims to diversify the plants in the campus. Indeed, the green landscape has been always respected, and protected with the highest care and standard. That is why; landscape integration of the building design has been realized successfully by the architect from the first beginning.
Partnership with Other Organisations to Promote Sustainable Ground Practices	20	10	This is an untapped area for the Construction Directorate. They have already great plans such as growing monumental trees and developing KU Arboretum with the partnership of Istanbul University, Faculty of Forestry. Some special trees could grow monumental sizes if the necessary environment is

			provided such as appropriate climate conditions, enough space to grow, and of course letting these trees to grow. KU Campus is very appropriate to grow monumental trees both as space and climate. Besides greening the campus, indeed, arboretums are botanical gardens having collection of trees, which are used for research, display and educational purposes. In addition, working and studying in such a campus increase satisfaction, and have positive impact on psychology of the campus community.
TOTAL	**100**	**90**	As one of the highest importance campus operations for KU, next step for the Construction Directorate could be to put in implementation their plans of "Monumental Trees" and "KU Arboretum" in the campus. In this way, the existing parking lot could be used for a more meaningful campus sustainability project. In addition, an arboretum in the campus is another way of engaging with the local community, opening the doors of the campus to people who would like to see the arboretum. With these projects, Construction Directorate could increase both environmental sustainability and improve social impact of KU through community engagement. Lastly, KU Campus could apply for LEAD or BREAM Certification for the new buildings in the campus.
Food and Dining	**Possible Points**	**KU Points**	**Explanations**
Providing Safety and Hygiene	25	25	Safety and hygiene are priorities for KU Food and Dining Management as 6000 people in the campus use food and dining facilities. Hence, all food suppliers in the campus are only allowed to use approved brands listed in their contracts while selling food. Food Manager systematically controls the consignment documents and storage rooms of every cafeteria in the campus to control the brands used and also the expiration dates of the products used in food preparation. Companies serving food in the campus have been chosen very carefully. The contractor, Johnson Diversey, does systematic safety and hygiene checks in all food preparation and selling points every 2 months; and prepares an independent hygiene report of cafeterias to KU Management.
Providing Quality and Affordable Food	25	25	Food safety and providing the best quality of food with cheapest price possible is an important strategy of the Facilities Management. There are one main super market, Migros, one main dining hall, a restaurant open to faculty and guests, several cafeterias to provide affordable and good quality food

			and catering services in the campus.
Sustainable Food Practices	50	10	This is an area that Food and Dining Services has the most potential to grow fast. Natural agriculture program and the new kitchen in the campus are important initiatives at KU. Even though, foods and products produced through "good agricultural practices" are not sold in the cafeterias due to their high prices; this natural agriculture program and the new kitchen projects offer new windows for KU in the area of innovation and sustainability in the food and dining. The land for the agriculture has been already prepared and made ready for the usage of children coming to KU for the summer school. These children grow vegetables in this land. The kitchen is again used for special cooking courses during the winter season "Cool Cook Program" open to students, staff, faculty and outside participants. Similar to the natural agriculture in the campus, the kitchen project could be developed based on the experiences in hand. More sustainable food related programs could be implemented in the Cool Cook Program. Other possibilities that could be implemented at KU are food composting, local food sourcing through the local agricultural and fishery cooperatives, trayless dining, and natural food program through the dining hall. In addition, considering that there are many events, organizations in the campus during a year, sustainable food options could be possibilities to offer to the organizers and participants.
TOTAL	**100**	**60**	Food and Dining is one of the campus operations which offer high potential to improve KU Campus Sustainability and as well as create social impact locally with sustainable food practices. General Secretary has provided safety, hygiene and has been able to offer quality food at affordable price; now, General Secretary Departments should work together to support sustainable food practices in the campus, and conduct a feasibility study.
Efficient Use of Resources	**Possible Points**	**KU Points**	**Explanations**
Awareness of the Cost of Energy	20	10	Awareness of the cost of energy in the campus is very low. Indeed, for other natural resources used in the campus, the awareness of the cost is very low as well. This is an area that there is a high potential of improvement with the launch of efficient, effective and integrated outreach programs.
Use of Energy, Water and Other	30	20	Using energy, water and other natural resources efficiently is important to help sustainability efforts on campus. Technical Service has been already working and improving infrastructure to use energy and

Natural Resources Efficiently			water more efficiently. Tools needed to use natural resources more efficiently should be developed for the campus community by improving technical and operational infrastructure to the next level and as well as developing and implementing complementary outreach programs for awareness and behavioral changes.
Reuse of Construction Materials and Furniture	20	15	At present, the reuse rate of the construction materials and furniture is 70.0%; but, of course this percentage could decrease as the construction materials and furniture get older. Regarding space efficiency, furniture in the campus could be replaced by time with furniture providing more space and flexibility to the campus community. Even though existing furniture are wood products, due to the lack of space in the campus offices, they do not provide space efficiency and flexibility.
Providing a Healthy and Sustainable Balance between Human Capital, Natural Capital, and Financial Capital of the University	30	25	The key to success for sustainability relies on the balance between human capital, natural capital and financial capital of KU. But, regarding sustainability, because HEIs are example institutions where ethics, responsibility and values should be important to show both to students and public, institutional decisions could not be based only on economic reasons, and social and environmental benefits should be always considered as an important part of the decision making process. For instance, trigeneration investment should be reconsidered, if it will improve the environmental impact of the campus.
TOTAL	100	70	Economic sustainability is a consequence of the campus sustainability activities to prove that the campus uses its resources efficiently that the budget could be saved for other vital activities such as research and education. For instance, using recycled papers for printing is both economic and environmental. But, this might not be always the case, sometimes due to the university's commitment to sustainability; investment decision requiring high financial resources could be taken if this investment has high potential to improve environmental impact and increase social impact of the university.
2. Education, Outreach and Community Engagement			
Education	Possible Points	KU Points	Explanations

Courses, Programs Related to or Focused on Sustainability	40	35	Regarding curriculum, KU undergrad curriculum offers a wide range of core courses on social and environmental responsibility. At present, all students regardless of their majors have to take courses related to ethics and social issues as electives. Indeed, approximately 20 core courses on social issues and ethics ranging from City and Society, Migration & Globalization to Human Rights, Environmental Ethics, Media Ethics, etc. are offered to all undergraduate students. Majority of these core courses are offered through the CSSH. In addition, there have been two courses related to environmental sustainability and energy that have been offered for years at KU through CS: Sustainable Energy Course and Energy & Environment Course. Furthermore, a new course “A Balance Sheet on Energy” has been added to the pool of core courses open to all KU undergrad students. Meanwhile colleges and schools at KU are also offering area elective and elective courses in various topics again on social, economic and environmental aspects of sustainability. Courses such as Corporate Social Responsibility, Public Health, International Organizations and NGOs, International Migration in A Global World, Women Discrimination and Human Rights, International Human Rights Law, Social Impact Creation and Project Development, and others are options to take for all undergrad students. GSB has been very active to integrate sustainability into its all programs. For the last 5 years, social component of sustainability has been emphasized in all the programs of GSB. A new course "Social Entrepreneurship open to all graduate students has been just open by the collaboration of GSB, KUSIF and OIP. Tracks such as Gender Track, Community Engagement and Leadership Track are options for undergrad students to get an additional credited certificate while graduating. However, some more courses related to environmental sustainability, corporate sustainability, ngo management, etc. could be open. In addition, students, even though they take courses among available options, they might have difficulties to see the full picture of sustainability with all its aspects. A more integrated approach is needed to foster sustainability learning across curriculum and programs. Moreover, interdisciplinary graduate programs could be developed related to or focused on sustainability.
Sustainability Immersive Programs Among Students Within or Outside the Campus	40	30	KUGlobalAid Program, international service learning program run by OIP for 2 years has started to offer certificate for students involved in it. GSVC, international social venture competition program where KU is the regional partner has integrated to the new "Social Entrepreneurship" Course to support students to develop social venture business models to offer to this global competition. Public Health Course for SoM third grade undergrad students offer social impact field projects in the local area. New course "Social Impact Creation and Collaborative Project Development", required course of the

			Community Engagement and Leadership Track offers filed studies to students through implementation partners. These are very important progress for KU, which are the results of the last 4 years. There are also some courses offering local field projects through the support of KUSIF such as Sarıyer Fish Clustering project run by a group of CEMS students. OIP is opening an international summer sustainability program. ALIS 350 Course also offers some campus sustainability field projects. However, more effort, awareness, and collaboration is needed to integrate sustainability field experience and research in the field into the existing courses and programs both inside and outside the campus locally, and internationally.
Sustainability Culture Within Teaching and Learning	20	10	More consented collaboration and work is needed in developing a sustainability culture within teaching and learning. Teaching and learning should support the full aspect of sustainability. A common emphasize areas could be discussed and planned; and components of sustainability could be integrated in all courses with some special sections, speakers, cases, articles, debates, and projects, and field studies. Faculty members could enrich the available curriculum with the support of KOLT and KUSIF. They should be supported when they implement sustainability related projects within and outside the campus. KUSIF could be positioned sustainability projects implementation partner for the faculty to get help and support for planning, organization, implementing, and tracking the projects.
TOTAL	**100**	**75**	There are many offerings related to sustainability; however, "sustainability" as a term could be more emphasized to foster sustainability learning among students. In addition, a consented action is needed to create synergy in the university, and take KU to the next level of sustainability integrated learning and teaching with real life experiences.
Outreach	**Possible Points**	**KU Points**	**Explanations**
Outreach Programs Related to or Focused on Campus Sustainability	70	50	Zero Waste Program; Natural Agriculture Program; New Kitchen in the Campus “Cool Cook Program”; Radio Program “Leaders of the Social Change From Business World to Civil Society” organized by TOÇEV, KUSIF and GSB to raise awareness on social problems, volunteerism, leadership, social innovation, social impact creation; real life implemented projects developed within the courses such as ALIS 350 Course / Academic and Life Skills: Transition to Professional Life (both

			education and outreach); awareness raising projects such as Peace in Hands Project “Peacemakers’ Initiative: Turkish People and the Armenian Community” funded by the Dutch Consulate Matra Program; other various programs developed by the Student Clubs; and as well as Idea Challenge Competition which will be run by the Incubation Center, KUSIF and OIP to support KU students finding solution to local social problems could be examples of outreach programs at KU. However, outreach programs should be strategized under the "campus sustainability", and further outreach programs should be developed regarding zero waste, energy efficiency, climate, transportation, food and dining and people (human rights, disabilities, gender, etc.) in the campus.
Visibility, Understanding and Awareness of Sustainability Issues Within the Campus Community	20	10	Outreach as an important operational area requiring the collaboration of many units in the campus. It is important to communicate effectively campus sustainability to the campus community and beyond the campus. Communication Office is the key for outreach activities to support campus community. For instance, some outreach activities like Zero Waste was not well communicated to the campus community. Green Office Certification and Award, Zero Waste, Carbon Footprint Calculator, Energy Conservation Outreach Program, Campus Sustainability Fact Sheets and Guides are some outreach programs that could be developed and implemented by the related departments and supported by the Communication Office. From the Zero Waste Program, it has been observed that the participation of the campus community to the program was low than it was expected. Effective campus sustainability communication is required within the campus. At present, campus community is not guided on what to do, or how to do to support campus sustainability. Especially, current students of y and z generations at KU are more conscious on sustainability issues. They are always open to do more when necessary platforms and tools are offered to them. KU should communicate the sustainability mission effectively to faculty, staff, and students. With KU sustainable campus mission, students will be encouraged not only protect the campus; but, also do more for their campus sustainability, and as well as for their future.
Campus Sustainability Culture Within the Campus Community	10	5	At present, "campus sustainability" is not communicated to the campus community. And, moreover, even though there are various initiatives, a holistic approach does not exist. So, it is hard to talk about an existing campus sustainability culture. The aim of this study is to develop campus sustainability culture in the campus. Dean of Student's approach is to develop responsibility and respect culture within the students. So, the question is that not only the students but the campus community as a whole

			how much they do feel responsible and has respect to their campus to make it more sustainable in all aspects. There is no available campus sustainability literacy and awareness survey run, however, a pilot has been developed with the ALIS 350 course students within this thesis. This survey could be revised and implemented to see the current situation among the campus community.
TOTAL	**100**	**65**	Even though there are programs available, there is no holistic approach and communication strategy regarding campus sustainability, so, it is not known which programs feed which aspects of the campus sustainability. More integrated outreach programs are needed to foster campus sustainability culture and encourage campus community to feel responsible and act.
Community Engagement	**Possible Points**	**KU Points**	**Explanations**
Community Engagement Programs and Partnerships	60	50	HEIs should give back to the community through engagement, community service and partnership. KU has financial resources and human resources as campus community to address community problems. Besides student volunteering opportunities through student clubs; there are courses having community engagement field studies and projects such as Creating Social Impact through Collaborative Project Management: Experiential Learning Course offers field studies with local and national stakeholders. Public Health Course has field research and implementations in the local area "Sarıyer". Some student groups at Microeconomics of Competitiveness Course work on fishery and tourism clusters in Sarıyer. In addition, a new competition and implementation program will start by Sping 2014. Idea Challenge Proposal Competition addresses social issues to be solved by the students, and themes related the local area will be offered to students such as agriculture, fishery, tourism, etc. While, the winning project will be funded and implemented through students by the support of the all related stakeholders at KU and local level. Impact Through Education Program of KUSIF works with the public high school teachers in Sarıyer by collaborating with local public high schools and District Education Authority. Soma faculty research and courses have already started to work to address local community issues. Third party engagement of GSB is important to mention as to understand the positive social impact potential of KU. Besides, being one of the leading education institutions in business administration, GSB has a vision and mission of contributing to the society through engagement with public institutions and NGOs. GSB has been also supporting NGOs by collaborating with the private sector.

			GSB has partnered with International Capacity Building Alliance Project (ICBA) in 2010, which is a worldwide project of Novartis. Since November 2012, KUSIF has also involved into the program to increase its social impact. ICBA project focus is to enable and encourage the creation of a sustainable partnership between non-profit organizations in given priority countries and business schools.All of these programs require partnership and collaboration with local, national and institutional institutions for implementations. These programs should be sustainable and new ones should be added in the near future.
Community Service Participation	30	20	At KU, community service participation through volunteering in the projects developed by the student clubs is high. However, community service opportunities could be planned and promoted to the staff and faculty as well. Currently, community services and collaborations with non-profit organizations have also become part of the annual evaluation of faculty. The annual evaluation process tracks community service of faculty through their consulting to private, public, and non-profit institutions, seminars and workshops, and positions in private, public, and non-profit institutions. The evaluation process also incorporates non-academic publications and presentations at non-academic meetings and conferences, contributions to popular media, and honors and awards for non-academic contributions (www.unprme.org, 2013).
Intra-Campus Collaboration	10	5	KU should collaborate with other colleges and universities to share experience in this field. For instance, KUTEM collaborates with Koç High School to develop an eco-house project. In Sarıyer, there are important public and private HEIs and high schools to collaborate and share experience.
TOTAL	**100**	**75**	Sustainable community engagement programs should be strategized further in every aspects of sustainability, involve all campus community not only students, and use all available resources of KU effectively in order to generate social impact creation in Sarıyer. KUSIF is a facilitator for KU units to give back to the community.
3. Research			
Research on Sustainability	**Possible Points**	**KU Points**	**Explanations**

Innovation in the Sustainability Area	30	20	İnventram, a partnership of Koç Holding and KU, is an early stage technology, innovation and IP investment, commercialization, and advisory company founded in April 2010. In addition, KU has become one of the TTO in Turkey. So, it could be concluded that a sufficient infrastructure has been set up at KU to promote and support innovation. The next step could be to define which aspects of sustainability could be prioritized and promoted further for innovation.
Encourage Multidisciplinary Research on Environmental, Economic and Social Aspects of Sustainability through Internal and External Collaborations	35	25	KU's core competency has been its commitment into the research, and of course, its success by being one of the leading research universities in Turkey. Faculty at KU has been well-known by their research achievement; and research topics are much diversified at KU. KU faculty is evaluated with their high value research projects and publications. At present, 17 projects worth of 52 million TL are active by the colleges and research centers (Figure 43). But, no data is available about the project related to or focused on sustainability. At present, although there is no specific research focus on sustainability, KU has various centers on working different aspects of sustainability such as TÜSİAD-KU Economic Research Forum; Social Impact Forum, Globalization and Democratic Governance, Research and Application Center for Gender and Women's Studies, Migration Research Program, Social Policy Applications and Research Center, KUTEM. Each research center runs researches in their domain. However, "sustainability" as a main topic is not often mentioned as the priority. For instance, regarding the environmental sustainability related topics in research in the domains of engineering and science, many collaborative and interdisciplinary research projects have been run by the KU Faculty, which have direct and indirect effects on environment and energy; even though, sustainability is not mentioned in the project name. Another research opportunity to promote sustainability research projects at undergraduate level is the "Summer Research Program for Undergraduates" where the faculty members announce their research projects; and interested students apply online to these projects. If they are chosen, they are offered free accommodation, and the program is tuition free to them to promote research among undergraduate students. Doing research with these senior researchers is a life time experience for interested students in doing research. There are some energy, environment, migration related research projects among the research projects offered in this program. However, there has been no specific sustainability topic project offered to students. Research topics related to or focused on sustainability should be included to summer research program for undergraduate students and high school students.

Links Between Campus Operations and Research	35	25	Combining research, implementation, and learning experience is possible through research collaboration with private sector, and implementation of these researches in the campus. For instance, KUTEM has already some research projects in its agenda which could be implemented in the campus buildings to make them more energy efficient such as: 1) Some implementations of nano insulate; 2) Photo-catalytic, self cleaning coating; 3) Research on near-infrared reflecting paints; 4) Research on ventilation systems. KU Research Centers could develop some campus sustainability implementation projects with the relevant units in the campus. For instance, KUTEM should work with the General Secretary for solar and wind energy project demonstration and energy efficiency implementations at KU campus. KUSIF could develop an institutional cultural development program with HR and Dean of Student and measurement tools for KU.
TOTAL	**100**	**70**	Sustainability research identification should be done, and faculty engaged in sustainability research should be identified in the short term. In this way, KU could plan and support strategic growth in chosen areas of sustainability. Increasing the number and the quality of international research collaboration is very important for KU to keep up its research competitiveness. OIP and VPRD could support faculty for travel and accommodation to develop research collaboration with important international partners on some important topics of sustainability that KU would like to be more internationally active and competitive.
4. Campus Community			
Diversity, Affordability, equity and Inclusion	**Possible Points**	**KU Points**	**Explanations**
Affordable Programs Accessible to All	50	40	Even though KU is a non-profit foundation university with tuition fee, the university offers various and strong scholarship programs to successful students having economic problems. In addition, the rate of the scholarship has been increasing year by year. 60.0% of the student body at KU has scholarship, and 40.0% of this 60.0% have full scholarship. Besides, there is a major scholarship program called "Anatolian Scholarship" which has been running since 2011 by the Corporate Relations and Development Office. This scholarship program raises funding for scholarship to successful students who do not have economic means from all Turkey to study at KU.

Culture of Diversity, Affordability, Equity and Inclusion Among the Campus Community	50	30	The rate of international campus community and disabled staff and students has been increasing and diversifying at KU. Both HR and Dean of Student have programs to provide equity and inclusion among the campus community. KU is committed to creating equal accessibility of any academic, residential, and campus-life related services to all students, and has the Office of Disability Services. As the number of disabled staff and students increase in the campus, improving campus infrastructure and support programs to disabled staff and students are at the core of the Committee of Occupational Health and Safety, which was established in April 2013. The well functioning of this committee should be provided, and the committee should be sensitive to coordinate and solve the needs submitted by the Office of Disabilities Services.
TOTAL	**100**	**70**	Diversity, affordability, equity and inclusion should be further developed and planned to have socially sustainable campus environment. Support programs for underrepresented groups in the campus should be a priority. Institutional cultural development program should be developed as a first step to foster inclusive and welcoming campus culture. Second, assessment method to measure diversity, equity and inclusion in the campus should be developed to support the improvement of institutional cultural development program. More programs for disabled students, staff and faculty for the whole campus community should be developed to build KU without Barriers.
Human Resource	**Possible Points**	**KU Points**	**Explanations**
Incorporating Sustainability into the Human Resources Programs and Policies	25	15	Koç İnsan was established in 2012, and is now on-line. Koç İnsan is an important tool to incorporate sustainability into the HR programs and policies as performances, progresses of staff are followed through this system. In the short run, the well functioning of the system and adaptation of KU staff to the new system is aimed. At present, personal development plan of KU staff is integrated into all managers' objectives. Besides, staff is able to put "contribution to social responsibility" section into their yearly work aims. Social responsibility option is already integrated into the performance evaluation of the staff. In the medium term, the development of more sustainability outreach programs for staff should be facilitated and the participation of staff to these outreach programs should be promoted. Staff should be more motivated to participate to these programs.

Treating and Remunerating Staff Responsibly and Fairly	25	25	KU has an HR Policy and Code of Ethical Conduct and Practice Principles to treat and remunerate staff responsibly and fairly.
Benefits, Wages, and Other Assistance that Serve to Respectfully and Ethically Compensate Staff	25	25	Benefits already exist, and are described in the HR policy. HR will provide more flexible fringe benefits in the short term. KU has an HR Policy and Code of Ethical Conduct and Practice Principles.
Faculty and Staff Training and Development Programs Related to or Focused on Sustainability	25	15	Koç Academy, having also online trainings, is newly launched at KU. This is an important tool to enhance the personal development of staff. In the short term, the well functioning of the system and adaptation of the system among KU staff is aimed. This is an important tool for staff professional development in sustainability. Trainings on ethical issues will be offered to staff, and these trainings will be also a part of the orientation program for new staff. Regarding the health and wellness programs, occupational health and safety trainings have just started, and will continue. Training on environmental and social sustainability should be added to the trainings possibilities and orientation program for new staff. Koç Academy will be an important tool to offer on-line and in hand sustainability related trainings to staff. Sustainability orientation program for faculty should be developed and sustainability orientation program for staff should be improved.
TOTAL	**100**	**80**	HR has already set objectives and key performance indicators to make KU campus socially sustainable by publishing KU Code of Ethical Conduct and Practice Principles in July 2013. Treating and remunerating staff responsibly and fairly, and as well as offering benefits, wages, and other assistance that serve to respectfully and ethically compensate staff are already part of HR strategy. Plus, KU Akademi has been already providing trainings to staff. A new addition to these objectives could be incorporating sustainability with more special topics on environmental and social sustainability into the programs of the HR. The most importantly, institutional cultural development program should be developed to equip faculty and staff with the tools, knowledge, and motivation to adopt behavior changes that promote sustainability.
5. Development and Implementation of Sustainability Policies and Efforts			

Sustainability Governance	**Possible Points**	**KU Points**	**Explanations**
Motivating and Empowering Campus Community to Support the Development, Implementation, and Evaluation of Campus Sustainability Policies	50	30	First, there is a need to develop procedure for campus sustainability coordination, planning, evaluation and reporting with the support of HR. Regarding the preparation of campus sustainability procedures, a working group should be established to work with HR. Second, Each department in the campus could integrate sustainability into their departmental objectives. HR should support them in this process. Third, KU could start reporting on campus sustainability. KU could be member to prestigious campus sustainability networks such as International Sustainable Campus Network.
Integrating Sustainability into all Strategies, Plans and Policies as They Come up for Renewal	50	30	In regard of the campus sustainability policies in the campus at KU, departments develop their own policies and implement them. Human Resource Directorate published KU Code of Ethical Conduct and Practice Principles on 15.07.2013, which is a very important document to enhance social sustainability in the campus. Regarding environmental sustainability policies, General Secretary Departments have already developed environmental policy, energy management policy, and implementation plans; however, these are internally developed policies and plans, and not communicated to the campus community. Whenever possible, KU units should add sustainability into all major documents. This revision will take time.
TOTAL	**100**	**60**	Sustainability governance is crucial to establish governance model and indicators for campus sustainability at KU.
Coordination and Planning	**Possible Points**	**KU Points**	**Explanations**
Goals and Targets for Campus Sustainability, Progress and Revision	50	30	Departmental and unit based campus sustainability related or focused goals and targets exist such as in the case of energy usage, HR targets and goals, etc., however, there is no institutional based goals and targets to enhance campus sustainability with a holistic approach. Existing targets and goals being each part of the institutional goals and targets should be unified, and missing parts should be added by committing to enhance KU campus sustainability. Sustainability Task Force should be established from the administrative, staff, faculty and students to set goals and targets for KU sustainability

			framework. The committee should have co-chairs from management and academics. Sustainability requires coordination of all units in the campus. Sustainability Task Force should report directly to the President. Decisions of Sustainability Task Force could be discussed and shared during the Coordination Committee meetings every month.
Coordination, Planning, Evaluation And Reporting Structure for Campus Sustainability	50	30	There is neither university wide coordination nor monitoring committee in regard of developing and implementing sustainability policies in the campus. At present, General Secretary Departments are involved in policy development or policy implementations in environmental sustainability of the campus in the operational area, and some outreach programs such as Zero Waste has just initiated. In addition, Director of Construction, HR, or Dean of Students have all their own rules, policies and plans in regard of some part of the campus sustainability. However, they are not coordinated, planned, evaluated or reported under one umbrella of campus sustainability. Theme based sustainability working groups should be established whenever Sustainability Task Force needs for further work such as planning, implementation, and evaluation. Students are the major players of coordination of campus sustainability. With the support of the Dean of Student, sustainability student leaders should be chosen every year to work in the sustainability projects in the campus. These students should be trained, oriented and have an agenda of campus sustainability implementations. With the guidance of the Sustainability Task Force, units in the university should start preparing sustainability plans for their departments. Universities committed to campus sustainability open campus sustainability offices to coordinate and plan all sustainability measures and implementations in the campus. This could be also possible at KU in the medium term
TOTAL	**100**	**60**	Coordination and planning is crucial for monitoring, reporting, and improving campus sustainability at KU.

Source: KU Sustainability Improvement Table is Prepared Specific to KU Criteria Capacity, Priorities and Structure Based on the Interviews, Various Meetings, and Researches on Sustainable Campus Implementations in Example Universities and Others in the World.

KU needs a holistic approach to campus sustainability	KU Campus has reached its optimal growth level regarding campus population and campus development	Every sustainability measure and improvement could rapidly improve KU campus sustainability	Actions to be taken in the short term in the road map have high and rapid impact on sustainability improvements in the KU Campus	Some sustainability measures and improvements could be easily implemented by the decision of directorates within the existing budget and human resources of the departments	Some sustainability measures and improvements need high budget and commitment of the higher management to campus sustainability	Creation of campus sustainability culture will trigger behavioral change within the campus community to support sustainability measures, and engage in implementation of these measures	KU is ready for taking further campus sustainability measures

Figure 47: Results of the Campus Sustainability Case Study of KU

Source: These Conclusions are derived from the study results.

4.2 Key Suggestions on Campus Sustainability for other Turkish Universities and Academia

Based on the experience in developing the KU case study, some key suggestions were presented for campus communities interested in initiating campus sustainability in their universities (Figure 48). There are eight key suggestions on campus sustainability for other Turkish universities and academia.

Knowing where to start to get support, and initiate campus sustainability: Every university has different capacities and structures. Sometimes a faculty member, sometimes an administrator, or a student club is the driver of campus sustainability. The biggest co-partner of a campus sustainability initiative could be one of these people. So the starting point should be in finding those people who will be supportive, knowledgeable, and interested in the campus sustainability topic. Learning about the school and management and what has been done about campus sustainability from these people is useful to match the missing parts.

Raising awareness: During the campus sustainability journey, the number of the supporters and interested people can increase as continuous interactions raise awareness on campus sustainability among different stakeholders of the campus community.

There is no barrier for campus sustainability: Even though there may be support and willingness at the management level, sometimes financing campus sustainability investments provide barriers faced during the process. For instance, just the application for LEAD certification is more than $30000. But, there are always other simple things to do for campus sustainability. That is why it is important to establish short, medium, and long term goals. Some immediate actions are possible without any big investments with the collaboration and support of some units in the university.

Overcoming resistance: During the campus sustainability journey, it is normal to encounter “No” and resistance from some campus community members as the university could change its usual ways of doing business. Changes for amore sustainable campus in some key operational areas can take time. In order to progress,

small steps could be taken in these areas with consensus. There are always things to do on campus sustainability, even small. In addition, as the campus sustainability initiative proceeds, the campus community having resistance to change will be more collaborative to work on campus sustainability improvements.

Doing more with the available sources: Almost every campus interested in sustainability can find available resources to increase social impact and improve the environmental impact of the campus. The first priority should be to investigate the possibilities for making the campus more sustainable with the available resources. For instance, using recycled paper is both economic and environmental. In this regard, promoting the usage of recycled papers could be prioritized. For every campus, first priorities will be different based on the available resources and campus structure.

Enhancing social innovation on campus: Promoting social entrepreneurship and social innovation in the university will increase the initiatives on campus sustainability. People need an umbrella and platform to develop and implement sustainable campus programs and initiatives. The university management and faculty may be able to provide this environment to students, staff and faculty.

Building a holistic approach to campus sustainability: A holistic approach to campus sustainability should be developed, and none of the campus units should be ignored in this approach. In this regard, campus has to be considered in every aspects of sustainability as economic, social and environmental.

Using a campus sustainability methodology: If the administration of the university would like to commit to campus sustainability, the campus sustainability development methodology (Figure 49) used in the KU case study could be implemented..

The KU case study is ready to be offered to the President of Koç University and other administrators at KU to take further steps for campus sustainability. In addition, key suggestions and campus sustainability methodology could be a practical guide for universities in Turkey and academia who are interested in developing a holistic approach to campus sustainability.

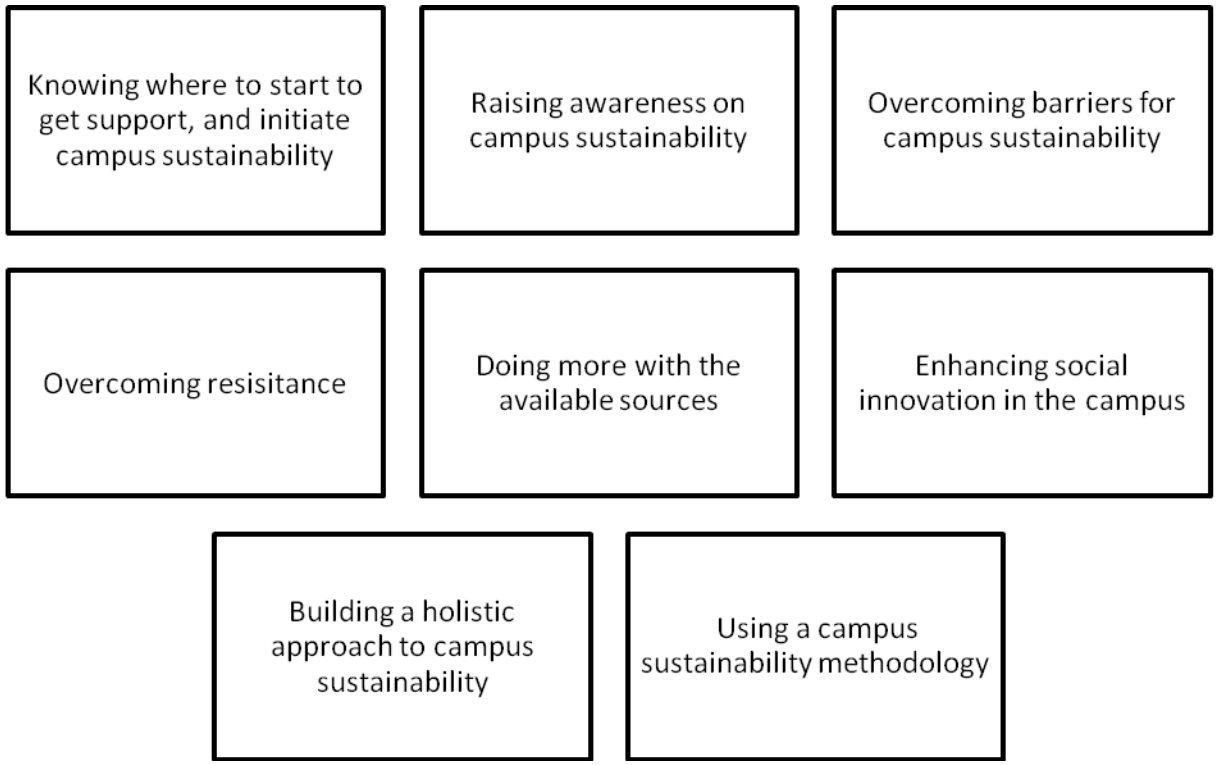

Figure 48. Key Suggestions for Campus Sustainability for Other Turkish Universities
Source: Key Suggestions for Other Universities are Developed Based on the results of the KU Case Study

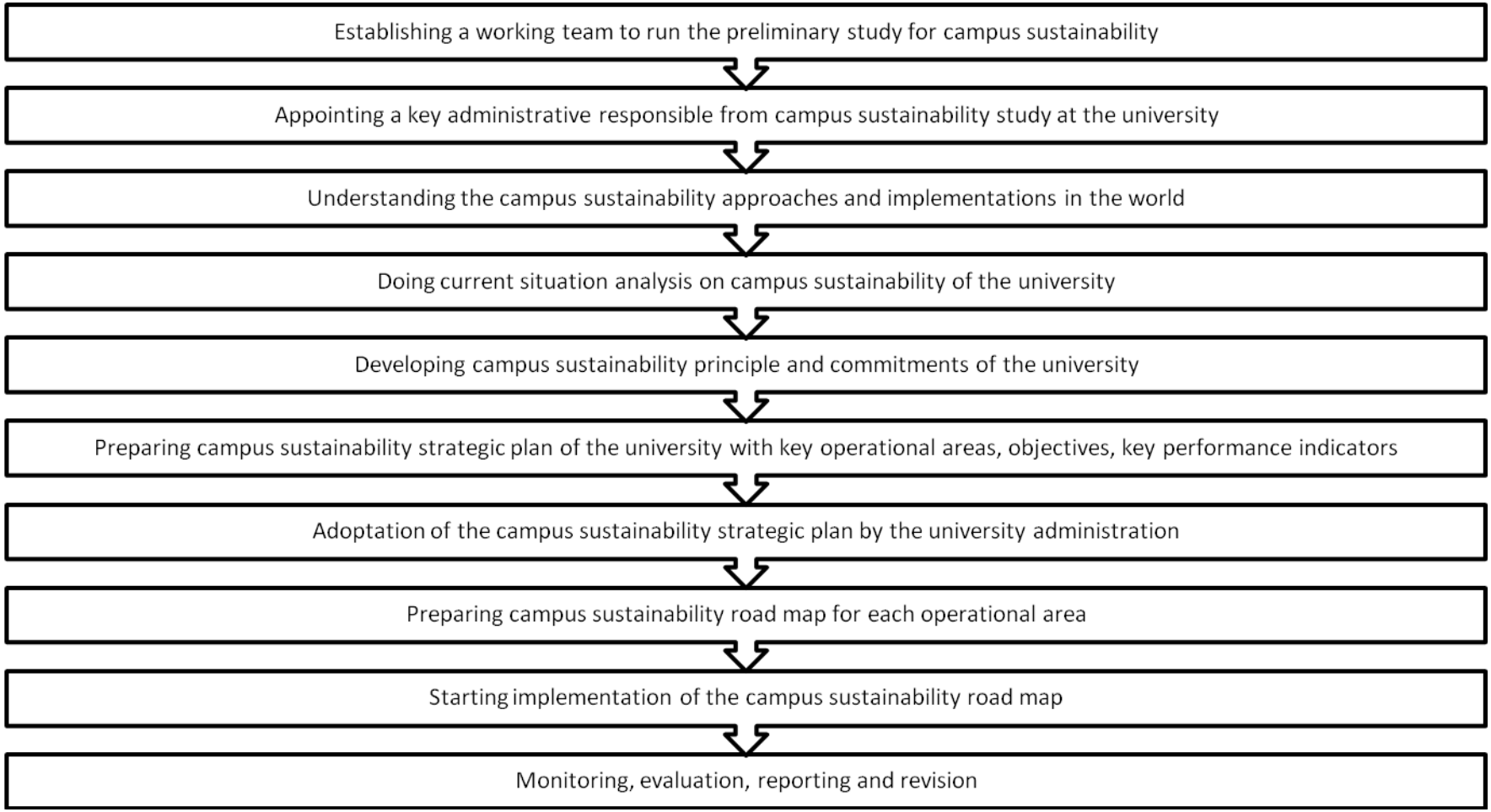

Figure 49. Campus Sustainability Methodology that could be used in other Turkish Universities
Source: This Methodology is Developed based on results from KU Case Study

5 CONCLUSION

The objective of this thesis was to examine campus sustainability in the EU and Turkey, and develop a holistic approach in Turkey using KU as a case study. Because HEIs play an essential role in society, creating new knowledge, and fostering innovation, the analysis of campus sustainability in the EU and Turkey included energy, energy efficiency and energy efficiency of buildings to see how HEIs are involved in national problem solving through sustainable campus implementations. *Sustainability* has been a fundamental objective of the EU since 1997 as sustainable development was included in the Treaty of Amsterdam as an overarching objective of EU policies (www.ec.europa.eu, 2013b). HEIs in the EU have succeeded in playing an important role in the achievement of this objective. The Bologna Declaration initiated the Bologna process in 1999 for HEIs and the Member States have been incorporating the European dimension into higher education (www.europa.eu, 2013c). This was the start of a major transformation of HEIs in the EU.

HEIs are more than academic institutions that manage ethical and moral approaches to national and global issues. Campus sustainability has become an important holistic approach on campuses to develop in all dimensions of environmental, economic and social sustainability and to integrate them into their communities. European Universities have unified in supporting sustainable development in education since the early 1990s by signing the COPERNICUS University Charter for Sustainable Development in 1993, which is a response to the Rio Conference (UNCED) in 1992, and establishing the COPERNICUS CAMPUS. After the announcement of the Guidelines, 320 universities from 38 countries including universities from Turkey have signed the Charter since 1993; thus, the Guidelines support them in curricula development, institutional management, establishing services to the local or regional society, and having a responsible balance between economic, ecological and social/cultural aspects (Copernicus Campus, 2007 p.6).

Another improvement through sustainability in the HEIs in the EU is the Bergen Communiqué which was made in 2005 stating that The European Higher Education Area (EHEA**)** must be open and education should be based on the principles of sustainable development (Communiqué of the Conference of European Ministers Responsible for Higher Educations, 2005, p.4). For the first time since 1999, a strong reference was made to the Bologna Process as a key mechanism to establish a European Higher Education Area by 2010 (www.sustainabilitytreaties.org, 2013) and EHEA was launched in March 2010.

However, the HEIs in Turkey have not introduced a major voluntary or governmental initiative in sustainable development until now. Campus sustainability is new and no holistic approach exists. The sustainability efforts in the universities are not combined and mostly scattered. For instance, in Turkey, establishing solar energy equipment for water heating in one of the dorms in the campus, or distributing a sustainable campus flyer is enough to consider the campus as sustainable. There are only a few individual greening initiatives and campus sustainability has not been mentioned yet. Turkish universities could be more active on campus sustainability and should take their roles to raise students aware of sustainability. Regardless of their majors and career goals, students should graduate as individuals who are aware of a sustainable lifestyle. Unfortunately, sustainability is not a top priority of Turkish Universities. Usually, efforts are gathered on greening the campus, mostly in the area of campus operation.

HEIs around the world are responsible for the needs of global sustainability. All of the global, regional and national level declarations and initiatives since the Talloires Declaration in 1990 have been investigating how HEIs should fulfill this responsibility and initiate necessary platforms for the HEIs.

Since the launch of the Bologna Process, the EU has been transforming their HEIs to make them an important element of the EU Lisbon Strategy to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion (Nyborg, 2008). The Heads of the States decided on the Lisbon Strategy of the EU in

March 2000, and committed to bring economic as well as social and environmental renewal to the EU (www.ec.europa.eu, 2011b). In the EU structure, every strategy is complementary with each other; that is why relevance with the EU Sustainability Strategy campus sustainability encourages HEIs in the EU to commit to social, environmental and economic sustainability of their campuses, to do more than what is legally required, and to complement current legislation (www.campusmoncloa.es, 2013d).

Even though there is no set definition of campus sustainability, most of the HEIs in the EU work on campus management (energy consumption, on-site renewable, energy efficiency, waste & recycling, sustainable campus development of housing & buildings, water management, transportation, procurement, landscape, food and dining), research, education, outreach, (curriculum, programs, outreach, community engagements), campus community (diversity, affordability, inclusion and human resource) and development and implementations of sustainable campus policies and efforts on campus (sustainability governance, coordination and planning) to make their campuses socially, economically and environmentally more sustainable.

Every component of campus sustainability is important for the holistic approach but this study puts energy efficiency in buildings in the sustainable campus as a priority. Energy consumption in every university campus is high, and the highest part of the carbon foot prints of the universities is caused by energy consumption. Energy efficiency and energy efficiency in buildings have become an important priority to be addressed for campus sustainability. Energy efficiency strategies and implementations on a campus should be active in buildings as buildings have the highest percentage of energy consumption on a campus with heating, cooling, and lighting. Indeed, buildings have high and untapped energy saving potential. Energy efficiency in buildings should be prioritized to become a sustainable campus.

HEIs are also important stakeholders to increase energy efficiency in their countries through their implementations on campus sustainability. Through campus sustainability, HEIs are able to raise responsible generations aware of the limited

energy sources during their education, decrease energy consumption and improve environmental impact of the university with energy efficiency programs other campus.

Understanding the driving forces of energy efficiency, the implementations, and regulations is necessary in understanding the role of energy efficiency.. This thesis provided a review of an energy outlook, energy efficiency approaches, and energy efficiency in buildings regulations and implementations in the European Union and Turkey. The review provides an indication of how the HEIs in the EU and Turkey could be part of the solutions for their national problems by developing and implementing campus sustainability strategies.

Energy is one of the oldest common policy areas in the EU and has always been at the heart of the European integration from the start. Energy has become one of Turkey's vital development priorities due to the increased population and income growth, unique geo-political and geo-political location, increased energy demand, and necessity to have more sustainable energy mix. A comparison of the EU case and Turkish case illustrates how HEIs play a role in solving national challenge energy related issues. European HEIs are far beyond the Turkish HEIs. It is surprising to see that when two sectors are taken separately as energy sector and higher education, Turkey has been showing a progress of harmonization in both of them: In the 2013 Progress Report of the EC, Turkey is considered at a rather advanced overall level of alignment in the field of energy (Commission of the European Communities, 2013c, p.37); Turkey participated in the Bologna Process in 2001 to reconstruct its higher education. However, there have been some black holes during this harmonization: Why have Turkish HEIs been lagging behind their European counterparts regarding campus sustainability?

EU Member States combined their efforts under the "EU Climate and Energy Package" containing measures 20-20-20 targets on emissions cuts, renewables, and energy efficiency by 2020 and the Energy Roadmap 2050 as part of the Resource Efficiency Flagship of the Europe 2020 strategy, and working to support the established objectives of EU energy policy regarding sustainability, energy security and competitiveness (www.ec.europa.eu, 2011i). A low-carbon energy system transition is underway in the EU where energy efficiency and energy

efficiency in buildings play crucial roles in this transition. HEIs in the EU have taken a stand to become part of this transition through successful sustainable campus implementations. Moreover, these campus sustainability implementations are not only in the area of energy, but include other implementations and approaches to make the campus in the EU much more socially, environmentally and economically sustainable. Besides various networks, associations, conferences, assessment tools and awards related to or focused on campus sustainability (Table 9), in most of the EU countries, a governmental approach to sustainable development in the HEIs exists. France, Spain and Sweeden are examples. In France, the environmental law "Grenelle de l'Enviroment" was published in 2009, and Article 55 is related specifically to the HEIs in France which states that institutions of higher education elaborate a "Green Plan" for campuses and that the universities and high schools can request a labelling on the foundation of criteria of sustainable development (www.eua.be, 2012). In Sweden, the Higher Education Act was changed in 2006 stating that HEIS in Sweden shall promote sustainable development ensuring present and future generations a healthy and good environment, economic and social welfare and justice (www.eua.be, 2013). On the other hand, the Spanish Government launched an initiative called Strategy University-2015 (SU-2015) to develop a framework of 4 key dimensions (missions, people, institutions, and environment) where the campus is one of the sub categories. (Rubrialta and Delgado, 2010). In addition, the International Campus of Excellence (CEI) Program was established to make Spanish university campuses among the best in Europe with sustainability focus a new concept on campuses. The CEI awarded funding and grants for the Spanish universities first time in 2009, where sustainability, the transformation of the campus; the development of an integral social model and interaction with the territorial environment were the criteria (Rubrialta and Delgado, 2010).

Since 2000, Turkey has been working to pass new legislations to restructure its energy sector to make it compatible with the European energy sector. At present, there are 35 Chapters and more than 100000 pages in the EU Acquis. Since March 2001, the EU has issued *4 Accession Partnership Documents* to set the priority areas for Turkey to align with EU's accession criteria. The latest Accession Partnership

Document was published in February 2008. Since 1998, 16 Progress Reports for Turkey have been published by the EC to assess the country's progress in preparation for EU membership. All of the documents issued by the Turkish Government were aligned with the EU's energy policy, even though there were some delays and difficulties in the implementation phases. Reducing the high energy intensity of the Turkish economy and securing rapid and continuous improvement in energy efficiency in a way that parallels EU countries are among the priorities of Turkey (www.energi.gov.tr, 2011a). In addition, the Energy Efficiency Strategy was published in February 2012 putting at least 20.0% decrease in energy intensity by 2023. Regulations on the energy performance of buildings and on eco-design requirements for energy-related products have been instituted. A set of new communiqués commenced on eco-design implementations (Commission of the European Communities, 2012, p.71). However, like their counterparts in the EU, HEIs in Turkey have not become part of this energy transformation happening in Turkey through successful sustainable campus implementations. Institutions at all levels should work to support Turkey in making progress toward EU membership. HEIs in Turkey should also transform themselves to support this progress. In Turkey, the sustainable campus concept is new and no holistic approach exists either legally or voluntarily. The sustainability efforts in the universities are not combined, and mostly scattered.

Ensuring economic growth, environmental protection and social integration, carbon reduction, renewable and energy efficiency targets are important strategies for the EU. Even though economic and social aspects of the sustainable campuses are not emphasized at the same level as the environmental campus sustainability, university campuses in the EU Member States responded to these strategies and targets as important stakeholders. Unfortunately, a holistic approach of being a model of sustainability, a sustainable campus, is lacking in Turkish HEIs. The challenge that Turkish universities face is both providing campus community a healthy and sustainable quality of life, and preparing students as responsible citizens for environmental and social issues. As the EU continues to give top priority to environment and energy efficiency in its future goals and the harmonization of EU

Acquis to Turkish Law on environment, energy efficiency continues, Turkish universities will be forced to put sustainability into the core of their strategies. The same is happening in Turkey as happened in North America or EU: the first step is greening the campus operation and then the next step is campus sustainability.

Some good examples of sustainable campuses were presented in this thesis. Indeed, universities will start recycling, turning off the lights, then asking "what is next?" to shift the university to a more comprehensive approach to campus sustainability. When the capital becomes a constraint to go further in investment in campus sustainability, using energy efficiency, triggering behavioral change, and inspiring and engaging the campus community will become new opportunities to continue sustainability efforts. Campus sustainability and campus greening are used interchangeably in most of the universities. Many universities in the world are trying to decrease their environmental impact, increase their positive social impact while being leaders in sustainability in teaching, research and practicing. Some universities are more successful in integrating the social aspects of sustainability with environmental sustainability efforts on their campuses.

Every campus has its own story of campus sustainability as well as a different way of approaching it. Some universities in the EU are successful at reinventing every dimension of the campus to be a living laboratory for students and consider campus sustainability as a competitive edge for the university. These universities have made important achievements by developing and implementing campus sustainability programs. Campus Moncloa in Spain is a good example of campus sustainability as two Madrid universities: The Universisad Complutense of Madrid (UCM) and the Universidad Politecnica de Madrid (UPM) collaborated and were awarded the project Campus Moncloa by the : the Power of Diversity. Four prominent points emerge in this Spanish campus sustainability case: First, there is a governmental approach to campus sustainability which is the International Center for Excellence Program, a program which started in 2009 to make Spanish university campuses among the best in Europe (sustainability and promotion of a new concept of campuses is a part of the International Center for Excellence Program. Second,

there is an example of collaboration and innovation as two major universities in Madrid come together to develop and implement this project for their universities and the city of Madrid. Indeed, Spain has been successful in having a competitive edge through sectorial clusters. Third, HEIs come together to increase their competitive edge and act in relevance with the EU Sustainability Startegy and Lisbon Strategy to make Europe the most competitive and dynamic knowledge based economy in the world. This is a concerted effort by two main Spanish universities to support Spain in the process of becoming a knowledge based economy. Fourth, there is a holistic approach to campus sustainability and not only greening the campus operations, but also economic, social and environmental aspects of the campus sustainability integrated with the city of Madrid are used, with specifying 11 sets of specific objectives based on their priorities. In terms of results of the Campus Moncloa project, both quantitative and qualitative satisfactory results were observed in 2012 and better results are expected to be achieved in 2015 (www.campusmoncloa.es, 2013c). Some of these results follow:

- ✓The number of people involved in gender equality awareness activities increased 20.0% in 2012 and is expected to increase 35.0% from the initial status in 2009.
- ✓The number of Students participating in collaboration programs for disabled persons in their centers increased 20.0% in 2012 and is expected to increase 60.0% from the initial status in 2009.
- ✓The number of bicycle parking spaces on campus increased 71.4% in 2012 and is expected to increase 128.7% from the initial status in 2009.
- ✓The number of renewable energy facilities/buildings on campus increased 66.7% in 2012 and is expected to increase 166.7% from the initial status in 2009.
- ✓The square meters of regenerated parkland increased 31.6% in 2012 and are expected to increase 84.2% from the initial status in 2009.

In addition to quantitative results, some qualitative results have been achieved as well in terms of a sense of belonging, designing a comprehensive campus from an urban and social perspective, improving the working environment, and a live campus; i.e., university life 24 hours a day (www.campusmoncloa.es, 2013c). The Moncloa Campus is a good example of a holistic approach for campus sustainability with social, economic and environmental aspects of sustainability.

HEIs in Turkey need exemplary successful campus sustainability cases. Even though there has been no specific governmental approach to campus sustainability, KU could be the first example HEI from Turkey becoming a sustainable campus by developing a holistic approach to campus sustainability, and supporting Turkey's membership process to the EU.

Turkish universities are at the stage of the environmental sustainability in operations of their campuses. In this regard, the KU Rumelifeneri Campus is used as an example of a sustainable campus in Turkey in order to guide universities on how to develop a holistic approach to campus sustainability in Turkey due to fact that demonstrating a case with a holistic approach to campus sustainability is an example for other Turkish universities. KU was chosen as an example because of its accessibility to and availability of data, the willingness to collaborate from the senior management, and already existing programs and units that could easily support developing a holistic approach to campus sustainability.

KU has 5000 students, 500 staff and 456 faculty members on campus. The KU main campus is located on an area of 250000 m² combining modern outdoor facilities with six academic, administrative, residential, recreational buildings and green areas. The Campus has a dormitory capacity of 1500 students, and 150 faculty housings.

Even though there could be some minor changes, KU Campus has reached its optimal growth level regarding campus population and campus development. A major growth of campus population or campus development is not foreseen in KU's plans. This is the physical environment of the campus. Also, KU is a signatory of the

10 Principles of the United Nations Global Compact and Principles for Responsible Management Education, two important international initiatives promoting environmental, social responsibilities, and a more inclusive and sustainable economy.

These elements provide the necessary conditions to use KU as a case and develop an exemplary model for campus sustainability in Turkey. The methodology used during the development of the case is based on semi-structured interviews and various meetings with key people from staff, management, and faculty, real data collection from different departments and categorization of them, evaluating and reporting the data collected through various processes and researching campus sustainability examples, approaches, rating systems and networks in the EU and the world.

The current situation at KU is organized under five headings: Environmental Sustainability in Campus Operations, Education and Outreach on Sustainability, Research Outlook and Sustainability, Development and Implementation of Campus Sustainability Policies, and Social and Economic Aspects of Campus Sustainability were chosen based on the sustainable campus criteria and structure of KU:

Environmental Sustainability in Campus Operations: Environmental sustainability in campus operations at KU were presented under six sections: Resource Use of Electricity, Natural Gas and Water; Waste and Recycling; Carbon Foot Print; Transportation; Procurement; Sustainable Campus Development; and Food and Dining.

Education and Outreach on Sustainability: Available courses, programs and outreach activities

Research Outlook and Sustainability: Research opportunities, projects and centers related to social, economic and environmental sustainability

Development and Implementation of Campus Sustainability Policies: Current sustainability related policies and their implementations at KU

Social and Economic Aspects of Campus Sustainability: Social and economic sustainability in the campus with a more focus on social sustainability

The current situation analysis demonstrated that even though there have been not concerted action and holistic approaches toward campus sustainability at KU, different departments and administrative, academics, and student clubs in the university have already been engaged in many implementations. The main aim should be to unify these existing initiatives and implementations as each of them bring important components of a sustainable campus and develop a common working platform under “campus sustainability” to develop a campus sustainability culture and approach at the university. Additional coordination and a concerted action are needed to unify all current efforts. Thus, all of these efforts will be synergized, and create more awareness, impact, and trigger further actions on campus to create a campus sustainability culture. Currently, there is no holistic approach on campus sustainability and present activities on campus sustainability are not communicated enough to the campus community.

In order to create holistic approach to develop campus sustainability culture at KU; *Sustainability* should be integrated into the University’s strategy. In this regard, developing sustainable campus strategy and a road map should be a priority. In this way, all units in the campus will be aware of this strategy, plan, and act accordingly. For instance, there are simple things which do not need big budgets but require awareness and coordination that could be done in short and medium terms. Having a university wide sustainability strategy, a road map, and a coordination and monitoring mechanism will unify every unit of the campus for the same aim which is making KU Campus more sustainable.

Effective campus sustainability communication is another important finding from the current analysis of the KU campus. At present, campus community is not guided on what to do or how to do to support campus sustainability. Especially, the current students of y and z generations at KU are conscious about environment and sustainability issues, and they are open to do more when necessary platforms and tools are offered to them. KU should communicate the sustainability mission effectively to faculty, staff, and students. With a KU sustainable campus mission,

students will be encouraged not only protect the campus but also do more for their campus sustainability, and as well as for their future.

For KU, campus sustainability should be beyond green as the university already has strong commitments on environmental, social and economic aspects of sustainability as demonstrated from the current situation analysis.

Even though some units need to make more effort on integrating campus sustainability in their departmental goals and project; most of the units have been engaged in projects, programs regarding sustainability of the campus within their areas of expertise and operations. In addition, a “Global Responsibility” already exists in the vision and mission of the University. However, what is lacking is the holistic approach on campus sustainability, where all units could work together, and create synergy and more actions to support KU to be a more sustainable campus. KU needs a campus sustainability strategy and a road map to implement this strategy. After setting sustainability commitment and principles for KU, a campus sustainability strategic plan and a road map to implement this strategy were developed.

In this thesis, KU Campus Sustainability Principle is defined as below:

As a “Center of Excellence” (Table 20), KU is committed to add value to sustainable growth and bears global responsibility as an exemplar for the environmental, social and economic aspects of campus sustainability through its human resources, education, research, engagement, and campus operations.

The following five commitments to support KU Campus Sustainability Principle were presented to top management at KU:

- ✓ integrating sustainability into teaching, learning, research, operation and campus culture
- ✓ reducing the use of resources and the operating costs
- ✓ improving its environmental impacts
- ✓ increasing its social impacts

- ✓ establishing governance model and indicators for sustainability to monitor, report and improve campus sustainability

Sixteen key operational areas specific to KU to implement these commitments were defined: energy consumption, water, carbon footprint, waste and recycling, transport, procurement, campus development, food and dining, efficient use of natural resources, curriculum, outreach programs, community engagement, research, diversity and affordability and equity andinclusion, human resources, sustainability governance, coordination & planning. These areas were grouped under five sections: campus operations, education and outreach, research on sustainability, campus community (students, staff, faculty), development and implementation of sustainability policies. To finalize the strategic plan, objectives and key performance indicators for each operational area were defined.

Every university has its unique operational structure and needs which define directions of the campus sustainability that the university could follow. Some operational areas and programs could be the priority for some universities, while for other universities, the same operational areas and programs could not be the first priority due to other priorities and limitations. For instance, food sustainability could be a long term objective for a university, while for another university this could be a short term objective. The destination to be a sustainable campus that the universities would like to go is the same; however, the journey could be different for them because they have different available resources, operational structures, and needs. In this regard, objectives are set specific to KU but other Turkish universities could use the methodology and the findings of this study to develop their own specific objectives for campus sustainability. Additionally, key performance indicators are also specific to each objective and important for measuring the improvements related to the objectives.

At the final stage, a road map to implement the developed strategic plan was formulated. The KU campus sustainability road map is the guide to actions to be taken in the short (1year), medium (2 years) and long term (3 years) to actualize the strategic plan.

Actions to be taken in the short term are mostly the actions that can be realized in the short term with available resources, or have already been in progress by the departments on campus. Actions to be taken in the medium term are mostly the actions that could be realized in medium term, which need some time to work on and coordination with other departments. To implement medium term actions, a strategic plan should be accepted and understood within the KU campus community. Actions to be taken in the long term are mostly the actions that could be realized in the long term, which need a financial and human resource commitment from the senior management to the campus sustainability strategic plan. The intention is to develop and propose a general road map that could guide departments to develop their own detailed road maps. The road maps of some sections are more detailed because there are more actions that could possibly be taken without a financial or human capital burden, there is a higher interest from the departments, and more data is provided to develop a road map.

The main idea is to use the existing sources more efficiently while improving the environmental impact and creating more social impact. Many proposed activities provide new ways of doing business on campus without having additional budget or human resources. Other activities will need the commitment of the higher level management, as they require budget and commitment to sustainability to improve environmental impact of the university.

A KU Campus Sustainability Improvement Table was prepared (Table 24) as an outcome of the campus sustainability case study, campus sustainability rating systems in the world and the EU, and other sustainable campus cases discussed in this thesis.

Table 24 shows the improvement necessary in every operational area to enhance campus sustainability at KU. Rating indicators of each operational area are based on the available rating systems, operational objectives and key performance indicators already prepared for the KU campus sustainability strategic plan. Each operational area is rated over 100 points, which are shared among the rating indicators. KU is evaluated based on the each indicator. As a result, it is possible to

see how KU campus could be improved to be more sustainable. The reasoning of the points that KU has earned is explained as well (Table 24).

The operational areas of Energy Consumption has 90 points, Water Usage has 70 points, Waste and Recycling has 70 points, Carbon Footprint has 85 points, Transportation has 45 points, Procurement has 60 points, Campus Development has 90 points, Food & Dining has 60 points and Efficient Use of Resources has 70 points.

Among the campus operations, energy consumption and campus development have the highest points. The energy infrastructure is well developed and necessary investments in energy consumption have been planned. However, investment decisions should not be based only on the return on investment, but also on improved environmental sustainability of the campus or positive social impact creation. A trigeneration investment is recommended. In addition, KU is one of the few universities having a cogeneration on its campus. However, further investments regarding the usage of renewable energy and clean technologies such as solar and wind energy sources for on-site energy production and usage, waste to energy production, and use of water cooled chillers could be reconsidered. Energy Consumption is one of the strongest campus operations on the campus which needs further development regarding awareness on the cost of energy among the campus community, more collaboration with academic research, and more demonstration renewable energy projects on campus. As one of the highest importance campus operations for KU, the next step for the Construction Directorate could be to put in implementation their plans of Monumental Trees and a KU Arboretum on campus. In this way, the existing parking lot could be used for a more meaningful campus sustainability project. In addition, an arboretum on campus is another way of engaging with the local community, opening the doors of the campus to people who would like to see the arboretum. With these projects, the Construction Directorate could increase both environmental sustainability and improve the social impact of KU through community engagement. Lastly, the KU Campus could apply for LEAD or BREAM Certifications for the new buildings on campus. The carbon footprint of

the campus has 85 points, so there is no need to increase the installed capacity of CHP with the existing growth objective of KU. At present, cogeneration provides 65.0% of the heat needed to produce hot water in dorms and heating of the campus. This shows that the carbon footprint caused from direct energy use is not expected to increase. However, waste amount could increase due to the increased number of students, staff, faculty and activities on campus. On the other hand, it is possible to decompose waste through existing waste management system on campus, and use waste to produce energy possibly through CHP. At present, GHG emission caused by waste is not included in the carbon footprint of the campus. While developing programs to minimize the production of waste through reduction, reuse and recycle waste could be used for waste to energy production, being an important tool to improve carbon footprint of the university. If the campus community grows, indirect energy usage such as electricity and water usage will increase. Another way to improve the KU carbon footprint could be solar energy sources on-site energy production and use in the existing buildings. At present, direct and indirect energy use is not expected to grow. So the existing carbon footprint of the university is not expected to increase. At present, the current carbon footprint of KU is at the highest reachable level.. Therefore, every measure that KU Management will take will have an immediate positive impact to improve the carbon footprint of KU.

Other campus operations such as Water Usage (70 points) and Waste & Recycling (70 points) could easily raise their points as they have already built the infrastructure to further campus sustainability programs with the commitment of the senior management to campus sustainability. Even though Technical Services has been implementing water conservation measures, the usage of water as an important natural resource in the campus should be reconsidered and strategized to be an important operational part of the campus sustainability; additionally, outreach programs should be developed for using water efficiently. Initiatives in environmental management of waste and recycling on campus have been planned and put in operation for the last two years at KU by the Facilities Management, General Secretary. KU is one of the first university having ISO 14001 Environmental Management Standard and has an environmental policy in action. The General

Secretary has achieved considerable progress regarding waste management and the next objective should be the evaluation and monitoring of waste reduction per person, recycled waste proportion percentage. Necessary measures should be taken, integrated waste programs should be initiated, and outreach programs creating awareness and as well as resulting behavioral change in the long run among the campus community should be developed.

On the other hand, Transportation (45 points), Procurement (60 points), Food and Dining (60 points) need to increase their points. Transport is one of the campus operations which need extra attention to improve the carbon footprint of KU and increase the quality of life on campus. Transport needs the commitment of the senior management to further improve campus sustainability. Reducing single-occupancy car use for commutes to the KU campus should be a priority for the KU campus sustainability commitment to reduce the carbon footprint and parking lot demand. The two other campus operations, procurement and food and dining offer a high potential to improve the environmental impact of KU and create a social impact. Even though purchasing decisions do not depend on the Procurement Management, because each department makes their own purchasing decisions, this department could play an important role in guiding and encouraging the campus community to purchase environmentally and socially preferable products and services where ever appropriate. Likewise, food and dining could be an important component of the KU sustainable campus with sustainable food practices. The General Secretary has provided safety and hygiene and has been able to offer quality food at affordable price; now, the General Secretary Departments should work together to support sustainable food practices on the campus and conduct a feasibility study.

The operational area of Education has 75 points, Outreach has 65 points, and Community Engagement has 75 points.

Outreach has the lowest points (65 points) as campus sustainability is not communicated well to the campus community. KU has many course offerings related to sustainability on the KU campus; however, sustainability as a term could be emphasized more to foster sustainability learning among students. In addition, a

concerted action is needed to create synergy in the university and take KU to the next level of sustainability, integrating learning and teaching with real life experiences. Even though some outreach programs exist, there is no holistic approach or a communication strategy regarding campus sustainability; it is not known which programs feed which aspects of the campus sustainability. More integrated outreach programs are needed to foster the campus sustainability culture and encourage the campus community to feel responsible and act. Sustainable community engagement programs should be strategized further in all aspects of sustainability, involve the entire campus community, not only students, and use all available resources of KU effectively to generate social impact creation in Sarıyer and further. KUSIF is a facilitator for KU units to give back to the community.

KU has 70 points for research on sustainability. Sustainability research identification should be done, and faculty engaged in sustainability research should be identified in the short term. In this way, KU could plan and support strategic growth in chosen areas of sustainability. Increasing the number and the quality of international research collaboration is important for KU to keep up its research competitiveness. The OIP and VPRD could support faculty for travel and accommodation to develop research collaborations with important international partners on some important topics of sustainability in which would like to be more internationally active and competitive.

The operational area of Diversity, Affordability, Equity and Inclusion has 70 points and Human Resources has 80 points.

The Dean of Students and HR have been working to make life on campus better for the campus community. In this regard, diversity, affordability, equity and inclusion should be further developed and planned to have a socially sustainable campus environment. Support programs for underrepresented groups on campus should be a priority. Institutional cultural development programs should be developed as a first step to foster inclusive and welcoming campus culture. Assessment methods to measure diversity, equity and inclusion in the campus should be developed to support the improvement of institutional cultural development

program. More programs for disabled students, staff and faculty for the whole campus community should be developed to build KU without Barriers. HR already has a set objectives and key performance indicators to make KU campus socially sustainable in the KU Code of Ethical Conduct and Practice Principles published in July 2013. Treating and remunerating staff responsibly and fairly, and as well as offering benefits and other assistance that serve to respectfully and ethically compensate staff are already part of the HR strategy. Plus, KU Akademi has already been providing staff training. A new addition to these objectives could be incorporating sustainability with more special topics on environmental and social sustainability into the programs of HR. Most importantly, an institutional cultural development program should be developed to equip faculty and staff with the tools, knowledge, and motivation to adopt behavior changes that promote sustainability.

The operational area of Sustainability Governance has 60 points and Coordination and Planning has 60 points.

Both sustainability governance and coordination and planning should be further improved to have a more sustainable campus at KU. Sustainability governance is crucial to establish governance model and indicators for campus sustainability at KU. Moreover, coordination and planning are needed for monitoring, reporting, and improving campus sustainability at KU.

To conclude, results of the study reveal eight recommendations for KU campus sustainability (Figure 47):

First, KU needs a holistic approach to campus sustainability. Even though different departments, administrative, staff, academics, and student clubs in the university have been already engaged in various campus sustainability implementations, the main aim should be to unify those initiatives and implementations as each of them are important components of a sustainable campus and develop a common working platform under campus sustainability with concerted action and communication. Thus, all of these efforts will be synergized and create

more awareness, impact, and trigger further actions on campus to create a campus sustainability culture.

Campus sustainability principles commitments should be adopted by the higher level management of the university. In order to implement these campus sustainability commitments, a campus sustainability strategic plan with key operational areas, objectives and key performance indicators should be prepared. Short, medium and long term road maps with activities and programs for each operational area have been proposed for the implementation of strategic plan. In this thesis, possible proposals were made for KU campus sustainability.

Second, even though there could be some minor changes, KU Campus has reached its optimal growth level regarding campus population and campus development. A major growth of campus population or campus development is not foreseen in KU's plans.

Third, Since the KU Campus will preserve its existing situation regarding campus population and campus development, every sustainability measure and improvement to be taken on campus will support KU in improving its sustainability.

Fourth, KU has a good current situation regarding campus sustainability, and could progress rapidly in being a sustainable campus; however, actions to be taken in the short term road map of the strategic plan are important for rapid sustainability improvements on campus.

Fifth, some sustainability measures and improvements could be implemented by the decision of directorates within the existing budget and human resources of the department or with low cost. In most cases, directorates are responding positively in planning and initiating these possible sustainability measures and improvements.

Sixth, some high budgeted sustainability measures and improvements need the commitment of the higher management to campus sustainability. High budgeted sustainability investments should be considered as long term investments and decisions should be based not only on the economic cost of the investment and

economic return on investment but also on creating positive social impact and improvements in the environmental impact of the university. A trigeneration investment and using renewable energy sources in the campus should be reconsidered by the higher management of the campus if these investments can secure a substantial decrease of the carbon footprint of the campus.

Universities committed to campus sustainability put climate action plans at the heart of their campus strategic plans and give priority to sustainability related investments and measures to decrease the campus foot print.

Seventh, the creation of a campus sustainability culture within the campus community will have a tremendous effect on the success of KU sustainability measures and implementations. The campus sustainability culture will secure behavioral change in the long term within the campus community to support sustainability measures and engage in the implementation of these measures.

Eight, KU is willing to commit to taking further campus sustainability measures in infrastructure, human and financial resources. These eight key suggestions are important for KU campus sustainability success.

Based on the experience in developing the KU case study, some key suggestions are made for Turkish universities and academia interested in initiating campus sustainability in their university (Figure 43). There are eight key suggestions on campus sustainability:

- ✓Knowing where to start to get support and initiate campus sustainability are important
- ✓Even though higher management may not be aware what could be done for campus sustainability, small steps and initiatives could be starting points
- ✓There are no barriers for campus sustainability with short, medium and long term goals as there are even small things to implement by coordinating with the available resources

- ✓Resistance from the some campus community members should be expected as the university could change some usual ways of doing business to be more sustainable
- ✓Doing more with the available sources is always possible as there are always things to do with available resources to increase social impact and improve the environmental impact of the campus.
- ✓Enhancing social on campus is necessary to promote the development and implementation of campus sustainability programs
- ✓Building a holistic approach to campus sustainability in consideration of all aspects of sustainability as economic, social and environmental is a must
- ✓Campus sustainability development methodology developed in the KU case study could be used for campus sustainability guidance

Turkish universities should develop and implement campus sustainability strategies based on a holistic approach with environmental, social and economic aspects of the sustainability and do more than what is legally required to complement to current legislation in the harmonization process of the EU Acquis to the Turkish legislation. Because HEIs play an essential role in society, creating new knowledge, and fostering innovation, as a Turkish university, KU has a considerably high potential to develop a sustainable campus and be an example for other Turkish universities willing to be involved in national problem solving through sustainable campus implementations.

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ANNEX

I. Campus Sustainability Literacy Survey Among Students

With this study, our goal is to collect preliminary information about the campus sustainability literacy in KU.
This survey consists of 3 parts and you are kindly asked to answer a total of 29 questions. Your support will shed light on future studies of sustainability in KU. Thank you for your cooperation.
This is an ALIS 350 project.

PART 1
Please read the following statements and put a check mark (√) on the 1-6 scale

While you're at KU	Almost Never	Rarely	Sometimes	Often	Usually	Almost Always
1.) How often have you been focused on sustainability during your courses?						
2.) How often are you exposed to extra-curricular (non-class related) activities and programs on sustainability?						
3.) How often do you participate to a student organization or event focused on sustainability?						

I do	Almost Never	Rarely	Sometimes	Often	Usually	Almost Always
4.) … recycle plastic, aluminum, paper, battery and cardboard when possible.						
5.) ….prefer a reusable bag when shopping.						

6.) ….use as little water as necessary in the kitchen and bathroom						
7.) ….turn off lights when not in use.						
8.) …unplug electronic appliances when not in use						
9.) …shut down and unplug my desktop PC or laptop completely at nights						
10.) …keep the door and the windows closed in the room when the air condition or heating is on						
11.) …keep the curtains closed in the room when the air condition is on during summer						
12.) ….choose public transportation.						
13.) ….share my car with others * *If you have or would have a car						
14.) …warn my friends and people in my circle to behave environmentally responsible						

PART 2

15. I engage in environmental practices because, (Choose all that apply)

a. I believe it will make the world a better place
b. I was taught by my community / school
c. I find them economically beneficial

16. Which three of the following are most important according to your definition of "sustainability"?

a. Reduce e. g. water usage
b. Reuse e. g. shopping bags
c. Recycling
d. Using energy efficiently
e. Making behavioral changes
f. Educating myself on responsible use of resources
g. Reserving resources for future generations
h. Understanding the global effects of my action
i. Balancing people, planet, prosperity, society, earth, financial

17. Why is it important to recycle? (Choose all that apply)

a. Recycling decreases the amount of habitat loss due to resource extraction.
b. Recycling typically takes less energy to process recycled materials than to use new materials.
c. Recycling cuts down on the amount of trash that goes into landfills.
d. None of these (recycling is not an efficient way of dealing with our wastes.)

18. What are the potential effects of global climate change? (Choose all that apply)

a. loss of habitats
b. less severe weather
c. expansion of deserts
d. decrease in sea level

19. The most significant driver in the loss of species and ecosystems around the world is (Choose that applies)

a. overhunting/overharvesting
b. conversion of natural space into human developments (farmland, cities, etc.)
c. acid rain
d. breeding of animals in zoos

20. Of the following, which contributes the most to sustainability? (Choose that applies)

a. Recycling products
b. Reusing products
c. Buying the newest products to increase the economic development
d. Reducing consumption of products

21. Which of the following statements about water is/are true? (Choose all that apply)

a. The number of people who have access to clean drinking water will increase over the next two decades
b. Globally, freshwater reserves (aquifers) are used faster than they are replenished.
c. Many people around the world do not have access to clean drinking water, so their only option is to drink contaminated water.
d. Global warming does not threaten to decrease freshwater reserves.

22. Imagine that we had to pay for all the costs associated with the manufacturing of the goods we use every day. What would go into calculating the true costs of a product? (Choose all that apply)

a. The cost of raw materials to make the product
b. The cost of environmental damage caused by production
c. The cost to transport that product from its manufacturing location to your location
d. The cost of health care for employees who manufacture the product

23. Put the following list in order of the activities with the largest environmental impact to those with the smallest environmental impact. (Choose that applies)

A. Keeping a cell phone charger plugged into an electrical outlet for 12 hours
B. Producing one fast food quarter-pound hamburger
C. Producing one fast food chicken sandwich
D. Flying in a commercial airplane from Washington DC to China

a. A, C, B, D
b. D, A, B, C
c. D, C, B, A
d. D, B, C, A

24. Istanbul Strait (Istanbul Boğazı) which is an ecological corridor is under threat. What are these threats? (Choose all that apply)

a. pollution
b. overfishing
c. maritime traffic
d. tidal flow (med cezir)
e. degradation of sandy coasts

25. The best way to support a local economy, such as the local economy of Sarıyer, is to buy goods (groceries, clothing, toiletries, etc.) from (Choose that applies)

a. large chain stories in Sarıyer
b. farmer's market and stores that sell locally produced goods in Sarıyer
c. locally owned stores and restaurants in Sarıyer

26. During your time at the Koc University, how many courses have you taken that address the topics presented in this survey? (Choose that applies)

a. 0 (none that I remember)
b. 1-2
c. 3 or more

27. When it comes to the development of 'green' energy (non-polluting energy sources that are fundamentally environmental friendly.**), would you describe yourself as:** (Choose that applies)

- Actively concerned
- Passively concerned
- Not too concerned
- Not concerned at all

28. What kind of activities should the university organize to increase the awareness of a sustainable campus?

……
……
……
……

29. Please choose that all apply that expresses the meaning of each image

a.

Food

b. Paper

c. Plastic

a. Plastic

b. Glass

c. Food

a. Paper

b. Food

c. Plastic

PART 3

Your status:	**Your faculty:**
□ **ELC**	◻ **College of Administrative Sciences and Economics (CASE)**
□ **FRESHMAN**	◻ **College of Sciences (CS)**
□ **SOPHOMORE**	◻ **College of Social Sciences and Humanities (CSSH)**
□ **JUNIOR**	◻ **College of Engineering (CE)**
□ **SENIOR**	◻ **Law School**
□ **GRAD**	◻ **School of Medicine (SOM)**

***Sex*:** □ female □ male

Age……..