

A Systemic Approach for Measuring Environmental Sustainability at Higher Education Institutions

A Case Study of the University of Oslo

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Abstract

Sustainability is becoming an integral part of the university system. A global trend among universities shows that they are revising their missions and strategies by embodying sustainability on their agenda. This study aims to define what a sustainable university is and how implementing sustainability and more precisely environmental sustainability can be measured at the higher education institutions. The contextual background of this study will elaborate on the role of higher education systems and institutions in promoting sustainable development and creating a sustainable society.

In this study the concepts of sustainability and sustainable development are analysed from a systemic perspective. Moreover the Cybernetics theory and Viable System Model for sustainability at higher education institutions are presented. This is to address how environmental sustainability can be implemented at higher education institutions in a systemic and viable way.

The theoretical framework will be operationalized and a tool of fifty indicators will be developed to measure the level of environmental sustainability at twenty international universities. The result of this measurement is compared to the environmental sustainability performance at the University of Oslo which is the main case study in this thesis.

The study is conducted in a qualitative way through content analysing the sample universities performance in sustainability, benchmarking their efforts and comparing with each other. The study will also analyse the sustainability performance of the University of Oslo in detail and will show how the process of implementing sustainability has progressed from 2010 to 2012 at this university.

Keywords: Environmental Sustainability in Higher Education Institutions, Sustainable Development, Measuring Sustainability performance, Viable System Model for Sustainability

Preface

During the past few years of studying the intriguing field of Higher Education, I have learned about the significant role of higher education institutions in leading the human society. Throughout the history of universities, these institutions have actively played remarkable roles and been responding to the society's matters. One of the main challenges of our time is the global concern about sustainability and more specifically environmental issues. This global concern triggered my curiosity to explore the role and responsibility of higher education institutions in dealing with sustainability challenges. This curiosity has initiated a continuous intellectual journey of learning for which I am grateful.

In addition to the academic aspects of this master program, it has been a great experience in many ways. Attending various universities in different parts of Europe, meeting classmates of very diverse culture and background, receiving caring support from academic and administrative staff and experiencing a life in motion in different parts of the world are only a few to mention.

I would like to thank the Erasmus Mundus Association for providing this study opportunity and to the Higher Education Development Association (HEDDA) for organizing the master program and supporting me in all the practical matters. I am grateful to Professor Peter Maassen for allowing me to take a slightly different approach and time frame in my thesis which provided me a better chance to enhance my knowledge in the field of sustainability. I also would like to express my appreciation to the Green UiO Office and in particular to the project leader; Jorulf Brøvig Silde for all their valuable support and information. I would like to express my immense gratitude to my supervisor Professor Karen O'Brien who attentively supervised me in the process of writing this thesis and provided me great opportunities to become involved in different sustainability projects and networks. In addition, I would like to thank Dr. Romulo Pinheiro who co-supervised this thesis at its initial stage.

On a more personal level, I would like to thank all my classmates of the HEEM 2010 program and friends who have inspired me during my study time. I am also thankful to my friends; Morten, Misha and Jonathan for their valuable comments. Last but not least, I am thankful and grateful to my father for challenging me to become stronger and to my mother for reminding me to be patient.

Maryam Faghihimani

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Abbreviations

ECO.E	Ecological Education
EE	Environmental Education
ES	Environmental Sustainability
ESD	Education for Sustainable Development
ESF	Education for Sustainable Future
HE	Higher Education
HEIs	Higher Education Institutions
SD	Sustainable Development
SiO	Students Welfare Organization (norsk)
THE	Times Higher Education
VSM	Viable System Model
UiO	the University of Oslo

Chapter 1: Introduction

This chapter aims to elaborate on the topic of this thesis. To clarify the topic, I will review the background and the context of the study. The rational, academic and practical relevance of undertaking the study will be explained as well. Furthermore the research problem and questions, as well as research design and limitation will be reviewed.

1.1 Background and Context

Higher education institutions (HEIs) are facing one of the greatest challenges in meeting their responsibility to provide the knowledge and prepare educated citizenry that will lead to a sustainable and thriving civil society. Sustainability is becoming an integral part of university life (Wals 2004; Bawden 2004; Sterling 2004 & 2001). A global trend among universities shows that they are revising their missions and strategies by embodying sustainability on their agenda. Furthermore HEIs have been restructuring courses and research programs, as well as technical operations on campus, to include sustainability in their institutions (Wals, 2004). The long list of signatories of various declarations which promote sustainability in higher education provides more evidence of this change. The Talloires Declaration, The Kyoto Declaration of the International association of Universities, The Swansea Declaration, The COPERNICUS Charter of the European Association of Universities and Luneburg Declaration¹ are some examples. Underlying most of these arguments is a growing recognition that responding to complex environmental challenges requires a different and non-linear approach to education and capacity building in HEIs (O'Brien et al. 2012).

Environmental sustainability (ES) as one of the main pillars of sustainable development has appeared to be a global challenge. The emergence of environmental sustainability in higher education is, however a relatively new phenomenon. The idea that universities are morally obliged to become models of environmental sustainability has roots back in higher education declarations for sustainability. These declarations, were specifically advanced for higher education institutions, emerged in the early 1990s (Wright, 2004). These declarations appealed to colleges and universities to take environmental concerns into consideration within the general framework of their institutions. The emphasis is not only on daily practices and technical operations but also on governance, education, research activities and community

¹ See chapter 2

services at the universities. Therefore, universities which have signed such declarations made a pledge to show their commitment by implementing environmental sustainability in their policies and practices.

Analyzing universities' commitments and practices in relation to the declarations, and in general to environmental issues, can clarify their role in dealing with such a global challenge. Given that environmental sustainability for higher education is a new field, efforts to measure and analyze universities' responses to questions of environmental sustainability are very recent and limited.

This study presents a systematic method to measure performance of higher education institutions with regards to environmental sustainability commitments against various international research universities. The study also offers a set of best practices for implementing and advancing environmental sustainability at higher education institutions. The University of Oslo is the case study in this thesis, its environmental sustainability efforts having been measured, monitored and analyzed from January 2010 to June 2012.

1.2 Motivation and Rationale

My motivation for conducting this research was triggered by the urgency of global sustainability challenges. In addition to preserving, providing and advancing knowledge, HEIs can play a significant role in raising awareness and changing culture among people, particularly intellectual groups, who will possibly become active global citizens after graduation. Therefore it is assumed that HEIs have the opportunity to facilitate ways in which students can become ecologically literate and responsive to ES as they leave the institutions. Moreover, higher education plays a unique and critical role in creating a just and sustainable society. Applying knowledge for wellbeing and development of human society represents one of the main tasks performed by universities (Castells, 2000). Thus importance of a sustainable society, particularly with regards to environment, should also be addressed responsibly at HEIs.

Being in the decade of Education for Sustainable Development (2005-2014) is another rationale behind this study. Education for sustainable development, as the United Nations have declared, 'aims to help people to develop the attitudes, skills and knowledge to make informed decisions for the benefit of themselves and others, now and in the future, and to act upon these decisions.'

Environmental sustainability concept aim at reconstructing the human interactions with the environment, in other words there is an assumed need for change and adaptation in society.

Universities, as Clark (1983) argues, are among the most traditional institutions in our society, but at the same time they are the most responsible for the changes. The possibility of ‘higher education for change’ has been agreed upon in many discussions including declarations and agreements for sustainability in HEIs. However there is an urgent need for adequate attention to the concept of ‘change for higher education’. Implementing environmental sustainability in all dimensions of higher education institutions is a milestone for a great change to embody the ES in society. The complexity of the sustainability concept implies a systematic approach which should be able to address various aspects of the concept. I will elaborate more cogently on the supporting theory and its relevancy in chapter 3. Because of the lack of existing research aiming to measure environmental sustainability at HEIs, contribution to the academic knowledge and enhancing the literature related to this field has been another motivation for doing this research.

1.3 Research Problem and Questions

In order to understand the implementation of environmental sustainability at universities, it is important to find the appropriate means and methods to measure related criteria. One way is to compare the performance of one university against that of other universities in a particular function to observe the level of commitment to environmental sustainability. In addition, we have to take time frame and size of thesis into consideration. Thus this study focuses on a particular scope which has been stated in the following research problem.

How are higher education institutions adapting to the challenges of global sustainability?

The research questions are:

1. What are the most significant factors contributing to environmental sustainability among higher education institutions?
2. How can we measure the implementation of environmental sustainability at the various operational dimensions of higher education institutions?
3. How has the approach to environmental sustainability taken by the University of Oslo changed over time?

This thesis will address these overarching research questions by introducing significant ES factors in developing systemic changes in HEIs. In addition it aims at finding ways in which environmental sustainability performance and changes in performance can be measured, monitored, evaluated and compared in HEIs. After that it focuses on the environmental sustainability performance of the University of Oslo as the case study to recognize how the approach taken by the University of Oslo has changed over time, and what the limits are to its approach. Using the Viable System Model, the study will identify the most important factors for environmental sustainability and, using these indicators, evaluate performance levels among leading universities around the world. Finally, the approach taken by UiO will be critically assessed, and the barriers and opportunities for transformative change at the institution will be analyzed.

To address the research questions the main theories I have applied are Cybernetics, and more specifically, Viable System Model. This theory argues that ‘valid knowledge and meaningful understanding comes from building up a whole picture of phenomenon, not by breaking them into parts’ (Flood, 2001). Considering the complexity of environmental sustainability in higher education, which includes; worldviews; the nature of sustainability, policy and practices, organizational culture and transformative change for adaptation, a systems approach can be considered useful and vital. The process of implementing environmental sustainability in higher education systems is more than simply an add-on to the current system. In fact it requires an essential epistemological change in educational thinking and other practices. I will discuss this in detail in chapters 2 and 5.

1.4 Research Design and Limitations

This thesis has two phases that are named *Diagnosis phase* and *Implementation phase*. Based on the VSM approach, the first phase of this study employs the competitive functional benchmarking method by analyzing sample universities’ implementation of and commitment to ES in various operational dimensions. Benchmarking is a search for the best practices that lead to superior performance. It is a systematic method, requiring assessment and comparison analysis. Through the first phase, a measuring tool which includes ES indicators for HEIs has been developed; data about ES efforts of those universities was collected and compared the results with what was achieved at UiO in 2010. It should be noted that the practice of benchmarking universities with regards to ES has been only recently developed (Beringer, 2007). Therefore, to provide the benchmarking criteria, the research examines the operational

meaning of adaptation (commitment) based on HE declarations of sustainability, and one of the previously implemented tools within systemic and VSM approach. This method is typically used for measuring an organization's process and methodology against those of other organizations (Kaemmere, 1996). This enables universities to measure a particular performance and identify best practices from other institutions to help improve their own performance. This process developed the second phase of the study, which is called implementation. Therefore after the ES level of universities was compared and their efforts were benchmarked, a set of best practices were proposed to the UiO leadership for enhancing the ES level at the institutional level. In this regard, the research should be considered an action research example. Action research is a reflective process on progressive problem solving. It is often conducted by researchers who are part of a problem solving team and work closely with the case over time, and can therefore observe, monitor and evaluate the progress (Reason, 2007). The methodological considerations will be discussed in full in chapter 4.

The limitations to the study are mostly regarding the limited related literature, scope of the thesis and time span for implementation and re-evaluation of ES in HEIs. Methodologically, it would have been desirable to have interval scales for all sample universities, but due to the limited time and access to the content of each individual university, it was not feasible.

1.5 Overview of the Thesis

This thesis has, including the introduction chapter, 6 chapters. This introduction chapter sheds light on the topic of study, relevance and rationale, research questions and methodology of the thesis. In chapter 2, the contextual background and literature relevant to the study are discussed. The theoretical framework and model is elaborated on in chapter 3. The second research question is answered in chapter 3 by explaining the Viable System Model. Chapter 4 includes research design which elaborates on methodological aspects of the study, the research sample and the operationalization of theory. I respond to the first research questions about the significant factors in measuring ES in chapter 4 by translating the theoretical model into a 'table of indicators', a tool for measuring ES in HEIs. In chapter 5 the findings of the thesis in both phases of the study will be presented, which explain the environmental sustainability level of UiO. Chapter 6 will reflect on the thesis' main research problem and summarize the outcomes.

Chapter 2: Contextual Background

To understand the concept of Environmental Sustainability and its implementation at universities, I first need to define the term of ES. Afterward I will look at Higher education and Environmental Sustainability in relation to the conceptual background and its history. Therefore I will review the history of education for sustainable development and its conceptual framework then will explain the chronology of declarations for higher education and sustainability which embodied the concept of ES.

2.1 Sustainable Development and Environmental Sustainability

To define ES, it is necessary to look at the broader frame of Sustainable Development (SD). The term of Sustainability has a variety of definitions depending on the context in which it is used. Dobson, (1996) collected three hundred definitions for terms of sustainability and sustainable development. Wals and Corcoran, (2004) argue that the multiple definitions for sustainability should not be considered as a weakness since they give the opportunity to define the term depending on the context, which is itself valuable.

The concept of sustainable development according to the 1987 World Commission on Environment and Development means “development which meets the needs of the present without compromising the ability of future generations to meet their own needs.” It refers to three mutually reinforcing pillars which are Economic, Social, and Environmental development. The Brundtland Commission (1987) explains SD as a process of change with a futurist approach; “a process where the exploitation, the orientation of technological development and industrial change, are made consistent with future as well as present needs.” Hamm and Muttagi (1998) argue that sustainability is not a concept aiming at static paradise but it refers to the capacity of humans, by means of social organization, to adapt to their non-human environments. Scott (2002) defines SD as a learning process through which we can learn – or choose to learn – how to build up and develop capacity, which enables humans to live more sustainably. Therefore SD is a process and the goal is sustainability. Sustainability refers to conservation, protection and regeneration of resources over an indefinite time. Central to sustainability is the fact that what we decide at the present time will affect the future of human well-being, environment and the economy. Munasinghe and Swart (2005) argue that since human welfare ultimately entails the use of ecological resources ignoring the limits of these resources enhances the risk of undermining the long-term prospects for

development. They posit that ES concentrates on the overall viability and health of ecological systems in a comprehensive and systemic way. Moore (2005) claims that SD is the reconciliation of social justice, ecological integrity and well-being of the entire living system. The integration model of SD shows the three main dimensions of sustainable development.

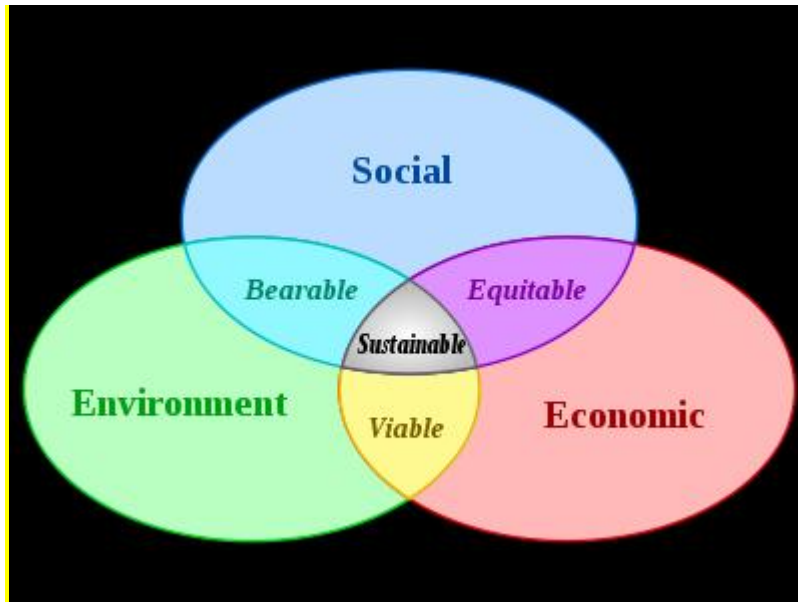


Figure 2.1: Sustainable Development Model (IUCN,2006²)

According to the IUCN model shown in figure 2.1, development will be sustainable when the three spheres – social, economic and environment – dynamically engage at one point. Therefore the development will be bearable, equitable and viable. In other words, SD is an interrelated cohesive concept. According to the United Nations Development Group (2009), ES is about meeting human needs without undermining the capacity of the planet’s ability to support life. However, it emphasizes that there is no common guide to define ES at an operational level. ES also has been defined as the process of observing and reconstructing the human interaction with the environment. The process signals the ideal behavior which enables us to keep the environment as pristine as possible. It is important to ensure the earth’s life-support systems including atmosphere, the oceans, and the land are maintained properly and get repaired after any damage (Moffatt, 2001). Some studies framed SD specifically in relation to the environment. Foster (2004) for instance defines SD as a process of making the emerging future habitable for humans by cultivating a resilient environment. He stresses that this process of improving human conditions can be achieved through continuous responsive learning. Therefore we can say that a sustainable environment is the one in which life-

² See: http://cmsdata.iucn.org/downloads/iucn_future_of_sustainability.pdf

sustaining process and natural resources of the earth are conserved and regenerated to serve the present generation, as well as future ones.

2.2 Sustainable Development in Educational Discourse

Education for sustainable development as an educational tradition was developed in early 1990. The United Nation Conference on Environment and Development (UNCED) in 1992 and the UN Agenda 21³ are the main legacies behind the concept. Ohman and Ostman (2003), attribute a certain amount of influence to economic globalization of in advancing education for sustainable development as well. Chapter 36 of Agenda 21 entitled ‘Promoting Education, Public Awareness and Training’ addresses education as a critical means for promoting SD. The chapter arrays a set of objectives in accordance with education, awareness and training for improving the capacity of the people to comprehend environmental issues. According to the chapter objectives, countries are assumed to develop their priorities and implement the relevant policies, strategies and programs to meet those objectives. In connection with *the UN Decade of Education for Sustainable Development*, spanning from 2005 to 2014, UNESCO has provided the characteristics of requested education. The vision is ‘a world where everybody has the opportunity to benefit from education and learn the values, behavior and lifestyles required for a sustainable future and for positive societal transformation’ (UNESCO, 2005).

Over the past decades, a general accreditation on the notion of education for SD as an important tool for achieving change has been developed. It has been proposed that in order to satisfy the need for education as change agent, the existing educational provision must be modified. ‘Education as change agent’ should cover the recognized need for professionals and learners and empower them to press sustainability challenges effectively (Mochizuki and Fadeeva, 2010). It also has been emphasized in Agenda 21 that formal and informal education at all levels are indispensable to raise awareness, change attitudes. These kinds of education can enable people to understand their responsibility about the environment and take the necessary actions to tackle the current challenges and prevent the possible future ones. It is important to stress that the term ‘education’ is not about a monolithic tradition wherein one teaches and the other learns, but rather that it emphasizes a dynamic and interactive process of learning. Scott (2002) argues that education for SD should be referred to as a learning process, thus it making that clear that we should not have too much emphasis on teaching. One reason

³ See: <http://www.un.org/esa/dsd/agenda21/>

for that is the approach should go beyond schools and university systems. It has capacity to promote ES through non-formal and informal education as well.

Up to this point, the important role of education in enforcing the change for a sustainable and just society was reviewed. However as it has been mentioned above, to implement ES in education we have to consider undergoing a change in education. O’Riordan (2004) argues that the current curriculum at school and HD institutions are geared toward an unsustainable economy and society. The educational philosophy and worldview of these schools and institutions promote a non-sustainable approach of economic and social growth, which encourages resource depletion and uncontrolled use of the natural environment. Orr (2009) forthrightly claims that ‘the problem is not *in* education but it is *of* education’. He continues that the field of pedagogy is predominated by deep beliefs that humans are separated from the rest of nature, and that the whole planet is a gift to them which will keep providing all the resources they need regardless of the human pattern of interaction toward it. Therefore the need to understand the nature of sustainability and the concept of ES will remain until we develop a set of beliefs and promote attitudes which will be in favor of a sustainable society. The concept of sustainability calls on the kind of educational philosophy that trains humans to optimize productivity by achieving accurate technical progress. In addition the concept of sustainability has to promote the cultural conditions conducive to social and economic change, which consent to provide the desired growth with the elimination of harmful impacts on the environment (Pidlisnyuk, 2009). Thus a change has to take place within the philosophical framework of the current higher education system, and eventually distribute the culture of sustainability within its organizational and institutional frameworks as, well as the whole society. It should be mention that although designing sustainable development and developing curriculum are theoretically separated, empirically they are interwoven. Thomas (2004) compares these concepts and counts their common points. He expresses that they both include time span and promote change, as well as leading to beneficial results. Therefore, an appropriately designed curriculum means that implementing SD in schools and HEIs is achievable in the near future.

However a new approach to curriculum could provide better study opportunities and understanding in line with SD and particularly ES, but the technical operations of universities have to be in line with ES standards and criteria. Thus, we should build up the whole picture of processes based on the combination of various dimensions of HEIs operations. The next chapter will give us a clear picture of HEI as a living system engaged with its complexity.

2.3 Educational Approaches towards Sustainable Development

The beginning of engaging education for environment has roots back in works by such figures such as Locke, Rousseau, Pestalozzi and Montessori, who put emphasis on learning by doing, and therefore took their students to nature to be acquainted with environment. Geddes (1854-1933) has been named as the father of modern environmental education according to some studies (Blewitt & Cullingford, 2004). However none of them had systemic approaches until late 1950s and early 1960s, during which time the environmental education evolved as a systematic tradition. In addition to that, the concept of sustainable development was not seen in educational literature until early the 1990s in advance of the UNCED, Rio 1992. There are several terms which describe the role of education in environmental challenges. The common terms are Environmental Education (EE), Ecological Education (Eco E), Education for Sustainable Development (ESD) and Education for Sustainable Future (ESF). Although some experts presume that these terms can be used interchangeably, each term brings its own philosophical approach and educational tradition. While labelling the concepts serves to simplify the communication and delivering the message, they can also be confusing. The intended definition can differ remarkably from the interpretation by the readers (Blewitt & Cullingford, 2004).

Ohman and Ostman (2005) reviewed the educational philosophy supporting EE, Eco E and ESD. The following paragraphs will briefly elaborate on the difference of these traditions and move to other traditions and perspectives.

Environmental Education (EE): also called Fact-based environmental education, which was formed during the 1960s, considers humans separated from nature, and posits that nature should be under the control of humans. Environmental problems are blamed on an unforeseen result of production and resource exploitation in society. These problems are characterized as scientific and knowledge based, and are solvable by research and information gathering. Environmental issues are seen as local issues and as belonging to the present. They can be studied only in natural science disciplines within factual information delivered from teachers to students, therefore in this approach students are passive receivers of scientific facts through separated subjects. EE concerns itself with the quality of the environment and neglects the social, economic and political aspects.

Ecological Education (Eco E): or in some texts Normative Environmental Education, evolved during the 1980s. It was a new orientation in the social sciences with regards to environmental challenges. The eco-philosopher Arne Næss gave rise to, and inspired, this movement. In this approach, environmental problems are rooted in values and can therefore be solved by influencing people's worldview and attitudes. Existing conflicts between society's desires and laws of nature cause environmental problems. In contrast with EE tradition, this orientation considers human as an element of nature that should live according to its laws. The combination of natural science and social science can address environmental issues effectively. The process of learning is active participation of students in the development of knowledge and values in a thematic frame. Freire (2005) through the critical thinking approach believed that hope was essential for facilitating an education that could truly challenge the injustices and inequalities of the past and present. His point of view on pedagogy starts from the position that we must help people recognize not only their oppressed situation, but their position as subjects in history with the power to change it. In this shift we reconnect with ecological and environmental movements and the belief that we are part of a world that offers us pleasure outside commodification. Eco E has a bilateral local and global perspective to address the ecological issues. In time perspective, environmental problems are related to present and future. Although in this approach, environmental issues have been studied in a thematic manner, it fails to make an integrated discipline to study various aspects of the change. It also has been criticized for opening less room for a pluralistic and democratic perspective.

Education for Sustainable Development (ESD): the ESD tradition, which was developed during the 1990s, assumes that humans and nature are bound in a cycle of events and tradition, and that the causes of environmental problems are conflicts between humans' wide range of achieved goals. These problems are conceptualized as political issues and should thus be dealt with democratically. The goal of education in ESD tradition is to assist students in developing their ability to critically evaluate various alternative views on ES. The views are considered to be incorporated locally, regionally and globally. In this approach, students are active and critical in the learning process, SD concept is integrated in the learning materials and study discussions are in a broad range. Environmental problems in the ESD tradition are future oriented, but are rooted in the past and present. Hesselink et al (2000) considers ESD the evolutionary stage and new generation of educational tradition with regards to environment. However the fundamental epistemology and lack of sufficient clarity

about the philosophical umbrella in the ESD approach, which comes from the pluralistic nature of the concept, have caused difficulties in implementation of sustainability in educational systems. Problems of integrating sustainability with educational policy, theory and practice as well as reorientation of systems are some examples.

Education for Sustainable Future (ESF): is a rather new concept which was created at the beginning of the century. This approach argues that it is not only development which needs a paradigm shift to achieve sustainability but also that the paradigm of education has to be changed in certain fundamental ways. The main difference between EFS and ESD is that the latter sees education as serving a new way of looking at sustainable changes and development, whereas ESF demands a necessary change in education which can cause a sustainable change and development in human society. Although various points from ESF approach are interrelated with ESD, the stress on some crucial points are more remarkable in the ESF approach. For example, lifelong and continuous learning, multi-sourced and multi-disciplinary approaches have been considered momentous for capacity building. The ESF learning process is participatory and based on learning with peers. In addition the ESF proponents criticize the ESD tradition for being outer-directed and too instrumentally oriented. They insist on ‘considering the inner dimensions of *valuative* psychological and perceptual change’ (Blewitt & Cullingford, 2004). In nutshell, ESF puts a strong emphasis on internal values and its role in the learning process and the way individuals reflect on surrounding conditions.

Jickling (1992) argues that, in general, educational approaches toward the environment do not have a specific definition and structure. Therefore any terms related to education for preserving the environment in as pristine state as possible can be used interchangeably. However, he reminds us that each term bears specific characteristics which can be more or less coherent in different contexts. He points at Huckle’s (1991) study and argues that ESD has entered the dialectic which characterizes modern environmentalism. It embodies a very pluralistic meaning as well.

Gough and Scott (2006) explain that the main difference between ESD and EE is about capacity building and problem solving. He argues that ESD is about capacity building while EE is about problem solving. To compare ESD with ESF we can say it is about realism vs. idealism. In terms of learning theories ESD is about behaviourism, but ESF is based on constructivism. Methodologically ESD reflects on content, in contrast with ESF which is about process. The former aims at transmission and the latter for transformation (Blewitt &

Cullingford, 2004). In this study the term of ESD is used, since the majority of declarations which urge educational institutions, particularly HEIs to implement ES in their function, are based on ESD approach. However it is important to mention that, wherever in the related literature, the term of EE was in line with ESD conceptual framework, it was adapted to the study.

2.4 Chronology of Sustainable Development Declarations in Higher Education:

The notion of sustainability in higher education was addressed internationally by the UN UNESCO-UNEP International Environmental Higher Education Program for the first time in 1978. After this a number of international, national and regional declarations relating to HE and environmental sustainability have been issued. These declarations have been signed by numerous HEIs. Here, briefly, the evolution of environmental sustainability declarations in higher education is reviewed.

The Stockholm Conference on the Human Environment in 1972 drew attention to SD and its relevance to the higher education. The Stockholm Conference stresses interdependency between humans and the environment and the role of educational institutions in providing environmental education for all ages. The declaration called on all educational institutions to ‘broaden the basis for enlightened opinions and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimensions’ (UNESCO, 1972, Principal 19). *The UNESCO-UNEP Intergovernmental Conference on Environmental Education* in 1977 stated that ‘Universities as centers for research teaching and training of qualified personnel for the nation, must be increasingly available to undertake research concerning environmental education and train experts in formal and non-formal education.’ It also clearly stresses environmental education for all students regardless of their majors. ‘It is necessary for students in all fields, not only natural and technical sciences but also social sciences and arts, because the relationship between nature, technology and society mark and determine the development of a society.’ Wright (2004) refers to the Belgrade Charter (1975) and the Tbilisi Declaration (1977) as influential events in the development of international environmental education and sustainability initiatives which asked universities to consider environmental education in curricula and engage faculty and staff in the process. In addition, they suggest that universities provide specialist training, participate in regional and international related projects, and educate

community and wider public about environmental challenges. Scott and Gough (2004) consider the *World Commission on Environment and Development* (1987), an influential event, particularly for introducing the term ‘Sustainable Development’. It has been recognized as a ground for further work such as the IUCN 1990; Caring for the Earth initiative, which introduced a strategy for sustainability. This strategy followed and developed into chapter 36⁴ Agenda 21 in 1992 during the Rio Earth Summit and the United Nations follow-up conference.

Chapter 36 of the Agenda 21 of the United Nations Conference on Environment and Development in 1992 explicitly focuses on education, training and awareness with regard to environmental issues within educational institutions. It has urged for reorienting education towards sustainable development. It emphasizes education as a critical means for promoting SD and improving the capacity of people to address environment and development issues. It calls on all countries and recommends that;

‘[g]overnments should drive to update or prepare strategies aimed at integrating environment and development as a cross-cutting issue into education for all levels within the next three years...A thorough review of curricula should be undertaken to ensure a multidisciplinary approach, with environment and development issues and their socio-cultural and demographic aspects and linkages.’

In addition to that, Agenda 21 has urged universities to be actively involved in education, research and raising awareness with regards to environmental challenges;

‘Educational authorities should promote proven educational methods and the development for innovative teaching methods for educational settings...Countries could support universities and other tertiary activities and networks for environmental and development education. Cross-disciplinary courses could be made available to all students. Existing regional networks and activities and national university action which promote research and common teaching approaches on sustainable development should be built upon, and new partnerships and bridges created with the business and other independent sectors, as well as with all countries for technology, know-how and knowledge exchange.’

⁴ See: The UN core publication http://www.un.org/esa/dsd/agenda21/res_agenda21_36.shtml

Agenda 21 also encourages educational institutions, especially HEIs, to contribute more to awareness and capacity building. In addition, the document reminds institutions ‘to ensure that environmental and human ecological considerations are integrated at all managerial levels and in all functional management areas such as marketing, production and finance’ The last part of chapter 36 of Agenda 21 encourages universities to take responsibility in community outreach as well as providing non-formal education, and vocational and management training within the environmental frame as community service. The chapter urges universities to set their operational standard in line with environmentally friendly criteria. Specific declarations for higher education and sustainability emerged at the early 1990s and continually evolved through the decades until the present time. One of the main motives in preparing such declarations is that HEIs encountered a world which is concerned about environmental issues. Wright (2004) explains that HEIs were looked upon by society as a place of preserving, creating and implementing knowledge and truth. These institutions were therefore expected from to imply the appropriate knowledge and values to deal with the complex problems of society. Wright (2004) also points to the criticism which universities received for their inability to be role models of sustainability in operating their infrastructures and technical endeavours, as well as their lack of environmental curricula. In this part of study the international sustainability declarations for HE⁵ which have taken place between 1990 to 2000 are briefly reviewed and compared.

Year	Declaration	Level
1990	Talloon Declaration	International
1991	Halifax Declaration	Canada
1993	Kyoto Declaration	International
1993	Swansea Declaration	International
1994	CRE Copernicus Charter	Europe
1997	Declaration of Thessaloniki	International
2000	Lunenburg Declaration	International

Table 2.1 Sustainability Declarations for Higher Education (Wright, 2004)

The Talloon Declaration: in 1990 as a result of the conference held in the Tufts University European Centre discussing the role of HE in an environmentally sustainable future, the university leaders issued the Talloon Declaration. They expressed that universities have a major role in education, research, policy formation, as well as in exchanging knowledge and

⁵ For the full text of the declarations, see: <http://www.iisd.org/educate/declare.htm>

information in order to make a sustainable future for all humankind in harmony with nature. They called on faculties, administrative staff and students to contribute to achieving this goal. In addition they recommended ‘creating programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate and professional school students.’ It also encourages universities to ‘convene deans and environmental practitioners to develop research, policy, information exchange programs and curricula for an environmentally sustainable future.’

The Halifax Declaration: the conference on University Action for Sustainable Development was held in Halifax in 1991. The main objective of this conference was about the role of universities in capacity building to address environmental issues as a follow up to implement the Talloires Declaration in Canadian universities. This declaration provided an action plan for universities to follow. The plan was set for short and long term achievement to work toward SD. The Halifax Declaration morally obliged universities to take responsibility toward environmental challenges.

The Kyoto Declarations: was declared at the Ninth International Association of Universities Round table in 1993 and was adopted by 90 international university leaders. The declaration advises universities to promote ES in education, research and physical operations (Wright, 2004). This declaration addresses the importance of values and consciousness that education should promote in order to build the ground for a sustainable society;

‘Global sustainable development implies change of existing value systems, a task which universities have an essential mission in, in order to create the necessary international consciousness and global sense of responsibility and solidarity.’ The declaration encouraged universities to take certain actions including promoting environmental literacy, community outreach, industry and government partnership, sustainability research and Eco-friendly physical operations.

The Swansea Declaration: in August 1993, participants in the Association of Commonwealth Universities 15th Quinquennial Congress at the University of Wales gathered to respond appropriately to the environmental challenges. The main theme of this Congress with participants from 400 universities from 47 countries was ‘People and the Environment-Preserving the Balance’. This declaration reiterated most of the objectives which were issued in the previous declarations. In addition to these, it stresses the issue of equality among countries as a crucial point toward a sustainable future, and requests that universities in more

fortunate countries support the less fortunate countries HEIs to help achieve their environmental sustainability objectives.

The CRE Copernicus Charter: this declaration was created by the Co-operation Program in Europe for Research on Nature and Industry through Coordinated University Studies in 1994. The program was established by Association of European Universities. It was an effort to evaluate and follow up the other declarations as well as Agenda 21 to develop universities' efforts and understanding of sustainability. The charter was signed by 213 European university rectors who aimed at making universities influential actors for creating sustainable societies. It emphasized on technology transfer, public outreach, environmental literacy programs, developing environmental ethics, collaboration, and partnership with other sectors and nations to achieve ES.

The Thessaloniki Declaration: After the UNESCO Conference on Environment and Society regarding Education and Public Awareness about Sustainability in 1997, this declaration was written. It urged universities to not only consider ES in their educational program but also in various other dimensions of HEIs such as research, operation and public outreach. It also called for governments to support and prove their commitments which they had made in the previous declarations.

Lunenburg Declaration: This declaration was announced as a result of the Higher Education for Sustainability – Towards the World Summit on Sustainable Development Conference

Declaration	Moral Obligation	Public Outreach	Physical Operation	Environmental Literacy	Inter-disciplinary Curriculum	Research	Partnership & Collaboration with other sectors	Inter-university Cooperation
Talloires	X	X	X	X	X	X	X	X
Halifax	X	X		X			X	X
Kyoto	X	X	X	X		X	X	X
Swansea	X	X	X	X		X		X
CRE-COPERNICUS	X	X		X		X	X	
Thessaloniki	X	X		X	X		X	
Lunenburg	X	X			X	X	X	X

Table 2.2 Common Principles of Sustainability in Higher Education Declarations (Wright, 2004)

(Rio+10). The declaration was drafted by members of the Global Higher Education for Sustainability Partnership. It emphasizes the interconnectedness of globalization, democracy, social justice, human rights, peace and environmental protection in relation to HEIs. It requested universities to develop their toolkits for making operational definitions and action plans based on the statement which they had signed. It also emphasized the importance of empowerment of all people for work together toward a sustainable future. Wright 2004 has compared the common principles of these declarations which are presented in table 2.2. A very recent effort for promoting SD in HEIs internationally was launched by the UN at the United Nations Conference on Sustainable Development, Rio +20 in 2012. The leaders of the international academic community were called upon to commit to the development of sustainable practices for Higher Education Institutions and were invited to sign the declaration called, Higher Education Sustainability Initiative for Rio+20⁶. Through this declaration leaders of HEIs declare that they will support the following actions;

- ‘Teach sustainable development concepts
- Encourage research on sustainable development issues
- Green the campuses
- Support sustainability efforts
- Engage with and share results through international frameworks’

All of these declarations lay a foundation for defining what a sustainable university is and provide a great resource for creating and developing a measuring tool to evaluate the implementation of ES in HEIs. In the methodology chapter, I will discuss how these declarations set a frame and guidelines for me to develop my research tool for this study.

2.5 Conclusion

This chapter discussed the relevance of higher education institutions dimensions with sustainable development and environmental concerns in a contextual framework. In order to clarify the context, the model of sustainable development, its definitions and main pillars were presented. The approaches in which educational traditions addressed and included sustainable development in their framework were elaborated upon in this chapter. The scope was narrowed down to higher education institutions and their roles and responsibilities with

⁶ For the full text, see: http://www.uncsd2012.org/hei_engage.html

regards to global challenges and sustainability issues. Reviewing a number of higher education declarations for sustainable development gave us a clear frame of reference for imagining what an institution committed to sustainable development should look like. This framework, derived from the declarations, mirrors what the systemic model of sustainability for the higher education institutions presents. It will be discussed in detail in chapter 3.

Chapter 3: Theory and Model

In this chapter the theory which has been applied in the study will be explained in detail. I will describe the systemic approach, the cybernetic model and finally the Viable System Model, which is the main model that is applied to study the process of implementation of ES at HEIs. The main reasons for choosing VSM as the main model for this study will be argued. Afterward I will touch upon the relevance of the systemic approach as well as cybernetic theory and VSM to the process of implementing ES in HEIs. Last but not least the VSM mechanisms will be explained, which will provide more details on the relevancy of the model within this study.

It is necessary to remember that the idea of measuring and studying the implementation of sustainability in an organization as if in absolute, traditional, empirical and objective terms can lead us to a failure (Bell & Morse, 2008). It is because SD as was discussed in chapter 2, is not a single element. Thus applying kinds of model which do not encompass the complexity and systemic approach will cause oversimplifying the study and reduce the variety of relevant and legitimate factors which play a role in the process of implementing ES in an organization.

3.1 Systemic Approach

The emergence of holistic thinking in systems science arose out of the need to understand man and his environment as an interacting system. This interaction has to be studied from multiple perspectives and holistically. System's thinking connotes Gestalt Theory in which we consider a system as a whole therefore if it is decomposed it will lose its synergetic properties. In the other words, it is based on synthesis, thus to understand the system through analytical method we need to take the steps in reverse order. In the first step, the system which holds a specific unit has to be identified then the properties or behavior of system have to be explained, and finally the properties or functions of the unit in focus which is part of the system should be explained (Skyttner, 2005). In fact system thinking claims that 'valid knowledge and meaningful understanding comes from binding up whole pictures of phenomenon, not by breaking them into parts (Flood, 2001).

3.1.1 Systemic Approach for Sustainability

In recent decades there have been some other studies which examined sustainability issues through holistic approaches (i.e. Salden and MaKempen, 2005, Morse, 2008, Asterios G,

2011, etc.). To deal with sustainability issues within systems, Baker (1997) claims a necessity for changing paradigms and divides these paradigms as anthropocentric paradigm versus eco-centric paradigm. The Anthropocentric paradigm supports an interventionist approach toward socio-economic development where nature is considered as a basic resource for overcoming human problems. In contrast, the eco-centric paradigm favors a holistic approach which addresses a combination of social needs, ecological limits and economic quality. This is a co-evolving model with equilibrium between growth criteria, social improvement and ecological conservation, which constitute the ideal model for sustainable development.

Other holistic approaches that can be used to study sustainability issues are the Evolutionary Social System (Banathy, 1996), addressing self-guided evolutionary process for organizations, and the theory of Evolutionary Learning Communities (Laszlo, 2003) which describes communities that make enormous efforts in synergistic interaction with their environment, individuals and groups in an evolutionary learning process toward sustainability (Espinosa, et al., 2007). Other suggested models that Espinosa, et al (2007) refers to, are Soft Systems Thinking (Checkland, 1981), Critical Systems Thinking (Jackson, 2003) and Organizational Cybernetics (Beer, 1972).

3.1.2 Systemic Approach for Sustainability in Higher Education Institutions

Sterling (2004) describes the system view of sustainability as a qualitative condition or emergent property that is the result of relationships within a system on any scale and demonstrates the survival, security and well-being of the entire system. With this definition, sustainability is therefore the ability of a system to sustain itself in relation to its environment. There is a wide acceptance of the necessity for a holistic approach to sustainability, a kind of approach and analytical tools that embody the principles of system thinking.

Applying a cybernetic systems model for sustainability at the institutional level requires a realization of a systemic coherence and healthy emergence within and between the various dimensions of an organization's operations.

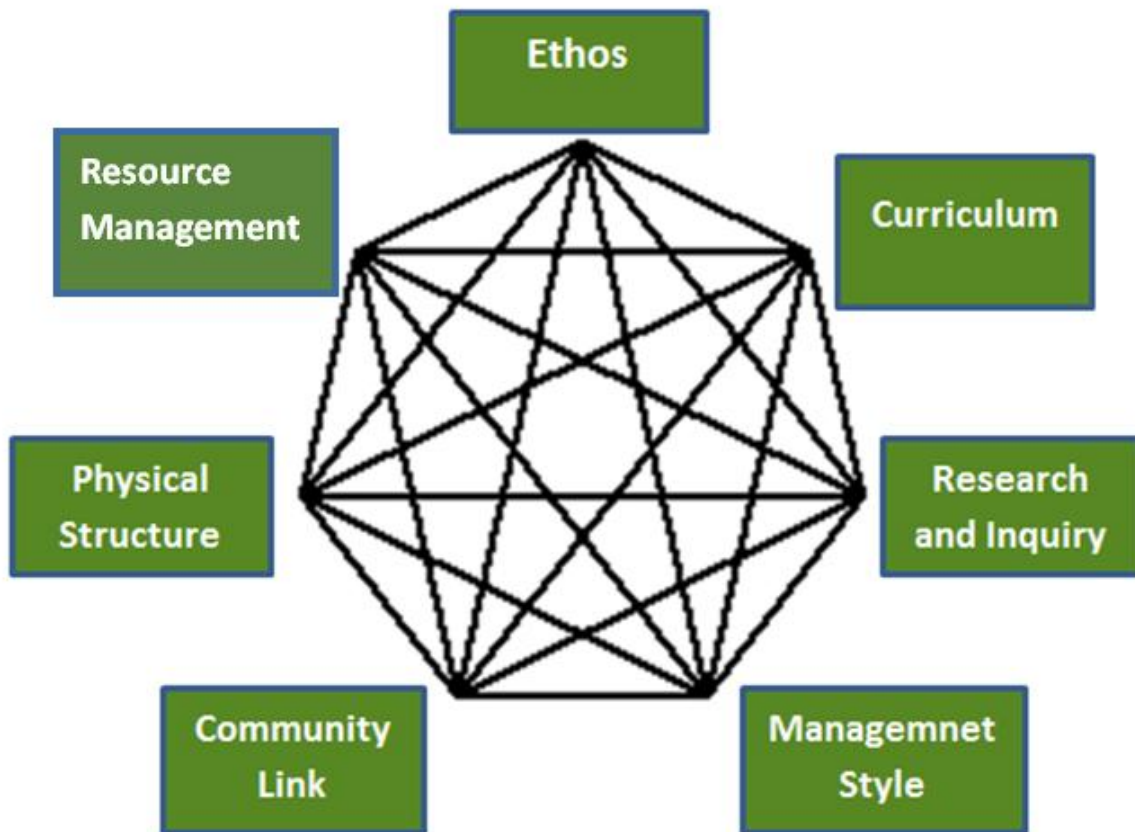


Figure 3.1: Seven Operational Dimensions of Higher Education Institutions (Sterling, 2004)

Sterling (2004) argues that in every academic organization or HEI, we identify at least seven dimensions in its operation:

1. Ethos
2. Governance and Management
3. Curriculum and Learning Opportunities
4. Research and Innovation
5. Community Outreach
6. Resource Management and Technical Operation
7. Physical Structure

Sterling (2004) also addresses the necessity for the general shift from a classical perspective towards a systemic approach for sustainability at HEIs. The main points in his view are shown in the table 3.1.

From	To
Incoherence and fragmentation	Systemic coherence and positive synergy
Large scale, loss of connectivity	Human scale, high connectivity
Closed community	Open 'permeable' community
Teaching organization	Learning organization
Microcosm of unsustainable society	Microcosm of sustainable society

Table 3.1: The general shift towards sustainable institutions (Sterling, 2004)

The recommended shift's elements mirror what the Viable System Model suggests for sustainability in organization, which this study will explain in detail in the following sections.

An organization can be considered a system with conscious parts, while itself as a whole may not be conscious. However the conscious parts, which are ultimately humans, cannot entirely control the organization (Middlehurst, 1993). The organization needs to adapt its structure to contingency factors which can control and affect organization via a super-system. Global environmental challenges and uncertainty are among the factors which can have a great impact on HEIs policy, strategy, mission and objectives. What differentiates an organization from other kinds of systems is transactional exchanges which are based on values. Therefore if preserving nature and being environmentally sustainable are values in one organization, the structure of the organization will be adjusted accordingly (Skyttner, 2005). It is assumed that HIEs value a sustainable society and feel responsible for creating such a society. This assumption is based on the large number of signatories in sustainability declarations for higher education. Values, which are a component of culture as Birnbaum (1988) explains, are the social or normative glue that keep an organization in one piece. These values influence what people believe and how they behave. They persuade purpose, commitment and order, as well as creating meaning, social cohesion and norms. As organizations become larger and more complex, so the need for the use of explicit formal models that the leaders and managers can adopt for understanding and communicating about situations increase as well (Hoverstadt,

2008). Hence, there is a need for a model which observes and analyses the complexity of an organization with its multi layered structures and mutual supports, while it deals with a complex phenomenon. In this thesis, such a model is assumed to be VSM, which attempts to analyze performance of HEIs as complex organizations dealing with the complex phenomenon of sustainable development concern.

3.2 Organizational Cybernetic Approach and Viable System Model (VSM)

This study applied the Organizational Cybernetic approach and, more precisely, Viable System Model (VSM), as one of Systems Theory-based models to study sustainability, and specifically environmental sustainability (ES), in higher education institutions (HEIS). Several other studies have implemented the same model (i.e. Bozicnik and Mulej, 2011, Espinosa et al., 2007 and Panagiotakopoulos et al., 2007, Hoverstadt, 2008, etc.). The Viable System Model, which was created and developed by Stafford Beer (Beer, 1984), provides a set of guidelines for the holistic approach to sustainable development. According to Beer (1984), an organization or a system is viable as long as it retains its identity. In the following paragraphs the justification for applying Cybernetic Approach and eventually the Viable System Model is discussed.

One of the reasons for choosing this model for this study is the complexity of the problems societies face. VSM in comparison with other models that have been discussed in this chapter, appeared to be rather successful for the diagnosis and transformation of complex organizations dealing with complex issues (Schwaninger, 2006; Kurlavicius, 2009). The key concept in VSM is that of complexity and how the organization and its management can deal with the complexity of their environment as well as their own activities (Hoverstadt, 2008). In addition to that reason for choosing VSM, the other holistic approaches which were described above, have a tendency to look at sustainability as a future state which should be aimed for, instead of a present necessity. Espinosa et al. (2007) also criticize those approaches for depicting sustainability as a state to be build up in a participative manner by including multiple viewpoints which they may even be conflicting. In contrast, a cybernetic approach constitutes sustainability as an ongoing process. Espinosa et al. (2007) argue this process moves on through the dynamic relationship between viable organizations and the reality that these relationships take place in their realization. In other words, it focuses on context and organization simultaneously. The point is that the context, or whole, evolves, and that whole is a network of mutual interactions between units which are evolving too (Morgan, 1983). The relationship between the parts and the whole is based on how we define boundaries.

Hoverstadt (2008) argues that since the understanding of the environment is basically more difficult than understanding the organization that those approaches which are not based on adequate research to analyze and understand the environment and future possibilities are prone to failure. According to Beer (1984) the natural world is made up of living systems nested and embedded within smaller or larger systems, each of which must be capable of coping with the far more complex world it lives in and of adapting in response to changes in that world, otherwise it wouldn't have continued to exist. Much the same rules are thought to apply to human social systems. The VSM is a model, in purely abstract terms, about the necessary and sufficient conditions that every system at every level of recursion must satisfy (Jopling, 2012). The system's primary activities are seen as carried on autonomously, supported by 'meta-system' functions – such as coordination between the primary activities, relating effectively to changes in the environment and maintaining the system's identity – which ensures that the primary activities operate together as a single viable system, able to cope with its own complexity and with the complexity of its environment.

In this study, HEIs are considered organizations that are sub-systems of a super-system or meta-system, and can therefore be viewed as groups of individuals filling roles and working together in order to achieve common goals within a defined social structure. Therefore HEIs are conceptualized as dynamic systems which are in continuous interaction with their external environment as well as with their units. Moreover, the system perspective allows this study to focus more on the dynamics through which the gestalt and its units interact instead of focusing on a specific role, structure or unit (Birnbaum, 1988). By using this approach the study focuses on the idea that strategic action should embody and reflect a systemic wisdom where the primary focus is facilitating the evolution of contexts. This is in contrast to the traditional approach, where strategy is a process of goal oriented adaptation of organizations to the environment. Morgan (1983) argues that the system approach develops a *re-punctuation* of the way we comprehend contexts in line with the cybernetic epistemology. The argument refers to the impact of the system approach on the orientation of action. To describe HEIs, the cybernetic model uses the 'living organism' metaphor. This means that an organization has the quality of brain; capable of being flexible, resilient and inventive in relation to new situations (Morgan, 1983). For an organization to be considered as a cybernetics system, Middlehurst (1993) introduces four principles that have to be observed:

1. Capacity to sense, monitor and scan remarkable aspects of its environment

2. Ability to relate this information to operating norms that lead system behavior
3. Ability to detect significant deviation from norms
4. Capability to initiate corrective action

What gives this model a dynamic quality is the fact that the cybernetic model deliberates the constant need for awareness and intelligent action because of changes in the internal and external contexts of organizations. Therefore organizations are identified as self-correcting systems through feedback loops which are mediated by political power, social-cultural norms, cognitive elements, and market and environmental demands (Birnbaum, 1988). Sustainability through cybernetic system approach at HEIs cannot necessarily be achieved by following a clear pattern of common understanding of organizational decision making with traditionally assumed as ‘agreed-upon’ goals, a clear technology and stable level of participation. On the contrary, sustainability at HEIs through this model is a standardized procedure for information flow, communication and constant feedback within the systems. The system has its own culture and environment which exists within a larger environment. The Probability of increasing one behavior and decreasing another one is analyzed through feedback loops within both systems.

3.2.1 Viable System Model Functionality

The Viable System Model aims to formulate the organizational structure and relationship between its components. As mentioned previously, the main concern in this model is complexity and how it is processed by organizations. This complexity refers to both complexity of the environment as a bigger system and complexity within an organization. According to Hoverstadt (2008) the VSM approaches the complexity in two ways which are;

1. Finding ways to balance the complexity between various parts of the organization
2. Assuring that every subsystem or fractal structure has the same VSM approach, which means the units of an organization have the exact same structure as the whole organization. In the other words, a viable system is made of number of viable systems.

Espejo (2003) explains that in VSM each component reserves its autonomy in relation to its environment, but contributes to the production of a larger, also autonomous, viable system. Similar complexity management requirements are needed for all the components in order to remain viable, at all structural levels of complexity, and therefore have the same structural

requirements, even if they are functionally diversified. Most of the complexity is managed locally in each of the components and only a small residual variety is required to align them with the more global interests, to increase the likelihood of higher levels of evolutionary *complexification* (Espejo, 2003).

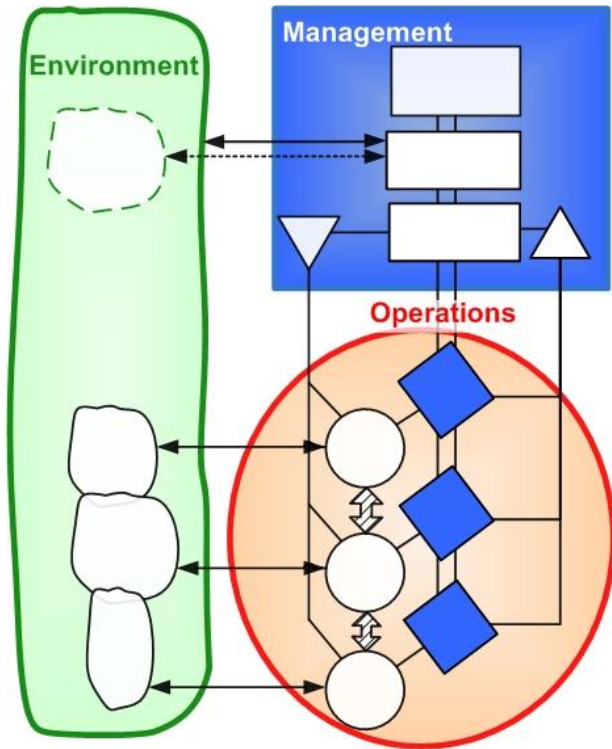


Figure 3.2 Viable System Model (Espejo, 2003)

This section briefly explains the main components in the VSM. In addition to the environment, which is a Meta system and includes all the physical and nonphysical surrounding of the organization, VSM introduces two other components; management and operations. These two components communicate through two main channels for different purposes. In this model all the processes take place within systems. Thus, the management component consists of 3 systems including:

1. Policy
2. Development
3. Delivery

The Operations component includes a system which is in charge of providing any services or products that the organization is supposed to provide. In the case of HEIs, the final products or services are; learning opportunities, research, and community outreach. Two components

of Management and Operations are linked through two systems called 'monitoring' and 'coordination' systems. All the systems and components are interlinked and interconnected (Espejo et al. 1996, Espejo, 2003, Flood and Carson, 1993).

Each of these autonomous units is functionally specialized in creating an aspect of the collective's purposes. One can now recognize a larger autonomous unit embedding a number of autonomous units, and itself embedded in an even larger autonomous unit. Obtaining cohesion of primary activities in autonomous units demands regulatory capacity, which is provided by regulatory activities. The more regulatory capacity is maintained at the level of small autonomous units, the smaller the residual variety left to the attention of higher levels of administration and management. The level of decentralization in which members of the organization want and are prepared to accept is a political question (Espejo, et al., 1996). A highly centralized structure can be viable, but it demands a high cost of co-ordination and support activities.

Regulatory activities produce the regulatory functions which create cohesion and adaptability for autonomous units. They are essential to the viability of the organization as whole and to each of its embedded autonomous units. Regulatory activities are performed at different levels depending on the approved balance between centralization and decentralization within the organization. Modelling the interaction between regulatory and primary activities is central to the use of the VSM as figure 3.2 shows. Regulatory activities take place mainly in the management component of this model, while the primary activities take place in operation component. The first challenge for the organization's staff however, is to obtain cohesion and synergy from their connectivity. This means the components as shown in figure 3.2 are not isolated, but on the contrary are strongly linked through two dynamic channels. These channels are in fact mechanisms which keep the system interconnected. This requires a mechanism which is called the *cohesion mechanism*, and enables the staff to produce meanings that transcend them as individuals. The second challenge is to remain viable over the course of time in co-evolution with those that these individuals interact to construct the world together. Remaining viable can be achieved through the second mechanism which is the *implementation mechanism*. This mechanism allows people to produce new meanings while conditions evolve. These two mechanisms are explained more in what follows. Cohesion here means aligning individual and collective interests. This alignment does not suggest that individuals and their collective have the same interests and purposes, but that, regardless of how different these might be, the implementation of individuals' purposes

produces the purposes ascribed to the organization. Espejo (2003) argues that the cohesion mechanism explains the kinds of stable forms of communication among organizational resources that enhance the likelihood of aligning the autonomous units' programs with the organization's purposes. For the purposes of clarity, this study distinguishes between those resources and relations which produce the organization's purposes. One of these mechanisms is called the implementation mechanism which includes all autonomous units that producing the collective's purposes and values. Those resources and relations steering the implementation function in the planned directions are observe by another mechanism which is the cohesion mechanism.

Managing the coherence of established policies and their implementation is the purpose of the cohesion mechanism. Therefore, the cohesion mechanism is constituted by resources whose purpose is first to negotiate programs and resources with autonomous units in order to make local policies coherent with the organization's global policies, and second to monitor the development and performance of these programs over time (Espejo, 2003). The fundamental concern in the cohesion mechanism is the organization's internal complexity, and for this, according to Espejo (2003),

‘the cohesion mechanism needs first, an accurate appreciation of the achievements and capabilities of those units that should develop autonomy in the organization, and second, a means to enable their coordination. In this sense the cohesion function is a form of control that respects and enables the autonomy of units in the organization’.

Achieving a degree of cohesion among units of organization is the main role of the cohesion mechanism and it is what this mechanism is held accountable for. Enabling autonomy enhances the flexibility of the viable system but it also increases the chance of units producing inconsistent responses (Espejo, 2003). To counteract this downside it is crucial to design and provide stabilizers among autonomous units. These stabilizers are what Hoverstadt (2008) names as factors for balancing complexity. Enabling lateral communications and interactions leads the organization towards reducing the chances of inconsistent responses and can increase possibilities for a coherent development. Some effective ways are setting common procedures and standards in all those aspects that are not central to the units' own purposes, as well as highlighting the similarities in culture and values which can play a role in coherent development process. This strategy, based on activating self-regulation, is likely to produce consistency among the autonomous units gradually. It can be achieved if the entailed

learning is not ceased at a primary stage because it is considered by the organization as too chaotic and costly. To a much lesser extent it is an option to use direct supervision for coordination. Whether a management team decides to take mutual adjustments approach or applies direct supervision, an organization depends on a coordination function for enabling autonomy. The coordination function provides a common ground that facilitates lateral communications among autonomous units and therefore provides opportunities for local problem solving (Espejo, 2003). It is similar to what Sterling (2004) recommends as a paradigm shift for HEIs to move towards ‘systemic coherence and positive synergy’ and ‘high connectivity’.

Coordination by mutual adjustment takes place in the regular actions of organizations continuously, thus it might cause more complexity than other formal approaches (Grembergen, 2001). Unfortunately coordination by mutual adjustment can be perceived by people, especially those working in traditional, hierarchically structured organisations, as bureaucratic interference with their personal freedom. This is partly because those standards can appear as top-down instructions instead of mutual support. The main vertical channel between the cohesion mechanism and the management of each of the autonomous units (e.g. divisions in a university) is the communication means through which top management negotiates programs with divisional management. Also, it is the channel that performance reports are submitted through and corporate in which interactions take place (Espejo, 2003). Therefore this central vertical channel plays a significant role in coordinating via mutual adjustment while it can also increase the trust and interest of individuals.

3.3 Overview

This chapter explained the system approach and the philosophy which supports system thinking. It also drew attentions to the application of the system model for environmental sustainability in higher education institutions and the necessary paradigm shift that these institutions are need in order to be framed as systems, instead of fragmented organizations. This chapter also explained the cybernetic model for organizations and the features which one organization should obtain to achieve coherence and cohesion. The Viable System Model was proposed as the main model for this study. VSM strongly emphasizes the management of variety which refers to multi players dealing with various issues while collaborating with each other through different mechanism and eventually achieve the goals. A key concept in VSM is complexity, thus people in the organization need enough information and knowledge to work

effectively and efficiently, but too much information can distract them from the organizational objectives and directions. To avoid the inconsistency in the work, two mechanisms link the main components of the organization, therefore the whole work in the organization will be in line and interwoven. Viable system will therefore be a kind of system or organization which consists of a number of smaller viable systems as its parts or units. In the next chapter it will be explained that how the implementation of environmental sustainability in higher education institutions can be formulated in the frame of Viable System Model.

Chapter 4: Research Design and Methodology

In this chapter I will describe the research design which is used in this study. I will also explain the methodology, which is used to answer to the second research question of: *What factors are most significant in developing systemic changes?* Thus the theoretical model that was developed in chapter 3 will be formulated into a research design. This design includes research methods, unit of analysis and a sample selection, which are part of the methodological foundation. After this section, I elaborate on the operationalization of the theoretical model. The main point of this is to address the question of how to translate the theoretical model into the indicators as an operational tool for measuring ES in HEIs. Conceptualization and method of analysis will be discussed as well. As with any other research project, this study has limitations, which will be addressed in this chapter. It is important that ethical issues have been taken into consideration while conducting the research.

4.1 Methodological Deliberations

This study has aimed for a high degree of validity, reliability and generalizability of the research outcomes within its potential. However the methodological choices for the thesis should be approached while bearing the aims and limitations of the study in mind.

4.1.1 Methodological Foundation

The ontological position found in this research is based on Systems Thinking, which emphasizes cohesion and coherence within the system (Espejo et al., 1996). Therefore the assumption is that everything in this world is interconnected and is part of a Meta system. Thus whatever choices individuals make will have impact on the present and future which we will have. In relation to sustainability, it immediately draws attention to nature, and hence expands the time scale to beyond one generation's lifetime. It is important to mention that, as a field of inquiry concerned with the holistic and integrative observation of phenomena and events, systems theory is connected to both epistemological and ontological situations. Methodologically however, it is essential to differentiate a theoretical system from an empirical system. The former as Laszlo & Krippner (1998) discuss 'is a complex of concepts, suppositions, and propositions having both logical integration and empirical reference, while the latter is a set of phenomena in the observable world that is amenable to description and analysis by means of a theoretical system'. Laszlo & Krippner (1998) define a system as a set of two or more interrelated components or units with the following properties:

1. Each component has an effect on the functioning of the whole.
2. Each component is affected by at least one other component in the system.
3. All possible subgroups of components also have the first two properties.

It brings us to an epistemological position which suits the ontology position while enabling us to explore the possible answers to the research questions. It also supports ‘foundherentism’ position which combines Foundationalism with ‘Coherentism’, while bypassing arbitrariness and circularity problems which often can be observed in Foundationalism and Coherentism (Lightbody, 2006). In Foundationalism the emphasis is on basic beliefs which have a linear relationship directed from the former to latter one while Coherentism argues that beliefs mutually support on each other. Foundherentism is set on the idea that beliefs mutually supporting each other and it occurs through multiple lines (Haack, 1993). This position allows studying complex organizations dealing with a complex phenomenon in a systemic way, thus it is context bound.

4.1.2 Research Method

This study has been conducted using a qualitative approach. Research that delves in depth into complexities and process is best to done in a qualitative way (Marshall & Rossman, 2006). This study has been carried out from January 2010 to June 2012; the main reason for the extended time was observing and evaluating the process of implementing the outcome of first phase of this study at the University of Oslo (UiO) over time. In this sense this study is labelled as ‘action research’. As mentioned in chapter 1, action research is a reflective process on progressive problem solving. Researchers who are part of a problem solving team and work closely with the case over time use this approach and can thus observe, monitor and evaluate the progress of work (Reason & Bradbury 2001). I have been employed at UiO as the sustainability adviser at the Green UiO Office from 2010 and have been assigned to analyse the ES status at the university I have therefore had the chance to study the case, as well as measure, analyse and observe the implementation progress. Hence the University of Oslo is the main case study of this thesis. Case study according to Babbie (2007) is an in-depth examination of a phenomenon by a specific focus on particular aspects or over a certain period of time.

This thesis has been conducted in two phases called *Diagnostic* phase and *Implementation* phase. It is recommended by both the VSM approach for dealing with complexity and in

action research method.

Diagnostic Phase: This was the first phase of the study and carried out in 2010. The aim was to recognise what a sustainable university is and how sustainability at universities can be measured. I would like to remind the reader that in this study terms such as ‘sustainable’, ‘environmentally sustainable’ and ‘green’ are used interchangeably. The definition of the term ‘Environmental Sustainability’ (ES) was based on the relevant literature; moreover it was formulated within the operational dimensions of universities as organizations. The following step was to develop a list of indicators that provide possibilities to measure the sample universities’ efforts with regards to sustainability. It was an operationalization of the theoretical model of this study which leads to designing the table of indicators for measuring ES level at HEIs. The data was collected for all the sample universities, which were then compared and benchmarked. Finally, I have graded the ES level of UiO and compared it with other universities’ efforts. The result will be shown in chapter 5.

Implementation phase: Prior to this phase, the level of ES at UiO was diagnosed. Although the study does not provide an interval scale for all the sample universities, the implementation progress has been closely observed and monitored at UiO. In addition to this, a set of best green practices that other sample universities in phase one implemented in have been documented. The outcome of this effort was a set of recommendations to enhance and advance the UiO’s ES level. According to the recommendations, UiO had framed and designed the annual plan at the Green UiO office in 2011. By June 2012 the environmental sustainability level at UiO was re-evaluated in order to measure the progress of implementation of environmental sustainability.

4.1.3 Unit of Analysis

The units of analysis for this study are higher education institutions. This means that the analysis will be on an institutional level. The main unit of study is the University of Oslo, consequently the outcome of this analysis will reflect on this university. Higher education institutions are based on long-standing traditions and continuity, often evolving over many generations with very specific sets of values, traditions and practices. Clark (1987) has introduced the concept of an organizational or institutional ‘saga’ referring to the long-standing characteristics that determine the distinctiveness of a university. HEIs’ primary functions are teaching and learning, research and innovation, and community service and outreach (Castells, 2000).

4.1.4 Sample Selection

The sample HEIS are located in three continents; Asia, Europe and North America. Diversity in this research sample increases its validity and makes it generalizable. It is important to make it clear that in the selection of samples for this study I have been asked to include some particular universities by the sustainability team at UiO. These universities are ten top universities according to Times Higher Education (THE) ranking in 2009⁷. The main reason for the selection of top universities is that UiO has ambition to become one of top research universities⁸ in the international rankings, therefore it is important for the university to compare itself with those that are in the top international university league in different aspects, including ES. In addition to these ten universities, I have also been asked to include; some of universities in the same bibliometric category as UiO; some other Norwegian universities; and finally some universities which are well-known for their ES efforts. Below there is a list of the twenty universities, in addition to UiO, that make up the study sample. Ten top universities according to their place in the THE ranking 2009:

1. Harvard University
2. Cambridge University
3. Yale University
4. UCL (University College London)
5. Imperial College London
6. Oxford University
7. Chicago University
8. Princeton University
9. MIT (Massachusetts Institute of Technology)
10. CALTECH (California Institute of Technology)

Four universities with the same bibliometric level as UiO chosen randomly:

11. Australian National University (THE Ranking: 17)
12. University of Tokyo (THE Ranking: 22)
13. Bristol University (THE Ranking: 34)
14. University of Copenhagen (THE Ranking: 51)

⁷ For the complete list, see: <http://www.timeshighereducation.co.uk/Rankings2009-Top200.html>

⁸ See: <http://www.uio.no/english/about/strategy/>

Three universities which have received Green award recognition:

15. British Columbia University (THE Ranking: 40)
16. Gothenburg University (THE Ranking: 185)
17. Bradford University (THE Ranking: N/A)

Three more Norwegian universities:

18. University of Bergen (UiB) (THE Ranking: 144)
19. Norwegian University of Science and Technology (NTNU) (THE Ranking: N/A)
20. Norwegian University of Life Science (UMB) (THE Ranking N/A)

UiO had 101st place in THE Ranking 2009.

4.2 Operationalization of Theoretical Model

In this section the theoretical model of this study is operationalized. To do so, the dimensions of HEIs' operations were categorized according to Sterling's (2004) model and content analysing of the ES declarations for higher education. These are labelled within the main frame of the VSM approach and include Management unit, Operation part and 2 main mechanisms of monitoring and coordinating which were explained in the previous chapter and shown in figure number 3.2. Hence the five categories of indicators are;

- Governance and Administration
- Curriculum and Study Opportunities
- Research and Innovation
- Operation
- Other Related Activities

Other related activities are those which mainly touch upon community service and outreach activities. It has to be mentioned that in order to test the plan for developing the tool including the indicators for measuring ES at HEIs, a previous study at the Luneburg University, which is relatively close to this thesis research problem was studied. The Luneburg study was conducted by Beringer (2007) in order to assess and compare the sustainability project at the university against its North American peers. The main headlines for the indicators used in that study are in line with those which have been used in this thesis. Based on the Sterling model (2004), the sustainability declarations for HEIS and Beringer's

(2007) assessment tool, a table of 50 indicators has been developed to measure ES at the sample universities. Bossel (2001) refers to number of studies (Becker 1997, Hardi and Zdan 1997, Moldan and Billharz 1997, Meadows 1998, Bossel 1999) and claims that there seems to

Governance and Administration	Curriculum & Study opportunity	Research & Innovation	Operation	Other related activities
Institutional declaration/ Resolutions	Undergraduate study in Environmental Sustainability	Research Centre / Institute	Energy	Conferences
Policies	Postgraduate study in Environmental Sustainability	Internal Grant Opportunity	Carbon emission	Students group
Strategic approach/ Action plan	Doctoral studies in Environmental Sustainability	External Funding	Waste Recycling	Events (except conferences)
Staff position / Sustainability office	Environmental Sustainability Education	Research Collaboration with Industry & Corporate	Building	Community Projects
Audits	Multidisciplinary Sustainability Education	Journal	Purchasing	University-Community Partnership
Annual Sustainability Reports	Service Learning	Communication within Research Centres	Water	Website of Sustainability center/activities
Students voice	Student Research	Other research Activities	Food & Dining	Media/ News from Sustainability of University
Internal Awards	Climate Change	Climate Change	Paper	External Awards and Recognition
			Housing	Campus tour & Flyers
			Sustainability Management System	Raising Awareness/ Culture Change
			Implementing Innovation & Technology	Visibility of Sustainability of University on the website
			Conservation	
			Transportation	
			Fair trade	
			Chemical Material Concern	
			Lead/ Pesticide/ Detergent	
			Green Lab	

Table 4.1: Indicators for Measuring Environmental Sustainability at Higher Education Institutions

be a general agreement that it is impossible to define only a single indicator of sustainable development, and that a substantial number of indicators are essential to capture all the

important aspects of ES in a specific application. Table 4.1 shows 50 indicators for measuring ES at HEIs in this study. The definition of each indicator is provided at the appendix 1.

4.2.1 Governance and Administration

One can define governance in the higher education field as the structures and processes in higher education institutions that enable institutional participants and social actors to interact and impact on each other. It also includes communication with the extensive surrounding in regional to super national frame. Governance includes political-decision making and management of a higher education institution. Maassen (2008) argues that governance affects institutional missions, academic programs and curricula, and non-instruction activities such as research. He also emphasizes the impact of governance on issues such as appointment and promotion of staff, admission of students, standards and degrees offered by universities, budget and other facilities. In fact the governance structure of an institution explains how stakeholders interact and communicate with each other. In other words, it shows who has authority; who is accountable to whom, how do they take responsibility, and what is their responsibility? (De Boer & Goedegebuure, 2003) The institutions' vision and resolutions are expressed by the governance of those institutions, which will be reflected by policy and strategic plan at some later stage. Policy should be implemented at different internal levels through administrative and academic actors as well as students. Monitoring and coordinating the implementation process assures the progress and success of the university work. Therefore the reporting and auditing systems are necessary in order to bring feedback to the loop and to arrange for the necessary adjustments. Recognition of active players in this process keeps individuals motivated to make efforts to achieve the goals desired by the organization

4.2.2 Curriculum and Study Opportunities

In formal education, study opportunities normally involve some kind of teaching process which takes place in a 'departmental learning milieu' (Brew, 2006). Karseth (2006) argues that a curriculum is more than the objectives and the syllabus of an education, but must always be viewed as symbolizing a system of ideologies, values, discourse, organisational forms, mandates, subjects and classroom practices. In addition to the formal study opportunities, HEIs can provide non-formal education in which educative processes have flexible curricula and methodology and are thus capable of adapting to the needs and interests of students. Informal education is another opportunity for students to learn about particular

subjects. It does not correspond to an organized and systematic view of education in a way that is seen in formal education. In addition, it does not necessarily encompass the objectives and subjects usually included by the formal curricula. It targets students and the public and imposes no obligations for them either (Dib, 1988). The indicators have been shown in the table 4.1.

4.2.3 Research and Innovation

Although research and teaching have been considered intertwined in some perspectives, this study views them as two domains that function separately but have an impact on each other. This impact is mostly about how the outcome of research can make teaching more effective by providing new knowledge to share with learners. Brew (2006) views research as what takes place in a disciplinary research culture, in which academics, researchers and postgraduate students carry out the task of generating knowledge. Table 4.1 shows the indicators related to research activities at HEIs as well.

4.2.4 Operation

This includes the set of activities which take place on campus in order to provide and maintain the physical environment and conditions for HEIs to achieve their goals. These mainly deal with infrastructures, technical issues, resource management, safety and health issues, as well as welfare consideration at HIEs. The list of indicators is addressed in the table 4.1 in Operation category.

4.2.5 Other Related Activities

HEIs can play a significant role in raising awareness and promoting specific cultures and values through capacity building. This is due to one of the main functions of HEIs called 'community service and outreach'. Developing productive leaders and active citizens has been a central goal of higher education for decades. Nowadays higher education experts are reemphasizing community building, outreach and providing services for citizens as central goal of HEIs in educating society on their roles in a democratic society (Antonio, et, al., 2000). These services that aim to promote ES, are varied and can be formed in a great range of activities such as organizing open lectures or campaigns, distributing informative flyers, partnership with communities, etc. Indicators related to these activities according to this study are listed in table 4.1.

4.3 Operation process

One of the crucial steps of this study was the search for appropriate indicators of system performance to condense essential information into a compact list of reliable guidelines for the HEIs management. The need for comprehensive indicators that evaluate system viability, performance and impacts is especially vital in management for sustainable development at HEIs due to the fact that it is a rather new arena (Bossel, 2001). As was mentioned earlier, this study was carried out in two phases which will be explained in the following sections.

4.3.1 Diagnostic Phase

After developing the indicators and selecting the sample universities, data related to the environmental sustainability efforts of each university were collected from their websites. Since it is an internationally oriented study, the English website of universities was the main resource for collecting data. However when it was not possible to find related pages to the sustainability office, groups or documents on the website, the universities were contacted and a request for information was sent to them. This was particularly the case in regards those universities where English was not the first language. When the necessary data was gathered, performance of each university was graded and finally shown in a comparison scale. Performance of the University of Oslo was compared with twenty other universities. Based on this comparison, a list of recommendations was proposed to the university to be included in the plan and implemented at the university. This phase is mostly based on a comprehensive benchmarking approach.

4.3.2 Implementation Phase

The second phase of this study focused on the performance of the University of Oslo with regards to environmental sustainability. Some recommendations from the proposed list were chosen as part of the sustainability plan in 2011 and 2012. The process of implementation was observed closely and it was re-evaluated in June 2012. A report was provided for the leadership team of the university to present the progress of work. This stage uses an action research approach. It is necessary to mention that after observing the first phase results, a few study trips were arranged to visit the universities which could be a good example for the University of Oslo to follow.

4.4 Limitations

One of the main limitations for this study is related to quality of data. Since the sample universities were spread broadly, there was not any opportunity to visit the universities and observe their efforts and collect more reliable and accurate data. Hence, all the data is based on what each university has provided on their website or through emails when it was requested. During this process there were cases which did not make it clear that what was on the website was in the existing action plan, or that it was to be achieved in the future. Also, what some universities presented as their long term plan did not show the timeline and milestone for various activities which could affect the number of indicators in this study. A lack of similar tools for measuring environmental sustainability can be considered as a limitation to the validity of this set of indicators as study tool suggested in the thesis. It is more likely that the reliability of a tool will improve when it is built upon a previous example which has been tested and shown its strength and weakness. On the other hand, developing a new tool which prior to this study did not exist can be considered as an added-value to the academic knowledge related to this field of study. Since the second phase of study has action research approach, there is a danger of not being objective and a tendency to being bias toward the process. Considering a relatively large research sample as well as carrying out two phases of study, time and the requested scope for thesis can be considered as additional limitations for this study.

4.5 Synthesis and Overview

Performance assessment of HEIs in this holistic approach has to deal with a complex set of interacting and self-organizing natural and human systems, all pursuing their internal objectives while also contributing to the development of the entire system. Performance indicators must therefore reflect the viability of essential component systems as well as their contributions to the viability and performance of other component systems and the total system under study. A systems-based approach and a comprehensive set of performance indicators requires the identification the factors that represent the viability states of the component systems. They should also address the contributions of these component systems to the performance of the total system. To be viable, a system must pay essential amounts of attention to achieving the performance that responds to its environment (Bossel, 2001). Therefore, defining the fifty indicators within the VSM approach and the cybernetic model for

HEIs provides the ground to design a set of reliable indicators for assessing environmental sustainability in those institutions. It is because this model and approach devote essential amounts of attention to the relationship between the internal units of institution as well as its interaction with its environment. The results of this study are presented and discussed in chapter 5 and 6.

Chapter 5: Research Findings

In this chapter the result of applying the set of indicators which are recognized to be significant factors for measuring environmental sustainability in higher education institutions are presented. These indicators were used to show to what degree environmental sustainability initiatives have been implemented at each of the sample universities. The outcomes of the both phases of this thesis; the Diagnostic and Implementation phases are discussed the by presenting the performance of all the sample universities and showing the place of the University of Oslo in a comparison perspective in the following sections. In addition, all the five categories of indicators will be shown and analysed separately. The outcome of the second phase; Implementation phase, will be discussed afterward in which the progress of implementation of environmental sustainability at this university in year 2011 and 2012 will be discussed.

5.1 Diagnostic Phase: Benchmarking Approach

The indicators for measuring environmental sustainability performance have been applied to each sample university. The overall grade of each university including the University of Oslo has been shown in figure 5.1. The full name of the universities can be found in section 4.1.4. The highest grade that one university can obtain within the frame of the tool is fifty, which

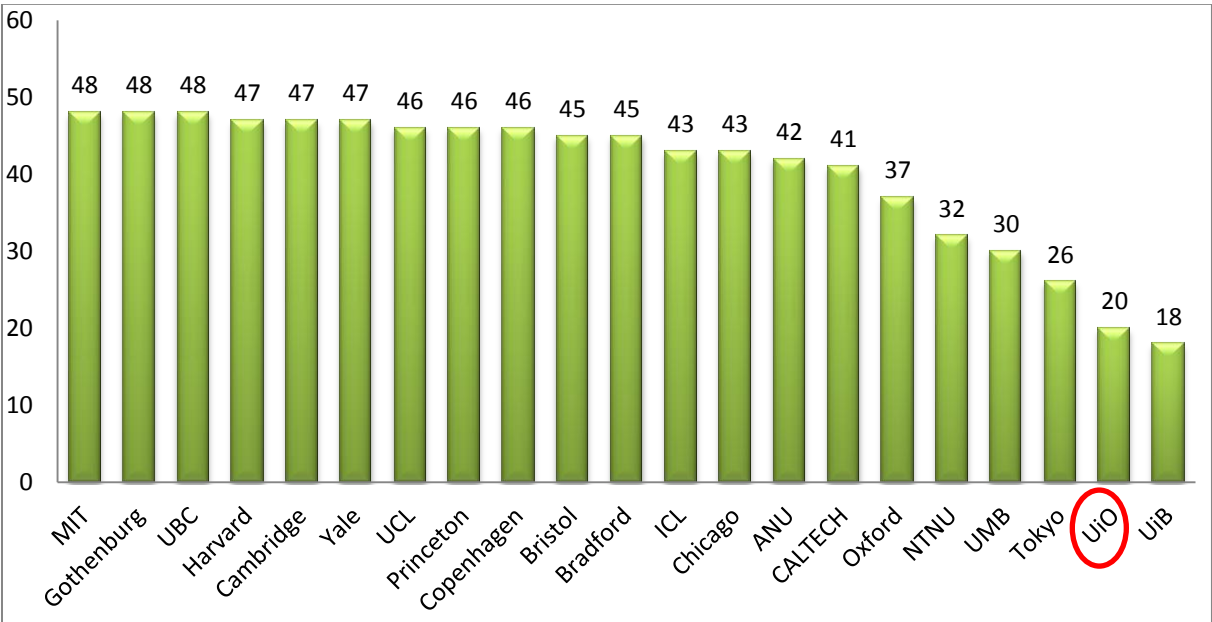


Figure 5.1 Level of Environmental Sustainability Implementation at the sample Universities based on the 50 proposed Indicators

means that a particular university has implemented environmental sustainability in various dimensions and in a systemic way.

As figure 5.1 shows, three universities obtained 48 out of 50 indicators. They are Massachusetts Institute of Technology (MIT), Gothenburg and University British Columbia (UBC). On the other end of the spectrum, the Tokyo University along with all the Norwegian sample universities in this study scored the lowest mark in comparison with other institutions. The University of Oslo's environmental sustainability efforts were achieved only 20 out of 50 indicators. The outcomes also show that 75% of the sample universities are marked above 40 in this study.

The three top universities in this study are important for the University of Oslo in different ways. For instance, MIT was among the top ten universities in the Times Higher Education ranking in 2009, which is where, according to the Strategy 2020 of the University of Oslo⁹, this university aims to be. In addition to being excellent in research and education, MIT is also among the leading universities in implementation of environmental sustainability. It expresses that the internal objectives and academic interest in this institution did not interfere and reduce the university's capability of coping with the far more complex world it lives in, and of adapting in response to changes and challenges which the globe is facing.

In the case of UBC the remarkable point is that, despite the short environmental sustainability history at the university, it shows great achievements in the ES indicators. Its first strategic action was initiated in 2007 in which the two cross-cutting themes; campus as a living laboratory and the university as an agent of change, were emphasized. The strategic plan defines 'cornerstones of UBC's living laboratory initiative as:

1. The integration of UBC's core academic mandate (research and teaching) with the University's operations
2. Partnerships between the University and private sector, public sector or NGO organizations
3. Sound financial use of UBC's resources and infrastructure
4. The potential to transfer the knowledge UBC gains into practical, positive action applicable to the greater community'¹⁰

⁹ To read the UiO Strategy 2020, see: <http://www.uio.no/english/about/strategy/Strategy2020-English.pdf>

¹⁰ UBC sustainability policy, strategic plan and initiatives: <http://www.sustain.ubc.ca>

The holistic implementation of environmental sustainability has been implied in these four principles.

Gothenburg University is another successful university with regards to environmental sustainability efforts. The steering model of higher education in Sweden is not entirely similar to Norway in sense that the state has more involvement and control over HEIs in Sweden than in Norway. The steering model of higher education institutions is a mixture of Sovereign, Institutional and Supermarket, especially in the case of Norwegian universities, Institutional steering model is more visible (Gornitzka & Maassen, 2000). However these differences between Norway and Sweden in comparison with their differences with the North American sample universities such as MIT and USB are considered diminutive. Thus the Swedish peer university is a good example for the University of Oslo to observe its model and exchange best practices.

Analysing the performance of the three top HEIs in this study, and the fact that they scored 48 from 50 indicators, show that they have implemented ES in most arena and dimensions of the institutions. It also addresses the ability and capacity of the institutions to sense the changes in their surrounding environment relate themselves to the changes and recognise the suitable reaction and adaptation. This brings us back to the four principles which were introduced in cybernetics system for a viable organization (Middlehurst, 1993). They are:

1. Capacity to sense, monitor and scan remarkable aspects of its environment
2. Ability to relate this information to operating norms that lead system behavior
3. Ability to detect significant deviation from norms
4. Capability to initiate corrective action

There are other universities in this study whose ES performance can enlighten and inspire the University of Oslo. One of these examples is the University of Copenhagen¹¹ which as a Scandinavian university has many similarities with higher education institutions in Norway with regards to governance and the steering model, finance, social-economic issues and cultural values. The Copenhagen University has been working on sustainability issues especially since 2009 in advance of launching the UN Cop15¹² in Copenhagen.

¹¹ Sustainability Science Centre at Copenhagen University: <http://sustainability.ku.dk/>

¹² See more details about Cop 15 here: http://unfccc.int/meetings/copenhagen_dec_2009/meeting/6295.php

It is necessary to show and explain the implementation of ES in all the five components which were defined according to the theoretical framework of this study separately. Hence the following sections will elaborate on implementation of ES in these main categories in 20 sample universities. The performance of The University of Oslo will be presented separately at the later stage.

5.1.1 Governance and Administration

Universities in different parts of the world have their own governance systems and administration models. The steering system might lean towards sovereignty with more power from the states or it might be more institutionally oriented, market oriented or be in the hands of multi stakeholders. However it is often a mixture of systems that is governing universities. The Administration model at HEIs can also be varied from Bureaucratic form to collegial or to markets (Dill, 2000). Although the kind of governance system and administration model that one university has, affects its operation and outcomes, all of these systems and model operate based on policies which universities set for themselves. These policies can be

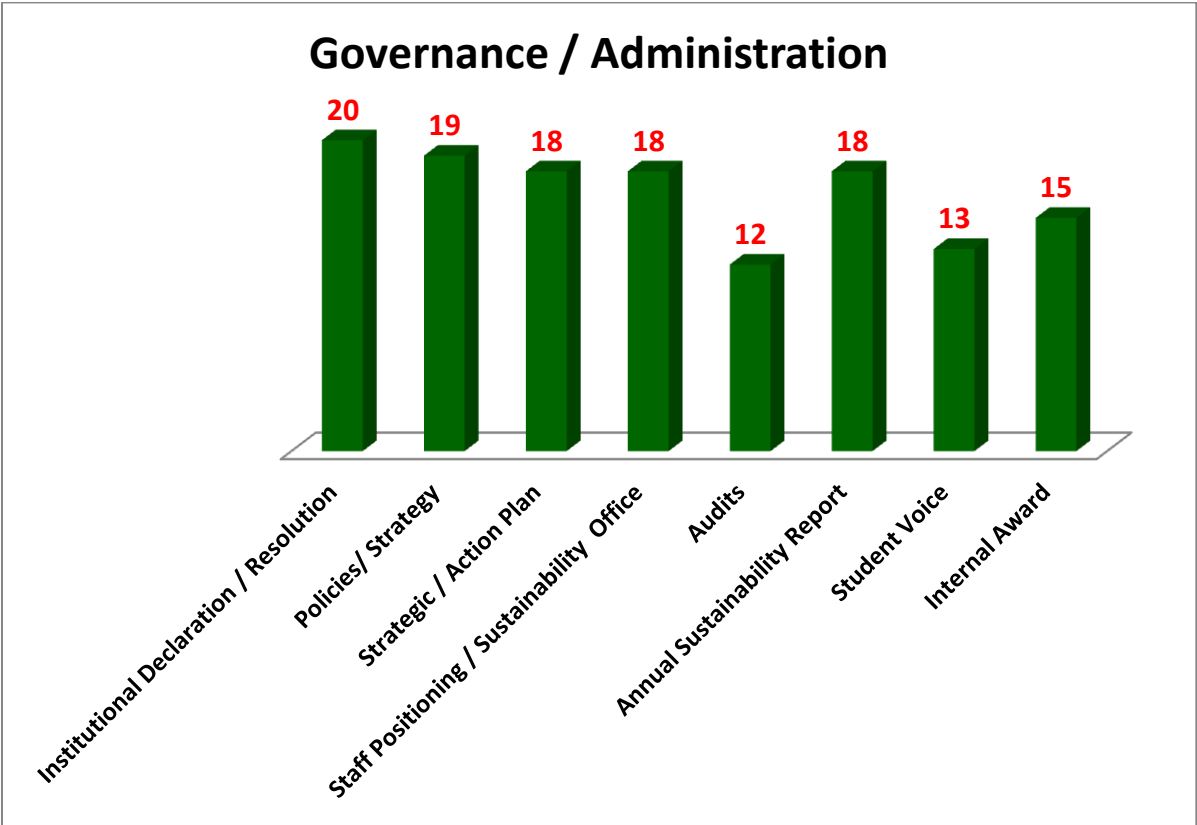


Figure 5.2: Level of Environmental Sustainability Implementation in Governance Function of HEIs (Numbers of universities out of 20)

operationalized through strategies. Managing the strategy consists of the following steps and tasks; strategy evaluation, strategy implementation, and strategy control (van Vught & Maassen, 2002). Figure 5.2 shows the ES performance of universities and presents how the vision or resolution of the universities affects the policy, and how the policy is formulated into strategy and operated in the institutions.

It is interesting to mention that all twenty sample universities have signed at least one of the higher education declarations for sustainable development¹³ or, through the states document such as the Agenda 21, have pledged to become more sustainable. This resolution has reflected on the policy and strategic planning of the institutions. Consequently, to carry on the task and achieve the goals, a team has been employed at each institution. Although the majority of the universities provide some sort of sustainability report, not many have an auditing system in which there is an external or third party involved. Those universities which are members of the International Sustainable Network (ISCN¹⁴) such as MIT, UBC, Gothenburg, Harvard, Yale and Oxford are obliged to send a sustainability report within a requested format to the ISCN secretariat for evaluation of performance. This auditing system affects the process of work from the beginning, since the university knows what kind of criteria they should implement and how the work should be organized. In the case of Gothenburg and UBC especially it is evident that their ES performance fits the VSM model since; 1) The Institution is responsive to its environmental changes and demands. 2) The management unit builds the necessary capacity to relate the information received from the environment to the operation unit (which includes education, research and technical operation unit as well as activities related to community outreach and service) through policy, strategic planning and staff positioning. The process is open to discussion with other players through the sustainability management system that these universities have established. 3) The process of work is monitored and coordinated closely to assure a coherent and systemic approach. Therefore all the departments in this process collaborate by appointing some percentage of their work force and assigning staff to coordinate the ES implementation with other unit and managements. These analyses and observations have been obtained through a few study trips which I have made to visit these universities. Depending on the governance system of the universities, student representatives may or may not be part of the steering board to include students' demands in the ES policy and planning

¹³ See chapter 2

¹⁴ ISCN: <http://www.international-sustainable-campus-network.org/>

of the university. Recognition of efforts made by a particular unit has been awarded at some universities. The recognition award can play a role in inspiring and motivating the staff to be assertive in achieving the university ES objectives.

The study shows that those universities who fulfilled more criteria of ES in governance and administration category, especially with regards to policy, strategic plan and audit, have been more successful in a systemic approach of implementing ES at the whole institution. This can be due to having stronger support from the leadership of the university, legitimacy which policy and strategic plan can give to the work, allocating of the budget for specific goals and assigning staff to ES tasks, monitoring the work through a network of coordinators from different units, and an external auditing system which demands a certain level of achievement.

5.1.2 Curriculum and Study Opportunities

The result of assessing ES implementation in curriculum and study opportunities is shown in figure 5.3. In this figure we can observe how HEIs as social systems, in which the handling of knowledge according to Clark (1983) is their most crucial activity, implement ES in their curriculum and study opportunities. It shows that all twenty sample universities provide undergraduate, postgraduate and doctorate degrees in environmental sustainability related fields. Consequently they have records of students' research related to ES.

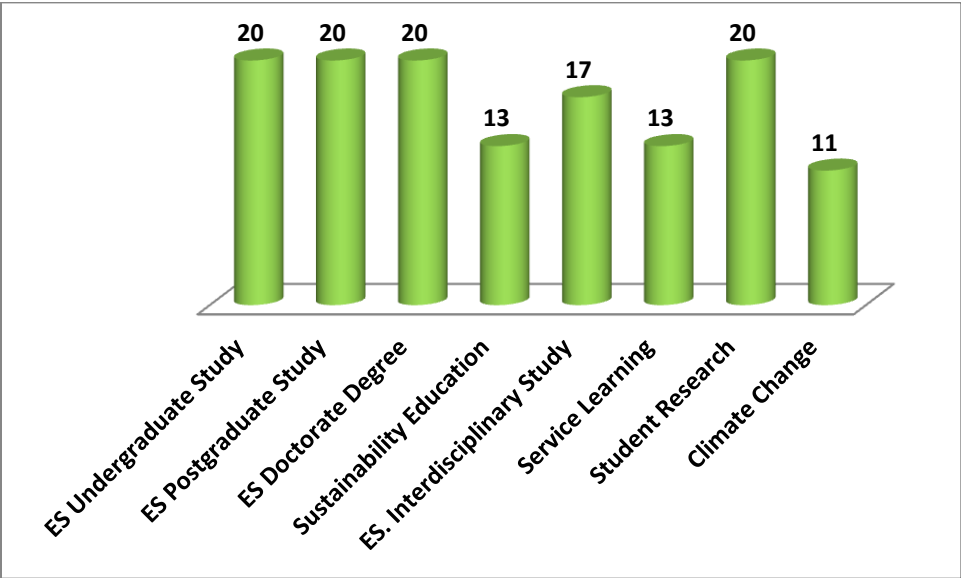


Figure 5.3: Level of ES Implementation in Curriculum & Study Opportunity at HEIs (Numbers of universities out of 20)

Climate Change as a field of study however is not provided in many universities. According to this study only 11 universities offer Climate Change as a major of study at some level. Sustainability education, which refers to available study opportunities that all students regardless of their discipline can get benefit of it, is not mainstreamed, and only 13 universities provide such opportunities for students. One of the main problems that can decrease accessibility of sustainability related courses to students of all disciplines is the limited place or teaching hours. Non-formal learning through a service learning plan with open access for students, staff and communities is not on the agenda for many universities, but 13 universities offer ES service learning. An interdisciplinary approach in environmental sustainability program has been observed in 17 sample universities.

5.1.3 Research and Innovation

Indicators accessing implementation of ES in research at HEIs and the performance of sample universities are shown in figure 5.4. All the universities in this study have research centres or institutes focusing on an environmental sustainability topic. Eighteen of them have research outcomes specifically on climate change issues. It also was observed that 18 universities receive external funding for their relevant research projects. Eighteen universities out of 20 have some sort of research collaboration with companies or industries on ES related topics. Having a network with other research centres in order to coordinate research activities, being updated

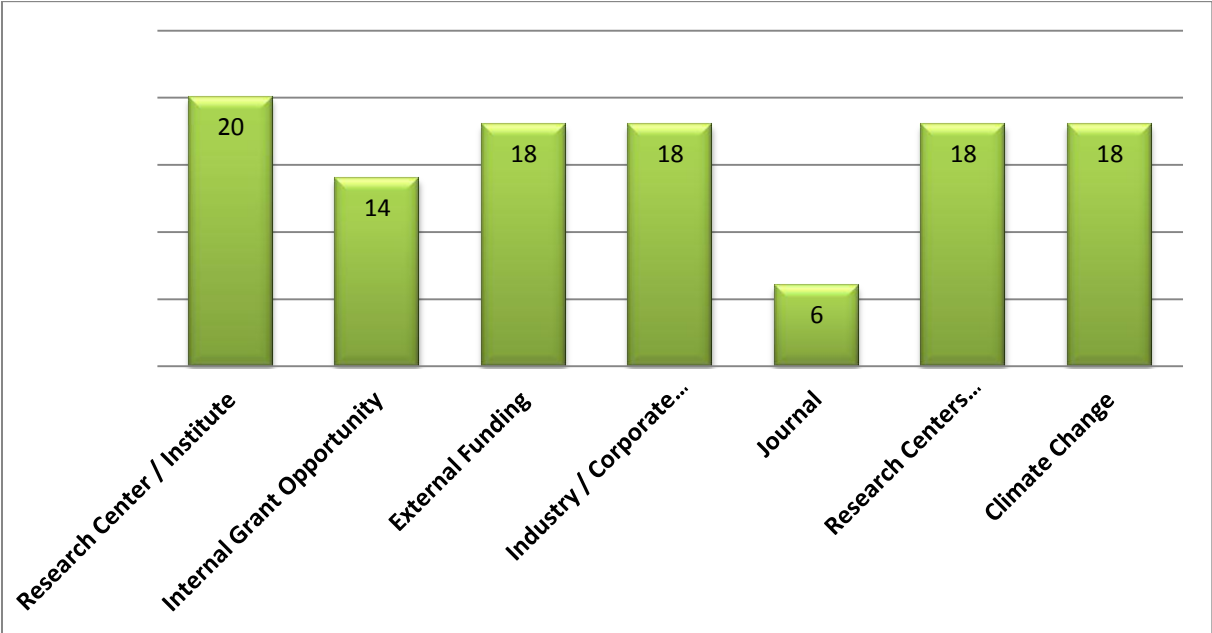


Figure 5.4: Level of ES Implementation in Research at HEIs (Numbers of universities out of 20)

about the latest projects at each centre, and collaborating on similar topics, are other indicators which show how research components at HEIs are systematically monitored and coordinated by their activities for a systemic implementation of ES. 18 universities in this study claim that they have a research network which put different research centres in touch with each other where ES is the cornerstone of collaboration. The extent to which this network collaborates with different centres varies and can be ranged from being actively engaging in many research centres and institutes to a passive existing platform.

Some universities provide internal grants for ES research, which includes mostly under and postgraduate degree students in universities that do not provide study grants automatically, or in some cases they can get extra fund for doing research on ES issues. Only 6 universities in this study publish scientific journals focusing on environmental sustainability.

5.1.4 Operation

This section elaborates on the result of ES implementation in operational function of HEIs in this study. The term *Operation* here should not be confused with its application in the VSM approach. As it was explained in chapter 4, operation as a category for indicators refers to technical and daily maintenance process at the universities as well as resource management and handling. The definition of each indicator is presented in the appendix 1.

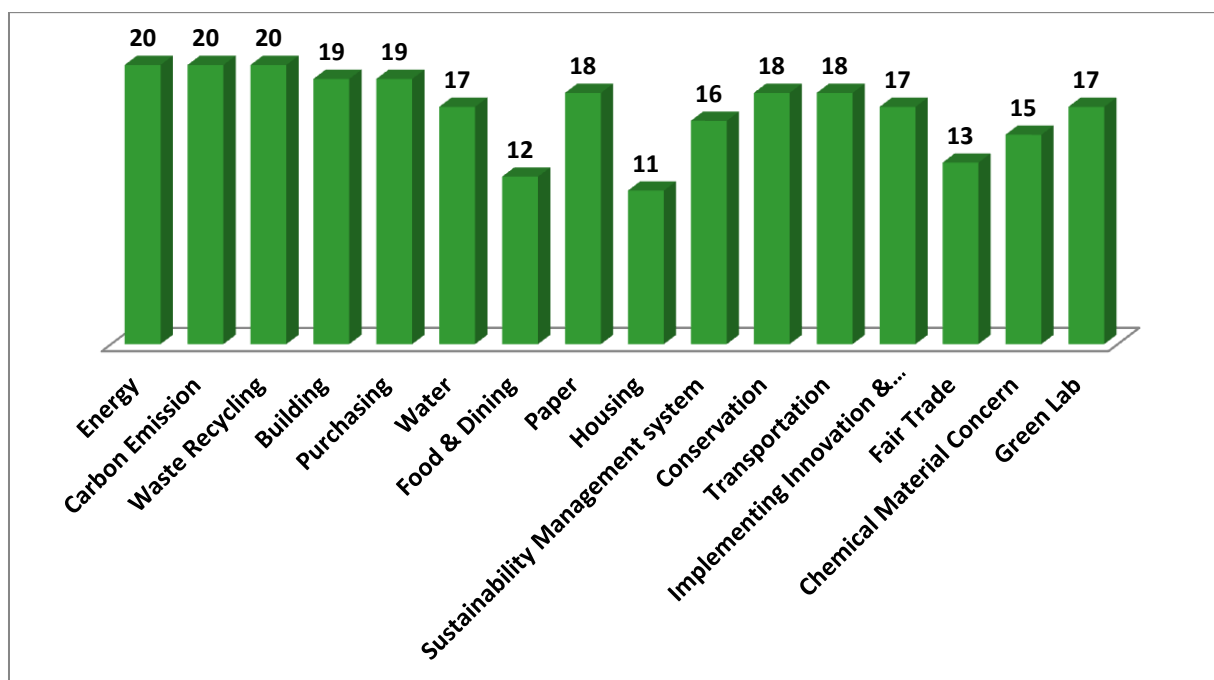


Figure 5.5: Level of ES implementation in Operation at HEIs (Numbers of universities out of 20)

All the sample universities in this study consider energy, carbon emission and waste recycling important in ES implementation. Figure 5.5 shows the result. Nineteen universities take environmental concerns and standards in their building and infrastructures as well as purchasing criteria.

Responsible uses of paper, conservation of resources and transportation habits have been observed in the performance of 18 universities. Issues related to water, its usage, reusing and resources are of concern to 17 universities. Also, many universities aim at implementing new technologies and innovation which are either remarkably environmentally sound or can reduce the level of harm caused by some other practices or devices at the universities. Green labs, in which sustainable resources are used, chemical wastes handled cautiously and environmentally harmful practices reduced or replaced with alternatives, were observed at 17 universities. In addition to 15 universities are careful with the kind of chemical material which is used on daily use. Fair trade¹⁵ products, food and dining and housing are present in fewer universities. This can be justified by explaining that not all the universities have student village or own and run the students housing themselves. It is also important to remember that there are some equivalent standards or concepts to Fair Trade which are regionally used to certify responsibly and organically produced materials.

5.1.5 Other Related Activities

In the following paragraphs the performance of universities in initiating and launching activities related to ES are reviewed. Figure 5.6 visualizes level of ES implementation in the related activities of HEIs. These activities are mainly about community service and outreach as well as students activities. They also aim at raising awareness, capacity building and increasing the visibility of ES activities at HEIs. As the figure below shows, 19 universities have organized or hosted conferences with ES as the main theme. Other events which could be non-scientific such as campaigns, art exhibitions and gatherings are seen at 18 universities. There are a number of international and regional sustainability awards which recognize sustainability efforts of universities, 18 HEIs from the sample have received at least one sustainability award or recognition. Community projects and activities which promote

¹⁵ For more details about Fairtrade, see: <http://www.fairtrade.org.uk/>

sustainability culture have been found in 16 universities. Branding universities with ES profile and presenting it on the website of the university as one of the main features is seen in 16 universities' websites. 14 universities have been updating the news about ES implementation

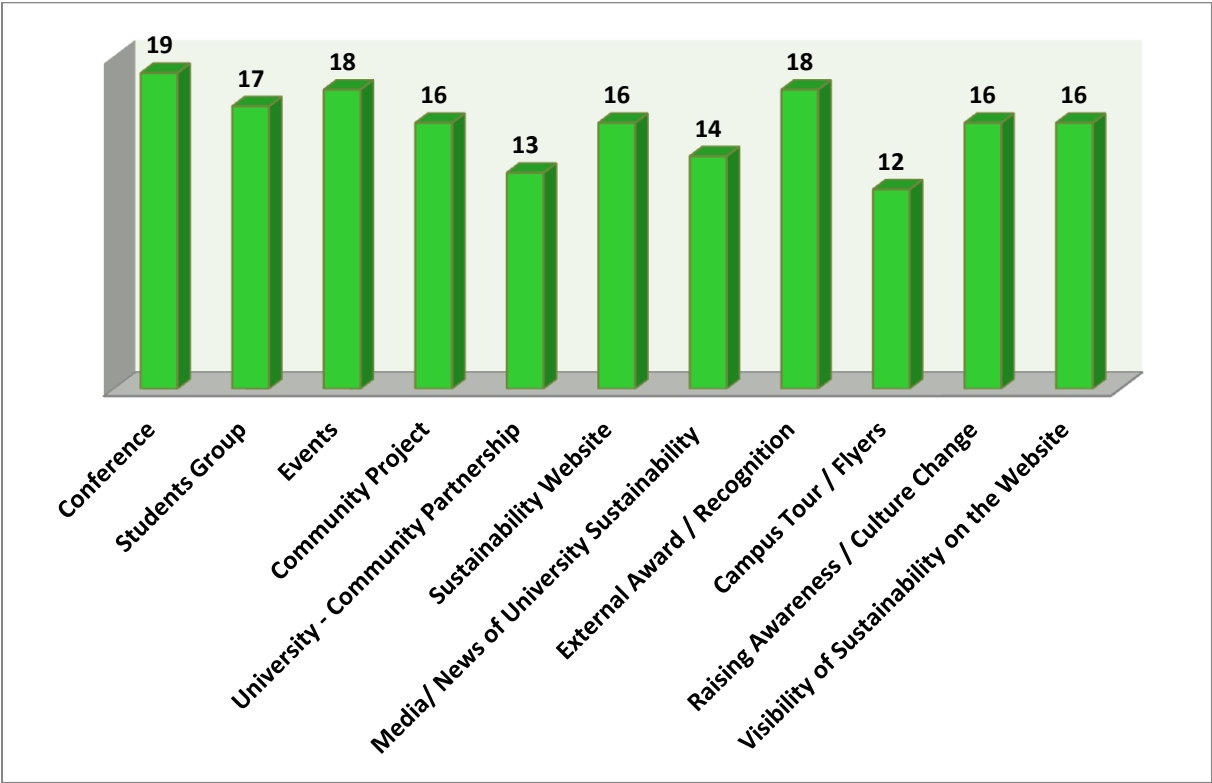


Figure 5.6: Level of ES Implementation in Other Related Activities at HEIs (Numbers of universities out of 20)

on their media channel as well as external media to communicate their efforts. 13 universities initiated partnership with communities through collaborative projects. Also to increase knowledge and promote culture of sustainability, 12 universities have chosen to distribute informative flyers and arrange sustainability tours in which they could show the weaknesses and strengths of their campus within the ES frame to the students, staff and communities and encourage them to get involve in ES activates.

5.2 Implementation Phase: Action Research Approach

This part elaborates on ES implementation at the University of Oslo (UiO) in 2010 in comparison with other 20 sample universities in this study. It also addresses the university's ES performance in all five indicators' categories. After this, the predicted place of ES performance at UiO in 2011 and the necessary adjustments in short term planning according to the recommendation list which has been proposed to the leadership of university will be

presented. And finally, the result of assessing the ES performance at UiO in June 2012 and its progress will be described.

5.2.1 Implementation of Environmental Sustainability at UiO from 2010 to 2012

To measure the level of ES at UiO the same 50 indicators which were applied for other sample universities have been used. UiO scored poorly in comparison with other universities

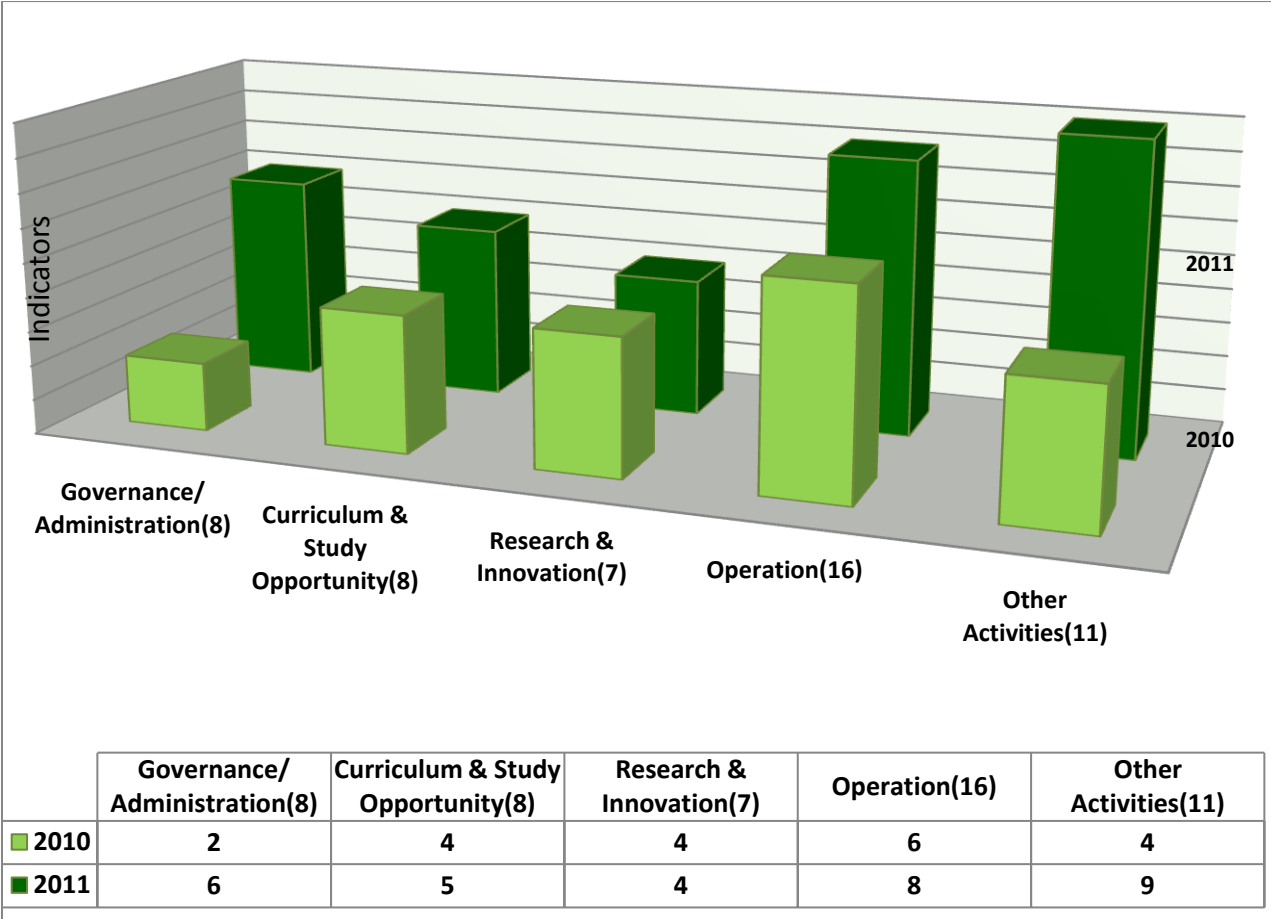


Figure 5.7: Comparing ES Implementation at UiO in 2010 with its predicted place in 2011 based on the proposed best green practice in all 5 categories of activities

by obtaining only 20 out of 50 points. Since, at the Diagnosis phase, the performance of other universities have also been studied and analyzed, it was possible to prepare a set of recommendations for the best green practices for UiO. This was to improve the level of ES efforts at the university within a year. Figure 5.7 shows the ES performance of UiO in 2009 and its potential score in 2011 if UiO could implement the recommended best green practices. It is important to mention that the recommended practice was tailor-made for UiO based on the available resources and as a short term plan. There has not been any recommendation in the research and innovation components because any adjustments within this frame requires more time than was proposed in the suggested yearly plan.

Figure 5.8 shows the overall score of ES performance of UiO in 2010 when it obtained 20 points out of 50. It also predicts that UiO could gain 32 points in 2011 if the best green

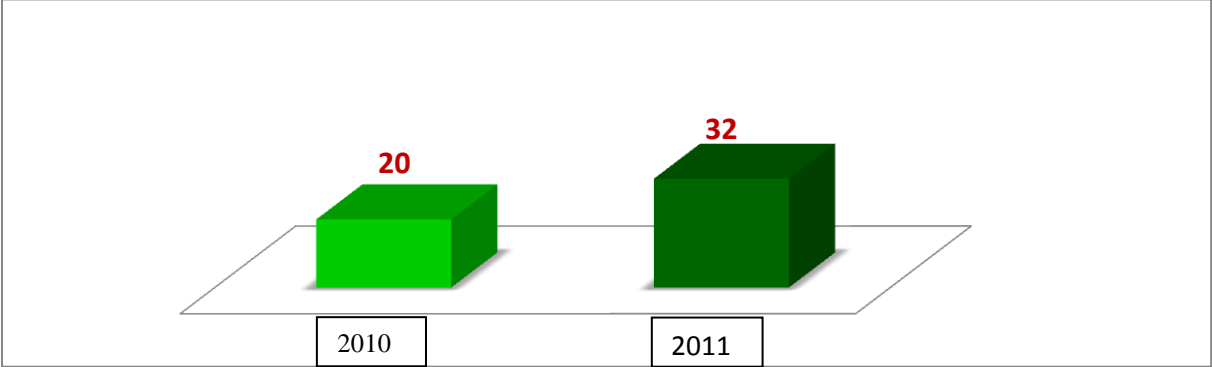


Figure 5.8: Comparing ES UiO to ES in 2010 with plans for 2011(Numbers of indicators out of 50)

practices would be implemented at the university. The suggested recommendation has been presented in table 5.1 briefly. A list of activities related to the four main categories in this study (excluding research component) was put into the sustainability plan. The progress of work during 2011 was closely observed and will be reflected in on the next chapter. By June 2012, the UiO environmental sustainability performance was re-evaluated and compared with the status in 2010 and the predicted ES performance place for 2011. The comparison is shown in figure 5.9.

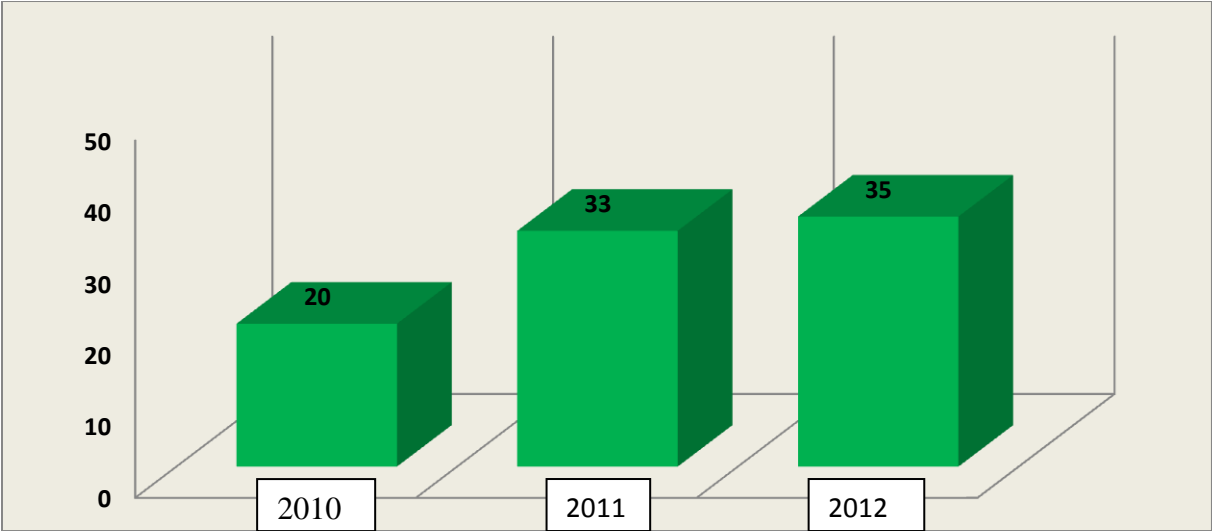


Figure 5.9: The Implementation of ES at UiO in 2010, predicted status in 2011 and its place in 2012 based on 5 ES indicators for HEIs

As figure 5.9 shows, the predicted score for UiO in 2011 was 33, which could be obtained by implementing the recommended best green practices. In 2012 the assessment of ES performance at UiO showed progress of 35 out of 50. There is obviously an increase in the level of ES implementation from 2010 to 2012. What was studied at by the end of first half of 2012 is mostly what UiO had achieved in the previous year. This is due to the fact that some of the activities in year 2012 have been on-going processes and had not come to a measureable result by the time this assessment was done. However the score in 2012 is 2 places higher than what was predicted to be achieved by the end of 2011.

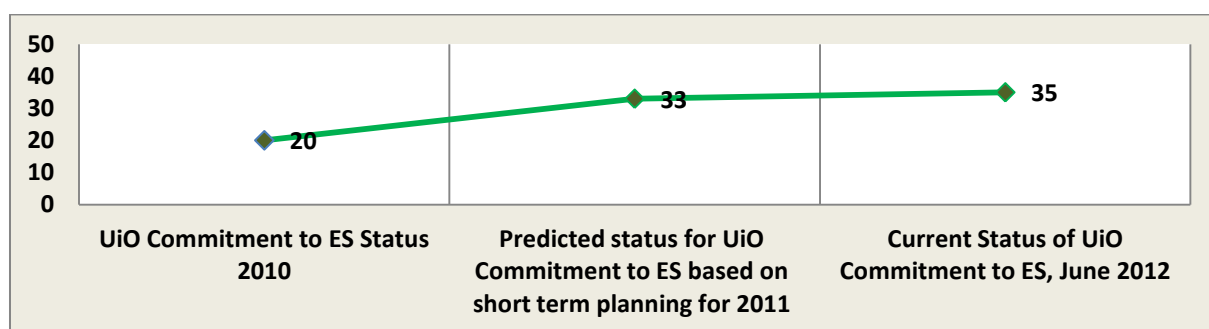


Figure 5.10: Progress of ES implementation at UiO from 2010 to 2012 based on ES Indicators for HEIs

It is important to mention that, in the case of some indicators marked by star (*) in the following tables, if these indicators are not implemented in a systemic approach it is likely that the process does not operate in a continuous way since it has not been constituted as regular practice. In other word, these indicators seem to be add-on activities rather than systemic implementations. Therefore, it is possible that UiO will fail to obtain a score in those particular indicators in the future unless the activities are implemented systematically. Table 5.1, 5.2, 5.3, 5.4 and 5.5 present the performance of UiO in implementing environmental sustainability from 2010 to 2012 in the five categories for activities and compares them with the performance of all other sample universities. In addition to that, the tables show how many sample universities have presented these indicators in their performances.

In Governance and Administration, UiO has improved its performance by endorsing environmental sustainability policy¹⁶. The policy is based on the CRE-COPERNICUS Charter that UiO, along with more than 330 higher education institutions, signed some years ago. The UiO environmental sustainability policy is available in appendix 2. UiO also emphasises the

¹⁶ See: <http://www.uio.no/english/about/strategy/environment/news/2011/environmental-policy.html>

responsibility of universities in tackling global challenges including environmental issues in the Strategy 2020. UiO is not member of any sustainability network which requests universities to make an official sustainability report or networks that demand audits. However a sustainability report reviewing the ES performance of UiO was provided by the Green UiO office and submitted to the leadership team. Although at the first phase of this study strategic

Indicators	Frequency among sample universities	UiO 2010	UiO 2011	UiO 2012
Institutional declaration/ Resolutions	20	N	Y	Y
Policies / Principles/ Strategy	19	N	Y	Y
Strategic approach/ Action plan	18	N	Y	N
Staff position / Sustainability office	18	Y	Y	Y
Audits	12	N	N	N
Annual Sustainability Reports	18	N	Y	Y *
Students Voice	13	Y	Y	Y
Internal Awards	15	N	N	N

Table5.1: Implementation of ES at UiO - Governance and Administration

planning for ES was recommended to the university, until 2012 UiO did not have any strategic plan for its sustainability practice in its short or long term planning. The Green UiO Office has proposed its own plan which frames the office's annual activities. The ES performance in governance and administration of UiO could have improved 3 levels instead of the current 2 levels if UiO implemented the recommended best green practices.

Table 5.2 shows no improvement in ES performance with regards to curriculum and study

Indicators	Frequency among sample universities	UiO 2010	UiO 2011	UiO 2012
Undergraduate study in Environmental Sustainability	20	Y	Y	Y
Postgraduate study in Environmental Sustainability	20	Y	Y	Y
Doctoral studies in Environmental Sustainability	20	Y	Y	Y
Environmental Sustainability	13	N	N	N

Education				
Interdisciplinary Sustainability Education	17	N	N	N
Service Learning	13	N	Y	N
Student Research	20	Y	Y	Y
Climate Change	11	N	N	N

Table 5.2: Implementation of ES at UiO - Curriculum & Study opportunity

opportunities at UiO. Even though the recommended best green practices for 2011 suggest including service learning for environmental sustainability UiO has not implemented them.

Indicators	Frequency among other sample universities y	UiO 2010	UiO 2011	UiO 2012
Research Centre / Institute	20	Y	Y	Y
Internal Grant Opportunity	14	N	N	Y
External Funding	18	Y	Y	Y
Research Collaboration with Industry & Corporate	18	N	N	N
Journal	6	N	N	N
Communication within Research Centres	18	Y	Y	Y
Climate Change	18	Y	Y	Y

Table 5.3: Implementation of ES at UiO - Research and Innovation

Although there were not any recommended best green practices as an outcome of the first phase of the study for ES in research and innovation, some research centres have promoted students' research within the environmental sustainability frame and offered research grants to those who write their thesis on the related issues. Hence the table 5.3 shows one level of improvement in UiO performance.

Table 5.4 shows 6 level of improvement in UiO environmental sustainability performance in operation and technical endeavours of the university from 2010 to 2012. These include planning for reducing carbon emissions, water usage, recourse conservation, transportation and implementation of new technology, and innovation for enhancing the level of ES at the university. UiO does not have any specific target for reducing its carbon emissions but there

have been some projects for climate accounting each university building, a project which could be the first step for setting targets for reducing CO2. In addition to that, UiO in

Indicators	Frequency among sample universities	UiO 2010	UiO 2011	UiO 2012
Energy	20	Y	Y	Y
Carbon emission	20	N	Y	Y
Waste Recycling	20	Y	Y	Y
Building	19	Y	Y	Y
Purchasing	19	Y	Y	Y
Water	17	N	N	Y
Food & Dining	12	N	N	Y*
Paper	18	Y	Y	Y
Housing	11	N	N	N
Sustainability Management System	16	N	N	N
Conservation	18	N	N	Y
Implementing Innovation & Technology	17	N	Y	Y
Fair trade	13	N	N	N
Transportation	18	N	Y	Y*
Chemical Material Concern Leeds/ Pesticide/ Detergent	15	Y	Y	Y
Green Lab	17	N	N	N

Table 5.4: Implementation of ES at UiO - Operation

collaboration with Students welfare Organization (SiO) have made some efforts to increase the ES level of food and dining services. UiO and SiO are two separate entities; however they collaborate on issues that increase students' welfare at the university. The indicator which recommends ES in food and dining services was not on the recommended best green

practices list because it could not be decided on solely by UiO and required SiO's agreement and cooperation. Hence this improvement is positively surprising.

Table 5.5 presents ES performance of UiO with regards to the other related activities. These are activities that can enhance and improve sustainability issues on campus and within communities.

One of the improvements at UiO is about launching a website of sustainability efforts which was initiated in 2011. The page is part of UiO domain and publishes ES related news, projects, achievements and plans. In addition to this, Green UiO has created a blog in which since beginning of 2012 they write, and invite others to write, about environmental sustainability issues at UiO or other universities. Another improvement is visibility of ES efforts on the main page of the university. Informing and advertising ES activities on the main page reflects the importance of sustainability for the university and also can encourage other universities and readers to consider their environmental impacts more seriously. Currently UiO has the Green UiO Office logo and direct link to the ES policy and strategy on the page describing the university's structure, vision and mission. Using Social media is another way that UiO has tried to reach a broader audience, promote sustainability and encourage students and staff to get involved in sustainability projects. These efforts are labeled as improvements in the ES performance of UiO according to the relevant indicators in table 5.5. In addition to the internal channels, the environmental sustainability performance of UiO has received external media attention from outlets such as *Aftenposten*, one of the main national newspapers.

The University of Oslo has certified one of its faculties; Faculty of Educational Studies and received the Norwegian Eco-certificate award of Miljøfyrtårn¹⁷. This recognition fulfills the indicator's demand on receiving external recognition and awards for ES performance. UiO has also certified one of its main European student's conferences in 2012 with the FEE¹⁸ certificate. In order to promote culture of sustainability and to raise awareness on the issue, the University of Oslo has arranged several campaigns on the occasion of the Earth Hours, Sustainability in Focus Day when many communities, organizations and group were invited to present their activities and ideas for a sustainable society. UiO has also published a guideline booklet for living in an environmental sustainable way on campus and in Oslo for local and

¹⁷ See: <http://www.miljofyrtarn.no/index.php/information-in-english>

¹⁸ FEE: <http://www.fee-international.org/en>

Indicators	Frequency among sample universities	UiO 2010	UiO 2011	UiO 2012
Conferences	19	Y	Y	Y
Students group	17	Y	Y	Y
Events (except conferences)	18	Y	Y	Y
Community Projects	16	N	N	N
University-Community Partnership	13	Y	Y	Y
Website of Sustainability center/activities	16	N	Y	Y
Media/ News from Sustainability of University	14	N	N	Y
External Awards and Recognition	18	N	Y	Y
Campus tour & Flyers	12	N	Y	Y
Raising Awareness/ Culture Change	16	N	Y	Y
Visibility of Sustainability of University on the website	16	N	Y	Y

Table 5.5: Implementation of ES at UiO - Other related activities

international students. Green UiO also supported launching the Student Garden at campus where students get together every week to work at the garden and discuss and plan their ideas on how to contribute more in ES efforts of the university.

5.3 Overview

In this chapter, the results of the first phase of the study were shown in the separated figures and ES performance of the sample universities was presented was compared in figure 5.1. After that, the ES performance of UiO in 2010 was described and the progress of work based

on the recommended best green practice and the result of the re-evaluation of UiO performance was presented in the tables 5.1 to 5.5. Analysing and reflecting on the findings of this study is presented in chapter 6 where the findings also will be linked to the research questions.

Chapter 6: Analysis and Conclusion

In this chapter the research questions will be discussed and eventually the research problem will be reflected upon. Moreover the outcome of measuring the environmental sustainability of the sample universities will be discussed and the case of UiO will be critically analysed. In the closing remarks of this thesis, I will explain the aspects of this research which need more attention hence should be possibly elaborated in the future research on environmental sustainability at higher education institutions.

6.1 Reflection on the Research Questions

As it was addressed in the first chapter, there are three main research questions in this study which are driven from the research problem about how higher education institutions are adapting to the challenge of environmental sustainability. This study has made an attempt to answer these questions and reflects on the research problem which will be presented in the following paragraphs.

First question: What are the most significant factors contributing to environmental sustainability among higher education institutions?

Answering this question has required a model in which a sustainable university can be visualized. This study suggests that implementation of ES at HEIs should be proceeded in a systemic approach. It is as mentioned in chapter 2 and 3, due to the complexity encompassed by universities as organizations and sustainability as a phenomenon. Hence the significant factors that affect success of universities in implementing ES in their practice are those suggested by Viable System Model. This model has a systemic view in understanding how an organization should function. VSM considers the organizations with their environmental context and not isolated from what is happening in the surrounding environment. According to this model as figure 3.2 shows, an organization is dealing with its internal complexity as well as external ones which affect organizational goals, norms, policies and even products and services. That means these organizations have intellectual quality capable to be flexible, resilient and inventive in relation to new situations.

Taking the example of environmental sustainability as a complexity which is exposed to universities as organizations, shows how this external phenomenon can have an impact on operational dimensions of universities. It deliberates the constant need for awareness and

intelligent action because of changes in the internal and external contexts of universities. Thus all the units or systems within the institutions should respond to this complex challenge adequately and appropriately. For doing that, VSM implies that universities should contribute to the challenge of implementing environmental sustainability in:

- The management component consisting of, policy, development and delivery

- The operation component which provides and offers products and services which in case of higher education institutions are learning opportunities and curriculum, research outputs and innovative solutions, and community services for improving wellbeing and life conditions.

In addition to implementing sustainability in the management and operation components, sustainability has to be monitored and coordinated through 2 systems which are

- The monitoring system which is a lateral system providing top-down and bottom-up set of instructions for assuring the sustainability objectives of the institutions are achieved in different units of the universities. This system deals mainly with the implementing mechanism which was described in chapter 3.

- The coordinating system is responsible for aligning the sustainability efforts of different units. Since VSM is about variety management and many tasks are managed in a decentralized way therefore a strong coordinating system is needed to inform the units about the general progress of work and level of implementation at the institutional level. This mechanism also helps to keep the complexity balanced by allocating or redirecting the resources to the unit which is overloaded by sustainability workload on a particular time due to sudden changes in the external context. The Cohesion mechanism is central to this system.

Although a viable organization consists of many subsystems or units which are viable and have the same model, procedure and structure at every unit as VSM presents and this study also elaborates but the aim of this thesis is looking at implementation of ES at institutional level. Therefore the institution's sustainability performance and its outcomes are analysed and not its units' contributions to work. Hence it is justified to consider the management components of the university equal to the leadership team of the university and not faculties or department management team.

To implement ES in the management component of universities, sustainability should be addressed in the primary tasks of the management team which is what is labelled under the

governance and administration category in this study. In addition to that technical operations of universities are often influenced directly by the management team decisions. However in the case of academic endeavour including curriculum and study opportunities, and research practices, the management component of the university does not have strong impact on their tradition and practice. One might argue that the level of influence that university management has over the academic activities varies in different higher education systems however this study take the example of management at the University of Oslo since it is the main case study of this thesis. Therefore it is assumed that if management of a university endorses environmental sustainability, it will be implemented in governance and administration practices as well as the operation of university.

Through the VSM coordination system, sustainability should be communicated with other units at the universities as well as with the society. Hence other related activities which are framed as community service, collaboration with other sectors, raising awareness and promoting sustainability culture on and off campus should take place and be aligned within the coordination system. There are many actors who may take the initiative in launching sustainability related projects within the described frame. But all of these projects or activities should be coordinated and linked to the other units which might contribute financially, intellectually or in other ways. This will keep the sustainability efforts of the universities cohesive.

The lateral monitoring system provides a comprehensive overview about progress of ES implementation at the universities. If the progress of a unit lags behind the desired plan, it can be analysed and improved in the monitoring process. This works mutually in a way that units provide regular reports and management set the milestones after consulting the case with the units.

The flexibility which VSM offers for dealing the complexity as well as effective systems for lateral mechanism and coordination, encourage the units which are not directly under influence of the management component and its decisions to participate in sustainability efforts within a systemic approach. The fact that academic freedom is respected by offering a lateral monitoring, being flexible at setting the milestones and receiving support for achieving the sustainability goals of the university through the coordinating system are appealing and encouraging to the academic staff whose main tasks are related to curriculum or research. This effect has been observed in the top sustainable universities of this study.

The remarkable sustainable universities shown in the figure 5.1 including MIT, UBC and Gothenburg University implement ES in their practice in a systematic way in line with what VSM recommends.

Second Question: How can we measure the implementation of environmental sustainability at the various operational dimensions of higher education institutions?

To answer this question the contextual background of implementing environmental sustainability in higher education institutions was reviewed. It was included the declarations of sustainability in higher education which give a framework for obligations, responsibilities and possibilities which these institutions have with regards to sustainability issues. In addition to the declarations, the previous study by Beringer (2007) focusing on sustainability efforts of universities in a comparison perspective, was adopted in this study. Since the main approach in this thesis is based on systemic approach, the operational dimensions of universities in which sustainability should be implemented were considered in a systemic way as well.

The table of 50 indicators for measuring environmental sustainability at higher education described in detail in chapter 4 is the measuring tool which this study has proposed in response to the second research question in this thesis. These 50 indicators showed in table 4.1 include the five main operational dimensions of a university. They also are framed within the VSM components which were explained in the previous section. The main categories of the indicators are governance and administration, curriculum and study opportunities, research and innovation, operation and other related activities. As expressed in the methodology section in chapter 4 this measuring tool has limitations such as ;having been used and tested in a limited number of universities and lack of an interval scale for measuring the performance which both can be developed in the potential further phases of this study. Nevertheless the indicators offer an opportunity to obtain a systemic overview of the level of ES implementation at the universities.

Third Question: How has the approach to environmental sustainability taken by the University of Oslo changed over time?

According to the outcomes of the study shown in the figures 5.9 and 5.10 also tables in chapter 5, the University of Oslo has been enhancing its ES efforts since 2010. UiO environmental sustainability performance score is increased from 20 to 35 out of 50 indicators in two years which is a positive achievement. However a closer look at the approach taken by

UiO for implementing sustainability can be alarming. This concern is caused due to absence of systemic approach for UiO sustainability efforts. An evidence for this claim can be observed in the Governance and Administration indicators for sustainability presented in table 5.1. It shows, in spite of endorsing sustainability policy for the university, UiO does not have any strategic plan at the institution level for implementing environmental sustainability. In addition to that Green UiO which acts as sustainability unit of this university did not have a strategic plan for its unit either. This office was asked to plan its activity based on the projects on a yearly basis and not for a longer period of time. Therefore all the sustainability related activities taking place at UiO are rather fragmented activities and are not following any systemic approach that VSM or any cybernetic theory recommends.

Furthermore UiO does not have sustainability audit on its profile and since the university is not member of any sustainability networks, hence UiO is not obliged to provide sustainability reports, complies with sustainability indicators or being accountable for fulfilling specific laws or regulations for assuring a certain level of sustainability at the university over the course of time.

UiO also lacks Environmental or Sustainability Management System which is ground for the VSM coordination and monitoring systems. It is also observable in the staff positioning of the sustainability office at the university. In the VSM approach as it is seen in the Gothenburg University, there is a group of employees who are coordinating the sustainability related work. They are either placed at the sustainability unit which can closely monitor and facilitate the process of ES implementation or are working at other units and departments of the university engaging with other types of work while allocating a fraction of their working time to coordinate the ES implementation at the university. However in the case of UiO there is only one permanent full time position for the sustainability office and based on the possible projects Green UiO can employ project assistance based on temporary and part time contracts which mostly targets students. Involving students in ES activities of the university is a democratic and suitable channel to increase students' knowledge, skills and experience in sustainability issues and can promote sustainability culture, but sustainability implementation at the institutional level needs more professional team to supervise students' projects as well.

Regarding the ES related and focused research; UiO has achieved a reasonably high score and has improved its place since 2010. There are number of reasons that explains the achievement including, external funding for sustainability related research projects obtained by researchers

and research centres at UiO, existence centres of excellence focusing on sustainability research (i.e. SUM and MILLEN), intellectual ability among concerned researchers for responding to the global challenge. These research activities can easily provide inputs for the implementation of sustainability in curriculum and study opportunities if a strong coordination system as VSM recommend is established at UiO. This system can facilitate initiating interdisciplinary ES courses for all the students providing a platform where researchers from various departments or centre could share their resources as a joint force for enhancement of sustainability in the curriculum. This enhancement can be initiated in a formal, informal or non-formal education format. The University of Oslo needs to increase its outreach activities and community services for sustainability literacy and raising awareness in the society. Currently UiO does not have an extensive sustainability oriented profile in community partnerships, company and industry collaborations or interaction with sustainability networks as the tables in the chapter 5 show.

6.2 Reflection on the Research Problem

The research problem in this study is: *How are higher education institutions adapting to the challenges of global sustainability?*

In general there are two unique opportunities for HEIs to engage in sustainable development. ‘Universities form a link between knowledge generation and transfer of knowledge to society’ and ‘Universities actively contribute to the societal development through outreach and service to society.’ (OECD HESD Report, 2007)¹⁹

These engagements should take place in a thriving atmosphere where the environmental impacts of technical operation are taken into consideration as well. Therefore higher education institutions should respond to the global challenges in various ways:

- Transforming their unsustainable practices to the sustainable ones and reducing the negative environmental impacts in their technical operation and daily endeavours
- Maintaining, creating and advancing sustainability oriented and focused knowledge at research and study opportunities provided by the universities
- Providing community services for enhancing sustainability knowledge, skills and culture

¹⁹ OECD final report on Higher Education for Sustainable Development:
<http://www.oecd.org/education/educationeconomyandsociety/centreforeffectivelearningenvironmentscele/45575516.pdf>

The outcomes of this study show that a systemic approach for sustainability in which universities can take advantage of their unique opportunities for engaging in sustainable development efforts, is not mainstreamed yet. It can be justified that the notion of sustainability in higher education and higher education for sustainable development does not have a long history however the urgency of global sustainability challenges should be understood by universities as intellectual institution as pressing matters which have to be dealt with immediately and appropriately.

Lack of similar studies to this thesis which aims at measuring sustainability a specific feature of universities is evidence that adapting to the challenges of global sustainability still is a new trend in higher education institutions and requires more research. However increasing number of sustainability networks for higher education institutions can be recognized as a sign for a flourishing trend among universities. Most of these networks such as ISCN, Copernicus Alliance²⁰, and Association for Advancement of Sustainability in Higher Education (AASHE)²¹ model the sustainability in higher education institution in a systemic approach and disagree with implementing sustainability in a fragmented way.

One of the driving forces for enhancing sustainability in higher education institutions can be regulations issued by the state, similar to what Sweden applies, in which public universities will be required to implement environmental sustainability in a systemic form in their institutions. Although the essential role of the state in promoting sustainability and facilitating this process for organizations including universities is undeniable, studies show that governments are but one of the actors. Janicke (1997) argues that failure or slow progress in sustainability policy cannot be explained solely by the wrong choice of instrument or strategy by government but culture and the value system in a university are also highlighted in success of sustainability implementation (Carraro, 1999). Sustainability, employed as a systems approach, is an issue of individual, as well as collective, human consciousness and values (Pappas, 2012). Therefore if environmental sustainability is introduced or appreciated by university leadership as well as academic staff and students, a change at the institutional level is very likely. Several factors such as environmental effectiveness, cost effectiveness, stimulation of innovation and competition to achieve a higher status among other institutions

²⁰ See: <http://www.copernicus-alliance.org/>

²¹ See: www.aashe.org

can bring strong motivations for universities including UiO to enhance its sustainability efforts in a systemic approach.

6.3 Conclusion

This study has shown that implementation of environmental sustainability at higher education institutions has many aspects and elements to measure, monitor, analyse and improve. This thesis has been one of few attempts which have been carried out to develop a tool for measuring the level of environmental sustainability at universities. Since sustainability is becoming more and more part of the universities engagement and system, availability of reliable measuring tools are essential. These tools can assist universities' management team to monitor, enhance and analyse the level of ES at their institutions effectively and efficiently. Hence the proposed indicators are one of the initials steps for advancing sustainability in higher educations.

The outcomes of this study has already had an impact on environmental sustainability practices at the University of Oslo, since its initial outcomes from the diagnostic phase along with the set of recommendations had been presented to the management team at UiO. However the further analysis which has elaborated in this thesis can improve UiO performance in a systemic way if VSM becomes the UiO approach for sustainability efforts.

This study can be valuable for other universities to become aware about sustainability efforts of other HEIs in an analytic framework provided by this research. Moreover they can apply the table of indicators for measuring environmental sustainability efforts at their own institutions.

Since this study is one of the first steps in measuring and analysing systemic implementation of sustainability at universities, future research can follow and build upon the present study. In this respect a logical next step is to improve the limitation of this study with regards to its methodological choices, theoretical model and operationalizing the model. Sustainability is a growing and dynamic phenomenon thus its frames, aspects and its assessing tools need to be modified over the time. It is predictable that not all the proposed indicators may remain relevant in the future hence improvement of the indicators and applying an interval scale in this tool can be considered constructive and corrective future research in this field.

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Appendix I: Definition of ES Indicators for HEIs

Governance & Administration:

This part of the table analyzes the sort of attributes to ES which are directly related to university governance systems. Environmental policy & strategy, institutional declaration and resolution, strategic approach or possible action plan, staff positioning & office of sustainability and annual sustainability report are the main criteria. In addition, student representative on the board of ES committee, introducing internal award of ES for staff, students and departments who show the most efficient green behaviour have been part of study.

Curriculum & Study Opportunity:

One of the main functions of a university is curriculum and learning opportunities. Different levels of study (undergraduate, postgraduate and doctorate level) in environmentally related fields have been reviewed. Availability of programmes at every level (under-/postgraduate) in interdisciplinary fields such as ES in law, economy, engineering, health, education, politics, etc have been considered. Due to the importance of the climate change issue, this has been reviewed separately. Environmental Sustainability education such as short or intensive courses where students earn certificates upon completion, study units, compulsory credits in lifelong learning either on campus or E-learning is another indicator which should be provided for all disciplines of study. All forms of service learning, even if not providing certification has also been taken into account.

Research & Innovation:

In this part of the study, environmental research centres or institutes and related projects and research activities have been assessed. Collaboration between university research centres and industry and/or corporations is another criterion which has been observed. The collaboration can be based on industry/corporate contribution by investing in a research project, sponsoring any innovative products made at a research centre, and sponsoring grants for student research. Planning workshops for staff training, designing a particular system or product for the customers and consulting services are examples of how research centres could contribute to the collaboration.

Furthermore specific internal grants for researchers who wish to work on ES fields, external funding for individuals or to cover a project at the centre are also considered as indicators.

External funds may have been provided by the government, international networks, local authorities, individual donations or industry and corporations.

In addition, the study has looked at the mutual communication with other research centres in institutional, national or international networks.

The availability of university journals to publish the outcome of ES research projects has been reviewed.

Operation & Daily Practice:

The analysis of this function of universities has been divided into 2 main columns: the first one is directly related to the operation of a university in more technical aspects. The other is focusing on ES activities at the universities.

Energy: The issue of energy is usually thought of as reducing the consumption of fossil fuels and replacing it by non-fossil fuel energy, renewable energy, conserving and in general any greener and more sustainable alternative source of energy.

Carbon emission on the action plan of universities is related to the source of the energy which is in use in universities, means of transportation and the amount of green land at the universities.

Waste recycling: refers to the developing waste management system, any systematic form of waste fraction, the re-use of waste for other purposes (heating, compost,...), the safe disposal of electronic devices (WEEE) and chemical substances.

Building: energy efficiency, environmentally friendly materials/design and systems, the implementation of innovative systems in order to conserve resources, heating and lighting systems, health issues, obtaining standard certificates.

Purchasing: giving priority to the purchase of environmentally friendly goods and services, supporting local markets, avoiding cost and harm from the use of unnecessary transport.

Water: installing appropriate equipment to conserve water, efficient water waste systems, initiating movement to change consumer behaviour.

Food and dining: promote and serving local products, encouraging vegetarian diet (Green Day), organic recycling, encouraging consumers to correct their consuming behaviour, non plastic cutlery.

Paper: recycling paper, promoting e-documents when possible (bills, letters, invoices, invitations), 2-sided print and copy, using recycled paper, avoid using paper cups and plates when possible.

Housing: energy efficiency, lighting systems, conserving water, waste recycling, durable materials and equipment.

Sustainability Management System: this is an explicit set of arrangements and processes to manage sustainability issues, and ensure that a university's sustainability goals and objectives are achieved.

Conservation: effective and appropriate use of resources such as energy and water, providing better quality materials and equipment which are durable and possible to use long-term in order to avoid unnecessary frequent purchasing. Reuse and repair instead of disposal.

Transportation: cutting carbon foot print by promoting walking/cycling/ public transportation/ electric cars/car pool. Favouring green means of travelling, promoting teleconferencing when possible to avoid flying, providing shelter for bicycles, giving priority for parking access to those who car pool, promoting Green Day or cycling day.

Implementation of innovation and new technology: implement the latest green products and systems, investing in research projects that can invent/produce environmentally friendly goods, services and systems.

Fair Trade: insisting on purchasing and offering products which have been made under Fair Trade Standard

Chemical Material: avoid using any environmentally damaging chemical substances such as pesticide, fertilizer, detergent, paints. Safe chemical waste disposal

Green Lab: environmentally friendly infrastructure, health and safety considered, training staff and students, waste system, energy efficiency, non plastic materials.

Other Practice/Activities:

Conferences: organizing, sponsoring any ES related conferences/ seminars/symposiums

Students Group: providing opportunity and encouraging students to create and join ES groups in order to contribute to greening campus, raising awareness and community service

Events: campaigns, workshops, gardening/recycling/green day gathering/meeting and any art and culture events to promote ES

Community project: offering services or providing facilities or activities which are beneficial to the community, community outreach, training, workshops.

University-Community Partnership: mutual support, investment and attribution between university and community in favour of ES

Website of Sustainability: the university has a sustainability website used to convey information about policy, action plan, activities and programs, training courses, events, latest update, news, competition and prize winners. Interaction with students and other stakeholders

Media: informing internal and external media about university ES activities and achievements, raising awareness in the society

External Award and Recognition: any sort of Standard certificates (ISO, LEED, BREEAM, Green Campus recognition, THE ranking

Campus tour and Flyer: briefing tour for students to learn about how the university is committed to ES and what is the students' responsibility, how to participate. Flyers and posters to get staff and students to take responsibility participate and demand ES.

Raising Awareness/Change the Culture: emphasis on policy, training, workshops, distributing emails, meetings, encouraging lecturers to bring the issue into the classroom,

Visibility on the website: refers to the internationally visible website (English version). By visibility, we mean that the university's commitment to ES is shown on either the first page (home) or a secondary one – usually on “About the university” page.

Appendix II: UiO Environmental and Sustainability Policy

Universities and equivalent institutions of higher education train the coming generations of citizens and have expertise in all fields of research, both in technology as well as in the natural, human and social sciences. It is consequently their duty to propagate environmental literacy and to promote the practice of environmental ethics in society, in accordance with the principles set out in the Magna Charta of European Universities and subsequent university declarations, and along the lines of the UNCED recommendations for environment and development education.

Indeed, universities are increasingly called upon to play a leading role in developing a multidisciplinary and ethically-oriented form of education in order to devise solutions for the problems linked to sustainable development. We must therefore commit ourselves to an on-going process of informing, educating and mobilizing all the relevant parts of society concerning the consequences of ecological degradation, including its impact on global development and the conditions needed to ensure a sustainable and just world.

To achieve these aims and fulfil their basic mission, we subscribe to and implement the ten principles of actions set out below.

Principles of action

1. Institutional commitment:

The University of Oslo shall demonstrate real commitment to the principle and practice of environmental protection and sustainable development within the academic milieu.

2. Environmental ethics:

The University of Oslo shall promote among teaching staff, students and the public at large sustainable consumption patterns and an ecological lifestyle, while fostering programmes to develop the capacities of the academic staff to teach environmental literacy.

3. Education of university employees:

The University of Oslo shall provide education, training and encouragement to the employees on environmental issues, so that they can pursue their work in an environmentally responsible manner.

4. Programmes in environmental education:

The University of Oslo shall incorporate an environmental perspective in all its work and set up environmental education programmes involving both teachers and researchers as well as students - all of whom should be exposed to the global challenges of environment and development, irrespective of their field of study.

5. Interdisciplinarity:

The University of Oslo shall encourage interdisciplinary and collaborative education and research programmes related to sustainable development as part of the institution's central mission. The University of Oslo shall also seek to overcome competitive instincts between disciplines and departments.

6. Dissemination of knowledge:

The University of Oslo shall support efforts to fill in the gaps in the present literature available for students, professionals, decision-makers and the general public by preparing information didactic material, organizing public lectures, and establishing training programmes. The university should also be prepared to participate in environmental audits.

7. Networking:

The University of Oslo shall promote interdisciplinary networks of environmental experts at the local, national, regional and international levels, with the aim of collaborating on common environmental projects in both research and education. For this, the mobility of students and scholars should be encouraged.

8. Partnerships:

The University of Oslo shall take the initiative in forging partnerships with other concerned sectors of society, in order to design and implement coordinated approaches, strategies and action plans.

9. Continuing education programmes:

The University of Oslo shall devise environmental educational programmes on these issues for different target groups: e.g. business, governmental agencies, non-governmental organizations, the media.

10. Technology transfer:

The University of Oslo shall contribute to educational programmes designed to transfer educationally sound and innovative technologies and advanced management methods.