Antje Disterheft

Sustainability at the Campus

Environmental Management Systems (EMS) implementation processes and practices at European Higher Education Institutions

Top-down versus Participatory Approaches

Lisbon, May 2011

Dissertação apresentada à Universidade Aberta, para cumprimento dos requisitos necessários à obtenção do grau de Mestre, em Cidadania Ambiental e Participação, realizada sob a orientação científica do Professor Ulisses Miranda Azeiteiro, Professor Auxiliar com Agregação, e da Professora Sandra Sofia Ferreira da Silva Caeiro, Professora Auxiliar, da Universidade Aberta

Universidade Aberta

Lisboa, Maio de 2011

This work is printed on 100% recycled paper
Este trabalho está impresso em 100% papel reciclado

Acknowledgements

I wish to thank Prof. Ulisses Miranda Azeiteiro and Prof. Sandra da Silva Caeiro, supervisor and co-supervisor respectively, for the extraordinary collaboration, support and advice. I am especially grateful to them for having challenged me to go much further with this project than ever imagined.

I wish to thank Prof. Maria do Rosário Ramos for the advice and support with statistical data treatment.

I wish to thank all representatives of the universities in this study for participating in the survey and for all information provided.

I am grateful to Reinhard Peglau from the German Federal Environmental Agency for the precious information and comments about environmental management systems in schools and universities.

I am grateful to Marco Lisi for the extra lessons in SPSS.

I am grateful to Ian Stalvies for his valuable comments on my work.

I am grateful to my family and friends for their understanding about my absence for the time of the elaboration of this work.

My special thanks go to Riccardo Wanke for always believing in me, encouraging me and supporting me in all aspects during this period and beyond.

Resumo

Dados os complexos desafios com os quais o nosso mundo de hoje está confrontado, as universidades são solicitadas a responder à necessidade de criar um futuro sustentável, que ambiciona uma vida digna para as gerações actuais sem comprometer a das gerações futuras.

Este trabalho está inserido no debate sobre o desenvolvimento sustentável e sobre o papel das universidades em contribuírem para a construção de sociedades sustentáveis. Incide sobre as oportunidades que sistemas de gestão ambiental (SGA) oferecem para melhorar a sustentabilidade do campus, para envolver a comunidade institucional e para aumentar a sensibilização para práticas sustentáveis na vida académica, profissional e pessoal. O trabalho está baseado numa combinação de métodos qualitativos e quantitativos, utilizando-se uma extensiva revisão de literatura, um questionário *online* com um desenho de tipo transversal e uma análise de estatística descritiva e bivariada. Os processos de implementação *top-down* foram comparados com abordagens participativas, e as últimas têm sido utilizadas para desenvolver um grau de desempenho participativo.

Fornece-se uma visão geral de 47 instituições de ensino superior na Europa com um SGA no campus, e apresenta-se, com base nos resultados do questionário respondido por 35 universidades, uma análise detalhada dos processos de implementação do SGA nos campi europeus. Entre vários reconhecimentos e aspectos práticos para o envolvimento dos estudantes e colaboradores, os resultados mostram que um SGA pode ser um instrumento fundamental no processo global do reforço da sustentabilidade no campus. Relativamente à abordagem da implementação de um SGA, consideramos como mais eficaz uma abordagem participativa ou uma que combine elementos *top-down* e participativos, para realizar a dupla missão de uma universidade: (1) Reduzir o impacto ambiental da instituição (2) Executar investigação e ensino, que oferecem oportunidades para aumentar a sensibilização para coerências complexas e desenvolver competências que conduzam a práticas mais sustentáveis.

Os resultados podem contribuir para o debate em curso sobre a sustentabilidade do campus e ser de utilidade para as universidades que têm implementado um SGA, ou que desejam obter inspirações das actividades de outras instituições nesta área. Oferece-se sugestões para a prática profissional.

Conceitos-chave:

Desenvolvimento Sustentável, Educação Superior, Universidades, Sustentabilidade do campus, Sistemas de Gestão Ambiental, SGA, ISO 14001, EMAS, participação pública

Abstract

In the light of the complex challenges our world of today is confronted with, universities are requested to respond to the need of creating a sustainable future that envisions a dignified life for the current generations without compromising those of next generations.

This research is embedded within the debate about sustainable development and about the role universities play in contributing to build sustainable societies. It focuses on the opportunities environmental management systems (EMS) can offer to enhance campus sustainability, student and staff engagement and awareness raising for sustainable practices in the academic, professional and personal life. The research is based on a combination of qualitative and quantitative methods, using an extensive literature review, an internet-mediated questionnaire of a cross-sectional survey design and a descriptive statistical data analysis, including in some cases a bivariate analysis. Top-down implementation processes were compared to participatory approaches and the latter have been used to develop a degree of participatory performance.

We provide an overview about 47 higher education institutions in Europe with an EMS at the campus and present, based on the results of the survey answered by 35 universities, a detailed analysis of EMS implementation processes and practices in European campuses. Among a number of insights and practical aspects for student and staff involvement, the results show that an EMS can be a key tool in the overall process to enhance campus sustainability. With respect to the implementation approach of an EMS, we regard a participatory approach or a mix of top-down and participatory elements as most effective to accomplish the twofold mission of a university: (1) To reduce the institutional environmental impact and (2) to carry out research and teaching, offering opportunities to increase awareness for complex coherences and to develop competencies that lead to more sustainable practices.

The results shall contribute to the ongoing discussion about campus sustainability and be of use for universities that have implemented an EMS or that wish

to get inspirations from other institutions' activities in this field. Implications for the professional practice are provided.

Keywords:

Sustainable Development, Higher Education, Universities, Campus Sustainability, Environmental Management Systems, EMS, ISO 14001, EMAS, public participation

Tell me and I will forget

Show me and I will remember

Involve me and I will understand

Chinese proverb

Index

Index of figures

Index of tables

List of Abbreviations

EMAS = Eco-Management and Audit Scheme

EMS = Environmental Management System(s)

ESD = Education for Sustainable Development

HEI = Higher Education Institution(s)

ISO = International Organization for Standardization

ISO 14001 = an international standard referring to environmental management system

PA = Participatory approach

SD = Sustainable Development

TDA = Top-down approach

UN = United Nations

UNESCO = United Nations' Educational, Scientific and Cultural Organization

List of symbols

Cr V = Coefficient Cramer's V

ρ = Rho (symbol for coefficient Spearman)

τ = Tau (symbol for coefficient Kendall-tau$_b$)

Introduction: EMS at the campus - why does campus sustainability matter?

Universities belong to the oldest social institutions in existence and contribute significantly with their services on research and education to the further development of societies. Education is seen as a key to further development.

In the light of the complex challenges our world of today is confronted with, universities are requested to respond to the need of creating a sustainable future that envisions a dignified life for the current generations without compromising those of next generations. Complex paradoxes are to overcome: It is not less than to find a balance between the actual risk-laden prosperity based on (over-)production, excessive consumption patterns and destruction of natural resources, causing disparity of opportunities, unjust distribution of wealth and unequal access to staple goods, and at the same time the necessity of economic and social development.

The concept of sustainable development seeks to develop strategies to compass this balance, which is only possible with an open and ongoing dialogue that enables a paradigm shift to more sustainable practices. As this implies above all a mental shift, it is necessary to encourage the processes for changing awareness among individuals—and this can only be accomplished through learning.

In this context, universities have been attributed a twofold mission: On the one hand, universities are called on reducing their environmental impact as operating institutions, caused through direct activities, like e.g. use of classrooms, laboratories, offices, catering, and indirect actions, like commuting and consumption of food and drink by the university's community. On the other hand, they are called on carrying out research and teaching in this field, and on creating settings that allow students and staff to develop new competencies that lead to more sustainable practices and finally to a more sustainable society. Participation and empowerment are two terms associated with the development of key competencies for sustainable development. The first term means that "individuals must be provided with numerous opportunities throughout their lives to acquire the information and skills necessary to enact the citizen role" (Howell *et al.* 1987); the second describes a multidimensional process of learning to think critically, to

effect change in one's life and one's community and to be involved in decision processes (Florin *et al.* 1990).

Campus sustainability links both – the operational aspects of reducing energy consumption, emissions, materials, etc. – and the educational aspect of teaching sustainability and providing opportunities to its community to learn, to reflect and to develop new habits, practices, life style concepts that take into account the well-being of the current and future generations.

One tool to tackle campus sustainability is the implementation of an environmental management system (EMS) that allows reducing the environmental impact and that offers at the same time manifold possibilities to involve the community and to start a new transversal dialogue about campus operations and activities.

It is with the idea in mind that campus sustainability indeed matters, that this research aims to add scientific knowledge about EMS development and implementation processes in universities around Europe, focusing on the learning and participation opportunities deriving from these processes.

EMS have primarily been used by industries and private organizations that see benefits like cost savings, optimized management processes and marketing benefits of a "green" image by pursuing a certified system. The two international and best known standards are ISO 14001 from the International Standardization Organization, and EMAS (Eco-Management and Audit Scheme), developed by the European Union. These offer the possibility to get a final certification and therefore differ from so called non-formal standards that usually are implemented without a certification. Since the launch of ISO 14001 and EMAS in the 90s, EMS have been implemented on a large scale. More recently, other organizations such as universities are also using these systems to improve their environmental performance and to express their commitment to sustainable development.

A large volume of literature can be found about how to move campus sustainability forward, and some authors compare different EMS models (Alshuwaikait *et al.* 2008) and discuss their adequacy for higher education institutions (Clarke *et al.*

2009). There exist also studies about EMS in universities at the national level (e.g. Australia, Canada, Sweden, United Kingdom, USA), and many universities report about their experience with EMS in case study articles. But there is little yet known about the current state of EMS implementation processes at European campuses and about the approaches universities have followed to implement an EMS. The confrontation of a top-down vs. a participatory approach within EMS is an investigation field still underexplored.

To close this gap, we examine EMS implementation processes in Europe and execute two data compilations: The first data compilation is based on a deep literature review and internet search that provides an overview about European universities with an EMS at the campus and an analysis of the distribution of respective EMS types.

The second data compilation is based on an internet-mediated questionnaire with cross-sectional survey design, administered to 35 environmental coordinators, sustainability officers, researchers or respective personnel in charge of the EMS at the campus. Herewith, we analyse the motivation, the implementation approach (top-down or participatory), participation levels of student and staff involvement as well as measurement and communication tools of sustainable development.

The results of this study shall contribute to the discussion how sustainable development can be integrated in higher education institutions and how EMS can improve campus sustainability. It also implies suggestions for the professional practice.

The study is organized as follows:

In the first chapter, we outline the scope of the study and discuss further the role of universities in the context of sustainable development. This argumentation leads to the research objectives and research questions.

The second chapter deals with the state of the art of sustainability in universities, providing an overview about milestones of implementing sustainability at universities and main facts about EMS, which are then put in the university context.

In the third chapter we explain the research methodology and data analysis applied.

The fourth chapter presents the results of the first and second data compilation about EMS implementation processes at European universities.

In the fifth chapter, we discuss the results in the face of opportunities for participation, systemic learning and awareness rising for sustainable practices. We include limitations and drawbacks, as well as recommendations for further research. As an outlook, we give suggestions for the professional practice.

In the last chapter, we draw conclusions from our research.

1. Scope of the study

1.1. Study context – Sustainable Development and the role of universities

From the webpage for the Earth Summit 2012 (Rio+20 conference):

"The world is facing a mounting crisis. In recent years we have experienced a combination of a global financial crisis, a food crisis, volatile oil prices, accelerating ecosystem degradation and an increasing number of climate-induced extreme weather events. These multiple and inter-related crises call into question the ability of a growing human population to live peacefully and sustainably on this planet, and demand the urgent attention of governments and citizens around the world." (Stakeholder Forum for a Sustainable Future 2011).

The global challenges of today and the question of how to integrate sustainable development in the resolution of these challenges are key issues of the 21st century.

There has been a remarkable progress in the debate about sustainable development over the last three decades. This debate has mainly commenced with the Brundtland Report "Our Common Future" in 1987 (World Commission on Environment and Development *et al.* 1987), and was followed by several UN-Conferences and other international meetings at most highest political level (UN Department of Economic and Social Affairs- Division for Sustainable Development 2009, United Nations 2009).

Implementing sustainability, for educational institutions and beyond, can be seen as an ongoing process and a continuous dialogue. The high number of different definitions about sustainability and different perceptions of the concept and its principles are proof of its progress and its barriers at the same time. Mawhinney (2002) wonders "if there is a common definition of sustainable development that applies to all cases". It is not the purpose of this study to debate the many definitions of sustainability, but in order to provide a guiding basis for this work, we start with the most commonly used definition of sustainable development in the educational context, elaborated by the UNESCO:

"**Sustainable development** is seeking to meet the needs of the present without compromising those of future generations. We have to learn our way out of current social and environmental problems and learn to live sustainably. Sustainable development is a vision of development that encompasses populations, animal and plant species, ecosystems, natural resources and that integrates concerns such as the fight against poverty, gender equality, human rights, education for all, health, human security, intercultural dialogue, etc. **Education for sustainable development** 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" (UNESCO 2010).

Merkel *et al.* (2007) resume that for institutions "sustainability means contributing to the sustainability of the global ecosystems, as well as to the well-being of their own constituents". Sustainable Development is understood as a continuous learning and training process, and embraces the interrelated dimensions of society, economy and environment.

The education sector has been attributed a key role to promote sustainable development (UNEP 1972, UNCED 1992, UNESCO 1998). Chambers (2009) explains: "The impact universities can have in sustainable development is vastly greater than the impact of any other single sector of society. This is because universities educate the next generation of decision-makers and influencers (including politicians, business leaders, engineers, educators and thinkers) and are centres for research & development activities". She underlines that "universities are where knowledge and attitudes are formed and their influence is vast" (ibid.). Figure 1.1 illustrates the influence a university has on society, showing at the same time the interconnections between education, research and campus life, university and society with its different stakeholder groups.

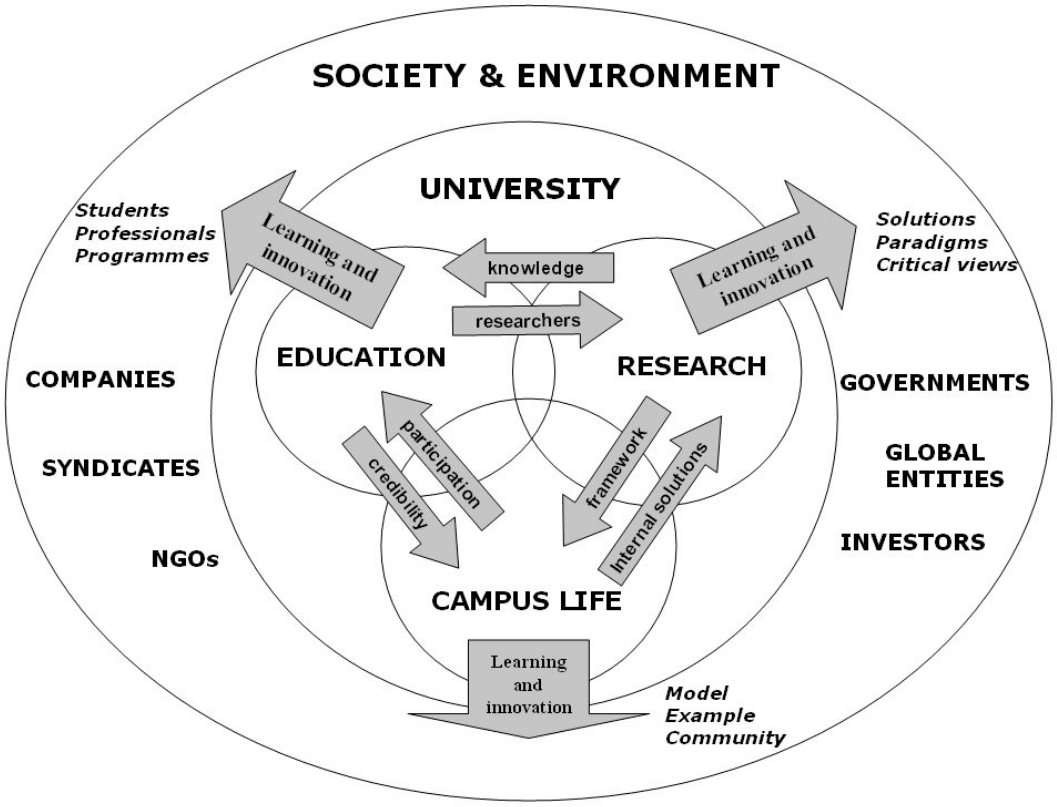


Figure 1.1 The role of a university in society
Source: Ferrer-Balas 2009

Due to their high societal impact, universities are challenged to take a leadership role in environmental issues. Several authors attribute an ethical or environmental imperative to universities and see it as their duty to systemically integrate sustainability into higher education institutions (Weenen van 2000, Sharp 2002, Cortese 2003, Hansen 2006, Adomssent *et al.* 2008). With regard to the global environmental crisis, Sharp (2002) states: "(…) every natural life support system is in long term systemic decline. If universities are going to survive into the next century, they must not only respond to this new force which, for the duration of this essay, will be termed the environmental imperative, but they must also provide leadership for broader society".

The General Report of the International Conference on Education for a Sustainable Future, organized by the International Associations of Universities (IAU) in Prague, 2003, concluded in that year:

"The higher education sector is failing society by producing leaders incapable of addressing the most pressing problems. If higher education is the "nursery of

tomorrow's leaders", then the sector bears profound responsibilities to create a sustainable future. This implies that graduates of every discipline need a sound working knowledge about sustainability"(IAU 2003) .

This topic has become a large study field, as the number of conferences and publications prove (Graham 2004, Velazquez *et al.* 2006b, Leal Filho 2009). The academic journal *International Journal of Sustainability in Higher Education*, dedicated exclusively to this research field and launched in 2000, is the scientific platform for SD in the university context and another proof of the high level this discussion has reached.

Filho (2009) points out that the discussion about sustainability has been brought forward by the climate change debate and by the UN Decade of Education for Sustainable Development (2005 – 2014, DESD). He states that "much ground has been covered" and that the discussion about "sustainability at, within and around universities" can be considered even "well developed today" (ibid.). He distinguishes three different stages of sustainability implementation at a university: (1) Stage 1, in which the principles of sustainable development are not integrally understood and no strong efforts have been undertaken yet towards promoting sustainability at the institution; systematic projects or a holistic approach are still lacking; (2) Stage 2, in which significant efforts towards sustainable campus operations have been realized, the principles of sustainable development are broadly understood and projects exist to promote sustainability as a whole or in the context of specific subjects and/or research; (3) Stage 3, in which the university has fulfilled the requirements of the previous stages and has a long-term commitment towards contributing to sustainable development, e.g. by means of sustainability policies, and/or by means of certification (ISO 14001 or EMAS for European institutions), and by means of the existence of senior staff members in charge of the coordination of sustainability efforts and projects (ibid.). According to Filho (2009), the implementation of EMS can be seen as a proof of an institution's process in following sustainable principles, and as a sign of the institution's orientation towards incorporating sustainability at an advanced level. *Campus Sustainability* is therefore *one* aspect in this overall discussion about sustainable development, and environmental management systems at the campus might be one tool not only to improve the institutions' environmental performance, but also to foster students' and staff's skills of environmentally-conscious behavior and to contribute to a

more sustainable society. Therefore, we have embedded this research in the ongoing discussion about Campus Sustainability.

1.2. Public participation

Promoting sustainable development is closely linked to the field of public participation and citizen's involvement. The Agenda 21, generated at the Earth Summit 1992 in Rio de Janeiro and published by the United Nations, stresses the importance of public participation as a "fundamental pre-requisite for the achievement of sustainable development" (UNCED 1992). The governance strategy "Citizens as partners" of the OECD countries and the Aarhus Convention, approved by the United Nations Economic Commission for Europe in 1998 are aligned with this approach (OECD 2001, UNECE 2001).

Meadowcroft (2004) lists several advantageous aspects by linking sustainable development to public participation:

"(…) Participation can allow individuals and groups to reconcile and redefine relevant interests, to contribute to shaping the future, and to adjust to impending change. (…) With respect to the normative content of sustainable development, participation can facilitate a more complete disclosure of existing attitudes, the juxtaposition of different approaches and the transformation of values. (…) it can promote the integration of knowledge and the adaptation of governance to the diverse cross-cutting contexts relevant to sustainable development. With respect to 'learning by doing', participation can promote adaptive management and knowledge acquisition by societal partners and governments".

Applied to the university context, participation refers to students' and staff involvement, giving each institution the opportunity to put into practice sustainability principles at a micro level, e.g. in their academic, personal and professional life.

The International Association for Public Participation divides public participation into five levels that lead from the lowest level "to inform" to the highest level "to empower based on the activities, methodologies and the impact the public is allowed to have at each level (Figure 1.2).

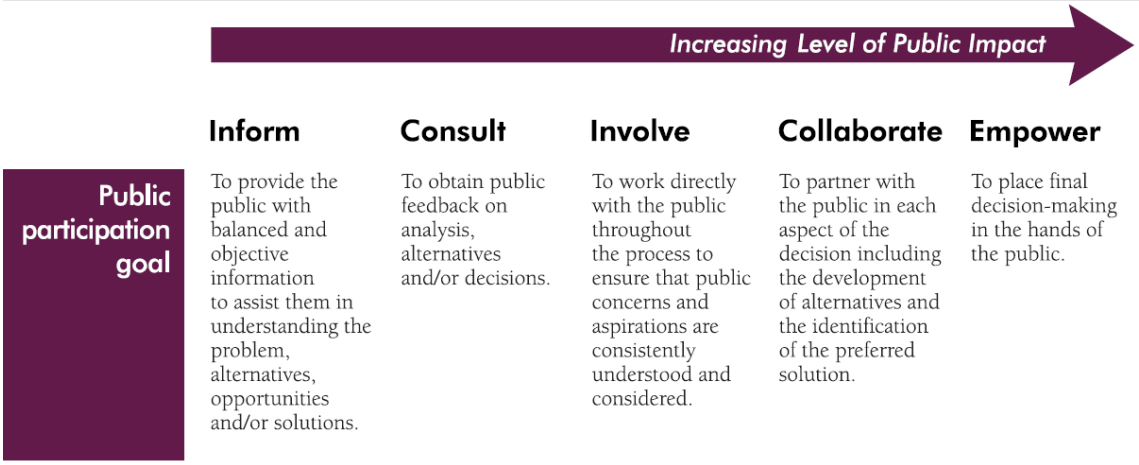


Figure 1.2 Spectrum of Public Participation
Source: International Association for Public Participation 2007

According to this spectrum, the public impact increases from level to level and cumulates into an empowerment process, where the decision-making is also put in the hand of the public. The effectiveness of empowerment has been studied broadly and its positive impacts have been proven empirically (Conger *et al.* 1988, Holyoak 2001) and have meanwhile also be linked to the future employability of the higher education students (Harvey 2000).

This research therefore links the topic of campus sustainability, namely the implementation of EMS, to the field of students' and staff participation by analyzing the approach of the implementation processes: top-down vs. participatory approaches.

1.3. Study objectives and research questions

Since there is little yet known about the current state of EMS implementation processes at European campuses and about the approaches universities have followed to implement an EMS, this research aims to close this gap for the European universities' landscape and shall contribute to the ongoing discussion about Sustainable Development. It focuses on the opportunities an EMS implementation process offers to universities and to their community – students, staff and other stakeholders - to meet the global challenges our societies are confronted with.

Our principal research questions are:

What is the current state of EMS implementation processes and practices at European universities? How have the EMS been implemented and which are the possibilities for students' and staff participation within the EMS implementation process?

We tend to verify, if an EMS can be considered a strong tool to enhance campus sustainability that can foster students' and staff's environmental awareness. The comparison of top-down versus participatory approaches shall give new insights into the possibilities and opportunities EMS can offer to contribute to an university's social and environmental performance and to its visibility. The results shall contribute to the ongoing discussion about sustainable development and be of use for universities that have implemented an EMS or that wish to get inspirations from other institutions' activities in this field. It attempts also to give guidance to universities that are considering implementing an EMS in the future.

We hereby summarise our research objectives and research questions via three main points:

(1) Analysis of EMS implementation processes realized at universities around Europe to obtain an overview about the state of current practices

- *Which universities in Europe have implemented an EMS at the campus?*
- *What types of EMS have been used in European universities?*
- *What are the drivers to implement an EMS at the campus (motivation and reasons that led to the decision to implement an EMS)?*
- *Implementation process with and without certification – how important is the final certification?*

(2) Top-down versus participatory approaches within an EMS implementation process

- *Which approach did the universities opt for(top-down or participatory approach)?*
- *How and at which levels have the universities' communities (students and staff) been involved?*

(3) Universities' sustainability measurement and communication about their campus initiatives

- *How do universities measure sustainability at the campus?*

- *How do universities communicate about the activities related to their EMS and to sustainability initiatives at the campus?*

We aim to present the following findings:

i) A current overview of EMS processes at European universities;
ii) Similarities and differences between the EMS implementation processes;
iii) Methods and activities for students and staff involvement at different participation levels;
iv) Instruments universities use in order to measure continuously sustainability at the campus;
v) Tools universities use to communicate about their initiatives and activities at the campus;
vi) Lessons learned from the implementation process of an EMS.

Due to time and research limitations, the investigation was restricted to the European Union's academic landscape only.

The opportunities and challenges given by a participative approach may require a further and more extensive research.

Therefore, this investigation can be a solid starting point for an ongoing research in this field at a later stage (see chapter 5.4 Recommendations for further research, p.98).

2. State of the art: Sustainability in universities and EMS at the campus

2.1. Introduction

The current review on existing literature about sustainability at the campus gives evidence that "universities have responded to the pressure of students, alumni, government, administration or faculty, to make some attempt at addressing the environmental imperative in the way campuses are operated" (Sharp 2002).

There is a large number of articles, reports and conference papers dealing with sustainability at the campus and "greening the campus" initiatives, e.g. (Weenen van 2000, Sharp 2002, Wright 2002, Velazquez *et al.* 2006a, Adomssent *et al.* 2008) to name just a few; and, in a growing number of articles, the question of an EMS at the campus and its contribution to SD is discussed (Sharp 2002, Simkins *et al.* 2004, Nicolaides 2006, Tauchen *et al.* 2006, Velazquez *et al.* 2006a, Alshuwaikait *et al.* 2008, Clarke *et al.* 2009). Furthermore, some universities with an EMS communicate in scientific articles about their experience (Noeke 2000, Arvidsson 2004, Oelreich 2004, Carreiras *et al.* 2006, Christensen *et al.* 2008, Sammalisto *et al.* 2008, Evangelinos *et al.* 2009, Ferrer-Balas *et al.* 2009, Institut fuer Umweltkommunikation 2009, Lehmann *et al.* 2009).

In this chapter, we start with a summary of milestones of implementing sustainability at universities and move then on to the main facts about EMS. We introduce briefly the EMS that have been identified at European higher education institutions', such as ISO 14001, EMAS, EcoCampus and regional/national systems. Afterwards, we give a summary of the core statements within the discussion about EMS in the university context.

2.2. Milestones of implementing sustainability at universities

The global discussion about sustainable development has created a debate about normative values and is therefore closely connected to environmental ethics. Higher Education Institutions have not only included environmental ethics in the curricula

discussion already at the beginning of the seventies, but the Higher Education Institutions themselves have played an important role as promoters and developers of environmental ethics and fostering the concept of sustainable development in the educational sector. To the present day, several international declarations for the Higher Education sector have been published, and all of them are based on a moral obligation towards promoting and contributing to sustainable development within the Higher Education Institutions: "Perhaps the unifying theme among all declarations and policies is the ethical and moral responsibility of universities to be leaders in promoting sustainability" (Wright 2002).

Wright (ibid.) examined in detail declarations up to 1997 (Table 2.1). We expand the list up to present and will present briefly the declarations listed in the table below:

Table 2.1 Chronology of Some Declarations Related to Sustainability in Higher Education
Source: adapted from Wright 2002

Year	**Declaration**
1972	The Stockholm Declaration On The Human Environment
1977	Tbilisi Declaration
1990	University Presidents for a Sustainable Future: The Talloires Declaration
1991	The Halifax Declaration
1992	Report of the United Nations Conference on Environment and Development – Chapter 36: Promoting Education, Public Awareness and Training
1993	Ninth International Association of Universities Round Table: The Kyoto Declaration
1993	Association of Commonwealth Universities' Fifteenth Quinquennial Conference: Swansea Declaration
1994	CRE Copernicus Charter
1997	International Conference on Environment and Society – Education and Public Awareness for Sustainability: Declaration of Thessaloniki
Year	**Declaration** *(continuation)*

(continuation)	
1998	World Declaration on Higher Education for the twenty-first century: Vision and Action
2000	Earth Charter *(directed to all education areas, not higher education-specific)*
2001	Lueneburg Declaration
2002	Ubuntu Declaration
2006	Declaration on the Responsibility of Higher Education for a Democratic Culture – Citizenship, Human Rights and Sustainability
2009	Tokyo Declaration of HOPE *(directed to all education areas, not higher education-specific)*
2005-2014	The UN decade Education for Sustainable Development

The first declaration referring to sustainability in higher education is the **Stockholm Declaration from 1972** (UNEP 1972), as stated above, followed by the **Tbilisi Declaration in 1977** (UNESCO 1977). Whereas the Stockholm Declaration had a "human-centered focus", discussing the "intra- and intergenerational equity amongst human beings", the Tbilisi Declaration takes for the first time an "international and holistic approach to the environment within the higher education context" (Wright 2002).

The **Talloires Declaration**, developed **1990** in the USA, and the **Halifax Declaration**, adopted **1991** in Halifax, Canada, are two examples of universities' commitment to sustainability. The Talloires Declaration focuses on providing leadership for sustainable development and on extending the international cooperation. The signatories of this declaration encompasses 423 universities (University Leaders for a Sustainable Future 2010). The Halifax Declaration, concentrating more on the Canadian universities' landscape, brings a new dimension to sustainability declarations, as it points out a voluntary action plan for short-and long-term goals, identifying concrete frameworks for the universities' action on sustainable development (Wright 2002).

The **Agenda 21** and its **Chapter 36** about Education, published **1992** as a result of the Earth Summit in Rio de Janeiro (UNCED 1992) can be seen as a key stone on environmental ethics and the linkage to education.

The **Copernicus Charter** resulted from a debate within the *Cooperation Programme in Europe for Research on Nature and Industry through Coordinated University Studies (COPERNICUS)*, at a conference of European rectors (today the Association of European Universities) in **1994**. The charter stresses the need of "a new frame of mind and set of environmental values within the higher education community"(Wright 2002).

The **Thessaloniki Declaration** from **1997** (UNESCO 1997) can be seen as a follow-up of the Tbilisi conference. This declaration emphasizes once again that the concept of environmental sustainability must be clearly linked with poverty, population, food security, democracy, human rights, peace and health and a respect for traditional cultural and ecological knowledge.

The **World Declaration on Higher Education for the twenty-first century: Vision and Action** (UNESCO 1998), published 1998 at the World Conference of Higher Education in Paris, focuses on equal access to education, gender justice and creative thinking.

The **Earth Charter** (Earth Charter Initiative 2010), developed over several years and launched in **2000** at the UNESCO headquarters by the Earth Charter Comission in Paris, is a global network that aims to spread new ethical values and principles for conservations, development and a sustainable future. The initiative is directed to the educational sector in general (not higher education-specific).

The **Lueneburg Declaration** (UNESCO 2010)**,** developed on the international Copernicus Conference "Higher Education for Sustainability towards the World Summit on Sustainable Development (Rio + 10) in 2001, called on higher education institutions, governments and UNESCO with regard to the upcoming Johannesburg summit 2002 to develop further and integrate better education for sustainable development in the educational sector.

The **Ubuntu Declaration** was developed within the United Nations Conference on Sustainable Development in Johannesburg 2002 and signed by 11 global educational organizations and scientific academies, proclaiming the integration of Education for Sustainable Development in the education curricula (United Nations 2002).

The **Declaration on the Responsibility of Higher Education for a Democratic Culture – Citizenship, Human Rights and Sustainability** (Council of Europe 2006), was developed in Strasbourg in 2006 by the Council of Europe and Global Network for Higher Education and Democratic Culture. It links democratic culture to sustainable development and prompts higher education institutions to foster citizen commitment for sustainable practices.

The **Tokyo Declaration of HOPE** (ACCU 2009) was developed in 2009 during the Asia-Pacific Forum in Tokyo and in cooperation with the UNESCO. It can be seen as a commitment of ESD Educators and Facilitators to action for sustainable development.

The UN Decade Education for Sustainable Development (2005-2014) (UNESCO 2010) is a general promoter of sustainable development within the education sector, not only for tertiary education, and started in 2005. Meanwhile, there are numerous UN decade projects around the globe in all educational sectors.

The declarations above can be considered meaningful first steps in facilitating change and integrating sustainable development into the universities' landscape. Nevertheless, Wright alerts that without an implementation plan these policies remain just a statement of intent and run the risk of serving only to "greenwash" the institutions' image (Wright 2002, 2006).

2.3. Main facts about EMS

Originally, EMS have their roots in the USA in the mid-eighties, when environmental legislation was enacted and companies felt an increasing need to prove their compliance with law. Europe followed this trend, and some European companies even saw the new managerial tools more "as a business opportunity than as a burden" (Wätzold 2009).

The Earth Summit 1992 in Rio de Janeiro gave further emphasis to the responsibilities corporation and industries have towards environmental protection, preserving biodiversity and their need to contribute to sustainable development. As a consequence, the International Standardisation Organisation (ISO) set up a committee to develop an EMS, which was concluded in 1995 and which became known as the international environmental standard **ISO 14001**. At the same time, the European Commission developed the **Eco-Management and Audit Scheme (EMAS)**, a voluntary system that was launched in 1993.

In general, EMS can be defined as "a structured framework for the assessment and management of an organization's environmental impacts and for the incremental improvement of environmental performance" (Simkins *et al.* 2004). They are delineated as transparent, systemic processes known corporate- (or sector-) wide and have "the purpose of prescribing and implementing environmental goals, policies, and responsibilities, as well as regular auditing of its elements" (Steger 2000). They derive from quality management systems and follow the Plan-Do-Check-Act-Cycle[1], which is a continuous quality improvement model, also known as the Deming Cycle. In Figure 2.1, the PDCA-Cylce is applied to the processes within an EMS.

[1] The PDCA-Cycle, Cycle or Deming-, was proposed by E. Edwards Deming in the 1950's as a tool to measure, control and improve business processes. It can be understood as a continuous feedback loop in order that the decisive organs in an institution can identify and change the parts of its processes that need improvement. Deming actually developed the previous Shewhart-cycle further, which was set up by Walter A. Shewhart, a scientist who developed the Statistical Process Control (SPC).

Figure 2.1 The PDCA-Cycle applied to an Environmental Management System
Source: Zutshi et al. (2005) and reference therein

The first stage of an EMS (PLAN) deals with environmental policy, environmental aspects, legal requirements, objectives and targets, and may establish an Environmental Management Programme. The second stage (DO) deals with structures and responsibilities within the given institution. At this stage, tasks such as training, communication, document and operational control as well as emergency preparations are executed. In the third stage (CHECK), processes are monitored and measured in order to identify any non-conformance and to proceed with corrections, if necessary. Audits can take place. In the fourth stage (ACT), the management reviews the institution's processes and proceeds with improvement actions that may affect the institution's structure and the distribution of responsibilities.

2.3.1. ISO 14001

ISO 14001 is the most well known and internationally recognised standard and was launched in 1996. It is one of ISO's 18000 standards, and together with the quality management system ISO 9001, one of the most widely implemented standards ever. It focuses on providing a voluntary management system for a company's or institution's

environmental performance and can be implemented without certification. However, many users opt for a certification, which is undertaken by an independent competent auditing body. In 2004, ISO 14001 was developed further (ISO 14001: 2004), and aims explicitly "to provide a framework for a holistic, strategic approach to the organization's environmental policy, plans and actions" (ISO 2011).

ISO offers a survey every year[2] with international, regional and country specific data. Sector-specific analyses are not provided. According to the ISO Survey 2008, in Europe there are 78,118 sites ISO 14001 certified; the highest number of ISO 14001 certification have been registered in Spain (16,443) and in the United Kingdom (9455) (ISO Central Secretariat 2009).

The first university in Europe to become ISO 14001 certified was Maelardalen University in Sweden in 1999 (Oelreich 2004).

ISO 14001 is often seen as a 'stepping stone' for EMAS certification and not as a competitor. In the next section 2.3.2 we will provide an overview about the main differences between ISO 14001 and EMAS.

2.3.2. EMAS

The Eco-Management and Audit Scheme (EMAS) was developed by the European Comission in 1993 and first only open to the industrial and later to the manufacture sector. It is open now to all types of organizations in the public and private sector. EMAS is considered to be more demanding than ISO 14001, as EMAS requires clear and quantified goals, as well as a verified environmental declaration (Steger 2000, European Comission 2010a).

In January 2010, the new EMAS III regulation became effective. The new regulation consists, amongst others, of simplified procedures for small- and medium size companies. Furthermore, institutions from outside Europe can also register for EMAS. EMAS III includes new environmental core indicators, which are energy

[2] The latest survey available at the time of this research was the ISO Survey 2008. Due to this reason we could not consider more recent data.

efficiency, material efficiency, water, waste, biodiversity and emissions (European Comission 2010c)

The numbers of EMAS registration are much lower compared to those of ISO 14001: In Europe, at end of March 2011, there are in total 4650 organisations and 7953 sites registered (European Comission 2011a), with most registration in Germany (1898 sites and 1401 organisations)), followed by Spain (1572 sites and 1263 organisations) and Italy (1503 sites and 1090 organisations) (European Comission 2011b).

A factsheet published by the European Commission, presents the differences between ISO 14001 and EMAS (Table 2.2):

Table 2.2 Differences between ISO 14001 and EMAS
Source: adapted from EMAS Factsheet (European Commission 2008)

	EMAS II (and changes to EMAS III)	**ISO 14001**
Status	Under legal bases (EU Member States and EEA countries). Regulation of the European Parliament and the Council under public law	Under no legal bases. (International: worldwide) ISO standard under private law
Organisation	The entity to be registered shall not exceed the boundaries of the Member State, and it is intended to go towards entities and site ***(suspended with EMAS III)***	Does not go towards entities or sites
Environmental policy	Included commitment to continual improvement of environmental performance of the organisation	Does not include a commitment to the continual improvement of environmental performance but of the performance of the system
Initial environmental review	Obligatory preliminary review, when is the first time that the organization sets its environmental status	Initial review is recommended, but not required
Environmental aspects	Identification and evaluation of the environmental aspects (direct and indirect). Establishment of criteria for assessing the significance of the environmental aspects	Required only a procedure able to identify environmental aspects
Legal Compliance	Obligatory to demonstrate it. Requires full legal compliance. There is a compliance-audit	Only commitment to comply with Applicable legal requirements. There is no compliance-audit
External communication	Open dialogue with the public. Public Environmental Statement (validated for verifiers)	Not open dialogue with the public. Only is required to respond to relevant communication from external interested parts. Control by public is not possible

(continuation)	**EMAS II (and changes to EMAS III)**	**ISO 14001**
Continual improvement	Requires annual improvement *(with EMAS III organizations send annually a non-validated environmental statement. The cycle of regular audits passes from three to four years)*	Required periodically improvement without a defined frequency
Management review	Is wider and requires an evaluation of the environmental performance of the organization, based in a performance-audit	Required an environmental performance in the management, but not through a performance audit
Contractors and suppliers	Required influence over contractors and suppliers	Relevant procedures are communicated to contractors and suppliers
Employees involvement	Active involvement of employees and their representatives	No
Internal environmental auditing	Includes: system-audit, a performance-audit (= evaluation of environmental performance) and an environmental compliance-audit (= determination of legal compliance)	Includes only system audit against the requirements of the standard
Auditor	Required the independence of the auditor	Advised the independence of the auditor

As the registration numbers prove, EMAS is highly represented in German-speaking countries. In Germany, there have been (and still are) financial supports for implementing an EMS, and this funding has partly favored EMAS to ISO 14001, which might explain the higher registration number for EMAS in this country (Wätzold 2009).

The first EMAS certified university in Europe is University of Zittau/Goerlitz (Germany), which obtained the certification in 1999 (Delakowitz *et al.* 2000). In December 2010, University of Applied Sciences Eberswalde (Germany) won the EMAS award 2010 within the category small public institutions (European Comission 2010b).

2.3.3. Other adoptions of EMS

Besides the formal EMS there are a number of non-formal EMS: Some are sector-specific and/or national-specific. In this section, we will refer only to the non-formal EMS that have been identified within our research, but which are not exclusive and are shown as examples.

In the United Kingdom, the national and sector-specific EMS **EcoCampus**, developed explicitly for the higher education sector, has become quite popular. Launched in 2005, it has attracted, according the EcoCampus register, approximately 30% of the British universities' landscape (EcoCampus 2011). The system is closely aligned to ISO 14001 and provides packages with frameworks for carbon and environmental management of a university. Good performances, like progress in the environmental performance and reduction of the institution's carbon footprint are awarded from "platinum to gold-awards" (ibid.)

The Universidad Autónoma de Madrid, Spain, has developed the campus project **Oficina EcoCampus**, which was implemented in 1997 as a response to the requirements of the Agenda 21 and expresses the university's commitment towards Sustainable Development. The project encompasses environmental management, environmental research, participation and teaching and accomplishes regularly internal audits (Universidad Autonoma de Madrid 2011).

University of Copenhagen, Denmark, implemented the project **Green Campus**, with a concrete plan for sustainable development and emission reductions of 20% between 2006 and 2013. Furthermore, the university has built the Green Lighthouse, Denmark's first carbon neutral house that hosts the Faculty of Sciences and offers several counseling services to students. The university operates an internal **energy management system** that involves students and the university's community in general.

The Swiss governmental administration developed the system **RUMBA** (= Ressourcen- und Umweltmanagementsystem der Bundesverwaltung (Environmental management system of the Governmental Administration)), that strives for the reduction of an institution's environmental impacts. This system prefers the use and consumption of sustainably produced goods and seeks the integration of sustainability in education, training and services (ETH 2009). RUMBA is implemented in the Swiss Federal Institute of Technology Zurich and at EPFL – École Polytéchnique Fédéral de Lausanne.

2.4. EMS in the university context

Even though an EMS in the university context is a relatively new study field, some progress has been made. As stated before, campus sustainability can be divided into different levels and having implemented an EMS can be seen as a signal of dealing with sustainability at an advanced level (Leal Filho 2009).

There is an ongoing debate about the different types of EMS and their adequacy for higher education institutions (Clarke *et al.* 2009). Some request a campus-specific EMS, as universities are perceived to be more complex than enterprises and corporations and to have different direct and indirect interactions with the environment. Furthermore, the drivers to implement an EMS can vary from those companies usually indicate (ibid.). Within a study in the late 90's, Bennet *et al.* (1999) distinguish, for example, three main categories of drivers for campus EMS. According to their study, the *first generation drivers* focus on cost savings and compliance with law and are similar to the drivers companies specify; the *second generation drivers* focus on stakeholder management, quality management and pollution prevention; and the *third generation drivers* focuses on stakeholder partnerships, sustainable development and life-cycle management. The third generation drivers underline the institution's role as a leader, as a ´good citizen' and emphasizes its function of providing best-practice examples. Clarke *et al.* (2009) conclude that the objectives a higher education institution associates with an EMS determine the choice for a specific type of EMS and influence also the decision whether to opt for a final certification or not. Indeed, some universities report about their positive experience with having a certified EMS; like the University of Applied Sciences Zittau/Goerlitz (Delakowitz *et al.* 2000), University of Applied Sciences of Paderborn (Noeke 2000), Maelardalen University (Oelreich 2004) among others, whereas other institutions do not link the question of success of an EMS to a final certification, e.g. (Ferreira *et al.* 2006).

Even though universities typically have different structures than industrial enterprises, Christensen *et al.* (2008) use a factory model to compare the universities' input and output processes. Therewith, they extend the discussion about campus sustainability far beyond direct interactions with the environment (output emissions), like solid waste, waste water and air emissions (Figure 2.2). Candidates (for academic

programmes) and professionals are included to the output products, too, like books, articles, patents etc. (ibid). Figure 2.2 is based on models of factories often used in EMS and applies a life cycle concept to universities' processes and activities:

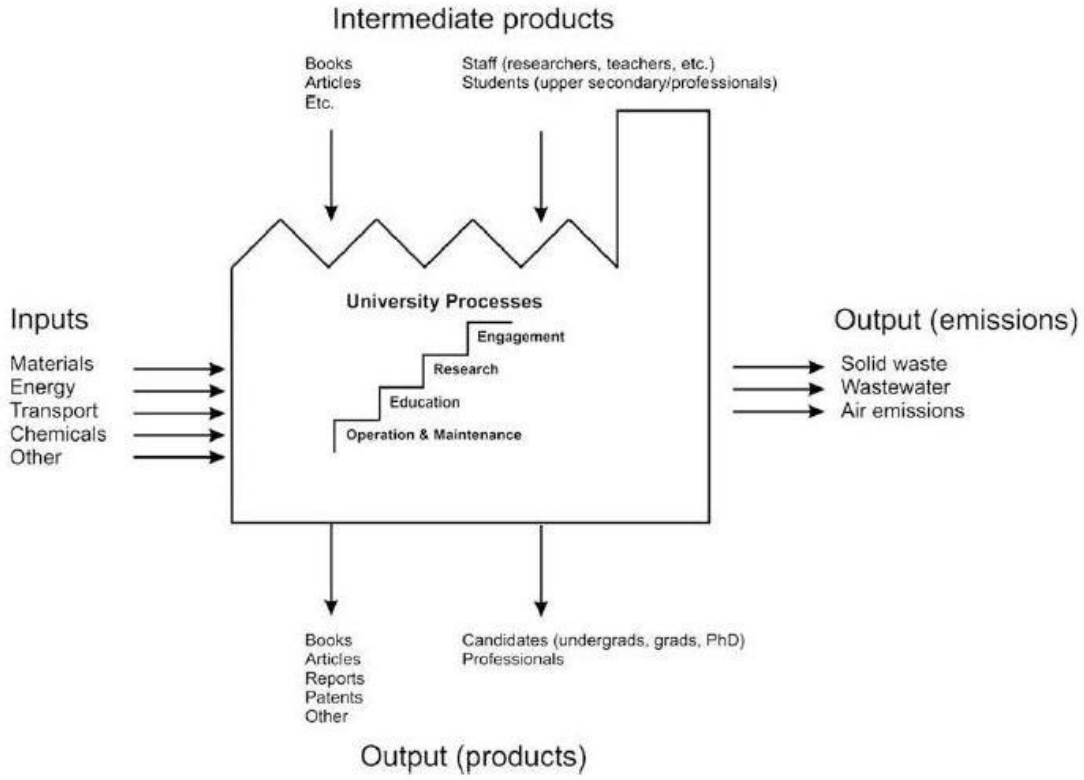


Figure 2.2 University as a factory – processes and activities
Source: Christensen et al. 2008

In this context, Christensen *et al*. (2008) argue the importance of early education for sustainable development and its impact for an environmentally-conscious behaviour: "It is difficult to measure the ecological footprint of an entire career, but it is obvious that the possibility of reducing the impacts is greater if education, tools and motivation are provided at an early stage of the career, preferably during the university education" (ibid.). Furthermore, the authors underline the "wider social impact pathway" this type of life cycle thinking offers, as it is not only about reducing the students' emissions by "recycling and the lowering of personal mileage driven (…)", but mainly about "ideas inventions, management and positive role models (that) may lead to a plenitude of reductions and preventive actions in the future" (ibid.).

This approach goes hand in hand with Sammalisto *et al.* (2005) step model of the role of EMS in higher education (Figure 2.3):

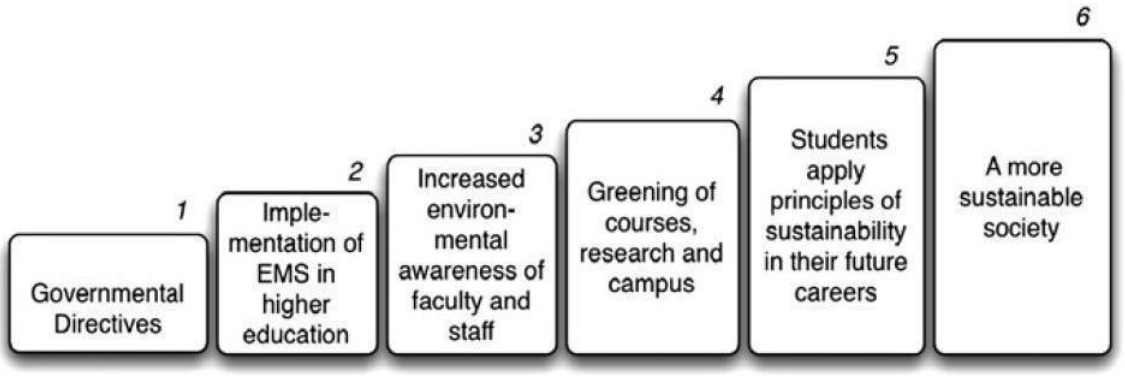


Figure 2.3 The role of EMS in higher education in the steps towards a more sustainable society
Source: Sammalisto et al. 2005 in Sammalisto et al. 2008

In this model[3], an EMS at the campus is a necessary starting point to increase environmental awareness of students and staff. It may lead at a later stage to more environmentally conscious behavior, where sustainable principles are put into practice in professional (and personal) life. In the end, these steps support the development of a more sustainable society.

To our knowledge, there have been two international studies so far, that have examined on international level the sustainability initiatives and practices at universities. One study was carried out by Velazquez *et al.* in 2006 and analyses eighty universities around the globe, benchmarking the best practices used by higher education institutions that actively implemented sustainability at their campuses (Velazquez 2006). Velazquez' research considered the literature available from 1990-2002 and applied a survey portfolio, in which he found out that 35% (14 institutions) of the universities that participated in the survey had chosen an EMS as a sustainability initiative at the campus (Table 2.3).

[33] In Sweden, the government requests higher education institutions to report annually about Sustainable Development at their institution. This governmental directive led to an increase of EMS implementation and is therefore put at first level in this step model.

Table 2.3 Sustainability initiatives on campus
Source: Velazquez 2006

Initiative	**Answer**	**%**
Energy efficiency	28	70
Water efficiency	24	60
Non-hazardous waste management	24	60
Transportation and commuting	23	57
Recycling	21	52
Environmentally preferable procurement	17	43
Green buildings	17	43
Natural heritage	17	43
Reducing hazardous waste management	15	38
EMS	14	35
Reusing	12	30
Global climate change	12	30
Composting	10	25
Dining services	9	23
Integrating post management	7	18

The percent column is based on 40 portfolios. Reducing, recycling and reusing initiatives are aimed at both hazardous and non-hazardous waste.

The other study was carried out by Tauchen *et al.*, also in 2006, and investigated 42 universities about their 'good practices' at the campus, categorizing these practices according to the structure of ISO 14001 and a PDCA-cycle. In this study, they indicate 10 universities worldwide being ISO 14001 certified. Both studies give evidence of (i) the general interest in sustainability initiatives and (ii) of linking sustainability initiatives to an EMS at the campus. Nikolaides (2006) affirms that "EMS's appear to be growing in leaps and bounds in higher education worldwide and many universities are certified to ISO 14001 or EMAS", which aligns with our personal observation.

Clarke *et al.* (2009) recently finalized a research that evaluates the different existing EMS practices, providing the practitioner with a synthesis and a decision-making aid when choosing an appropriate EMS for a university.

Alshuwaikhat *et al.* (2008) provide the interested parties with an assessment of current environmental management practices at university campuses and identify three widely used approaches, which are "the green building initiative, ISO 14001 and EMAS". In Figure 2.4, they demonstrate the different aspects of Campus Sustainability and the areas embraced, pointing out the complexity of Campus sustainability and alerting for an integrated and systemic approach (ibid.):

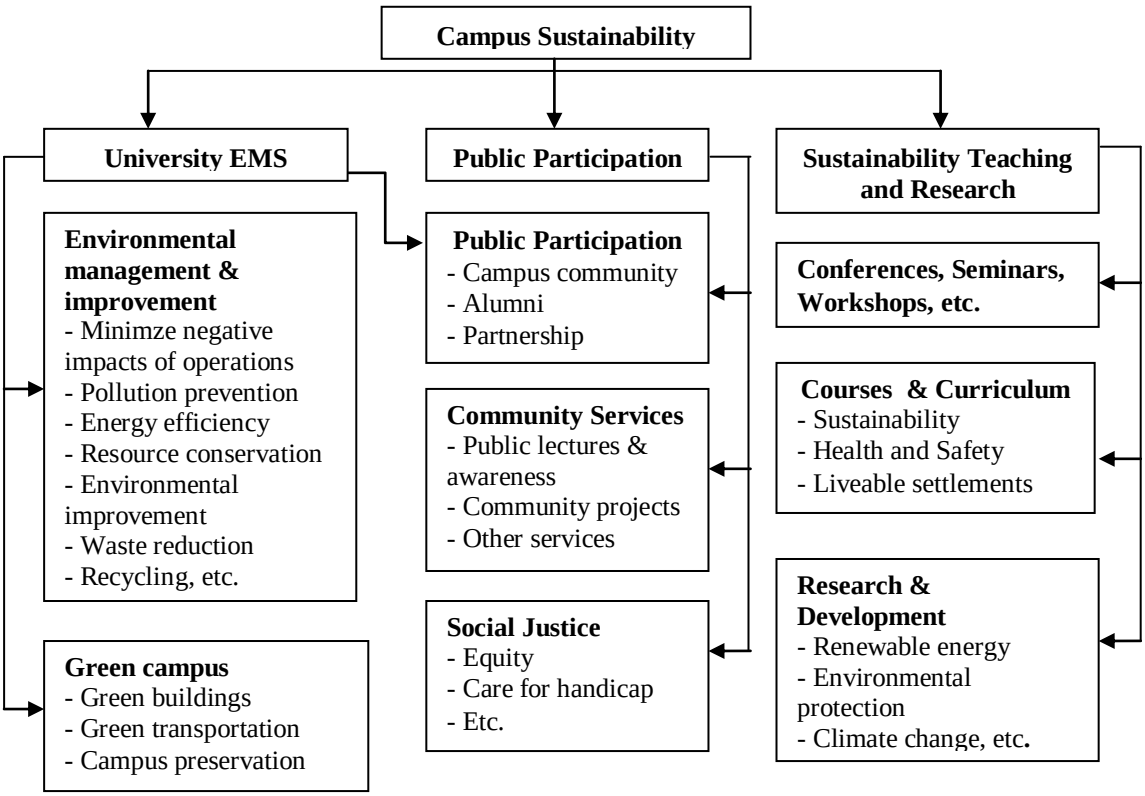


Figure 2.4 Campus Sustainability
Source: Alshuwaikhat et al. 2008

It can be seen that an EMS at the campus is linked to Public Participation and Social Responsibility as well as to Sustainability Teaching and Research, and the vision for a more sustainable campus is based on these three pillars. We emphasize the relation between the EMS and public participation, as this relation deals directly with our research subject and supports the focus of this thesis. Ferreira et al. (2006), for example, see participation as "a touchstone of environmental sustainability" and argues that even though a participative approach within an EMS's implementation process is more time consuming and more difficult, it "is the only approach capable of inducing

conscientious changes in the individual behavior towards sustainability and foster citizenship" (ibid.). These aspects shall be discussed further in Chapter 5.

3. Methodology

3.1. Introduction

Our research is based on a combination of qualitative and quantitative methods, using a deep literature review, an internet-mediated questionnaire of a cross-sectional survey design (Tashakkori *et al.* 1998, Fowler 2002) and a descriptive statistical data analysis to answer our research questions (Pereira 2006, Magalhães Hill *et al.* 2009). We divide this chapter into three sections: First, we will present our initial approach to the literature review and to the finding of samples (first data compilation). Next, we explain in detail how the questionnaire was developed and how it was administered to the samples found at the previous stage (second data compilation).

In the third section, we present the data analysis for the first and second data compilation, and refer to the tools chosen for presenting the results.

Table 3.1 resumes the methodology used according the three research stages.

3.2. First data compilation - Literature review and finding of samples

The purpose of the first data compilation was to find samples for our study. The samples needed to fulfil the following characteristics:

(a) To be a higher education institution in Europe;
(b) To have implemented or to be in an implementation process of a formal or non-formal EMS at the campus.

For the first data compilation, we examined the existing literature about Environmental Management Systems in a university context, like books, scientific journal articles and case studies, and set up a data base to collect relevant data for our topic. This search was conducted mainly in English, and only in a few cases we searched for some keywords in German, Portuguese, Spanish, French and Italian.

Table 3.1 Methodology and research design

Overall objective	*Analysis of EMS implementation processes realized at universities around Europe in order to obtain an overview about the state of current practices. The comparison of top-down versus participatory approaches shall give new insights into the possibilities and opportunities EMS can offer to contribute to an university's social and environmental performance and to its visibility. The results shall contribute to the ongoing discussion about sustainable development and be of use for universities that have implemented an EMS and that wish to get inspiration by other institutions' activities. It shall also give guidance to universities that are considering implementing an EMS in the future*

Research Stage	**Stage-related objective**	**Method used**	**Application / Design**
1 - Literature review and finding of samples	To find universities in Europe with an EMS at the campus	Literature Review Internet search	Set up a database to collect: i) University's profile (location (European sub region and country) and size (number of students enrolled)) ii) EMS type implemented at the campus iii) University's contact person for EMS
2 – Survey	To collect data about EMS implementation processes (according to research questions)	Internet-mediated questionnaire	Cross-sectional survey design, sent to all samples found at Stage 1 to collect the data: iv) extension of EMS implementation (partial or complete implementation and with or without certification) v) motivation to implement an EMS at the campus vi) implementation approach (top-down vs. participatory approach) vii) levels of participation according the table of the International Association for Public Participation (IAP2)
3 - Data Analysis	To analyse the data according the research questions	Descriptive statistical and bivariate analysis	Dynamic pivot tables (Excel) to produce graphs and figures Maps to present geographical data Bi- and multivariate analyses (SPSS) to produce data tables

The main information sources were library and online databases that have been checked by the using a list of keywords that led to the following list of scientific journals, see Table 3.2. The contents of these journals have been verified into detail, selecting the relevant information for our research topic.

Table 3.2 Literature Review – Keywords used and Scientific Journals checked

Keywords	Scientific journals
• Capacity development • Community education for Sustainable Development • Education for Sustainable Development • Education for the future • EMAS • Environmental Education • Environmental Management System • Global Reporting Initiative • Greening the campus • Higher Education • ISO 14001 • Participation • Problem-oriented and project based learning • Sustainability • Sustainability assessment / Auditing • Sustainability Reporting • Sustainable Development • System's thinking • University	• Ecology • Ecology letters • Environmental Impact Assessment Review • Environmental Science and Technology • International Journal of Sustainability in Higher Education • Journal of Applied Ecology • Journal of Cleaner Production • Land Use Policy • Management of Environmental Quality: An international journal • Resources, Conservation and Recycling •

We also proceeded with an internet search using the same keywords, and additionally scrutinised the following university networks:

Table 3.3 International networks linked to Sustainability at Higher Education Institutions

	Network	Website
International University Networks	Alliance for Global Sustainability	http://www.globalsustainability.org/
	Copernicus Alliance	http://www2.leuphana.de/copernicus/
	International Sustainable Campus Network	http://www.international-sustainable-campus-network.org/
	OIKOS International – students for sustainable economics and management	http://www.oikos-international.org/
	University Leaders for a Sustainable Future	http://www.ulsf.org/index.html
Country specific networks	EMAS Deutschland (Germany)	http://www.emas.de/
	EMAS– Verbaende –Hochschulen (Germany, contact list provided by the national EMAS advisory board for Higher Education Institutions)	http://www.emas.de/service/adressen-links/verbaende-hochschulen/
	Gruene Uni ("Green University", Germany; students initiatives for greening the campus)	www.grueni-uni.org
	HEEPI – Higher Education Environmental Performance Improvement (United Kingdom)	http://www.heepi.org.uk/
	Klimagerechte Hochschule ("Climate-friendly University", Germany)	http://www.klimagerechte-hochschule.de/
	The environmental association for universities and colleages (United Kingdom)	http://www.eauc.org.uk/home
	The Green League (United Kingdom)	http://peopleandplanet.org/greenleague
	Times Higher Education Sustainability Award (United Kingdom)	http://www.timeshighereducation.co.uk/

We contacted as well approximately 25 institutions (universities, public authorities like environmental ministries, the main EMAS Help Desk in Brussels as well as country specific EMAS held desks) to look for further universities with an EMS.

We restricted the research to member-states of the European Union; however, we included one institution from Norway and two institutions from Switzerland we had found in this stage. As the data was of interest for our research topic, we decided to use them, even though these countries are not EU member-states.

We refined our search by verifying each institution's web pages and completed our data base by selecting the following data:

i) university profile (institution's name, location (European sub region and country), institution's size (number of students enrolled))
ii) the EMS type implemented at the campus
iii) contact persons (environmental officers, sustainability coordinators, researchers, etc)

We found a large amount of data about universities in the United Kingdom, where a national wide ranking for environmental performance of Higher Education Institutions – the People & Planet Green League – is applied every year to universities. In 2010, 133 universities have been ranked according to their environmental performance and, within these, 43 universities apparently use "Environmental Auditing" and "Student and Staff Engagement" (People & Planet 2011). Furthermore, the British EcoCampus register lists 30 universities that have obtained an EcoCampus Award (EcoCampus 2011). In order not to concentrate our research too much on the British universities' landscape, we did not refine our search to collect the data i-iii for all universities listed in the Green League Table or in the EcoCampus register, but collected these data only for some British universities with an EMS we had identified before during the literature review. However, we have considered these circumstances when analysing the region-specific data.

At this stage, we identified in total 47 universities fulfilling the sample requirements.

3.3. Second data compilation - Internet-mediated questionnaire

The purpose of the second data compilation was to verify the respective data i) University profile, ii) EMS type used and iii) Contact person for EMS (Table 3.1, p. 32) and further to collect the following data:

iv) extension of EMS implementation (partial or complete implementation and with or without certification)
v) motivation to implement an EMS at the campus

vi) implementation approach (top-down vs. participatory approach)

vii) levels of participation according the table of the International Association for Public Participation (IAP2)[4]

viii) Sustainability measurement at the campus (sustainability reports, audits etc.)

ix) Communication about activities

For the second data compilation, we developed an internet-mediated questionnaire with cross-sectional survey design (see annex I.1 for complete questionnaire) according to our research topics and research questions, mentioned in chapter 1.3, and sent it to all samples found at the previous stage.

In Table 3.4, we relate our research questions to the corresponding questions in the questionnaire.

Table 3.4 Research questions and corresponding questions in the questionnaire

1st Research topic	*Analysis of EMS implementation processes realized at universities around Europe in order to obtain an overview about the state of current practices*
Research question	**Related question in the questionnaire**
Which universities in Europe have implemented an EMS at the campus?	Question 1: Name of University
What types of EMS have been used in European universities?	Question 1.1 and 1.2.: Please specify the type(s) of the EMS implemented (you can choose one or more)
What are the drivers to implement an EMS at the campus?	Question 2: On a scale for 1-5, how important are the following reasons and motivations that led to the decision to carry out an EMS at the university (1= not important at all, 5= very important) • Social and environmental awareness / responsibility • Reduce institutional consumption patterns • Greening the institution's image • Research interest • Financial supports / funding • Open field to add further reasons / motivations

[4] The International Association for Public Participation (IAP2) divides participation processes into 5 levels of participation: TO INFORM – TO CONSULT – TO INVOLVE – TO COLLABORATE – TO EMPOWER (International Association for Public Participation 2007), see Figure 1.2, p.10.

Research question	**Related question in the questionnaire**
Implementation process with vs. without certification – how important is the final certification?	Question 3.a and 3.b: Did the university opt for a. Carrying out the EMS process in order to achieve a final certification b. Carrying out the EMS process without a final certification If you ticked 3.a, please specify the reasons. If you ticked for 3.b, please specify the reasons
2nd Research topic	*Top-down versus participatory approaches within an EMS implementation process*
Research question	**Related question in the questionnaire**
Which approach did the universities opt for – top-down vs. bottom-up approach? *How and at which levels have the universities' communities (students and staff) been involved?*	Question 4: Did the university follow a. A top-down approach b. A participatory approach Other Question 4.1 to 4.4: If you ticked 3.b please specify the level of participation *(The following list of activities and methods follows the table of the International Association for Public Participation (IAP2) that divides the participation processes into 5 levels of participation: To inform – To consult – To involve – To collaborate – To empower (source: www.iap2.org)*). You can choose none, one or more answers) Question 4.1. Participation level 1 - To inform a. Campaigns b. Info session, public meetings c. Website d. Reports Other Question 4.2. Participation level 2 – To consult a. Appreciative Inquiries b. Questionnaires / Surveys c. Online forums / Virtual platforms Other Question 4.3. Participation level 3 – To involve a. Round tables b. Open forums c. Workshops d. Thematic weeks e. Conferences f. Work groups on specific topics Other

Research question	**Related question in the questionnaire**
	Question 4.4. Participation level 4 +5 To collaborate & to empower a. Special training for staff and students b. Projects within one department c. Interdisciplinary or interdepartmental projects d. Projects with stakeholders / surrounding society (neighborhood, city etc.)
3rd Research topic	*Universities' sustainability measurement and communication about their campus initiatives*
Research question	**Related question in the questionnaire**
How do universities measure sustainability at the campus?	How does the university measure its sustainability at the campus? You can choose one or more answers: a. Annual sustainability report, that follows the GRI guidelines (Global Reporting Initiative) b. Annual sustainability report that follows another structure than the GRI guidelines c. Regular internal audits d. Regular audits within the certification process
How do universities communicate about the activities related to their EMS and to sustainability initiatives at the campus?	How do you communicate about your activities related to the EMS and to sustainability at the campus? a. Web page b. Newsletter c. Reports d. Open days Other
n/a	If you wish, please add your further observations, remarks or comments here

This questionnaire was published via Google docs, and was easily accessible by a web link. We prepared a personalised mailing (see annex I.2) with a short introduction text about our research and a link to the questionnaire. We sent our request to participate in the survey by e-mail to all contact persons (environmental managers, sustainability officers, etc.) identified at the previous stage.

We contacted in total 47 higher education institutions identified during the first data compilation.

3.4. Data Analysis

We have followed a descriptive statistic analysis, using Excel and SPSS for data treatment. For visualizing geographical related data, we developed maps used by permission of the programme Stepmaps.

Since our study can be described as a census investigation that aims to give a general overview about the current state of EMS implementation processes and practices, it is not designed for generalization as the samples group is relatively small, not homogenously distributed and the variables are mainly of nominal and ordinal character (non-probability sampling). The statistical analysis is therefore limited to univariate and bivariate techniques. The variables have been tested to parametric and non-parametric correlations. We used the coefficient Cramer's V for nominal variables, and coefficient Kendall-tau$_b$ and Spearman for nominal / ordinal variables (Hill *et al.* 2009). Due to the small number and the non-homogeneous distribution of cases, we excluded the independent chi-square test and acknowledge that the results for correlations are narrow.

We divided the data obtained into two samples groups according to the first and second data compilation in order to facilitate the reading of the results and to handle better missing data. We resume the specific variables for each samples group below:

Samples Group A

The first samples' group encompasses all European higher education institutions identified with an EMS at the campus (first data compilation) and consists of 47 institutions in total. The variables of this sample group and the respective level of measurement are i) the institution's name, location (European sub region and country; *nominal level*), ii) university's size (number of students enrolled; *ratio level*) and the EMS type implemented (*nominal level*). These variables allow conducting descriptive statistical analyses, like frequencies, cross tabulation and non-parametric correlation in order to answer partly our first research point:

- Distribution of universities that have implemented an EMS at the campus
- Distribution of EMS types (ISO 14001, EMAS, non-formal EMS) implemented
- Relation between institution's size and the EMS type chosen

- Relation between the European sub region (Eastern, Northern, Southern and Western Europe) and the EMS type chosen

Samples Group B

The second samples' group encompasses all institutions from Group A that have responded to our internet-mediated questionnaire (second data compilation) and consists of 35 institutions in total. The variables and the respective level of measurement are:

- University's profile (name, size, location); *nominal, ratio and ordinal level*
- EMS type implemented; *nominal level*
- Drivers for implementing an EMS at the campus; *ordinal level*
- Implementation approach (top-down vs. participatory approach), *nominal level*
- Activities and methodologies used at different participation levels, *nominal level*
- Measurement procedures for Campus sustainability, *nominal level*
- Communication tools; *nominal level*
- Degree of participation*; ordinal level*

According to the characteristics of these variables, we conducted the following analyses.

- Frequencies of drivers for implementing an EMS and bivariate analysis (Kendall-tau$_b$ and Spearman coefficients) to test correlations between different drivers
- Distribution of the implementation approaches: Top down vs. participatory approach
- Relation between implementation approach and EMS type chosen
- Relation between the EMS type and the institution's size
- Analysis of the different participation levels by developing a scale of participation and a degree of participation
- Relation between the degree of participation and the European sub regions (Eastern, Northern, Southern, Western)
- Relation between the degree of participation and the EMS type chosen

- Relation between the degree of participation and the institution's size (number of students enrolled)
- Frequency of measurement procedures for Campus sustainability
- Frequency of communication tools used about EMS at the campus

For the analysis of the participation levels, we had to transform nominal to ordinal data in order to obtain a scale for the degree of participation (*ordinal variable*). The objective was to measure the participatory performance according the five levels of public participation of the International Association of Public Participation – IAP2 (International Association for Public Participation 2007) and to relate it to other variables, which was only possible by having another ordinal variable.

In order to measure the institution's participatory performance, we developed an evaluation scale and attributed weighted scores based on the institution's answers. By attributing scores on performance, we have followed a similar methodology to the Green League that measures the environmental performance of universities in the United Kingdom (People & Planet 2011). In concrete, we counted the number of different types of activities the university had indicated to perform at each participation level and gave it a specific score. We gave higher scores for types of activities at an up-scale participation level according to the spectrum of participation of IAP2 (Figure 1.2, p.10): For example activities that allow students and staff involvement (participation level 3) weigh three times more than activities with passive participation. Activities that are geared to collaboration and empowerment are counted with weight factors 4 and 5, respectively. This calculation aligns with the IAP2' perception of a rising scale of public impact: Activities and techniques that allow the public to get involved and to collaborate are considered to be on a higher participation level than passive techniques, which are mainly used to inform or to consult. Activities that empower the participants have the highest public impact. Figure 3.1 shows the rising level of participation when interactive activities are used.

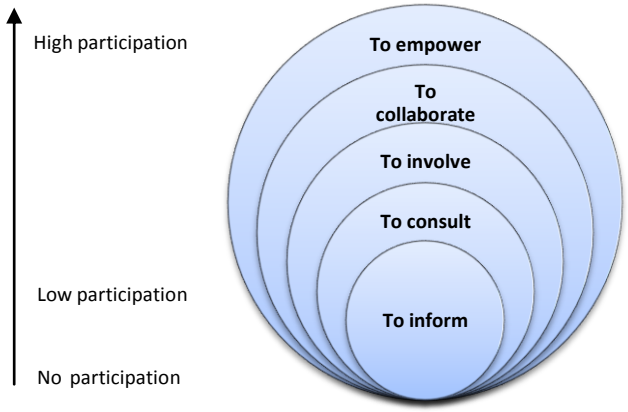


Figure 3.1 Level of participation related to the spectrum of public participation
Source: Adapted from International Association for Public Participation 2007

We aimed at reflecting this perception in our evaluation by scoring activities at an up-scale participation level higher than those of the first and second level (Table 3.5). At the end, we summed up all scores and related the final score to a scale of participation (Table 3.6).

Table 3.5 Evaluation of participatory performance

Participation Level 1: To inform (passive participation) Answers to choose from in the questionnaire: *Campaigns, Info Sessions, Public meetings, Website, Newsletter, Flyers, Reports, Other*	Simple weight (factor 1)
Analysis of responses	**Attributed score**
University does not indicate any activities at this level	0
University indicates ONE type of activity at this level	1

Analysis of responses *(continuation)*	**Attributed score**
University indicates TWO types of activities at this level	3
University indicates THREE types of activities at this level	4
University indicates FOUR OR MORE types of activities at this level	5
Participation Level 2: To consult (passive participation) Answers to choose from in the questionnaire: *Appreciative inquiries, questionnaires, surveys, online forums / platforms, Other*	Simple weight (factor 1)
Analysis of responses	**Attributed score**
University does not indicate any activities at this level	0
University indicates ONE type of activity at this level	2
University indicates TWO types activities at this level	4
University indicates THREE OR MORE types of activities at this level	5
Participation Level 3: To involve (interactive participation) Answers to choose from in the questionnaire: *Round tables, Open forums, Workshops, Thematic weeks, Conferences, Work group on specific topics, Other*	Weighted score (factor 3)
Analysis of responses	**Attributed score**
University does not indicate any activities at this level	0
University indicates ONE type of activity at this level	6
University indicates TWO types of activities at this level	9
University indicates THREE types of activities at this level	12
University indicates FOUR OR MORE types of activities at this level	15
Participation Level 4: To collaborate (interactive participation) Answers to choose from in the questionnaire: *Special training, Curricula related activities, Other*	Weighted score (factor 4)
Analysis of responses	**Attributed score**
University does not indicate any activities at this level	0
University indicates ONE type of activity at this level	8

University indicates TWO OR MORE types of activities at this level	16
Participation Level 5: To empower (interactive participation) Answers to choose from in the questionnaire: *Projects within one department, interdisciplinary projects, projects with stakeholders, Other*	Weighted score (factor 5)
Analysis of responses	**Attributed score**
University does not indicate any activities at this level	0
University indicates ONE type of activity at this level	10
University indicates TWO types of activities at this level	15
University indicates THREE OR MORE types of activities at this level	20
Max. score possible	61

Universities could get maximum five points at the first participation level; five points at the second level, 15 points at the third level, 16 points at the fourth level and 20 points at the fifth level, summing up to 61 points in total.

The scores have been related to a scale of five levels that define the degree of participation. As the scores run from 0 to 61, we have normalized them to a scale from 0-100. In Table 3.6 we link the scores to five degrees of participation:

Table 3.6 Scale for degree of participation

Scores *Scale 0-61*	**Scores** *(Normalized Scale 0-100)*	**Degree of participation**	
0-12	0-20	**1**	No participation or very low degree of participation
13-24	21-40	**2**	low degree of participation
25-36	41-60	**3**	intermediate degree of participation
37-48	61-80	**4**	high degree of participation
49-61	81-100	**5**	Very high degree of participation

We are aware that some activities or techniques can be grouped at different participation levels and that some techniques encompass several participation levels at

the same time. However, we have followed the suggestions of IAP2 and the concept of empowerment and citizen participation by Florin *et al.* (1990).

The new ordinal variable "degree of participation" permitted us to analyse relations to other variables, such as to the EMS type, to the implementation approach and to the European sub region.

Previously, we reflected on how to define the variable "European sub region" and pondered whether to use the UN Geoscheme (United Nations Statistic Division 2010) or to follow the geographic division of the World Factbook (CIA 2008) that divides Europe into eleven sub regions (the EU member states are located in only seven of these sub regions). The next maps show these differences more clearly:

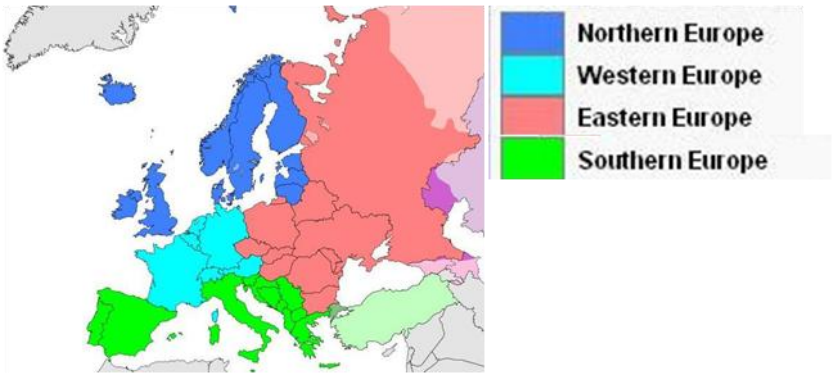


Figure 3.2 Europe according the UN GEO scheme
Source: Kolja 21 2009a

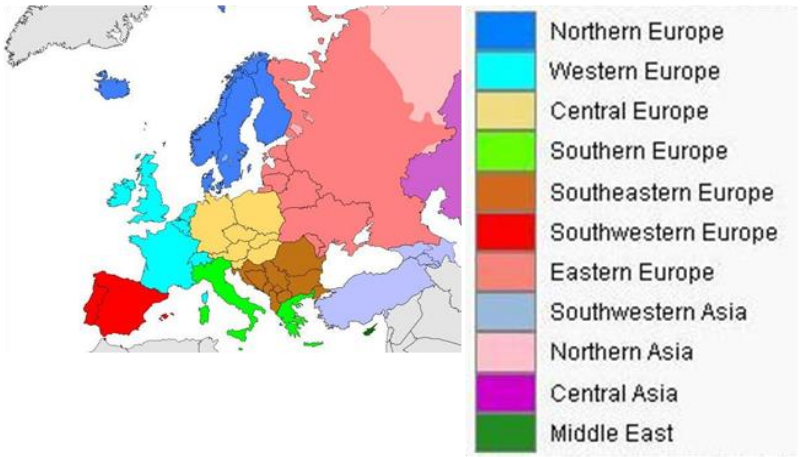


Figure 3.3 Europe according World Fact Book
Source: Kolja 21 2009b

We came to the conclusion to opt for the UN Geoscheme, because the data resulting from our survey (second data compilation) was found in eleven European

countries only and a division into seven sub regions would make the analysis too narrow and difficult to interpret. Nevertheless, we are aware that the countries in this study could be grouped differently and therefore present the different regional categories according to the UN Geoscheme and the World Fact Book (Table 3.7).

Table 3.7 Countries of this study according to UN Geoscheme and World Fact Book

country	**European sub region according UN Geo scheme**	**European sub region according World Fact book**
Austria	Western	Central
Denmark	Northern	Northern
France	Western	Western
Germany	Western	Central
Greece	Southern	Southern
Luxembourg	Western	Western
Poland	Eastern	Central
Portugal	Southern	Southwestern
Slovenia	Southern	Central
Spain	Southern	Southwestern
Sweden	Northern	Northern
United Kingdom	Northern	Western
Norway	Northern	Northern
Switzerland	Western	Central

This table makes clear, that Austria, Germany, Poland, Portugal, Slovenia, Spain, United Kingdom and Switzerland can belong to different geographic sub regions, depending on the scheme one follows. By opting for the UN Geoscheme we gave preference to a clearer presentation of the results and do not express any political attitude.

4. Results

4.1. Introduction

As we have two sample groups – (A) European universities with an EMS at the campus and (B) those institutions which answered to the survey -, we divided the results into the following sub sections:

First, we start in chapter 4.2 with the state of EMS implementation processes at European universities, considering all 47 universities that have been identified with an EMS at the campus. We will present a general analysis about the universities' profile – size and location – and about the EMS types implemented.

In chapter 4.3 we present the results of the survey, concentrating on the current practices within the EMS implementation processes at European campuses. We analyse the implementation area of the EMS (implementation at a specific department or faculty versus implementation at the whole institution), the drivers for implementing an EMS at the campus as well as the importance of the final certification. The focal point will be on the comparison of top-down and participatory approaches. In the last sub section, we examine the measurement and communication tools the universities use to measure sustainable development and to communicate about the EMS at the campus.

4.2. The state of EMS implementation processes – general analysis of the first data compilation

In this section, we demonstrate the results about the first sample group:

- Distribution of European universities with an EMS at the campus or that are in an EMS implementation process
- Distribution of EMS types (ISO 14001, EMAS, Non-formal EMS) implemented or in implementation process at European campuses

Our first sample group consists of 47 universities, at which the smallest institution has 350 students and the largest institution has 41,215 students enrolled (see annex for descriptive analysis, Table A. 1). We created a new ordinal variable by dividing the

number of students into three categories in order to measure the institution's size. We related the size of the institution to the respective country (Table 4.1.).

Table 4.1 Samples group A: Distribution of the Institution's size per country

Country	Size of the institution (number of students enrolled			*Total (N)*
	<10000 students	10001-20000 students	>20000 students	
Austria	1	1	0	2
Denmark	0	1	1	2
Germany	10	4	3	17
Greece	1	1	0	2
Poland	0	1	0	1
Portugal	1	0	0	1
Slovenia	0	0	1	1
Spain	0	0	3	3
Sweden	1	3	3	7
Switzerland	1	1	0	2
United Kingdom	1	0	5	6
Luxembourg	1	0	0	1
France	1	0	0	1
Norway	1	0	0	1
Total(N)	19	12	16	47
Total %	40	26	34	100

Our samples are from 14 different countries and the majority are institutions with less than 10,000 students enrolled (40,4%). Germany is the country with most universities identified with an EMS (17 institutions, 36,2%), followed by Sweden and the United Kingdom (seven institutions, 14,9%, and six institutions, 12,8%, respectively).

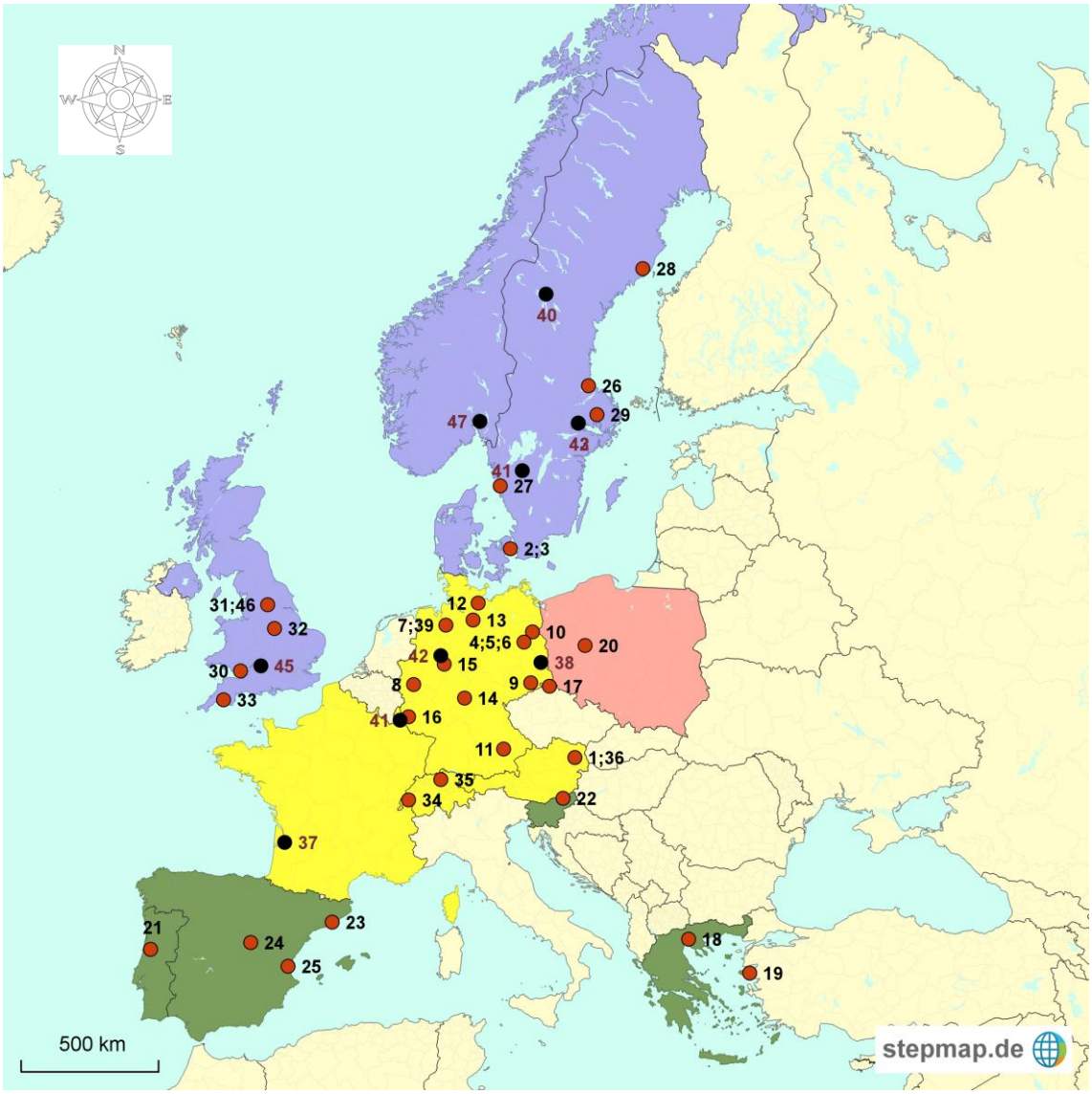
We related the institution's size to the types of EMS and can see (Table 4.2) that i) EMAS and ISO 14001 are the most often implemented systems; ii) EMAS has been mainly implemented in institutions with less than 10,000 students (58,8%), whereas iii)

ISO 14001 is equally distributed (31,3%, for small, 31,3% for medium and 37,5% for larger institutions). It is interesting to notice that six institutions have more than one system implemented: one university combines ISO 14001 with a non-formal EMS and five have implemented ISO 14001 and EMAS.

Table 4.2 Relation of the institution's size and type of EMS chosen

	Size of the institution (number of students enrolled)						Total	
	<10000 students		10001-20000 students		>20000 students			
	(N)	%	(N)	%	(N)	%	(N)	%
Non-formal EMS	3	37,5	1	12,5	4	50,0	8	100,0
ISO 14001	5	31,3	5	31,3	6	37,5	16	100,0
EMAS	10	58,8	3	17,6	4	23,5	17	100,0
ISO 14001 & Non-formal EMS	0	0	1	100	0	0	1	100,0
ISO 14001 & EMAS	1	20,0	2	40,0	2	40,0	5	100,0

In the map, Figure 4.1, we provide a geographical overview of the results: The countries' colours visualize the category of the UN Geoscheme, dividing them into four sub regions Eastern, Northern, Southern and Western Europe. We have spotted all universities identified with an EMS at the campus, and differentiated graphically between the 35 universities that have participated in the survey (blue bullets), and the 12 universities which have been identified during the literature review to have an EMS at the campus, but which did not respond to the questionnaire (grey bullets). On the next page, all institutions are listed in alphabetical order following (i) country, (ii) city, (iii) original institution's name (Table 4.3). The institution's name in English is indicated in brackets. Furthermore, we indicate the type of EMS that has been implemented at the respective institution.



Legend

●	Universities **with an EMS and** having participated in the survey (1-35)
●	Universities **with an EMS**, but not having responded to the questionnaire (36-47)
numbers	**see Table 4.3 about universities in this map**
	Eastern Europe
	Northern Europe
	Southern Europe
	Western Europe

Figure 4.1 European universities with an EMS at the campus
Source: Own elaboration; software by stepmap.de

Table 4.3 European Universities with an EMS at the campus

Country	City	Nr.	Name	EMS
Austria	Viena	1	Fachhochschule Wiener Neustadt fuer Technik und Witschaft (Austrian Marketing University of Applied Sciences)	ISO 14001+EMAS
Denmark	Copenhagen & Esbjerg	2	Aalborg Universitet (Aalborg University)	ISO 14001
	Copenhagen	3	Kobenhavns Universitet (University of Copenhagen)	Energy Management
Germany	Berlin	4	Freie Universitaet Berlin (FU Berlin)	ISO 14001
	Berlin	5	Hochschule fuer Wirtschaft und Recht Berlin (HWR) (Berlin School of Economics and Law)	ISO 14001
	Berlin	6	Technische Universitaet Berlin / Max-Volmer-Institut (TU Berlin)	EMAS
	Bremen	7	Universitaet Bremen (University of Bremen)	EMAS
	Cologne	8	Fachhochschule Koeln (University of applied sciences Cologne)	ISO 14001+EMAS
	Dresden	9	TU - Technische Universitaet Dresden (Technical University Dresden)	EMAS
	Eberswalde	10	Hochschule fuer nachhaltige Entwicklung Eberswalde (University of Applied Sciences Eberswalde)	EMAS
	Landshut	11	Hochschule fuer angewandte Wissenschaften Fachhochschule Landshut (University of Applied Sciences Landshut)	EMAS
	Luebeck	12	Fachhochschule Luebeck (University of Applied Sciences Luebeck)	EMAS
	Lueneburg	13	Leuphana Universitaet Lueneburg (Leuphana University Lueneburg)	EMAS
	Osnabrueck	14	Universitaet Osnabrueck (University of Osnabrueck)	similar to EMAS
	Paderborn	15	Universitaet Paderborn (University of Paderborn)	EMAS
	Trier	16	Umwelt-Campus Birkenfeld (FH Trier) (University of Applied Sciences Trier)	EMAS (in process)
	Zittau / Goerlitz	17	Hochschule Zittau / Goerlitz (University of applied Sciences Zittau/Goerlitz)	EMAS
Greece	Thessaloniki	18	Πανεπιστήμιο (University of Macedonia)	EMAS
	Mytilene	19	ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΙΓΑΙΟΥ (University of the Aegan)	ISO 14001+EMAS
Poland	Poznan	20	Uniwersytet Ekonomiczny w Poznaniu (University of Economics Poznan)	EMAS
Portugal	Coimbra	21	Instituto Politécnico de Coimbra - Escola Superior Agrária de Coimbra (IPC - Politechnic Institute of Coimbra, ESAC)	EMAS (suspended)
Slovenia	Maribor	22	Univerza v Mariboru (University of Maribor)	Life Cycle Assessment
Spain	Barcelona	23	UPC - Universitat Politècnica de Catalunya (Barcelona Tech (UPC))	ISO 14001 in process
	Madrid	24	Universidad Autónoma de Madrid (UAM - Autonomous University of Madrid)	Oficina Ecocampus
	Valencia	25	Universidad Politecnica de Valencia (UPV - Polytechnical University Valencia)	ISO 14001+EMAS

Country	City	Nr.	Name	EMS
Sweden	Gävle	26	Högskolan i Gävle (University of Gävle)	ISO14001
	Gothenborg	27	Goeteborgs Universitet (University of Gothenburg)	ISO 14001+EMAS
	Umea	28	Umeå universitet (Umea University)	ISO 14001 in process
	Uppsala	29	Sveriges Lantbruksuniversitet (Swedish University of Agricultural Sciences)	ISO 14001 at some departments
United Kingdom	Cardiff-Pontypridd	30	University of Glamorgan	ISO 14001
	Leeds	31	Leeds Metropolitan University	ISO 14001
	Nottingham	32	Nottingham Trent University	EcoCampus
	Plymouth	33	University of Plymouth	ISO 14001
Switzerland (non EU)	Lausanne	34	École Polytechnique Fédérale de Lausanne (EPFL)	RUMBA
	Zuerich	35	ETH Eidgenoessische Technische Hochschule Zuerich (Swiss Federal Institute of Technology Zurich)	ISO 14001 + RUMBA
Austria	Vienna	36	Universitaet fuer Bodenkultur Wien (University of Natural Resources and Life Sciences, Vienna)	EMAS
France	Bordeaux	37	Université de Bordeaux 1 (University of Bordeaux)	EcoCampus
Germany	Bielefeld	38	Universitaet Bielefeld (University of Bielefeld)	ISO 14001
	Bremen	39	Hochschule Bremen (University of applied sciences Bremen)	EMAS
	Cottbus	40	Brandenburgische Technische Universitaet Cottbus (Brandenburg University of Technology Cottbus)	EMAS
Luxembourg	Luxembourg	41	Université du Luxembourg (University of Luxembourg)	Non-formal EMS in process
Sweden	Bispgården	42	Former department of Mittuniversitetet (Mid Sweden University)	EMAS at one department
	Boras	43	Hogskolan i Boras (University of Boras)	ISO 14001 in process
	Västerås	44	Mälardalen University (Mälardalen University)	ISO14001
United Kingdom	Gloucestershire	45	University of Gloucestershire	ISO 14001
	Leeds	46	University of Leeds	Similar to ISO 14001
Norway (non EU)	Aas	47	UMB - Universitetet for miljø- og biovitenskap (Norwegian University of Life Sciences)	ISO 14001

Note: See annex for institutional contacts

In Table 4.3, we identify the six universities with more than one EMS at the campus, which are:

- Austrian Marketing University of Applied Sciences, Austria (ISO 14001 + EMAS)

- Swiss Federal Institute of Technology Zurich, Switzerland (ISO 14001 +RUMBA)
- University of Applied Sciences Cologne, Germany (ISO 14001 + EMAS)
- University of Gothenburg, Sweden (ISO 14001 + EMAS)
- University of the Aegan, Greece (ISO 14001 + EMAS)
- UPV - Polytechnical University Valencia, Spain (ISO 14001 + EMAS)

Furthermore, five universities are at the time of this study in an implementation process:

- Umea University, Sweden (ISO 14001)
- University of Applied Sciences Trier, Germany (EMAS)
- University of Boras, Sweden (ISO 14001)
- University of Luxembourg, Luxembourg (Non-formal EMS)
- UPC – Barcelona Tech, Spain (ISO 14001)

One university, IPC – Politechnic Institute of Coimbra and its agricultural school ESAC, has meanwhile suspended the EMAS at the campus of its agricultural school[5].

In the next step, we have counted all EMS (implemented and in implementation process) and grouped them according to the respective European sub region. As six universities have more than one system implemented, the total number of EMS is 53. We highlight the distribution of EMS at European campuses per sub region: almost 50% of universities are located in Western Europe (26 systems), a third in Northern and a little less in Southern Europe (17 systems, 32%, and 9 systems, 17%, respectively). In Eastern Europe we discover just the one system (2%) (Figure 4.2).

[5] The implementation of EMAS at the agricultural school ESAC of IPC was a three years EU-financed Life project. The university informed that due to a broad participatory approach and a lack of human resources the final certification could not be achieved within the project timeline. As there was no further funding, the EMS was not developed further, resulting in its suspension. As ESAC's experience is of interest for our study, we included them in our further analysis.

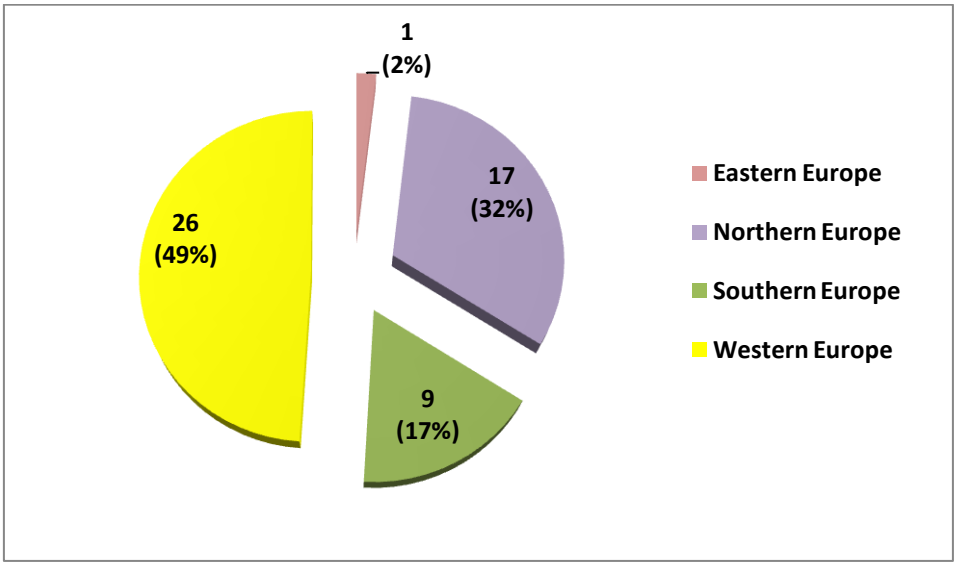


Figure 4.2 Distribution of EMS at the campus per European region

Although most EMS implementations were found in Western Europe, we should take into account that a high number of universities with a formal and non-formal EMS have been identified in the United Kingdom by the Green League 2010 (People & Planet 2011) and the register of EcoCampus (EcoCampus 2011). For a more detailed panorama about EMS in British universities, we would like to refer to these studies.

Looking at the different types of EMS and considering how often they have been implemented, we can onserve that EMAS is slightly more represented than ISO 14001: EMAS is implemented in 22 institutions (41%) and ISO 14001 is implemented in 21 institutions (40%), whereas non-formal EMS are implemented in 10 institutions (19%) (Figure 4.3).

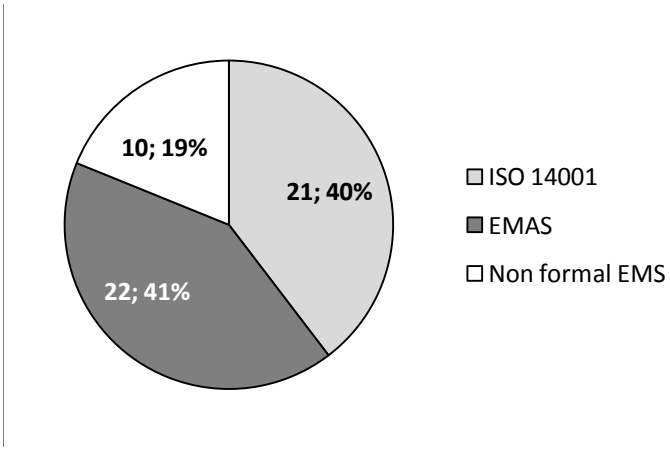


Figure 4.3 Distribution of EMAS, ISO 14001 and non-formal EMS at European universities

The majority of the universities have opted for a formal EMS and only 19% have chosen a non-formal EMS, however, in this context it is wothwhile to verify the number of certification, which is analysed in chapter 4.3.3, p. 61.

Examining the distribution of a specific EMS type per European region, it is interesting to see that ISO 14001 is more represented in Northern Europe (12 institutions), whereas EMAS is more dominant in Western Europe (15 institutions) (Figure 4.4).

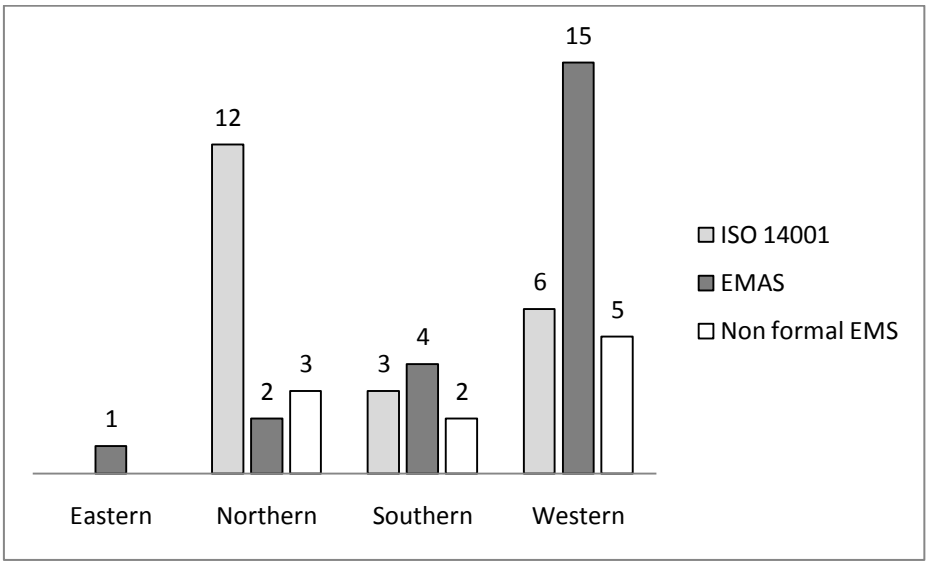


Figure 4.4 Distribution of EMAS, ISO 14001 and non-formal EMS at European universities per sub region

We resume the most important results from this section: i) 47 universities in Europe have been identified to have an EMS at the campus, from which five are at the time of this study in implementation process, ii) the majority of the institutions counts for less than 10000 students enrolled; iii) most universities are from Western Europe and with Germany being the most represented country; iv) EMAS is more implemented in institutions with less than 10,000 students whereas ISO 14001 has been identified almost equally in small (<10000 students), intermediate (10001-20000 students) and large (>20000 students) institutions; v) EMAS and ISO 14001 are almost equally distributed in Europe, but vi) EMAS is more dominant in Western and ISO 14001 more in Northern Europe.

4.3. The state of current practices within EMS implementation processes – survey analysis

4.3.1. Introduction

In this section, we deliver the results of the internet-mediated questionnaire. The survey was sent to 47 universities presented in the previous chapter, and 35 institutions (74,5%) answered the questionnaire.

We start with a brief description of the samples and continue subsequently in separate sections to analyse

- The implementation area of an EMS (EMS implementation at a specific department or faculty versus EMS implementation at the whole institution, chapter 4.3.2
- The importance of the final certification, chapter 4.3.3
- The drivers for carrying out an EMS, chapter 4.3.4
- Top-down versus participatory approaches, chapter 4.3.5
- Measurement and Communication tools for Sustainable Development, chapter 4.3.6

Analogously to the previous section, we characterize our samples by the size of institutions, based on the number of students enrolled. Our group consists of 35 universities, at which the smallest institution has 350 students and the largest institutions 41,215 students enrolled (see annex, Table A. 2).

The universities are from 11 different countries, being Germany the country with most universities (14 institutions, 40%) represented in this study, followed by Sweden and the United Kingdom (4 institutions, 11,4% each) (Table 4.4.).

Table 4.4 Number of universities represented in the study per country

Countries	**Region according UN Geoscheme**	**Universities per country**	**Percent**
Austria	Western	1	2,9
Denmark	Northern	2	5,7
Germany	Western	14	40,0
Greece	Southern	2	5,7
Poland	Eastern	1	2,9
Portugal	Southern	1	2,9
Slovenia	Southern	1	2,9
Spain	Southern	3	8,5
Sweden	Northern	4	11,4
Switzerland	Western	2	5,7
United Kingdom	Northern	4	11,4
		35	**100**

Associating the size of the institutions to the country, we obtain a slightly different image to the previous samples' group: The distribution of smaller and larger institutions with an EMS is almost equal (13 and 14 institutions, respectively), whereas in the previous samples group the majority consisted of smaller institutions with less than 10,000 students (19 institutions) (Table 4.5 to Table 4.1.).

Table 4.5 Samples group B: Institution's size per country

Country	Size of the institution (number of students enrolled			*Total (N)*
	<10000 students	10001-20000 students	>20000 students	
Austria	1	0	0	1
Denmark	0	1	1	2
Germany	8	3	3	14
Greece	1	1	0	2
Poland	0	1	0	1
Portugal	1	0	0	1
Slovenia	0	0	1	1
Spain	0	0	3	3
Sweden	1	1	2	4
Switzerland	1	1	0	2
United Kingdom	0	0	4	4
Total(N)	13	8	14	35
Total %	37	23	40	100

In Table 4.6 we relate the type of EMS to the country, and similarly to the previous section, we see that i) EMAS is the most implemented system in our samples group (18 institutions; 51,4%), ii) ISO 14001 has been implemented mainly in Northern Europe (Denmark, Sweden and United Kingdom), whereas EMAS was mainly implemented in institutions from Western Europe (Austria and Germany). Six universities have more than one system implemented.

Table 4.6 EMS type and country

	EMS type					Total (N)
	Non-formal EMS	ISO 14001	ISO 14001 & Non-formal EMS	EMAS	ISO 14001 & EMAS	
Austria	0	0	0	0	1	1
Denmark	1	1	0	0	0	2
Germany	1	3	0	9	1	14
Greece	0	0	0	1	1	2
Poland	0	0	0	1	0	1
Portugal	0	0	0	1	0	1
Slovenia	0	0	0	1	0	1
Spain	1	1	0	0	1	3
Sweden	0	3	0	0	1	4
Switzerland	1	0	1	0	0	2
United Kingdom	1	3	0	0	0	4
Total (N)	5	11	1	13	5	35

In this group of 35 universities, those which are still in an EMS implementation process are: University of Applied Sciences Trier, Germany, UPC – Barcelona Tech, Spain, and to Umea University, Sweden.

IPC – Politechnic Institute of Coimbra, which has meanwhile suspended the EMAS at its agricultural school ESAC, has participated in the survey and the data have therefore been considered, as explained earlier.

4.3.2. Implementation area

In this section we analyse the implementation area of the EMS at the campus, i.e. whether the EMS was implemented only (a) at specific(s) department(s) or faculties or (b) at the whole university. According to the answers of the 35 survey participants, we note that 23 institutions applied the EMS to the whole university (66%), and just nine implemented the EMS at a specific department or faculty (26%) (Figure 4.5).

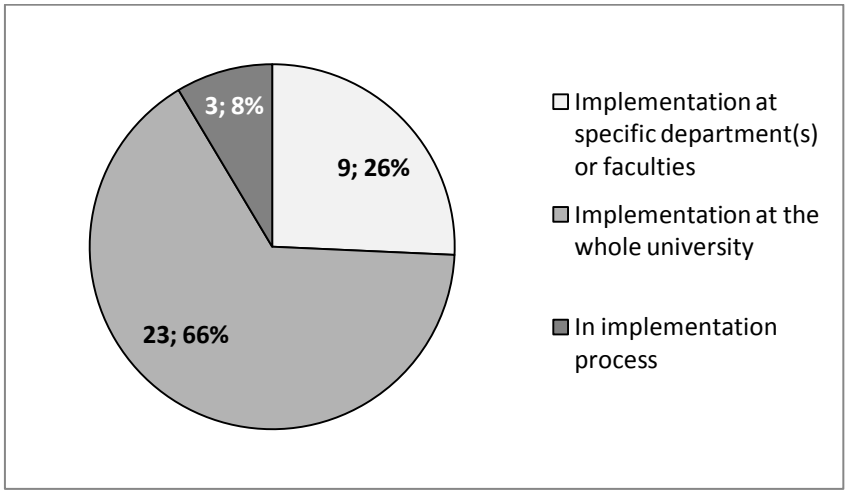


Figure 4.5 Implementation area of an EMS at the campus

Within this analysis of the implementation areas, we emphasize the distribution of the different EMS types for each group (Figure 4.6).

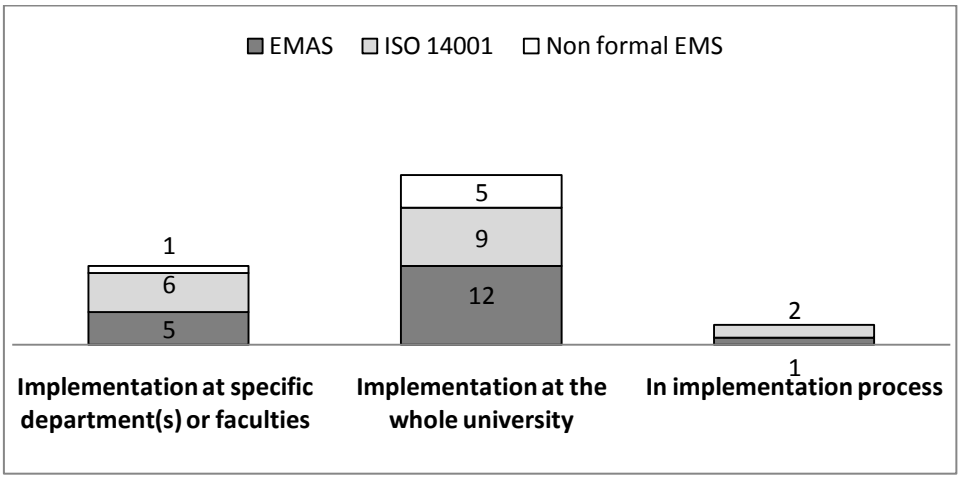


Figure 4.6 EMS types according to the respective implementation area

The number of institutions that have EMAS or ISO 14001 implemented at a specific department or faculty are almost identical (five and six institutions). Among those universities with an EMS at the whole institution, we can see that the number of EMAS is slightly superior to ISO 14001 (12 and 9 institutions, respectively). Three institutions are still in implementation processes, i.e. two are implementing ISO 14001 and one is implementing EMAS.

We tested both variables for non-parametric correlation at a level of 5% significance and obtained a very low level of association, statistically insignificant (crv

= 0,33 and p> 0,05). As the number of cases is small, we can therefore not identify a concrete relation between EMS type and the implementation area.

We resume the results of this section: i) the majority of the universities (66%) implemented the EMS at the whole institution and ii) EMAS was slightly more represented in this group than ISO 14001 (12 institutions compared to nine institutions); iii) a relation between the implementation area and the EMS type could statistically not be confirmed, and the level of association is very low due to the reduced number of cases.

4.3.3. The importance of the final certification

Next, we study the number of institutions that have chosen to implement the EMS with and without a final certification. As the universities that are currently in an implementation process have answered to this question, indicating their choice for or against a final certification, we included them in this analysis. One institution did not answer to this question (see annex, Table A. 3).

In Figure 4.7 we can observe that 71% of our samples – these are 25 universities – have opted to implement the EMS with a final certification.

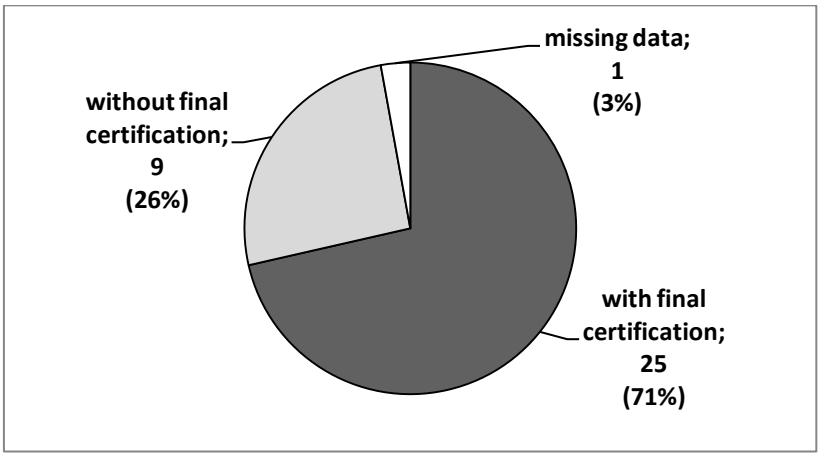


Figure 4.7 Universities' EMS with final vs. without final certification

We have broken down the data to the different EMS types – EMAS, ISO 14001 and non-formal EMS, counting the number of EMS implemented and in implementation process. In Figure 4.8, we can see that in our samples group the number of certifications

for either EMAS or ISO 14001 is equal: In 14 cases, EMAS as well as ISO 14001 are implemented or going to be implemented with a final certification.

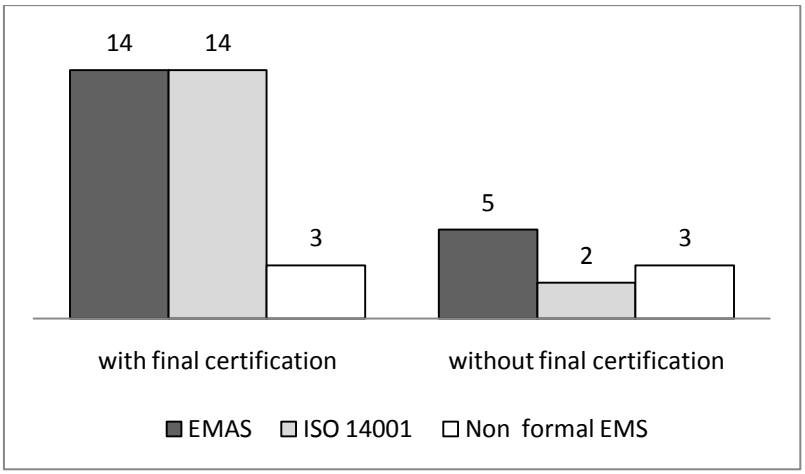


Figure 4.8 EMS type and status of certification

Note: As six universities have two systems implemented, the total number of EMS implementation is 41

When opting for a formal EMS like EMAS or ISO 14001, most universities in our study proceeded until the final certification. With respect to EMAS, only five institutions decided against or did not obtain the final certification, and with respect to ISO 14001 only in two cases the final certification was not achieved or not considered.

We tested the level of association between the variables *institution's size* and *certification* and obtained Cr V = 0,21, p> 0,05 and can therefore not confirm a relation between these two variables.

We hereby resume that i) the majority of our samples opted for a final certification (71%); ii) EMAS and ISO are equally often certified and therefore iii) within the range of our samples the certification is not related to the institution's size.

4.3.4. Drivers for implementing an EMS at the campus

After having analysed some general aspects about EMS at European universities, we will investigate more in detail the motivations that led the universities to implement an EMS at the campus.

In the questionnaire, the participant could classify five drivers on a scale from 1 (not important at all) to 5 (very important) that led to the decision to implement an EMS at the campus. Further reasons / motivations could be added in an open text field. We started calculating the average for each driver (Figure 4.9 and annex for descriptive statistics,Table A. 4).

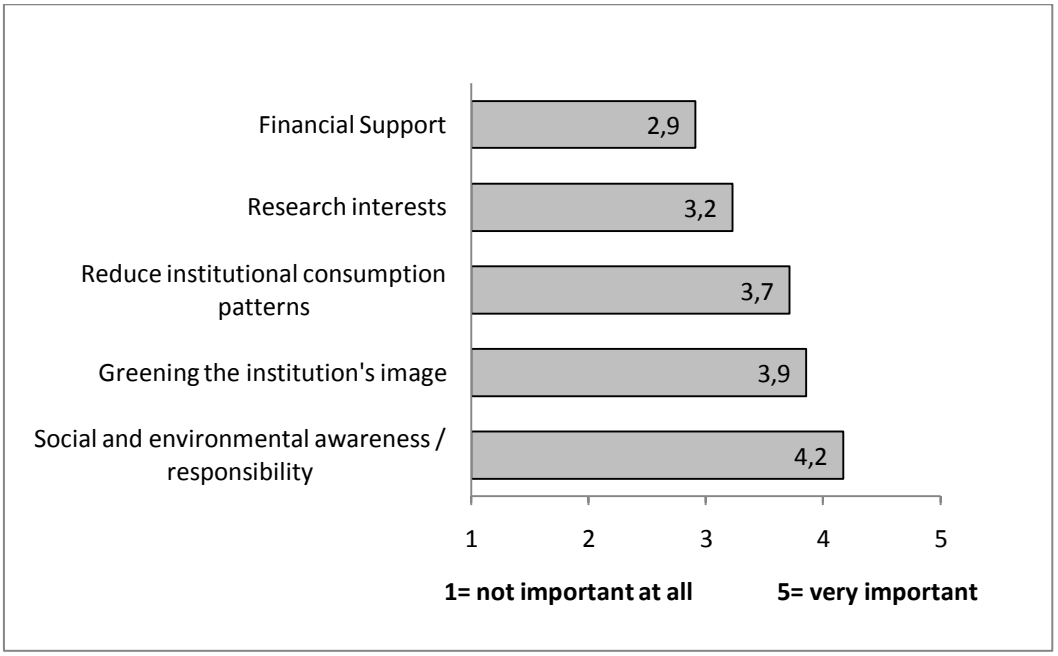


Figure 4.9 Drivers for EMS – mean values

The driver *"Financial support / funding"* has the lowest mean (2,91 of 5) and the driver *"Social and environmental awareness / responsibility"* has the highest mean (4,2 of 5). Inferentially, we can say that *financial support* was in average considered to be the least important driver whereas "S*ocial and environmental awareness / responsibility"* was in average considered to be the most important driver to implement an EMS.

We opted for a bivariate analysis to test the correlation between the different drivers. We used the correlation coefficients Kendall-tau$_b$ (τ) and Spearman (ρ), as the answers have been given on an ordinal scale of five points[6]. From the results (summarized in

Table 4.7), we can conclude that there is a relatively moderate correlation between the drivers "*Greening the institution's image"* and *"Social and environmental*

[6] We excluded the independent chi-square test as our samples are not homogenously distributed.

awareness" (τ=0,48 and ρ= 0,51) and between the drivers *"Reduce institutional consumption patterns*" and "*Social and environmental awareness"* (τ=0,45 and ρ=0,51). A less strong moderate can be observed between the drivers *"Research interest"* and *"Greening the institution's image"* (τ=0,30 and ρ= 0,36).

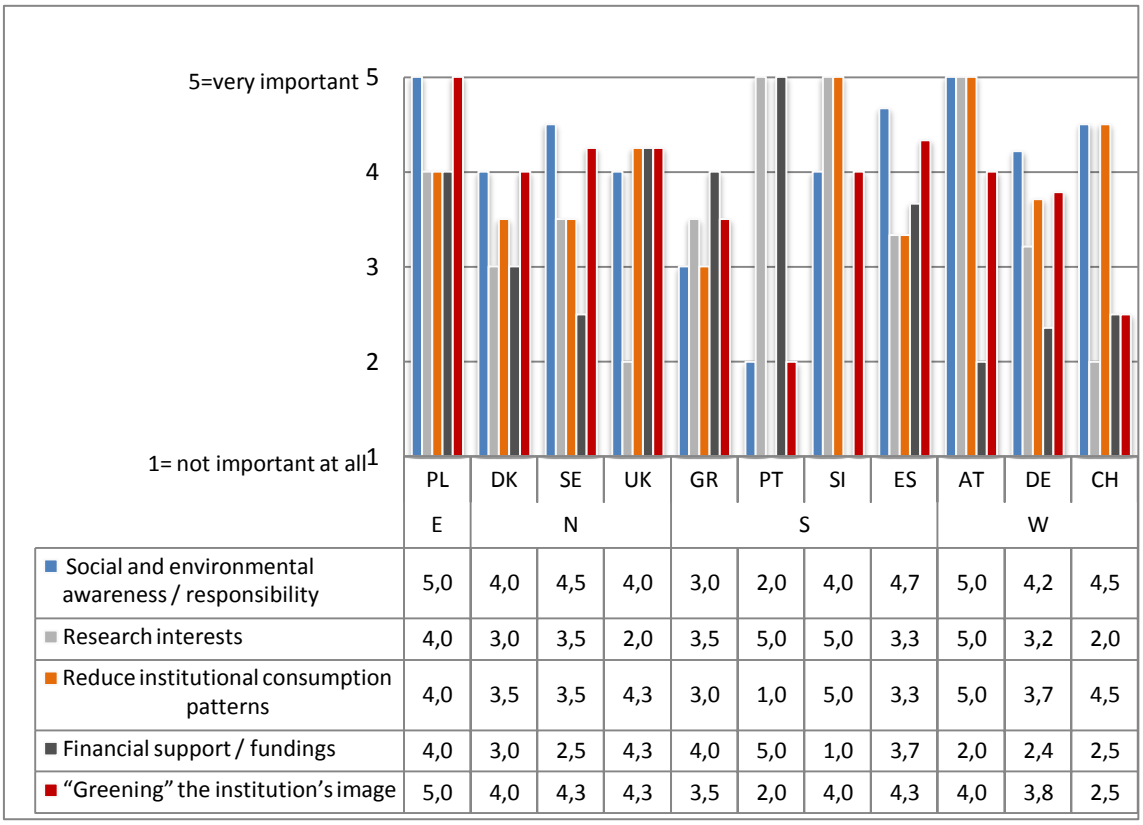
Table 4.7 Correlations between drivers for implementing a EMS at the campus

	"Greening" the institution's image		Financial support / funding		Reduce institutional consumption patterns		Research interests		Social and environmental awareness / responsibility	
	τ	ρ	τ	ρ	τ	ρ	τ	ρ	τ	ρ
"Greening" the institution's image	1,00	1,00	0,27	0,23	0,27	0,31	0,30*	0,36*	0,48**	0,51**
Financial support / funding	0,23	0,27	1,00	1,00	0,14	0,16	0,10	0,26	-0,02	-0,02
Reduce institutional consumption patterns	0,27	0,31	0,14	0,16	1,00	1,00	0,19	0,21	0,45**	0,51**
Research interests	0,30*	0,36*	0,10	0,12	0,19	0,21	1,00	1,00	0,23	0,27
Social and environmental awareness / responsibility	0,48**	0,51**	-0,02	-0,02	0,45**	0,51**	0,23	0,27	1,00	1,00

Note: * p<0,05 Correlation is significant at the 0,05 level (2-tailed)
** p<0,01 Correlation is significant at 0,01 level(2-tailed)

For the next step, we grouped the results per European region and per country, in order to compare the average values of each country and to identify main similarities or differences (Figure 4.10). We selected the average values for each driver per country represented in this study. It becomes clear that the motivations for implementing an EMS are highly heterogeneous. For example, the Portuguese, Slovenian and Austrian institutions consider research interest as a *very important* driver whereas those from the U.K. and Switzerland do not give high value to it. For the Slovenian and Austrian universities it is *very important* to reduce the institutional consumption patterns, but for

the Portuguese institution this driver is *not important at all*. Greening the institution's image is *very important* for the Polish university and *important* for the Danish, Swedish, British, Slovenian, Spanish and Austrian universities, but less important for the Portuguese and Swiss institutions.



	PL	DK	SE	UK	GR	PT	SI	ES	AT	DE	CH
	E	N			S				W		
Social and environmental awareness / responsibility	5,0	4,0	4,5	4,0	3,0	2,0	4,0	4,7	5,0	4,2	4,5
Research interests	4,0	3,0	3,5	2,0	3,5	5,0	5,0	3,3	5,0	3,2	2,0
Reduce institutional consumption patterns	4,0	3,5	3,5	4,3	3,0	1,0	5,0	3,3	5,0	3,7	4,5
Financial support / fundings	4,0	3,0	2,5	4,3	4,0	5,0	1,0	3,7	2,0	2,4	2,5
"Greening" the institution's image	5,0	4,0	4,3	4,3	3,5	2,0	4,0	4,3	4,0	3,8	2,5

Figure 4.10 Drivers for EMS per country (mean values)

Due to the small size of our samples group, we cannot generalize these observations to national level, but we tried to identify eventual specific trends for the European sub regions by analysing the data in more detail.

We decided to have a closer look at the two outstanding drivers, namely the driver *"Social and environmental awareness / responsibility"* as it was rated in average with the highest value (4,2 from 5), and the driver *"Financial support / funding"* with the lowest average value (2,9 from 5). To do so, we chose to count the number of respondent for the values 4 and 5 (important and very important) for each country. In Table 4.8 we show the countries that have considered the driver *"Social and environmental awareness/responsibility"* as *important (value 4)* or *very important (value 5)*, relating the number of respondent to the total number of institutions of the respective country.

Table 4.8 Countries with high-ranking for "Social and environmental awareness/responsibility"

Country	Value 4 (important)	Value 5 (very important)	Total universities (%)[(a)]
Austria	0	1	100%
Denmark	2	0	100%
Germany	3	8	79%
Greece	0	1	50%
Poland	0	1	100%
Slovenia	0	1	100%
Spain	1	2	100%
Sweden	2	2	100%
Switzerland	1	1	100%
United Kingdom	0	2	50%
total	**9**	**19**	**80%**

[(a)]*ratio between the analysed samples and total number of universities*

We can see that 80% of the universities in this study consider this driver to be important / very important. Among the German, British and Greek participants exist different perceptions about this driver, since not all participating universities of these countries have attributed the same importance to it. Portugal is not represented in this table, as it considered this driver as less important (value 2, see Figure 4.10).

The assessment of the driver *"Financial support / funding"*, in contrast, is more diverse. We proceeded in the same way, counting the respondents per country who considered this driver to be "not important at all" (value 1) or "not important" (value 2). We show the ratio of this driver to the total number of universities, grouped per country (Table 4.9).

Table 4.9 Countries with low-ranking for "Financial Support / Funding"

country	Value 1 (not important at all)	Value 2 (not important)	Total universities (%)[(a)]
Austria	0	1	100%
Denmark	1	0	50%
Germany	6	4	71%
Slovenia	1	0	100%
Spain	0	1	33%
Sweden	1	1	50%
Switzerland	0	1	100%
total	**9**	**8**	**49%**

[(a)]ratio between the analysed samples and total number of universities

Interestingly, slightly less than the half of our samples, 49%, classify this driver as "not important at all" or "not important. The majority of the German participants do not regard financial support as determined, neither the Slovenian university nor half of the Danish and Swedish universities.

To complete this picture, we extended the analysis for this driver to those respondents who attributed a high importance to this motivation. Table 4.10 shows the responses per country for value 4 and 5:

Table 4.10 Countries with high-ranking for "Financial Support / Funding"

Country	*Value 4 (important)*	*Value 5 (Very important)*	Total universities (%)[(a]
Denmark	0	1	50%
Germany	1	3	29%
Greece	2	0	100%
Poland	1	0	100%
Portugal	0	1	100%
Spain	1	1	67%
Sweden	1	0	25%
United Kingdom	1	2	75%
total	**7**	**8**	**43%**

[(a)]ratio between the analysed samples and total number of universities

It is mainly the Polish and the Portuguese university, together with the Greek and British universities that give high importance to financial support.

We can see that 15 universities (43%), in contrast to 17 universities (49%), regard financial support as important or very important in the decision process to implement an EMS. The remaining three universities of our samples attribute to this driver an average importance (value 3). We can observe a split about this driver between institutions from Northern / Western and Southern / Eastern Europe: It is perceptible that mainly institutions in Northern and Western Europe do not consider financial support as important, whereas those in Southern and Eastern Europe evaluate this driver as important or even very important.

In Figure 4.11, we show the frequency of each EMS type per driver when having been attributed with a high or very high importance. Among those participants who considered *"Social and environmental awareness"* as important or very important, 29 have implemented EMAS, 14 have implemented ISO 14001 and 5 have a non-formal EMS. Within the drivers *"Reduce institutional consumption patterns"* and "Greening the institution's image", the formal systems are equally distributed. Non-formal EMS are most often allocated to the driver "Reduce the consumption patterns".

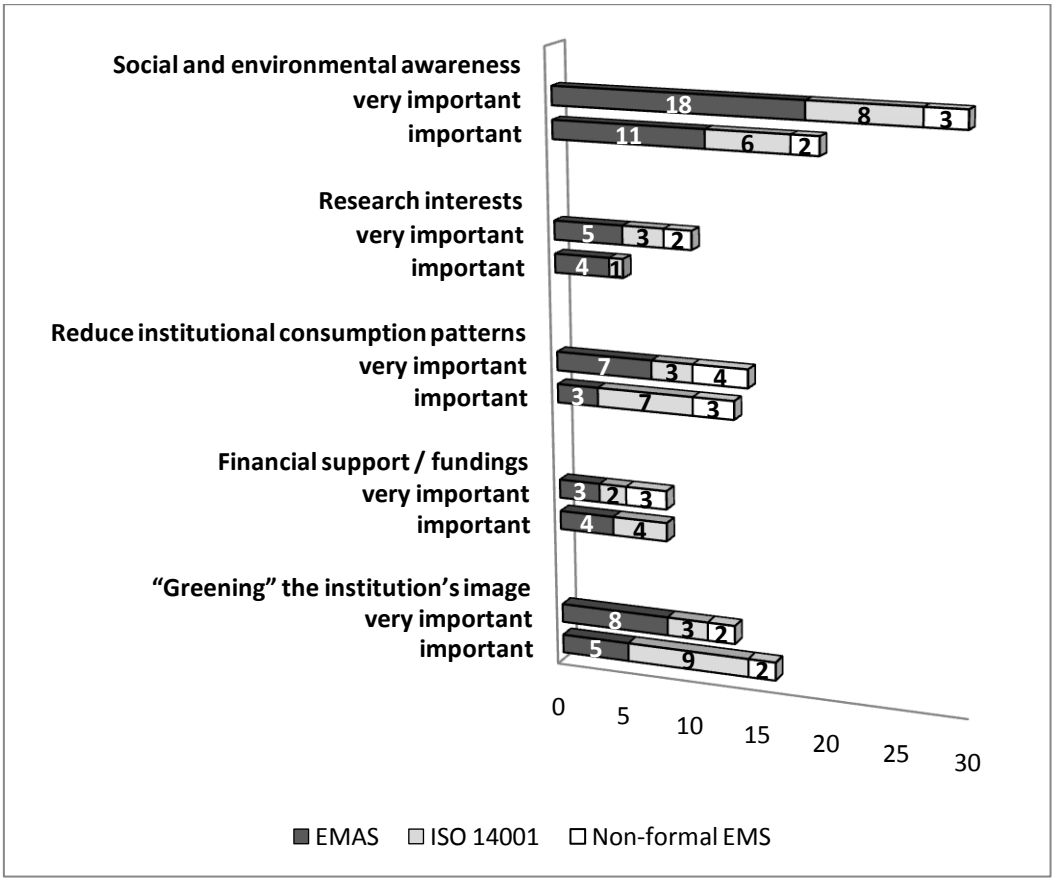


Figure 4.11 Frequency of EMS type per high-ranked driver

To complete this analysis, we conducted a cross tabulation with non-parametrical correlation between each driver and each EMS type. In Table 4.11, we see that there is a moderate relationship between the driver *Reduce institutional consumption patterns* and ISO 14001 and between this driver and EMAS at the level of 10% (Cr V = 0,48 and Cr V = 0,47 respectively; p<0,10). *"Greening" the institution's image* is more associated to ISO 14001 than to EMAS and the relation is statistically significant at a level of 5% (Cr V = 0,48, p<0,05). *Financial support / funding* is more associated to non-formal EMS than to ISO 14001 and to EMAS, though statistically insignificant. The drivers *"Research interests"* and *"Social and environmental awareness"* are weakly associated to each of the EMS types, but no statistically relevant level of association could be confirmed.

Table 4.11 Levels of association between drivers and EMS type (Cr V)

Driver	***Non-formal EMS***	***ISO 14001***	***EMAS***
"Greening" the institution's image	0,13	0,48**	0,33
Financial support / funding	0,56	0,29	0,42
Reduce institutional consumption patterns	0,35	0,48*	0,47*
Research interest	0,34	0,35	0,37
Social and environmental awareness	0,20	0,22	0,24

Note: *p<0,10 Level of association is significant at the 0,10 level (2-tailed)
**p<0,05 Level of association is significant at the 0,05 level (2-tailed)

Several universities added personal comments about further reasons and motivations that led to the decision to implement an EMS at the campus (Table 4.12).

Table 4.12 Qualitative data about drivers for EMS

Country	**University**	**Comment on further reasons and motivations for implementing an EMS at the campus**
Austria	**Austrian Marketing University of Applied Sciences**	*To realize the contents of our study programme at the campus. (Learning by doing, students are involved in the EMS. They develop and calculate key performance indicators, do environmental assessments, prepare environmental targets and measures)*
Denmark	**University of Copenhagen**	*Energy reductions is a good investment, saving money for core activities: research and education*
Germany	**FU Berlin**	*Saving money by reducing energy consumption and by better waste management*
Germany	**TU Berlin / Max-Volmer Institute**	*The EMS should be a pilot project and set an example for the whole institution*
Germany	**University of Applied Sciences Zittau/Goerlitz**	*To combine lecturing and "training on the job" since our university has been providing specific courses and classes (e.g. LCA, Integrated Management, Environmental Law, ...) for more than 15 years.* *To maintain and enlarge our already existing educational-industrial network comprising a large range of major enterprises both on national and international level (such as BMW, Volkswagen, Vattenfall Europe)*
Spain	**Barcelona Tech (UPC)**	*Structuring the decisions and the organizational model.*
Sweden	**University of Gothenburg**	*To reduce environmental impact.* *To work more systematic and goal directed.*
Switzerland	**Swiss Federal Institute of Technology Zurich**	*To assure legal compliance in the field of environmental/hazardous materials etc.*

These comments allow us to formulate an additional list of motivations that could be considered for further studies:

- Cost reductions;
- New teaching possibilities ("learning by doing" and "training on the job");
- EMS as a support of the general management of the institution ("structuring the organizational model"; "working goal directed");
- EMS as a supporting tool for networks between the education sector and industry;
- Legal compliance;
- Reducing the environmental impact;

From this section, we resume: i) "*Social and environmental awareness/responsibility"* has been considered the most important driver to implement an EMS, whereas "*Financial support/funding*" appears to be the least important one; ii) there are some correlations between specific sets of motivation, and the strongest correlations was found between the driver *"Greening the institution's image"* and "*Social and environmental awareness/responsibility"*; iii) "*Social and environmental awareness/ responsibility"* was crucial for 80% of the respondents, whereas financial support was more important to universities from Eastern and Southern Europe than for those from Northern and Western Europe; iv) there are relationships between the drivers and the different EMS types, but only three moderate or weak associations were found with statistical significance; v) the number of further inspirations and motivations is high as shown by the resume of qualitative data and could induce to expand this study in the future.

4.3.5. Top-down versus participatory approaches

In this chapter, we focus on the score aspect of this study: the confrontation of top-down and participatory approaches within an EMS implementation process.

First, we will analyse in detail the implementation approaches that the universities have followed and compare them with the EMS type chosen as well as with the European sub region. Second, we will examine the methodologies and activities used at the different participation levels and attribute a degree of participation based on the university's participatory performance. Last, we will relate the degree of participation to the EMS type chosen as well as to European sub region.

The majority of our samples, 60% (21 universities), has opted for a participatory approach (Figure 4.12 and Table A. 5). A little less than a quarter, 20% (7 universities), indicate to have followed a mix of top-down and participatory approaches and 17% (6 universities) declare to have implemented the EMS by a top-down approach. One institution did not respond to this question.

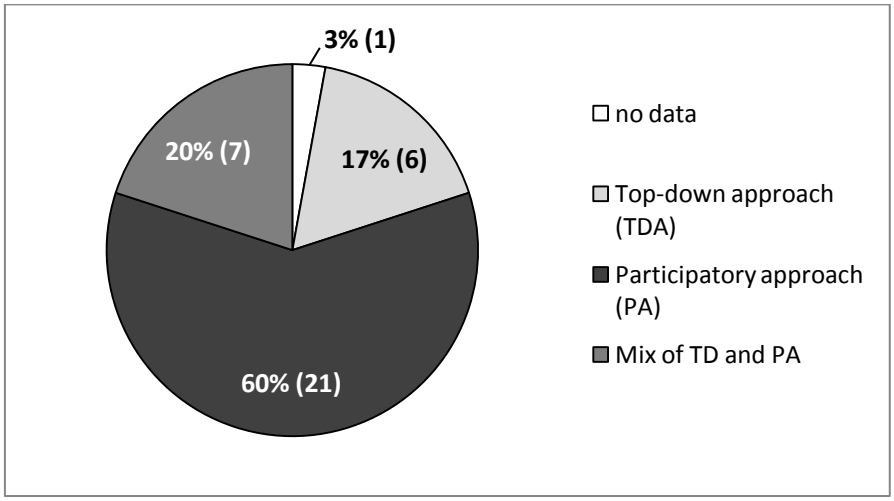


Figure 4.12 Top-down versus participatory approaches

We decided to highlight the differences between each European sub region and obtained the following distribution (Figure 4.13):

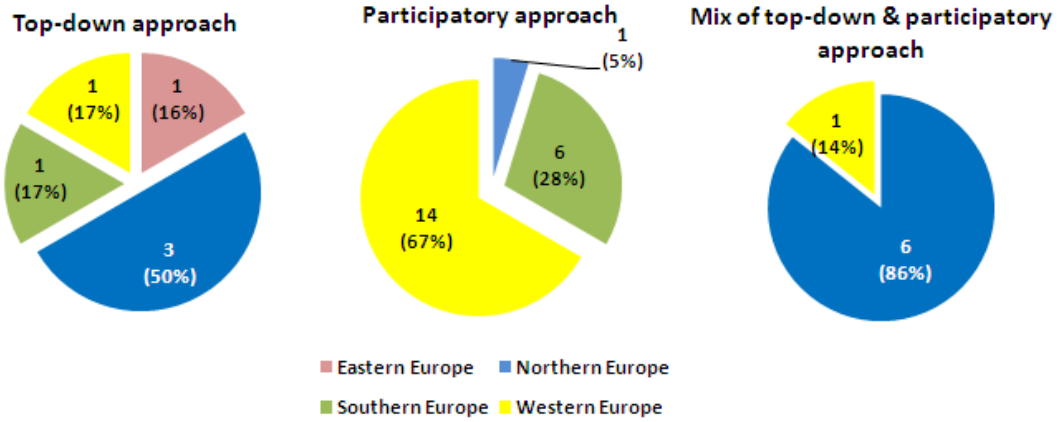


Figure 4.13 Implementation approaches within EMS processes

It is very interesting to monitor how the different participatory strategies are spread geographically in Europe: The participatory approach (PA) has been mainly found in Western Europe and Southern Europe (14 and six institutions, respectively), whereas the universities that have followed a top down (TDA) or a mix of both methods appear to come primarily from Northern Europe (three and six institutions).

To complete the picture, we executed another comparison changing the order of our parameters: We compared in each European region the number of approaches and can identify the following preferences[7] (Figure 4.14): In Northern Europe, the institutions have predominantly chosen a mix of a top-down and participatory approach (60% of all Northern European institutions), whereas Southern and Western European universities have followed largely a participatory approach (86% and 82% of the total number of institutions in the respective region).

[7] We excluded Eastern Europe from this comparison, because we only had one sample from this region. The university in Eastern Europe followed a top-down approach.

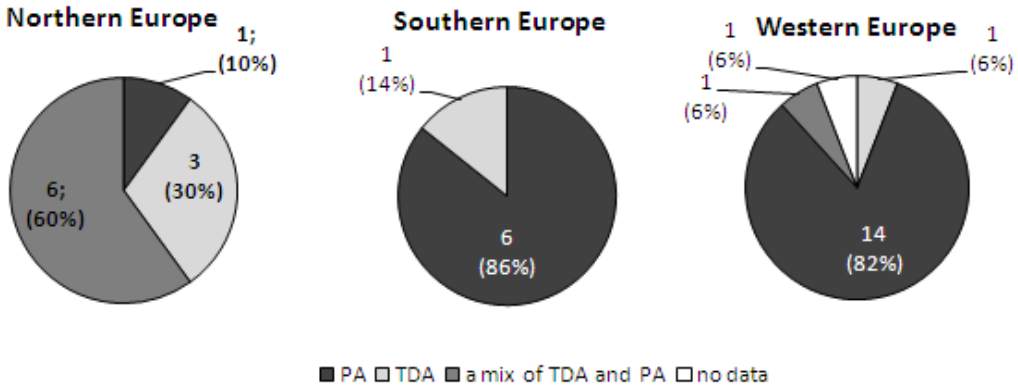


Figure 4.14 European sub region and the respective implementation approach

We tested the association between these two nominal variables, and the relationship between the approach and the European region relatively strong and statistically significant (Cr V = 0,60 with p< 0,01).

Next, we analyse the relation between the specific approach (TDA, PA or mix of both) and the EMS type chosen (EMAS, ISO 14001 or non-formal EMS). We have compared the frequency of each of these two variables and have sorted the different EMS types according to the approach the institution has followed (see annex, Table A. 6). We remember that six universities have more than one EMS implemented at the campus and that one university did not indicate its implementation approach. Hence, Figure 4.15 shows the frequency of a respective implementation approach in relation to EMAS, ISO 14001 and non-formal EMS.

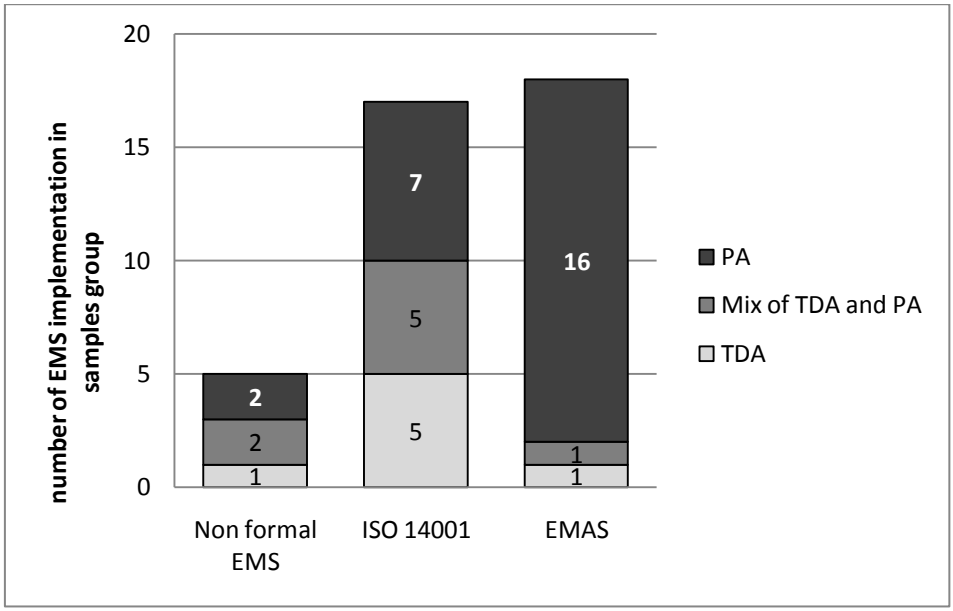


Figure 4.15 Frequency of implementation approach per EMS type

It is interesting to observe the distribution of the different strategies in the three EMS types. In fact, EMAS has predominantly been implemented by a participatory approach (16 institutions), whereas all approaches have been applied almost equally to ISO 14001: In seven cases, ISO 14001 was implemented following a participatory approach, in five cases following a top-down approach and in five cases following a mix of both. Non-formal EMS have been implemented mainly by a participatory approach and a mix of top-down and participatory approach.

To complete our analysis, we changed the order of our parameters and calculated the percentage of EMS within each category of approach, see Figure 4.16.

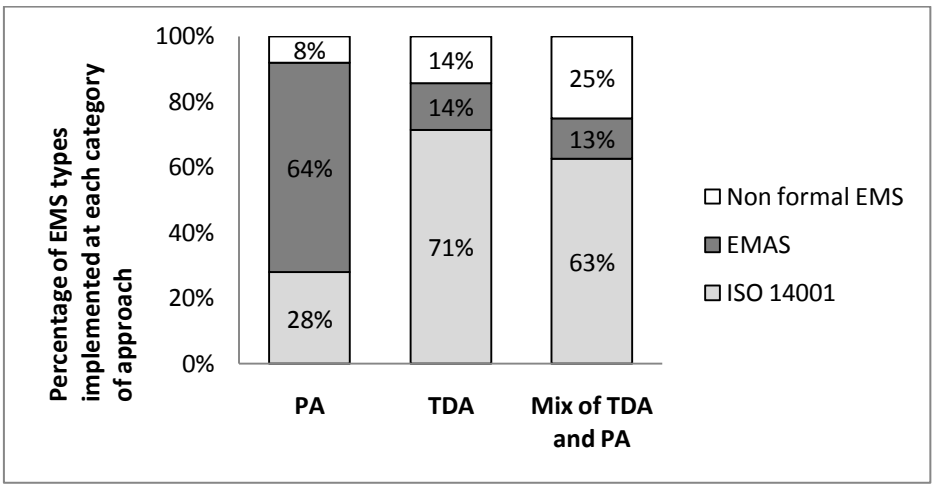


Figure 4.16 Percentage of EMS types per implementation approach

The institutions that have followed a participatory approach mainly implemented EMAS (64%), whereas the institutions that have executed a top-down approach predominantly implemented ISO 14001 (71%). The institutions that followed a mix of both approaches opted preferably for ISO 14001 (63%) or for a non-formal EMS (25%).

Testing these two nominal variables for their level of association at 5%, we obtained Cr V = 0,53 with p = 0,13. Even though we can assume that there is a relatively moderate relationship between these variables, it is statistically not significant.

We proceed to analyse which activities and methodologies have been used within a top-down or participatory or a mix of both approach. To do so, we executed a cross tabulation between each variable referring to an activity and the implementation process chosen. For this calculation, we considered 31 valid cases (see annex, Table A.7). Respondents could give multiple answers on each participation level (see annex for complete questionnaire). In Figure 4.17 we resume our results: On the x-axis, we have grouped the variables to five participation levels, according to the spectrum of public participation (International Association for Public Participation 2007). On the y-axis we show the frequency of activities per implementation category (TDA, PA or mix of TDA & PA).

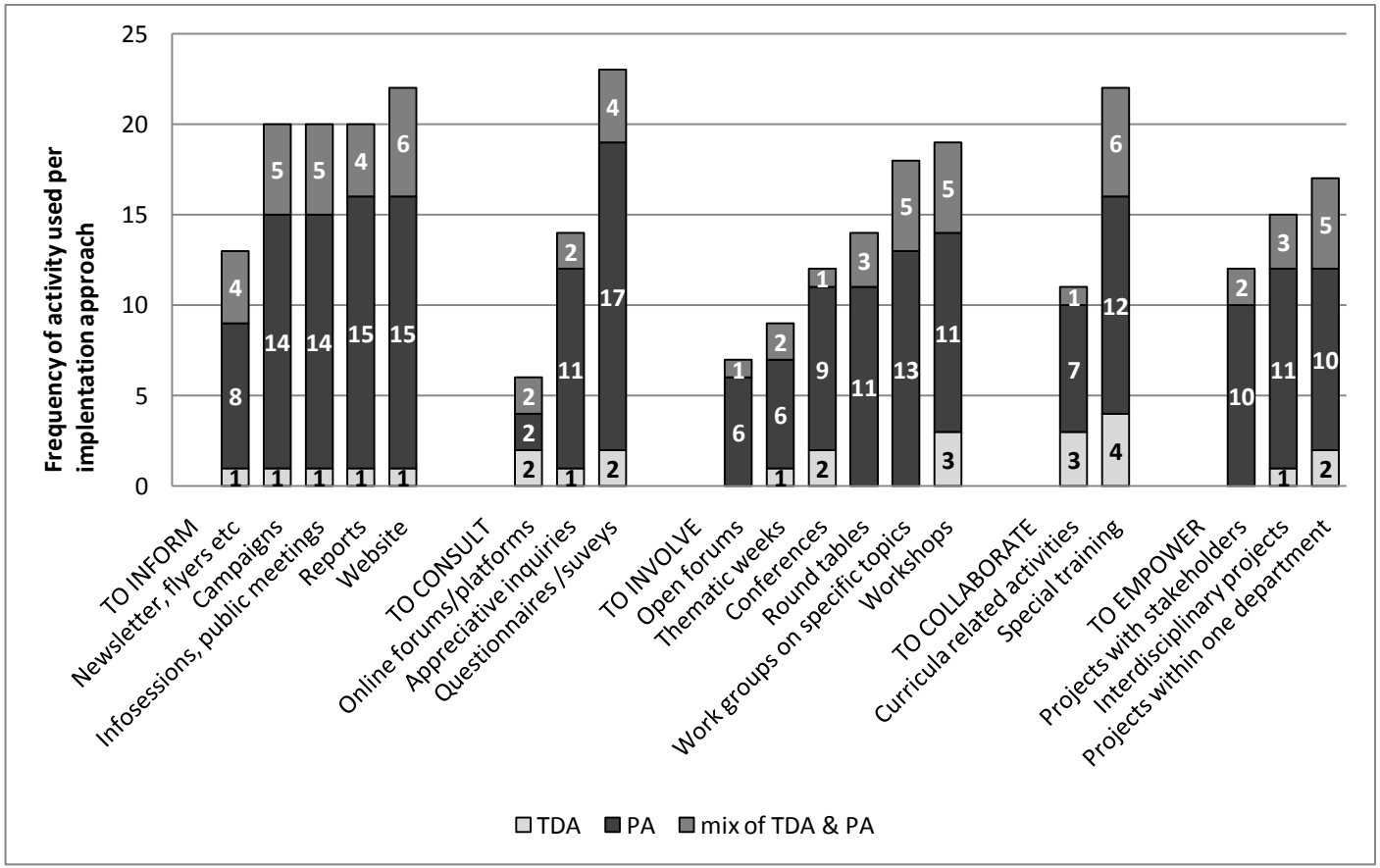


Figure 4.17 Participation levels – Activities and methods used according the participation level and the approach followed

The most often indicated methodology within an EMS implementation process have been *surveys and questionnaires*, followed by *special training*. The *website* is the most often indicated medium to inform about the implementation process. *Online platforms* and *open forums* are the least chosen methodologies. Even though six universities have declared to follow a top-down approach, some of them offer participatory activities or methodologies, like e.g. special training or workshops.

In general, we can observe that more institutions are active on the first level TO INFORM than on the following levels. But at the same time, we can register that some activities from the higher levels have also been chosen frequently, like *work groups on specific topics*, *workshops*, *special training* and *projects within one department*. In order to understand the participatory performance better, we developed an evaluation scale from 0-100, see Table 3.5, in order to attribute a degree of participation to each institution and which allows us to proceed with further comparisons. By evaluating the institution's performance on activities and methodologies used at each participation level, we obtained the following scores, see Table 4.13. We considered 30 samples, because in five cases there were missing data and did therefore exclude these samples from the calculation[8].

Table 4.13 Degree of participation (DP) and Participation Scores of European universities with an EMS at the campus

Legend

Score	Degree of Participation (DP)	Comment
0-20	1	No participation or very low degree of participation
21-40	2	Low degreee of participation
41-60	3	Intermediate degree of participation
61-80	4	High degree of participation
81-100	5	Very high degree of participation

[8] Cases with missing data had the following characteristics: i) The institution is in an implementation process at an early stage; ii) the universities did not provide any information on activities or methodologies even though having indicated to follow a participatory or a mix of both approaches; iii) from the literature review we know that some activities within a participatory approach have been executed but have not been indicated in the questionnaire.

DP	Score	Institution's name	EMS	Approach
1	0	ETH Eidgenoessische Technische Hochschule Zuerich *(Swiss Federal Institute of Technology Zurich)*	ISO 14001 + RUMBA	TDA
2	26	TU - Technische Universitaet Dresden *(Technical University Dresden)*	EMAS	PA
2	33	Universitaet Paderborn *(University of Paderborn)*	EMAS	PA
2	39	Univerza v Mariboru *(University of Maribor)*	Life Cycle Assessment (Non-formal EMS)	PA
3	46	University of Plymouth	ISO 14001	TDA
3	48	University of Glamorgan	ISO 14001	TDA
3	48	Uniwersytet Ekonomiczny w Poznaniu *(University of Economics Poznan)*	EMAS	TDA
3	51	Sveriges Lantbruksuniversitet *(Swedish University of Agricultural Sciences)*	ISO 14001	Mix of TDA & PA
3	52	Universidad Autónoma de Madrid *(UAM - Autonomous University of Madrid)*	Oficina EcoCampus (Non-formal)	PA
3	57	Technische Universitaet Berlin / Max-Volmer-Institut *(Technische Universitaet Berlin)*	EMAS	PA
3	57	Umwelt-Campus Birkenfeld (FH Trier) *(University of Applied Sciences Trier)*	EMAS (in process)	PA
3	59	Universitaet Bremen *(University of Bremen)*	EMAS	PA
4	61	Freie Universitaet Berlin *(Freie Universitaet Berlin)*	ISO 14001	Mix of TDA & PA
4	62	University of the Aegean	ISO 14001 + EMAS	PA
4	64	Fachhochschule Koeln *(University of applied sciences Cologne)*	ISO 14001 + EMAS	PA
4	64	Fachhochschule Wiener Neustadt fuer Technik und Witschaft *(Austrian Marketing University of Applied Sciences)*	ISO 14001 + EMAS	PA
4	64	Umeå universitet *(Umea University)*	ISO 14001 (in process)	PA
4	66	Nottingham Trent University	EcoCampus	Mix of TDA & PA
4	67	Universidad Politecnica de Valencia *(UPV - Polytechnical University Valencia)*	ISO 14001 + EMAS	PA
4	69	Hochschule fuer Wirtschaft und Recht Berlin (HWR) *(Berlin School of Economics and Law)*	ISO 14001	PA

DP	Score	Institution's name	EMS	Approach
4	69	Kobenhavns Universitet *(University of Copenhagen)*	Energy Managment	Mix of TDA & PA
4	69	Leeds Metropolitan University	ISO 14001	TDA
4	70	Fachhochschule Luebeck *(University of Applied Sciences Luebeck)*	EMAS	PA
4	77	Högskolan i Gävle *(University of Gävle)*	ISO 14001	Mix of TDA & PA
4	77	University of Macedonia *(University of Macedonia)*	EMAS	PA
4	80	Hochschule Zittau / Goerlitz *(University of applied sciences Zittau/Goerlitz)*	EMAS	PA
5	85	Goeteborgs Universitet *(University of Gothenburg)*	ISO 14001 + EMAS	Mix of TDA & PA
5	85	Instituto Politécnico de Coimbra - Escola Superior Agrária de Coimbra *(IPC - Politechnic Institute of Coimbra, ESAC)*	EMAS (suspended)	PA
5	85	Leuphana Universitaet Lueneburg *(Leuphana University Lueneburg)*	EMAS	PA
5	87	Universitaet Osnabrueck *(University of Osnabrueck)*	Similar to EMAS	PA
n/a	n/a	Aalborg Universitet *(Aalborg University)*	ISO 14001	Mix of TDA & PA
n/a	n/a	École Polytechnique Fédérale de Lausanne *(EPFL)*	RUMBA (Non-formal EMS)	*No data*
n/a	n/a	Hochschule fuer angewandte Wissenschaften Fachhochschule Landshut *(University of Applied Sciences Landshut)*	EMAS	PA
n/a	n/a	Hochschule fuer nachhaltige Entwicklung Eberswalde *(University of Applied Sciences Eberswalde)*	EMAS	PA
n/a	n/a	UPC - Universitat Politècnica de Catalunya *(Barcelona Tech (UPC))*	ISO 14001 (in process)	TDA

According to these results, we identify the Swiss Federal Institute of Technology Zurich and the Technical University of Dresden with the lowest scores among the survey participants (0, no participation and 26, low degree of participation, respectively). University of Gothenburg, IPC – Politechnical Institute Coimbra / ESAC, Leuphana University and University of Osnabrueck are the institutions with the highest

participation scores among the survey participants (85, 85, 85 and 87, very high degree of participation).

In Figure 4.18 we show the distribution of participation scores of our survey participants.

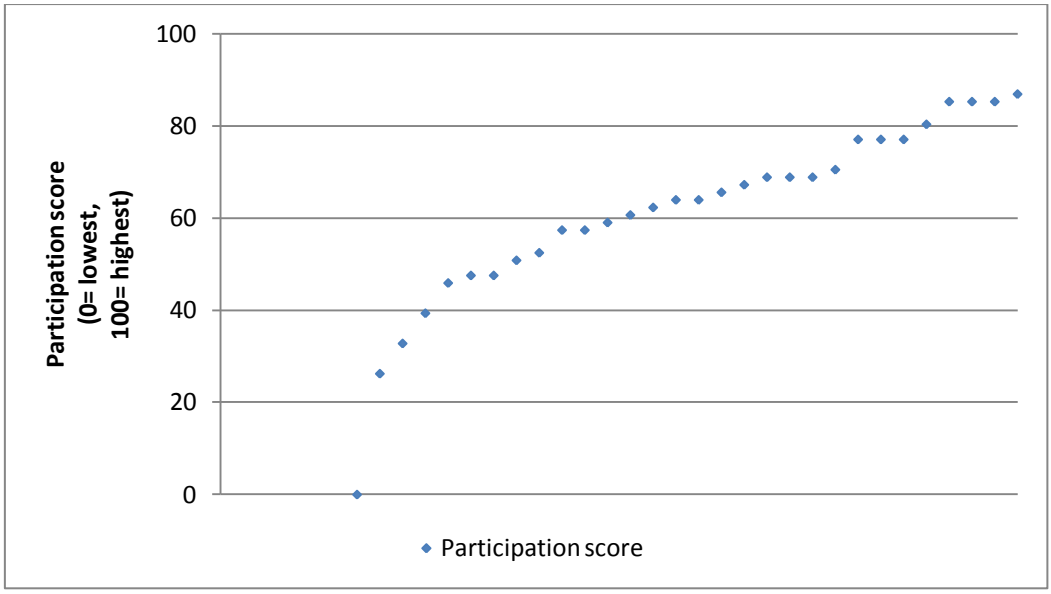


Figure 4.18 Distribution of participation scores of survey participants

Most of our samples obtained scores between 40-60 and 60-80. Transposing the scores to our scale for the degree of participation, we see in Figure 4.19 that eight universities (27%)[9] have an *intermediate degree*, 14 (47%) have a *high degree of participation* and four universities (13,3%) have been attributed a *very high degree of participation*. When comparing the number of institutions with a *high degree of participation* to the region, we can see that there is no significant difference between Northern and Western European institutions (five and seven, respectively). The institutions from Southern Europe are also relatively highly presented on the upper participation scale: Three institutions have a high degree and one institution has a very high degree of participation (out of six institutions in total from Southern Europe). Looking at the intermediate degree of participation, we note that universities from all four sub regions are represented and that the number between northern and western institutions is distributed equally. We also find a relatively homogenous distribution on

[9] The percentage is based on the number of universities that have been considered for the calculation of the degree of participants. We excluded the universities to which we could not apply the scale due to the reason explained before.

the highest participation level, where two universities come from Western, one from Northern and from Southern Europe.

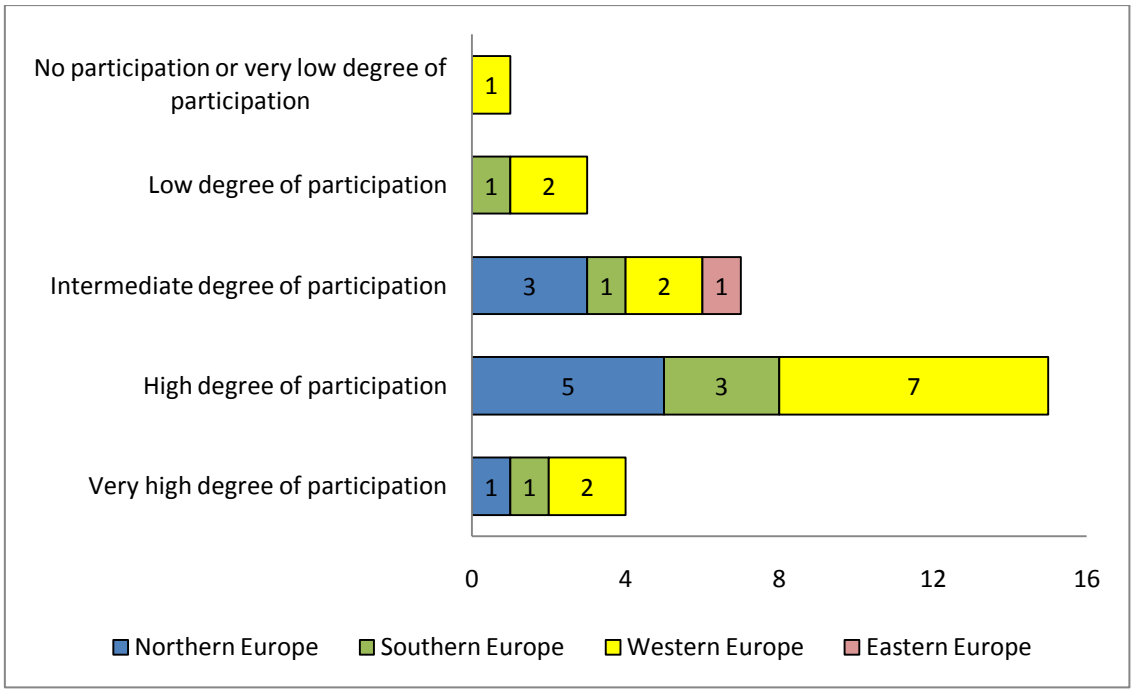


Figure 4.19 Frequency of degree of participation per survey participants and European sub region

When testing the level of association at a level of 5% between the degree of participation and the European sub region, we received a relatively weak relation, which is statistically not significant (Cr V =0,26 with p >0,05). The same applies when testing relation of the degree of participation and the implementation approach, where we obtained a stronger association, but also without statistical significance (Cr V =0,43 with p >0,05). It is the same case when testing the relation between the degree of participation and the institution's size, where there is some relation, but statistically insignificant (Cr V = 0,30 with p >0,05). The level of association between the degree of participation and the type of EMS however is moderate and statistically significant (Cr V =0,56 with p <0,05).

As stated before, due to the small number of cases and very heterogeneous distribution further statistical analysis are limited.

Some of the universities added personal comments on the activities and methodologies at different participation levels and underlined thereby the importance of

the personal contact / dialogue, curricular related activities and an environmental statement (Table 4.14).

Table 4.14 Qualitative data about methodologies and activities on different participation levels

Country	University	Further activities and methodologies on different participation levels
Austria	**Austrian Marketing University of Applied Sciences**	• *Environmental Statement (level TO INFORM)* • *Involving students by charging them with several topics (e.g. environmental programme) within a lecture (level TO COLLABORATE)*
Germany	**TU Berlin**	• *Dialogue*
Portugal	**IPC – Politechnical Institute Coimbra (ESAC)**	• *Personal direct contact*

From this section we can conclude that, i) the majority of our samples has followed a participatory approach; ii) the universities with a participatory approach have been identified mainly in Western and Southern Europe; iii) (European Commission 2008), iv) questionnaires and surveys, special training and workshops are the most often used activities within a participatory approach; v) participatory performance took also place within a top-down approach, but led in maximum to an intermediate degree of participation, as the universities with a higher degree in participation followed either a participatory or a mix of both approaches; vi) a high number of the survey participants has a high degree of participation; vii) the participatory performance is associated to the EMS type; viii) further relations (to the European region, to the institution's size and to the implementation approach) are weak and statistically not relevant.

4.3.6. Measurement and Communication tools for Sustainable Development at the campus

In this section, we resume the most often tools used to measure sustainable development and to communicate about the EMS.

Regular internal audits have been indicated by 21 institutions (60% from all samples), followed closely by the regular audits within a certification process[10] (20 institutions, 57%) (Figure 4.20). 19 institutions use Sustainability Reports, from which only seven (20%) follow the Global Reporting Initiative Guidelines.

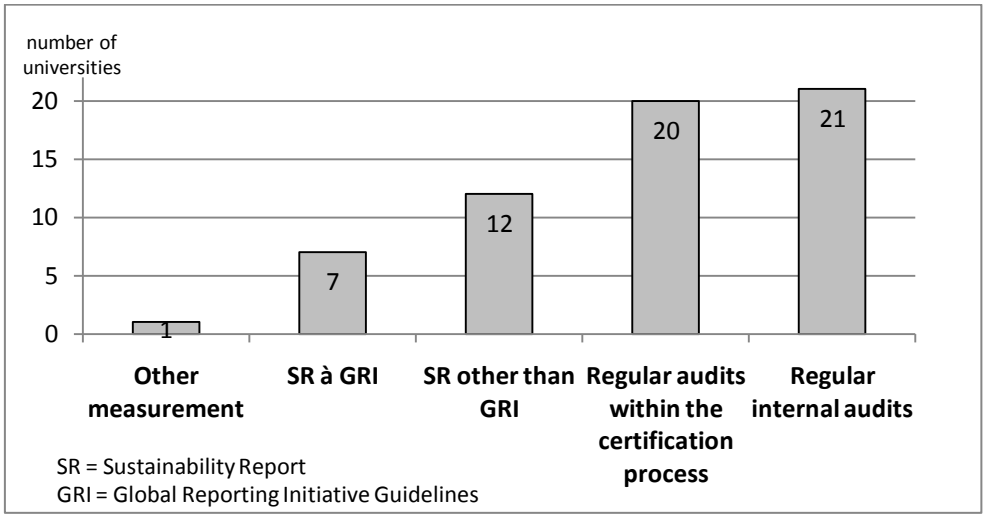


Figure 4.20 Measurement tools for sustainable development at the campus

With respect to the communication tools, most universities use their webpage to communicate about their EMS (31 institutions, 87%), followed by reports (27 institutions, 77%) Figure 4.21). Only a smaller number uses a newsletter or an open day in this context (15 and 13 institutions, 43% and 37%, respectively). Still eight universities have indicated further communication tools, which are annual environmental days, e-mails, speeches, newspapers, academic papers and workshops.

[10] EMAS requires usually a new validation every three (EMAS II) or every four years (EMAS III).

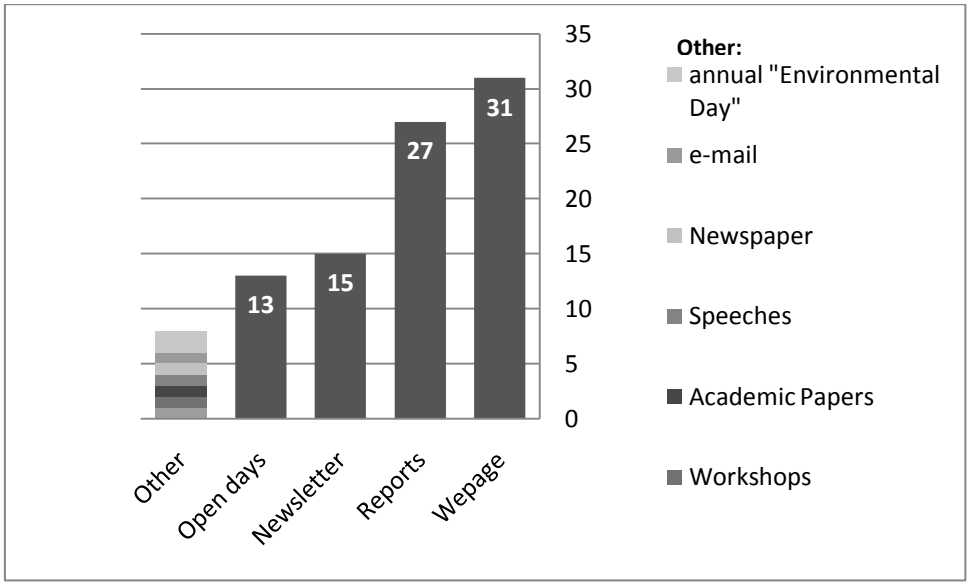


Figure 4.21 Communication tools used to communicate about the EMS

From this section, we briefly conclude that i) regular audits are the most often measurement tools for sustainable development at the campus; ii) less than half of the samples use sustainability reports and only a little more than a third follow the Global Reporting Initiative Guidelines; iii) the webpage is most frequent communication tool to communicate about the EMS, but a number of other tools have been indicated as well, from which we highlight open days, environmental days, speeches and workshops as the most interactive tools compared to passive tools like newspapers and academic papers.

5. Discussion

5.1. EMS at the campus – a key tool to enhance sustainable practices, participation and new competencies to shape sustainable development?

In this chapter we aim to discuss the previously presented results of our study. We will start with a brief resume of the most significant findings and examine them in the light of other studies. This discussion shall lead us to an answer to the question whether an EMS at the campus can be considered as a key tool to enhance sustainable practices and participation in universities that allow developing new competencies to shape sustainable development.

In total, we identified up to date 47 universities from 14 different European countries with an EMS at the campus; out of which five institutions are currently in an EMS implementation process. The majority are universities with less than 10,000 students. We recognized a geographical trend within the spread of the different EMS types: ISO 14001 is more implemented in Northern Europe, whereas EMAS is more employed in Western Europe, but in terms of numbers both systems are almost equally distributed. Five institutions even have both systems implemented and only a few institutions opted for a non-formal EMS. 74,5% of the contacted institutions (35 universities) answered to our internet-mediated questionnaire, of which most come from Germany (40%), followed by Sweden and the United Kingdom (11,4% each). Overall, the participants gave high value to the final certification, as more than 70% achieved a final certification of their EMS. The motivations and reasons to implement an EMS are diverse, but "social and environmental awareness / responsibility" was in average considered to be the most important driver, while financial funding was considered to be less important. Again, we could recognize a geographical trend: Institutions from Northern and Western Europe considered financial funding less important than universities from Southern or Western Europe.

The majority of the universities followed either a participatory or a mix of top-down and participatory approach to implement the EMS (60% and 20%, respectively). While the first occurred mainly in Western and Southern Europe, the second was executed almost only in Northern Europe. To most of the universities has been

attributed a high degree of participation based on the activities and methodologies they offer at an up-scale participation level, like special trainings, workshops and interdisciplinary projects. Most universities measure their environmental performance by executing regular internal audits and about a half of them (19 institutions) use sustainability reports to measure their achievements. Those who follow the Global Reporting Initiative Guidelines (GRI) within their sustainability reports are noticeably fewer: only seven universities adopted the GRI guidelines.

When comparing our results to the previous international studies of Velazquez *et al.* (2006) and Tauchen *et al.* (2006), we can register a general increase of EMS implementation in universities. Velazquez *et al*. (2006) identified 14 higher education institutions worldwide to have an EMS, whereas we can show that today only in Europe are already 47 institutions with an EMS. Tauchen *et al*. (2006) identified 10 universities worldwide with ISO 14001, whereas today in our study we report about 16 European institutions that have ISO 14001 implemented (of which two are currently in an implementation process). Alshuwaikhat (2008) sees "the rate of adoption of EMAS to be declining among companies and institutions", but according to the EMAS statistic provided by the EMAS helpdesk (European Commission 2010) there is moderate increasing trend for EMAS registrations. One university of our study is currently in an EMAS implementation process.

Regarding the fact that five universities have both ISO 14001 and EMAS implemented, we presume that those universities implemented first ISO 14001 as a stepping-stone to EMAS. As EMAS is more demanding, ISO 14001 might have facilitated the EMAS implementation at a second stage (see chapter 2.3.1, p. 19).

Our results about the distribution of the different EMS types among Europe (Figure 4.3, p. 54) align with the observation of EMAS and ISO 14001 distribution in companies (Steger 2000, Wätzold 2009), where EMAS is mainly present in German speaking countries and ISO 14001 in Northern European countries. The high number of German universities with an EMS can be explained by several factors. The main factor might be, as previously explained, that Germany offers financial support for implementing EMS, (and for a period of time EMAS was privileged). However, in a

correspondence with the Senior Scientific Officer of the German Federal Environmental Agency about funding for EMS in universities, we have been informed that for the best of his knowledge German universities did not make demands on funding and that the implementation resulted mainly due to students and professors' interest (Peglau 2011). This statement is supported by Maier (2005), who explains the high level of EMS certification in Germany with the historical fact of strong public awareness of environmental issues. The second factor might be the easy access to information in English and German, as both languages are familiar to the first author (whose mother tongue is German). National and sector-specific networks could easily be searched for information and therefore the research limits were less than for other countries. We also acknowledge once again the fact that in the United Kingdom many universities do environmental auditing and offer student and staff engagement in this context. Within the ranking of the Green League 2010, 43 British universities out of 133 were indicated to be active in this field. We can therefore attribute a comparably high environmental concern and awareness to the British university landscape as well.

In contrast to Clarke et al. (2009), who state in her study about Canadian and New Zealand universities that most universities pursue non-formal EMS and are not seeking certification, we found out that a) in European universities formal EMS are more present than non-formal EMS (81% compared to 19%) and b) the majority opted for the final certification (25 institutions). We could confirm that the spectrum of reasons for implementing an EMS is large, as stated as well by Clarke (ibid.), and can relate the most important drivers of our study ("*Social and environmental awareness / responsibility"* and *"Greening the institution's image"*) to the "third generation drivers" identified by Bennet *et al.* (1999) (see chapter 2.4, p. 24).

The majority of universities in this study follow a similar approach as suggested by Alshuwaikhat *et al.* (2008) to achieve campus sustainability. The authors draw campus sustainability on three pillars, which are the implementation of an EMS, public participation and sustainability teaching (Figure 2.4, p. 28). We can say that the high number of certified EMS and the relatively high degree of participation of the universities in this study reflect this integrated approach, as many institutions link the EMS to public participation and to curricula related activities. However, with regard to the latter, fewer universities - only 11 - have indicated to offer this type of activities in the context of the EMS. This does not necessarily mean that the universities do not have

further curricula activities related to sustainable development, but supported by observations found in the literature (Lidgren *et al.* 2006, Lozano 2010), we may conclude that there is still a lot of potential to revise and to green the curricula.

We showed that EMAS was mainly implemented via a participatory approach, whereas ISO 14001 has been implemented almost equally by a participatory, a top-down and a mix of both approaches (Figure 4.13, p. 73). These results align with the specific characteristics of each EMS: ISO 14001 is considered to be a little less sophisticated and more flexible than EMAS, and therefore any of the approaches can be appropriate (Chapter 2.3). EMAS, instead, includes as a requisite the involvement of the community (in enterprises the employees, in our context students and staff). Furthermore, many institutions with EMAS indicated '"social and environmental awareness / responsibility"' as their main motivation and might have considered a participatory approach being more appropriate to realize this goal than a top-down approach. We interpret that these are the main reasons why EMAS is more often implemented via a participatory approach than ISO 14001.

The relation between the degree of participation, the implementation approach and the EMS type is relative. Universities that have followed a top-down strategy included also participatory activities and have obtained a degree of participation up to level 3 (intermediate). Two universities with EMAS, implemented via a participatory approach, have reached only level 2 (low). Even though those universities with the highest degree of participation have mainly employed EMAS, the EMS type itself is not determined for a good participatory performance. It is up to the universities to shape the approach, independently from the system they have decided to implement.

This conclusion aligns with a number of previous studies where the effectiveness of different approaches to incorporate sustainability at the campus has been discussed (Dahle *et al.* 2001, Lozano 2006a, Lukman *et al.* 2007, Adomssent *et al.* 2008): Whereas some favour a top-down, others see a bottom-up or a mix of both approaches as the most effective way. In the light of the experiences reported so far, we consider it important to maximise an integrated approach with possibilities for public participation at all levels.

In our study, Brunmayr (2011) from the Austrian Marketing University of Applied Science (Campus Wieselburg) highlights, for example, the possibilities of practical learning within the EMS (EMAS). It gives the chance "to realise the contents of our study programme at the campus: Learning by doing, students are involved in the EMS. They develop and calculate key performance indicators, do environmental assessments, prepare environmental targets and measures". We can identify a participatory and 'hands-on-the-job' approach.

Furthermore, Lukman *et al*. (2006) report about their project *"A Sustainable University*" at University of Maribor, Slovenia, that after initial enthusiasm of the rector and the dean, the project was shoved aside and blocked by long decision processes. In the end, the project was introduced to students and stakeholders where it was very well received, and the strategy changed from a top-down to a bottom-up approach. The authors conclude that "students are difficult to organize, but easier to motivate".

These two examples show practical aspects and advantages of a participatory approach. A support of the top-management, however, is crucial, in order to develop the initiatives continuously and systemically. The "Lueneburg approach" (Adomssent *et al.* 2008) is one of the first examples in European universities to integrate systemically sustainable development in the whole institution, where the EMS is just one tool within the overall approach. Another interesting example is the first Zero-Emission-Campus in Europe: The Environmental Campus Birkenfeld of University of Applied Sciences Trier, Germany, follows a zero-emission-concept with the following key ideas i) interdisciplinary education for sustainable development; ii) applied research for sustainability; iii) project-based learning in small learning groups; iv) international research and education networks; v) residential campus (combining living, learning, working) (Helling *et al.* 2007). In this concept, they integrated the implementation of EMAS, which is currently in process. Also this example depicts an integrated approach for campus sustainability, with the EMS being one component in the overall strategy.

Ferreira *et al.* (2006) see within the implementation of an EMS "a golden opportunity to develop theoretical and practical work and (...) to foster participation". Even though EMAS is suspended today at the Agricultural School of IPC Coimbra, Portugal, Ferreira *et al* (ibid.) resume: "The project provides a meeting point for students and academic staff across a range of disciplines, providing new opportunities to

improve curricula contents and providing new examples and 'hands-on' opportunities to push forward research and educational aspects of environmental matters. Such integration between research and education in a 'business environment' where problems were identified, solutions developed and discussed through a participatory approach and actions plans implemented, is a desirable goal in enhancing environmental education quality."

In contrast to the previous examples, Ferrer-Balas (2011) reports in view of the UPC – Barcelona Tech experience: "My opinion is that standardized EMS do not work very well in universities for structural and cultural reasons. Other forms of sustainability management, based on participation & innovation and less hierarchic are needed". In fact, there are many barriers to overcome when one wants to start with sustainability initiatives at the campus, and a formal EMS has many demands, like reviewing all institutional processes, documenting and monitoring processes, initiating a complete management review etc., which require extra time and a high effort of human resources. Two studies about barriers and constraints to campus greening, with focus on EMS, by Dahle *et al.* (2011) and Evangelinos *et al.* (2009) denote as the main barriers: i) Financial – the lack of financial resources; ii) awareness – the lack of environmental education; iii) cultural – a non-en(Evangelinos *et al.* 2009)vironmental attitude prevailing at campus; iv) urban – the lack of space for storing waste and constructing new, more energy efficient, buildings, v) informative – lack of information on environmental issues. Nicolaides (2006) adds as further obstacles vi) perception of 'change' as a threat, vii) rigid conservative spirit; viii) lack of senior management consciousness with regard to an environmentally friendly institution; ix) edginess between academics, administrators and students; x) resistant employees who are working in 'comfort-zones'.

Even though the obstacles are numerous and barriers high, we could give in this study a high number of positive examples that combine an EMS at the campus with participation and opportunities for sustainable learning. Some of the institutions have an EMS implemented already for many years and have gone through regular re-validation processes. So, besides the constraints universities face, the majority have gone (and are going) a continuous way to more campus sustainability.

The implementation of an EMS can go, in fact, beyond the practical advantages of an EMS, like cost savings (more energy efficiency, less consumption of resources like water, materials etc.), institutional visibility, among others. When applied with a participatory approach, it allows particularly a new dialogue and new opportunities for sustainable learning, like we have shown above. Especially interactive methodologies and project-based learning possibilities can lead not only to students' empowerment, to more awareness and understanding of complex coherences, but also to a better preparation for the job market. Being confronted with their personal impact on the university's emissions and involved in improvement and solution strategies, the experience and time they spend as a student at a sustainable university can have manifold effects in the personal and professional life. Christensen *et al*. (2009) supports this line of thought when referring to the ecological footprint of our academic and professional career and emphasizes the positive long-term effects of learning sustainable practices during the university studies.

The British organization People & Planet (2011), publisher of the annually Green League, sees a good environmental performance as a market advantage and directs the following advice to students: "If you are considering going to uni, check out its performance first, as studying or working at the greenest UK unis has a minimal impact on your carbon footprint, whereas studying at the worst (uni) in People & Planet's Green League 2010 adds almost a third to the average UK carbon footprint." It is an interesting and yet uncommon thought to choose a university with good environmental performance, but presumably with increasing significance. As the university is a place, where students and staff spend a lot of their time, usually over years, the institution's and its community's environmental performance has a significant impact on their ecological footprint, and the individual ecological footprint will be larger or smaller correspondingly. Notwithstanding, educational indexes or rankings that include environmental or sustainability indicators are still rare and therefore it is not practice yet to evaluate a university on more aspects than research and education. Three examples are the College Sustainability Report Card for US and Canadian universities, and the Audit Instrument for Sustainability in Higher Education (AISHE) (Roorda 2010) and the Graphical Assessment of Sustainability in Universities (Lozano 2006b). Lukman *et al*. (2010) have developed a university ranking using research, educational and environmental indicators, following the multidimensional concept of sustainable

development. This type of ranking is still in an initial research phase, but further development in this field is expected (ibid.). We strongly believe that sustainability indicators, encompassing economical, social and environmental performance of a university, are fundamental to embrace nowadays global challenges. We discussed in the beginning of this study the role and mission of a university, and resume: "The modern university not only seeks knowledge, but applies knowledge in order to solve the complex problems of society" (Brubacher 1982 in Wright 2006). The worldwide financial crisis, the lack of resources, the limited access to staple food and water, the nuclear catastrophe in Japan, the ongoing pollution and destruction of the ecosystems, the oil catastrophe in the Gulf of Mexico in 2010 and its long-term social and environmental consequences, and many more incidents we could number, are challenging the society to develop more sustainable practices and habits in order to keep the planet liveable for the current and next generations. In this aspect, also the requirements at the job markets are expected to change. The better students are prepared, when leaving the university, and familiar with sustainability issues, aware of social, environmental and economical impacts and knowing how to tackle complex problems, the better they can react on new demands in their professional life, contribute constructively to sustainable-minded solutions and even initiate new solution strategies.

Universities therefore play a key role to promote a paradigm shift to more sustainable development. An EMS at the campus can be supportive for this shift, when inserted in an integrated approach to campus sustainability, as it offers possibilities to enhance sustainable practices, to foster participation and in the end to build more sustainable societies. Therefore, in the light of this study, our answer to the initial question of this chapter is positive. It is desirable that more universities respond to the challenge to create sustainable campuses; EMS can be a key tool in this journey to change, although not the only and exclusive one.

5.2. Implications for professional practice

Altogether, the number of universities with an EMS at the campus is low compared to the total number of universities existing (20,000 worldwide according to

Webometrics 2011). Furthermore, only a few institutions have extra staff exclusively for sustainability issues, like environmental coordinators or sustainability officers. This type of staff is regarded as crucial for the success of sustainability activities and for the coordination of an EMS at the campus (Sharp 2002, Lidgren *et al.* 2006, Lozano 2006a, Wright 2006, Lukman *et al.* 2007, Leal Filho 2009). Most of the universities in this study have employed personnel for these tasks, but it is not yet a widely-implemented practice.

We would like to draw a comparison to the international exchange activities of universities that have started in the late 80s and that meanwhile are an important pillar of academic activity, institutional presence and academia evaluation. Especially in Europe, academic exchange was promoted by the Erasmus programme, supported by the European Union. The Erasmus programme started in 1987, and meanwhile more than 2,2 million students have participated since then in intra-European exchange activities (European Comission 2010d). The exchange is also open to professors and staff in order to increase the international cooperation and network. It aims to foster European citizenship and to develop better students' intercultural skills, self-reliance and self-awareness. Internationalization and partnerships among universities are one of the core focuses of today's university development and are given high attention. Almost every university has an international relations office to coordinate the activities and to develop further partnerships. It is seen as a win-win situation for the engaged institutions and students.

It would be desirable that political authorities and universities give a similar attention to sustainable development in higher education institutions like they are doing for internationalization issues. We even see possibilities of combining both and would like to develop this line of argument further.

Education for sustainable development encompasses a number of key competences, that de Haan (2006) defines like "shaping competences" (in German *"Gestaltungskompetenz"*) for sustainable development and which are:

- Competencies in foresighted thinking;
- Competency in interdisciplinary work;
- Competency in cosmopolitan perception, cross-cultural understanding and cooperation;

- Participatory skills;
- Competency in planning and implementation;
- Capacity for empathy, compassion and solidarity;
- Competency in self-motivation and in motivation others;
- Competency in distanced reflection on individual and cultural models.

With regard to this list we see manifold opportunities to use an EMS at the campus to support the development of 'shaping competencies' in line with the objectives of international exchange experience. Why not think about exchange activities in the sustainability field, for example with EMS related activities? As an EMS is engaged with a wide spectrum of academic areas (management, engineering, social science, education, to name but a few) student and staff exchange could not only support the development of the competencies listed above, but also help the institutions and their communities to learn from each other and to develop a better understanding about practical issues of a sustainable campus. Student awards, international competitions about the institution's carbon footprint, international weeks or summer programmes, just to name a few, could stimulate activities in this field. We wish to give universities the possibility to enlarge their networks and to share experiences. For this purpose, we include therefore a list of institutional contacts in the annex of this study.

It is time that competencies for sustainable development are included in the priority area of a university. It is desirable that they get the same attention like the development of intercultural skills and cross-cultural awareness, as in the end these are transversal skills linked together. We can register progress in this field; however, a broad focus on sustainable development is still missing in most of the higher education institutions.

5.3. Limitations and drawbacks of the research

Even though having carried out a cautious and deep research, some information is still lacking due to the following reasons:

a) The data is not always available in English. Even if a university is active in sustainability initiatives and EMS, articles are not necessarily published in international scientific journals. Often, universities report about their initiatives only in the country specific language. Despite the fact that most of the universities examined in this research have an institutional website in English, this website often is not as complete as the site in the national language. Therefore, not all information available was accessible to us.

b) Due to the same reason, the information from British universities was easier to access. This applies also to German universities, as the researchers' native language is German. When analyzing the country specific data, we have considered these particular aspects.

c) Whereas EMAS provides an EMAS Helpdesk and an open register to search for specific categories and sectors (for higher education institutions it is NACE code 85.4), ISO only provides country-wide statistics within the ISO Survey[11], but not sector-specific information. Therefore, in contrast to EMAS, we could not search in concrete for ISO 14001 certified higher education institutions and may therefore not have found all Higher Education Institutions certified according to ISO 14001.

d) There are a number of general drawbacks when using e-mail questionnaires, like the problem of non-response and the impossibility of validating the answers received. Answers must be accepted as they are and can represent a subjective opinion of the questionnaire's participant. Furthermore, although having searched carefully for the person in charge for environmental affairs, we cannot be sure that the right person has answered the questionnaire.

e) The calculation of the degree of participation is based only on the offer of participatory activities and interactive methodologies. In the questionnaire it was not asked how often and for whom in concrete activities were offered and how many persons have attended. In order to keep the questionnaire in an acceptable length, we did not examine these indicators, but suggest including them in an eventual future research about participation. This information should be reported

[11] ISO states clearly in this survey: "ISO Central Secretariat cannot satisfy requests for lists of certified organizations in a particular country or business sector"(ISO Central Secreatariat 2009)

in sustainability reports, but it would have exceeded our time to investigate for this type of information.

f) This research was planned to be concluded within 6 months and due to this short time frame we needed to set priorities according our main research questions and could not investigate all aspects in the wished depth. We consider this research as a solid basis for an investigation to be continued.

5.4. Recommendations for further research

Our study could be the basis for an ongoing research within campus sustainability and participation processes. It would be interesting to investigate in detail different phases of a participatory approach and examine how it can contribute to students' maturity and personality development, enhancing their key competencies for sustainable development and fostering citizenship. In this context, we consider the assessment of participation processes as fundamental in order to measure success and effectiveness and to develop participatory approaches further.

Other aspects for an ongoing research can be: i) economic, environmental, and social benefits of an EMS at the campus (assessment of the consumption of resources, level of awareness of the community, etc.); limitations/drawback of the EMS certification process; ii) advantages of the certification process; iii) institutional changes due to the EMS process; iv) further environmental management tools and assessment possibilities to measure sustainability at the campus.

6. Conclusions

Campus sustainability is receiving growing attention and has meanwhile become a well-established study field, even though campus sustainability itself has not become a reality yet to most of the universities.

In this study we investigated the following research questions:

- What is the current state of EMS implementation processes and practices at European universities?
- How have the EMS been implemented and which are the possibilities for students' and staff participation within the EMS implementation process?

EMS implementations started to appear at the end of the 90s. In Europe, the first ISO 14001 certified university was Maelardalen University, Sweden, and the first EMAS certified university was University of Applied Sciences Zittau / Goerlitz, Germany, both certified in 1999. We provided an overview about 47 higher education institutions in Europe with an EMS and offered, based on the results of the survey answered by 35 institutions, a deep analysis of EMS implementation processes and practices in European campuses. A main focus was put on the comparison of top-down versus participatory approaches. Among a number of insights and practical aspects for student and staff involvement, we draw as a central conclusion that independently from the approach and the specific EMS chosen, it is up to the university to shape the process towards campus sustainability. Certain approaches and specific EMS types may work better in some and worse in other institutions, as the institutional and cultural realities are diverse. However, based on our results, the literature review and the experiences reported, we consider an integrative approach as the maxim.

An integrative approach sets as first step the development of a vision for campus sustainability. This vision can be brought up either by a bottom-up approach, as many "grassroots movements", like students' unions, student groups and clubs, have been the initiators of sustainability initiatives at the campus, or by a top-down process, emanating from the rector or dean. Nonetheless we consider that it as essential to include opportunities for public participation, as the process will affect the whole institutional community. The vision for campus sustainability should rest upon three

pillars which are the university's EMS, public participation and sustainability teaching, as shown by Alshuwaikhat (2008). The support of the top-management is important, because it influences the activities at all three pillars and determines their continuous development and improvement. Many of the universities in this study apparently follow an integrated approach, linking the EMS to public participation and to green curricula activities, with further potential to improvement. Social and environmental awareness / responsibility go in hand with the wish to "green" the institutional image and to reduce the institutional consumption patterns.

We see an EMS as one tool in the overall process to enhance campus sustainability. With respect to the implementation of an EMS at the campus, we regard a participatory or a mix of top-down and participatory approach as most effective to accomplish the twofold mission of a university stated in our introduction: (1) To reduce the institutional environmental impact and (2) to carry out research and teaching, offering opportunities to increase awareness for complex coherences and to develop competencies that lead to more sustainable practices.

If an EMS is implemented only by a top-down process, it may achieve environmental improvements within the universities operations, but it then addresses not more than one aspect of campus sustainability. Only in combination with participation, the EMS can be a powerful tool not only to improve operational environmental performance, but to create the necessary settings that allow a paradigm shift to sustainable practices and to achieve in the end the development of more sustainable societies. Nevertheless, it is always important to assess the effectiveness of the participation process and to apply the principles of continuous improvement (plan-do-check-act-cycle) within the development to more campus sustainability.

A frequently reported barrier to campus greening has been the overall lack of awareness. By offering hands-on approaches to tackle complex problems, the situation can be reversed. With regard to the global challenges and expected changes in the job markets, it is essential to prepare the students in the best way for the needs we are confronted with and to involve them in establishing new sustainable strategies.

7. References

ACCU (2009). "Tokyo Declaration of HOPE." *Asia-Pacific Forum for EDS Educators and Facilitators*; last access; http://www.accu.or.jp/esd/mt-static/news/topics/Tokyo_Declaration_of_HOPE%28English_version%29.pdf

Adomssent, M.; Godemann, J. and Michelsen, G. (2008). "Sustainable University - empirical evidence and strategic recommendations for holistic transformation approaches to sustainability in higher education institutions. *Proceedings of the 4th International Barcelona Conference on Higher Education*," In *Higher education for sustainable development*. Barcelona: GUNI.

Alshuwaikait, H. M. and Abubakar, I. (2008). "An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices." *Journal of Cleaner Production*, 16: 1777-85.

Arvidsson, K. (2004). "Environmental management at Swedish universities." *International Journal of Sustainability in Higher Education*, 5(1): 91-99.

Barth, M.; Godemann, J.; Rieckmann, M. and Stoltenberg, U. (2007). "Developing key competencies for sustainable development in higher education." *International Journal for Sustainability in Higher Education*, 8(4): 416-30.

Bennet, M.; James, P. and editors (1999). *Sustainability measures: evaluating and reporting on social and environmental performance.* Sheffield, UK: Greenleaf Publishing Ltd.

Brubacher, J. (1982). *On the philosophy of higher education*. San Francisco: Jossey-Bass.

Brunmayr, T. (2011). Personal Comments in questionnaire "Environmental Management Systems (EMS) development processes in European Higher Education Institutions - Study for a Master thesis". 24-01-2011

Carreiras, M.; Ferreira, A. J. D.; Lopes, M. and Castanheira, E. (2006). "Comparison between two implementation strategies of environmental systems," In. Coimbra.

Chambers, D. (2009). "Assessing & Planning for Environmental Sustainability - A Framework for Institutions of Higher Education," In *Sustainability at Universities - Opportunities, Challenges and Trends*, ed. W. L. Filho. Frankfurt: Peter Lang.

Christensen, P.; Thrane, M.; Herreborg Jorgensen, T. and Lehmann, M. (2008). "Sustainable Development. Assessing the gap between preaching and practice at Aalborg University." *International Journal of Sustainability in Higher Education*, 10(1): 4-20.

CIA (2008). *World Factbook*. Washington: Skyhorse Publishing.

Clarke, A. and Kouri, R. (2009). "Choosing an appropriate university or college environmental management system." *Journal of Cleaner Production*, 17: 971-84.

Conger, J. A. and Kanungo, R. N. (1988). "The Empowerment Process: Integrating Theory and Practice." *Academy of Management Review,* 13(3): 471-82.

COPERNICUS (1994). "Copernicus - The University Charter for Sustainable Development." last access (08-08-2010); http://www.iisd.org/educate/declarat/coper.htm

Copernicus Alliance (2010). "Copernicus Charta." last access (August 07); http://www2.leuphana.de/copernicus/index.php?id=3

Cortese, A. D. (2003). "The critical role of Higher Education in Creating a Sustainable Future." *Planning for Higher Education;* last access (02-02-2011): 1-8; http://www.aashe.org/documents/resources/pdf/Cortese_PHE.pdf

Council of Europe (2006). "The Responsibility of Higher Education for a Democratic Culture: Citizenship, Human Rights and Sustainability." *Conference on Higher Education and Democratic Culture*; last access 02-02-2011; http://www.coe.int/t/dg4/highereducation/democraticculture/Declaration_EN.pdf

Dahle, M. and Neumayer, E. (2001). "Overcoming barriers to campus greening - A survey among higher educational institutions in London." *International Journal for Sustainability in Higher Education*, 2(2): 139-60.

de Haan, G. (2006). "The BLK '21' programme in Germany: a 'Gestaltungskompetenz'-based model for Education for Sustainable Development." *Environmental Education Research*, 12(1): 19-32.

Delakowitz, B. and Hoffmann, A. (2000). "The Hochschule Zittau/Goerlitz: Germany's first registered environmental management (EMAS) at an institution of higher education." *International Journal for Sustainability in Higher Education*, 1(1): 35-47.

Earth Charter Initiative (2010). "Earth Charta." last access (06-09-2010); http://www.earthcharterinaction.org/content/

EcoCampus (2011). "EcoCampus - Demonstrating Excellence in sustainability." last access (16-03-2011); http://www.ecocampus.co.uk/about_us/index.html

ETH (2009). "FACTSHEET ETH: Ressourcenverbrauch substanziell gesenkt," In. Zurich: ETH.

European Commission (2008). "EMAS and ISO/EN 14001: differences and complementarities." last access (30-05-2010); http://ec.europa.eu/environment/emas/pdf/factsheet/fs_iso_en.pdf

European Commission (2010a). "EMAS "*;* last access (31-06-2010); http://ec.europa.eu/environment/emas/index_en.htm

European Commission (2010b). "EMAS - Newsletter, Issue 04/2010." last access (30-03-2011); http://ec.europa.eu/environment/emas/pdf/newsletter/Newsletter%2012-10.pdf

European Commission (2010c). "EMAS III - A premium management instrument." last access (30-03-2011); http://ec.europa.eu/environment/emas/pdf/factsheet/fs_EMAS2to3.pdf

European Commission (2010d). "The ERASMUS programme - studying in Europe and more." last access (18-04-2011); http://ec.europa.eu/education/lifelong-learning-programme/doc80_en.htm

European Commission (2011a). "Overview EMAS across the years." last access (15-04-2011); http://ec.europa.eu/environment/emas/pictures/Stats/2011-03%20Overview%20of%20the%20take-up%20of%20EMAS%20across%20the%20years%202.JPG

European Commission (2011b). "Overview EMAS in the participating countries." last access (15-04-2011); http://ec.europa.eu/environment/emas/pictures/Stats/2011-03%20Overview%20of%20the%20take-up%20of%20EMAS%20in%20the%20participating%20countries%202.JPG

Evangelinos, K. I.; Jones, N. and Panoriou, E. M. (2009). "Challenges and opportunities for sustainability in regional universities: a case study in Mytilene, Greece." *Journal of Cleaner Production*, 17: 1154-61.

Ferreira, A. J. D.; Lopes, M. A. R. and Morais, J. P. F. (2006). "Environmental management and audit schemes implementation as an educational tool for sustainability." *Journal of Cleaner Production*, 14(9-11): 973-82.

Ferrer-Balas, D. (2011). Personal Comments in questionnaire "Environmental Management Systems (EMS) development processes in European Higher Education Institutions - Study for a Master thesis". 08-02-2011

Ferrer-Balas, D.; Buckland, H. and de Mingo, M. (2009). "Explorations on the University's role in society for sustainable development through a system transition approach. Case-study of the Technical University of Catalunia (UPC)." *Journal of Cleaner Production*, 17: 1075-85.

Filho, W. L., (ed.), (2009). *Sustainability at Universities - Opportunities, Challenges and Trends*. Frankfurt: Peter Lang.

Filho, W. L. and Delakowitz, B. eds. "*Umweltmanagement and Hochschulen: Nachhaltigkeitsperspektiven*." Frankfurt: Peter Lang, 2005.

Florin, P. and Wandersman, A. (1990). "An introduction to citizen participation, voluntary organizations, and community development: Insights for empowerment through research." *American Journal of Community Psychology*, 18(1): 41-54.

Fowler, F. J. J. (2002). *Survey Research Methods*. Thousand Oaks: SAGE Publications.

Graham, A. C. (2004). Report on Higher Education Sustainability Activities. Cambridge.

Hansen, J. A. L., Martin (2006). "Agents of change: universities as development hubs." *Journal of Cleaner Production*, 14(9-11): 820-29.

Harvey, L. (2000). "New realities: The relationship between higher education and employment." *Tertiary Education and Management*, 6(1): 3 - 17.

Helling, K. and Cosack, T. (2007). "Zero-Emission-Campus. Successes and experiences of the Environmental Campus Birkenfeld." *Sustainable Campus Conference*; last access; http://www.international-sustainable-campus-network.org/fileadmin/downloads/Panel_A1_Klaus_Helling.pdf

Hill, M. M. and Hill, A. (2009). *Investigação por questionário*. Lisbon: Edições Sílabo.

Holyoak, L. (2001). "Participation and Empowerment in Organizations: Modeling, Effectiveness and Applications." *Leadership & Organization Development Journal*, 22(3): 139-42.

Howell, R. E.; Olsen, M. E. and Olsen, D. (1987). *Designing a citizen involvement program: A guidebook for involving citizens in the resolution of environmental issues*. Western Rural Development Center.

IAU (2003). "International Conference on Education for a Sustainable Future - General Report," In *Report on Higher Education Sustainability Activities*, ed. A. C. Graham, 10. Cambridge: Massachusetts Institute of Technology.

Institut fuer Umweltkommunikation, P. D. (2009). "Sustainable University - Project details." last access (17-05-2010); http://www.leuphana.de/en/institute/infu/unesco-chair/chair-activities/sustainable-university-project-details.html

International Association for Public Participation (2007). "Spectrum of public participation." last access (27-01-2011); http://www.iap2.org/associations/4748/files/IAP2%20Spectrum_vertical.pdf

ISO (2011). "ISO 14000 essentials." last access (02-01-2011); http://www.iso.org/iso/iso_catalogue/management_and_leadership_standards/environmental_management/iso_14000_essentials.htm

ISO Central Secretariat (2009). The ISO Survey - 2008. Geneva.

Koester, R. J.; Eflin, J. and Vann, J. (2006). "Greening the campus: a whole systems approach." *Journal of Cleaner Production*, 14(9-11): 769-79.

Kolja21 (2009). "Europe subregion map UN geoscheme." last access (09-11-2010); http://en.wikipedia.org/wiki/File:Europe_subregion_map_UN_geoschme.svg

Kolja21 (2009). "Europe subregion map world factbook." last access (09-11-2010); http://commons.wikimedia.org/wiki/Media:Europe_subregion_map_world_factbook.svg

Lehmann, M.; Christensen, P.; Thrane, M. and Jørgensen, T. H. (2009). "University engagement and regional sustainability initiatives: some Danish experiences." *Journal of Cleaner Production*, 17(12): 1067-74.

Leuphana University (2009). "Science Initiatives." last access (31-01-2010);

http://www.leuphana.de/en/international/research.html

Lidgren, A.; Rodhe, H. and Huisingh, D. (2006). "A systemic approach to incorporate sustainability into university courses and curricula." *Journal of Cleaner Production*, 14(9-11): 797-809.

Lozano, R. (2006a). "Incorporation and institutionalization of SD into universities: breaking through barriers to change." *Journal of Cleaner Production*, 14(9-11): 787-96.

Lozano, R. (2006b). "A tool for a Graphical Assessment of Sustainability in Universities (GASU)." *Journal of Cleaner Production*, 14(9-11): 963-72.

Lozano, R. (2010). "Diffusion of sustainable development in universities curricula: an empirical example from Cardiff University." *Journal of Cleaner Production*, 18(10): 637-44.

Lukman, R. and Glavic, P. (2007). "What are the key elements of a sustainable university." *Clean Technology & Environmental Policy*, 9: 103-14.

Lukman, R.; Krajnc, D. and Glavic, P. (2010). "University ranking using research, educational and environmental indicators." *Journal of Cleaner Production*, 18(7): 619-28.

Maier, S. and Vanstone, K. (2005). Do good environmental management systems lead to good environmental performance? London, E. I. R. Services.

Mawhinney, M. (2002). "Sustainable Development - Understanding the green debate," In. Oxford: Blackwell Science.

Meadowcroft, J. (2004). "Participation and Sustainable Development - modes of citizen, community and organisational involvement," In *Governance for Sustainable Development - The Challenge of Adapting Form to Function*, ed. W. M. Lafferty, 162-90. Northampton: Edward Elgar Publishing, Inc.

Merkel, J. and Litten, L. H. (2007). "The sustainability challenge." *New Directions for Institutional Research*, 2007(134): 7-26.

Nicolaides, A. (2006). "The implementation of environmental management - Towards sustainable universities and education for sustainable development as an ethical imperative." *International Journal of Sustainability in Higher Education*, 7(4): 414-24.

Noeke, J. (2000). "Environmental management systems for universities - A case study." *International Journal of Sustainability in Higher Education*, 1(3): 237-51.

OECD (2001). "Citizens as partners - OECD Handbook on information, consultation and public participation in policy-making," In *Governance*, ed. OECD. Paris: OECD Publications Service.

Oelreich, K. V. (2004). "Environmental Certification at Maelardalen University." *International Journal for Sustainability in Higher Education*, 5(2): 133-46.

Peglau, R. (2011). Personal communication about funding in German universities. Dessau. 18-03-2011

People & Planet (2011). The People & Planet Green League 2010. Oxford, P. P. Limited.

Pereira, A. (2006). "SPSS - Guia prático de utilização," In. Lisbon: Edições Sílabo.

Roorda, N. (2010). Sailing on the wind of change - The Odyssey to Sustainability of the Universities of Applied Sciences in the Netherlands. PhD thesis. International Centre for Integrated assessment and Sustainable development (ICIS);Maastricht University

Rudestam, K. E. and Newton, R. R. (2007). *Surviving your dissertation - A comprehensive guide to content and process*. Thousand Oaks: SAGE Publications.

Sammalisto, K. and Arvidsson, K. (2005). "Environmental Management in Swedish higher education. Directives, driving forces, hindrances, environmental aspects and environmental co-ordinators in Swedish universities." *International Journal for Sustainability in Higher Education*, 6(1): 18-35.

Sammalisto, K. and Brorson, T. (2008). "Training and communication in the implementation of environmental management systems (ISO 14001): a case study at the University of Gaevle, Sweden." *Journal of Cleaner Production*, 16: 299-309.

Sharp, L. (2002). "Green campuses: The road from little victories to systemic transformation." *International Journal of Sustainability in Higher Education*, 3(2): 128-45.

Simkins, G. and Nolan, A. (2004). "Environmental Management Systems in Universities." last access (17 May 2010); http://www.eauc.org.uk/environmental_management_systems_in_universities_a

Stakeholder Forum for a Sustainable Future (2011). "Earthsummit 2012." last access (20-02-2011); http://www.earthsummit2012.org/index.php/about-us

Steger, U. (2000). "Environmental management systems: empirical evidence and further perspectives." *European Management Journal*, 18(1): 23-37.

Steger, U.; Schindel, C. and Krapf, H. (2002). "The experience of EMAS in three European countries: a cultural and competitive analysis." *Business Strategy and the Environment*, 11(1): 32.

Tashakkori, A. and Teddlie, C. (1998). *Mixed Methodology - Combining Qualitative and Quantitative Approaches*. Thousand Oaks: SAGE Publications.

Tauchen, J. and Brandli, L. L. (2006). "A Gestão Ambiental em Instituições de Ensino Superior: Modelo para implantação em campus universitário." *Gestão & Produção*, 13(3): 503-15.

UNCED (1992). *Agenda 21, Ch. 36: Promoting Education and Public Awareness and Training*. Rio de Janeiro: United Nations.

UNECE (2001). "Aarhus Convention - Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters." last access (20-02-2011); http://www.unece.org/env/pp/

UNEP (1972). "Declaration of the United Nations Conference on the Human Environment." *United Nations Conference on the Human Environment*; last access; http://www.unep.org/Documents.Multilingual/Default.asp?documentid=97&articleid=1503

UNESCO (1977). "Tbilisi Declaration - Final Report." *Intergovernmental Conference on Environmental Education*; last access; http://unesdoc.unesco.org/images/0003/000327/032763eo.pdf

UNESCO (1995-2010). "Copernicus." last access (07-08-2010); http://portal.unesco.org/education/en/ev.php-URL_ID=34756&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO (1997). "Declaration of Thessaloniki." *International Conference on Environment and Society: Education and Public Awareness*; last access;

UNESCO (2001). "Lueneburg Declaration." *Higher Education for Sustainability - Towards the World Summit on Sustainable Development (Rio + 10)*; last access 08-10 Oct 2001; http://portal.unesco.org/education/en/files/37585/11038209883LuneburgDeclaration.pdf

UNESCO (2010). "UN Decade of Education for Sustainable Development " *Education;* last access (20-02-2011); http://www.unesco.org/en/education-for-sustainable-development/decade-of-esd/

UNESCO (1998). "World Declaration on higher education for the twenty-first century: Vision and Action." *World Conference on Higher Education*; last access; http://www.unesco.org/education/educprog/wche/declaration_eng.htm#world%20declaration

United Nations (2002). "Press Conference about the Ubuntu Declaration." last access (06-09-2010); http://www.un.org/events/wssd/pressconf/020901conf1.htm

United Nations (2009). "Commission on Sustainable Development"*;* last access (20-02-2011); http://www.un.org/esa/dsd/csd/csd_index.shtml

United Nations Statistic Division (2010). "Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic groupings." last access (01-03-2011); http://unstats.un.org/unsd/methods/m49/m49regin.htm#europe

Universidad Autonoma de Madrid (2011). "ECOCAMPUS." last access (11-02-2011); http://www.uam.es/servicios/ecocampus/especifica/default.html

University Leaders for a Sustainable Future (2010). "Talloires Declaration Institutional Signatory List." last access (06-09-2010); http://www.ulsf.org/programs_talloires_signatories.html

Velazquez, L.; Munguia, N.; Platt, A. and Taddei, J. (2006). "Sustainable university: what can be the matter'." *Journal of Cleaner Production*, 14(9-11): 810-19.

Vereinte Nationen (1992). "Agenda 21." *Konferenz der Vereinten Nationen fuer Umwelt und Entwicklung*; last access;

Viebahn, P. (2002). "An environmental management model for universities - from environmental guidelines to staff involvement." *Journal of Cleaner Production*, 10(1): 3-12.

Wätzold, F. (2009). "Explaining differences in EMAS participation rates across Europe: the importance of institutions, incomplete information and path dependence." *European Journal of Law and Economics*, 28(1): 67.

Webometrics (2011). "Ranking Web of World Universities." last access (20-04-2011); http://www.webometrics.info/index.html

Weenen van, H. (2000). "Towards a vision of a sustainable university." *International Journal of Sustainability in Higher Education*, 1(1): 20-34.

World Commission on Environment and Development; Brundtland, G. H. and Khalid, M. (1987). Our Common Future. Oxford.

Wright, T. S. A. (2002). "Definitions and frameworks for environmental sustainability in higher education." *International Journal for Sustainability in Higher Education*, 3(3): 203-20.

Wright, T. S. A. (2006). "Giving "teeth" to an enviornmental policy: a Delphi Study at Dalhousie University." *Journal of Cleaner Production*, 14(9-11): 761-68.

Zutshi, A. and Sohal, A. (2005). "Integrated management system: the experience of three Australian organisations." *Journal of manufacturing technology management*, 16(2): 211-32.

Annex

I – Survey

I.1. Internet-mediated Questionnaire *"Environmental Management Systems (EMS) development processes at European Universities"*

Environmental Management Systems (EMS)

development processes at European Universities –

Study for a Master's Thesis

My name is Antje Disterheft, and I am conducting a study about Environmental Management Systems (EMS) at European universities as part of my Master's Thesis at Universidade Aberta, Lisbon, Portugal.

I would like to ask you a couple of short questions about the implementation process of an EMS at your institution. It should not take longer than 5 minutes.

Your contribution is very important to my study and I would like to thank you in advance for your time!

Antje Disterheft

antje.disterheft@gmail.com phone: +351 922125358

---

* Required

1. Name of University *

1.1. Please specify the type(s) of the EMS implemented *

You can choose one or more

- [ ] ISO 14001
- [ ] EMAS (Eco Management and Audit Scheme)
- [ ] Other:

1.2. Please specify where the EMS was implemented

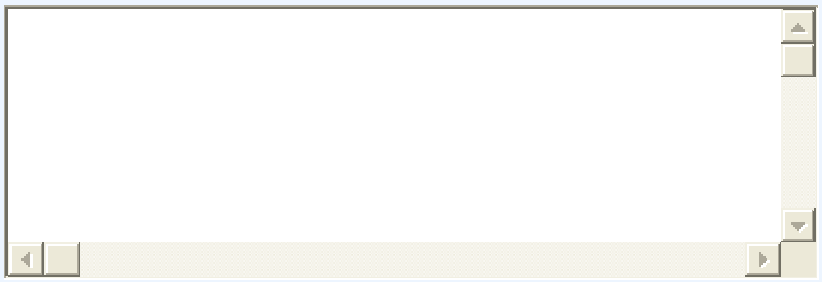
- At the whole university
- At a specific department(s) or faculty(ies)

1.3. Can you please specify the department(s) and/or faculties

2. On a scale from 1-5, how important are the following reasons and motivation that led to the decision to carry out an EMS at the university? 1 - Not important at all; 5 - Very important

	1	2	3	4	5
Social and environmental awareness / responsibility					
Reduce institutional consumption patterns					
“Greening” the institution’s image					
Research interests					
Financial support / funding					

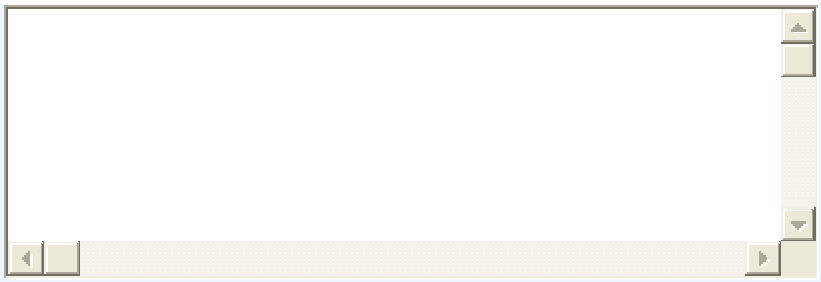
Please feel free to add further reasons/motivations



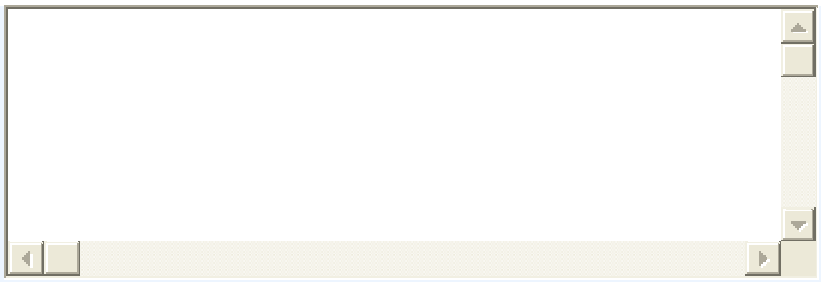
3. Did the universitys opt for

- a. Carrying out the EMS process in order to achieve a final certification
- b. Carrying out the EMS process without a final certification

If you ticked 3.a, please specify the reason: The university opted for achieving a final certification, because



If you ticked 3.b, please specify the reason: The university opted for NOT receiving a final certification, because



4. Did the university follow

- a. A top-down approach
- b. A participatory approach (students and staff involvement)
- Other:

4.1 If you ticked 4.b, please specify the level of participation: Level 1 - TO INFORM The following list of activities and methods follows the table of the International Association for Public Participation (IAP2) that divides the participation processes into 5 levels of participation TO INFORM – TO CONSULT – TO INVOLVE – TO COLLABORATE – TO EMPOWER (source: www.iap2.org).

You can choose none, one or more answers.

- ☐ a. Campaigns
- ☐ b. Info sessions, public meetings
- ☐ c. Website
- ☐ d. Newsletter, flyers, etc.
- ☐ e. Reports
- ☐ Other:

4.2. Participation level 2 - TO CONSULT

You can choose none, one or more answers

- ☐ a. Appreciative Inquiries
- ☐ b. Questionnaires / Surveys
- ☐ c. Online forums / Virtual platforms
- ☐ Other:

4.3. Participation level 3 - TO INVOLVE

You can choose one or more answers

- ☐ a. Round tables
- ☐ b. Open forums
- ☐ c. Workshops
- ☐ d. Thematic weeks
- ☐ e. Conferences
- ☐ f. Work groups on specific topics
- ☐ Other:

4.4 Participation level 4 & 5: TO COLLABORATE & TO EMPOWER

You can choose none, one or more answers

- ☐ a. Special training for staff and students
- ☐ b. Projects within one department
- ☐ c. Interdisciplinary and /or interdepartmental projects
- ☐ d. Projects with stakeholders / surrounding society (neighbourhood, city etc.)
- ☐ e. Curricula related activities (assignments, course assessments, research for thesis etc.)
- ☐ Other: ____

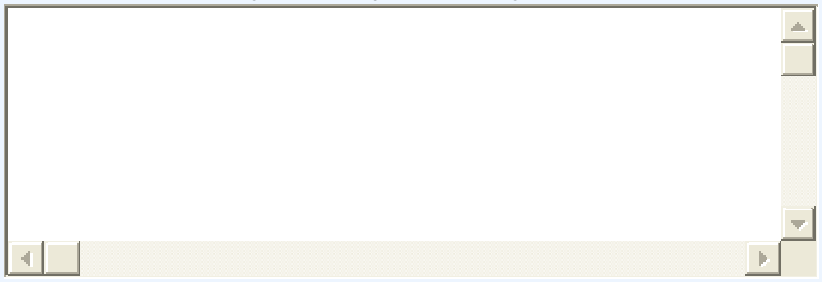
5. How does the university measure its sustainability at the campus? You can choose none, one or more answers

- ☐ a. Annual sustainability report, that follows the GRI guidelines (Global Reporting Initiative)
- ☐ b. Annual sustainability report, that follows another structure than the GRI guidelines
- ☐ c. Regular internal audits
- ☐ d. Regular audits within the certification process
- ☐ Other: ____

6. How do you communicate about your activities related to the EMS and to sustainability at the campus? You can choose one or more answers

- ☐ a. Web page
- ☐ b. Newsletter
- ☐ c. Reports
- ☐ d. Open Days
- ☐ Other: ____

7. OPTIONAL: If you wish, please add your further observations, remarks or comments here



Submit

Powered by Google Docs Report Abuse - Terms of Service - Additional Terms

I.2 Mailing to sample group A:

Dear «contact_person_1», dear «contact_person_2»,

My name is Antje Disterheft, and I am conducting a study about **Environmental Management Systems (EMS) at European universities** as part of my **Master's Thesis at Universidade Aberta, Lisbon**, Portugal.

During my literature review, I found out that **«University_name_in_English»** has carried out «EMS_type_1_» in «year1» and «EMS_type_2» in «year2».

I would like to ask you a couple of short questions about the implementation process at your institution. It should not take longer than 5 minutes.

Please follow this link to the questionnaire: EMS at European universities - short questionnaire

Your contribution is very important to my study and I would like to thank you in advance for your time.

Best regards,

Antje Disterheft

If you are interested, I will be pleased to inform you of the conclusions of this study. For any suggestions, comments or questions, please do not hesitate to contact me.

Contact

Antje Disterheft
Rua da Saudade 12, 2° esq.
1100-583 Lisbon
Portugal
Phone: +351 922 12 5358
antje.disterheft@gmail.com

I.3. Contact list European Universities with an EMS at the campus

#	country	University's original name	University name in English	EMS type	nr students	institutional website
1	Austria	Fachhochschule Wiener Neustadt fuer Technik und Witschaft	Austrian Marketing University of Applied Sciences	ISO 14001 + EMAS	350 of 3200	www.wieselburg.fhwn.ac.at
2	Austria	Universitaet fuer Bodenkultur Wien	University of Natural Resources and Life Sciences, Vienna	EMAS	10570	www.boku.ac.at
3	Denmark	Aalborg Universitet	Aalborg University	ISO 14001	14000	http://www.en.aau.dk/
4	Denmark	Kobenhavns Universitet	University of Copenhagen	Energy Management	38000	http://www.ku.dk/english/
5	France	Université de Bordeaux 1	University of Bordeaux	EcoCampus	9800	http://www.u-bordeaux1.fr/
6	Germany	Hochschule fuer Wirtschaft und Recht Berlin (HWR)	Berlin School of Economics and Law	ISO 14001	9115	http://www.hwr-berlin.de/en/
7	Germany	Brandenburgische Technische Universitaet Cottbus	Brandenburg University of Technology Cottbus	EMAS	6400	http://www.tu-cottbus.de
8	Germany	Freie Universitaet Berlin	FU Berlin	ISO 14001	28500 (4300 PhD)	http://www.fu-berlin.de/en/index.html
9	Germany	Technische Universitaet Berlin / Max-Volmer-Institut	TU Berlin / Max-Volmer Institute	EMAS	29200	http://www.tu-berlin.de/
10	Germany	Umwelt-Campus Birkenfeld (FH Trier)	University of Applied Sciences Trier	EMAS + Zero Emission University / Green-Campus-Concept	2350 (students and staff)	http://www.umwelt-campus.de/ucb/
11	Germany	Hochschule Bremen	University of applied sciences Bremen	EMAS	8000	http://www.hs-bremen.de

#	country	University's original name	University name in English	EMS type	nr students	institutional website
12	Germany	Fachhochschule Koeln	University of applied sciences Cologne	ISO 14001 + EMAS	17000	http://www1.fh-koeln.de
13	Germany	Hochschule Zittau / Goerlitz	University of applied sciences Zittau/Goerlitz	EMAS	3741	http://www.hs-zigr.de/
14	Germany	Universitaet Bielefeld	University of Bielefeld	ISO 14001	17500	http://www.uni-bielefeld.de
15	Germany	Universitaet Osnabrueck	University of Osnabrueck	similar to EMAS	10350	http://www.uni-osnabrueck.de
16	Germany	Universitaet Paderborn	University of Paderborn	EMAS	7000	http://www.uni-paderborn.de/
17	Germany	Universitaet Bremen	University of Bremen	EMAS	19000	http://www.uni-bremen.de/
18	Germany	TU - Technische Universitaet Dresden	Technical University Dresden	EMAS	36000	http://tu-dresden.de/en
19	Germany	Hochschule fuer angewandte Wissenschaften Fachhochschule Landshut	University of Applied Sciences Landshut	EMAS	3200	http://www.fh-landshut.de/
20	Germany	Fachhochschule Luebeck	University of Applied Sciences Luebeck	EMAS	4400	http://www.fh-luebeck.de
21	Germany	Leuphana Universitaet Lueneburg	Leuphana University Lueneburg	EMAS	7000	http://www.leuphana.de/
22	Germany	Hochschule fuer nachhaltige Entwicklung Eberswalde	University of Applied Sciences Eberswalde	EMAS	1800	http://www.hnee.de/
23	Greece	University of Macedonia	University of Macedonia	EMAS	8000	http://www.greenuniversity.gr/en/
24	Greece	University of the Aegean	University of the Aegan	ISO 14001 + EMAS	11000	http://www.greenuniversity.gr/en/ http://mespom.eu/aegean

#	country	University's original name	University name in English	EMS type	nr students	institutional website
25	Luxembourg	Université du Luxembourg	University of Luxembourg	EMS in process - UL Strategic Action Plan on Sustainable Development	5000	http://wwwen.uni.lu/sustainability
26	Poland	Uniwersytet Ekonomiczny w Poznaniu	University of Economics Poznan	EMAS	11725	http://www.pue.ue.poznan.pl/
27	Portugal	Instituto Politécnico de Coimbra - Escola Superior Agrária de Coimbra	IPC - Politechnic Institute of Coimbra, ESAC	EMAS (suspended)	1100	http://portal.esac.pt/portal
28	Slovenia	Univerza v Mariboru	University of Maribor	Life Cycle Assessment (Engeneering Departments)	24600	http://www.uni-mb.si/
29	Spain	Universidad Autónoma de Madrid	UAM - Autonomous University of Madrid	Oficina Ecocampus	36000	http://www.uam.es/ss/Satellite/en/home.htm
30	Spain	Universidad Politecnica de Valencia	UPV - Polytechnical University Valencia	EMAS	34600	http://www.upv.es
31	Spain	UPC - Universitat Politècnica de Catalunya	Barcelona Tech (UPC)	ISO 14001 in process	30000	http://www.upc.edu/
32	Sweden	Mälardalen University	Mälardalen University	ISO14001	13000	http://www.mdh.se/
33	Sweden	Mittuniversitetet (intends to register again)	Mid Sweden University	EMAS registration in one department	21500	http://www.miun.se/Mittuniversitetet-In-English/Home/
34	Sweden	Sveriges Lantbruksuniversitet	Swedish University of Agricultural Sciences	ISO 14001	4500	http://www.slu.se/en/
35	Sweden	Umeå universitet	Umea University	ISO 14001 in process	34000	http://www.umu.se/english/

#	country	University's original name	University name in English	EMS type	nr students	institutional website
36	Sweden	Hogskolan i Boras	University of Boras	ISO 14001 in process	15000	http://www.hb.se/wps/portal/
37	Sweden	Högskolan i Gävle	University of Gävle	ISO14001	12000	http://www.hig.se/
38	Sweden	Goeteborgs Universitet	University of Gothenburg	ISO 14001 + EMAS	37000	http://www.gu.se/
39	United Kingdom	University of Gloucestershire	University of Gloucestershire	ISO 14001	8745	http://www.glos.ac.uk/
40	United Kingdom	University of Plymouth	University of Plymouth	ISO 14001	30000	http://www.plymouth.ac.uk/
41	United Kingdom	University of Leeds	University of Leeds	similar to ISO 14001	33585	http://www.leeds.ac.uk/
42	United Kingdom	Nottingham Trent University	Nottingham Trent University	EcoCampus	25690	http://www.ntu.ac.uk/index.cfm
43	United Kingdom	Leeds Metropolitan University	Leeds Metropolitan University	ISO 14001	41215	http://www.leedsmet.ac.uk/
44	United Kingdom	University of Glamorgan	University of Glamorgan	ISO14001	23900	http://www.glam.ac.uk/
45	Norway	UMB - Universitetet for miljø- og biovitenskap	Norwegian University of Life Sciences	ISO 14001	3800	http://www.umb.no/
46	Switzerland	École Polytechnique Fédérale de Lausanne	EPFL	RUMBA	7100	http://www.epfl.ch/
47	Switzerland	ETH Eidgenoessische Technische Hochschule Zuerich	Swiss Federal Institute of Technology Zurich	ISO 14001 + RUMBA	16230	http://www.umwelt.ethz.ch/rumba/index

II – Statistical treatment of data with SPSS

Table A. 1 Descriptive statistics – variable number of students (Sample group A)

	Minimum	Maximum	Mean	N
number of students	350	41215	16437,57	47

Table A. 2 Descriptive statistics – variable number of students (Sample group B)

	Minimum	Maximum	Mean	N
number of students	350	41215	17704,74	35

Table A. 3 Frequency of EMS certification

	(N)	%
EMS with certification	25	71,4
EMS without certification	9	25,7
Total	34	97,1
Missing	1	2,9
Total	35	100,0

Table A. 4 Descriptive statistics of drivers for implementing an EMS at the campus

Drivers	Minimum	Maximum	Mean	Std. Deviation	(N)
Financial support / funding	1	5	2,91	1,56	35
Research interests	1	5	3,23	1,24	35
Reduce institutional consumption patterns	1	5	3,71	1,23	35
“Greening” the institution’s image	2	5	3,86	1,12	35
Social and environmental awareness / responsibility	1	5	4,17	1,10	35

Table A. 5 Frequency of variable Implementation approach

	(N)	%
Top-down approach	6	17,1
Participatory approach	21	60,0
Mix of top-down & participatory approach	7	20,0
Total	34	97,1
Missing	1	2,9
Total	35	100

Table A. 6 Cross tabulation variables EMS type and Implementation approach

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
EMS type * Implementation approach	34	97,1%	1	2,9%	35	100,0%

EMS type * Implementation approach Crosstabulation

			Implementation approach			Total
			Top-down approach	Participatory approach	Mix of top-down & participatory approach	
EMS type	Non-formal EMS	Count	0	2	2	4
		% within EMS type	,0%	50,0%	50,0%	100,0%
		% within Implementation approach	,0%	9,5%	28,6%	11,8%
	ISO 14001	Count	4	3	4	11
		% within EMS type	36,4%	27,3%	36,4%	100,0%
		% within Implementation approach	66,7%	14,3%	57,1%	32,4%
	ISO 14001 & Non formal	Count	1	0	0	1
		% within EMS type	100,0%	,0%	,0%	100,0%

	EMS	% within Implementation approach	16,7%	,0%	,0%	2,9%
	EMAS	Count	1	12	0	13
		% within EMS type	7,7%	92,3%	,0%	100,0%
		% within Implementation approach	16,7%	57,1%	,0%	38,2%
	ISO 14001 & EMAS	Count	0	4	1	5
		% within EMS type	,0%	80,0%	20,0%	100,0%
		% within Implementation approach	,0%	19,0%	14,3%	14,7%
Total		Count	6	21	7	34
		% within EMS type	17,6%	61,8%	20,6%	100,0%
		% within Implementation approach	100,0%	100,0%	100,0%	100,0%

Table A. 7 Frequency of Participation activities and methodologies

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Campaigns * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Infosessions, public meetings * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Website * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Newsletter, flyers etc * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Reports * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Appreciative inquiries * Implementation approach	31	88,6%	4	11,4%	35	100,0%

Questionnaires /suveys * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Online forums/platforms * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Round tables * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Open forums * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Workshops * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Thematic weeks * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Conferences * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Work groups on specific topics * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Special training * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Curricula related activities * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Projects within one department * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Interdisciplinary projects * Implementation approach	31	88,6%	4	11,4%	35	100,0%
Projects with stakeholders * Implementation approach	31	88,6%	4	11,4%	35	100,0%

Table A. 8 Relation between implementation approach and Degree of participation

Implementation approach * Degree of Participation Crosstabulation

			Degree of Participation					
			1	2	3	4	5	Total
Implementation	TDA	Count	1	0	3	1	0	5

approach		% within Implementation approach	20,0%	,0%	60,0%	20,0%	,0%	100,0%
		% within Degree of Participation	100,0%	,0%	37,5%	7,1%	,0%	16,7%
	PA	Count	0	3	4	9	3	19
		% within Implementation approach	,0%	15,8%	21,1%	47,4%	15,8%	100,0%
		% within Degree of Participation	,0%	100,0%	50,0%	64,3%	75,0%	63,3%
	Mix of TDA & PA	Count	0	0	1	4	1	6
		% within Implementation approach	,0%	,0%	16,7%	66,7%	16,7%	100,0%
		% within Degree of Participation	,0%	,0%	12,5%	28,6%	25,0%	20,0%
Total		Count	1	3	8	14	4	30
		% within Implementation approach	3,3%	10,0%	26,7%	46,7%	13,3%	100,0%
		% within Degree of Participation	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,615	,183
	Cramer's V	,435	,183
N of Valid Cases		30	

ACCU (2009). "Tokyo Declaration of HOPE." *Asia-Pacific Forum for EDS Educators and Facilitators*; last access; http://www.accu.or.jp/esd/mt-static/news/topics/Tokyo_Declaration_of_HOPE%28English_version%29.pdf

Adomssent, M.; Godemann, J. and Michelsen, G. (2008). "Sustainable University - empirical evidence and strategic recommendations for holistic transformation approaches to sustainability in higher education institutions. *Proceedings of the 4th International Barcelona Conference on Higher Education*," In *Higher education for sustainable development*. Barcelona: GUNI.

Alshuwaikait, H. M. and Abubakar, I. (2008). "An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices." *Journal of Cleaner Production*, 16: 1777-85.

Arvidsson, K. (2004). "Environmental management at Swedish universities." *International Journal of Sustainability in Higher Education*, 5(1): 91-99.

Carreiras, M.; Ferreira, A. J. D.; Lopes, M. and Castanheira, E. (2006). "Comparison between two implementation strategies of environmental systems," In. Coimbra.

Christensen, P.; Thrane, M.; Herreborg Jorgensen, T. and Lehmann, M. (2008). "Sustainable Development. Assessing the gap between preaching and practice at Aalborg University." *International Journal of Sustainability in Higher Education*, 10(1): 4-20.

CIA (2008). *World Factbook*. Washington: Skyhorse Publishing.

Clarke, A. and Kouri, R. (2009). "Choosing an appropriate university or college environmental management system." *Journal of Cleaner Production*, 17: 971-84.

Conger, J. A. and Kanungo, R. N. (1988). "The Empowerment Process: Integrating Theory and Practice." *Academy of Management Review*, 13(3): 471-82.

Cortese, A. D. (2003). "The critical role of Higher Education in Creating a Sustainable Future." *Planning for Higher Education;* last access (02-02-2011): 1-8; http://www.aashe.org/documents/resources/pdf/Cortese_PHE.pdf

Council of Europe (2006). "The Responsibility of Higher Education for a Democratic Culture: Citizenship, Human Rights and Sustainability." *Conference on Higher Education and Democratic Culture*; last access 02-02-2011; http://www.coe.int/t/dg4/highereducation/democraticculture/Declaration_EN.pdf

Dahle, M. and Neumayer, E. (2001). "Overcoming barriers to campus greening - A survey among higher educational institutions in London." *International Journal for Sustainability in Higher Education*, 2(2): 139-60.

Delakowitz, B. and Hoffmann, A. (2000). "The Hochschule Zittau/Goerlitz: Germany's first registered environmental management (EMAS) at an institution of higher education." *International Journal for Sustainability in Higher Education*, 1(1): 35-47.

Earth Charter Initiative (2010). "Earth Charta." last access (06-09-2010); http://www.earthcharterinaction.org/content/

EcoCampus (2011). "EcoCampus - Demonstrating Excellence in sustainability." last access (16-03-2011); http://www.ecocampus.co.uk/about_us/index.html

ETH (2009). "FACTSHEET ETH: Ressourcenverbrauch substanziell gesenkt," In. Zurich: ETH.

European Comission (2010a). "EMAS "; last access (31-06-2010); http://ec.europa.eu/environment/emas/index_en.htm

European Comission (2010b). "EMAS - Newsletter, Issue 04/2010." last access (30-03-2011); http://ec.europa.eu/environment/emas/pdf/newsletter/Newsletter%2012-10.pdf

European Comission (2010c). "EMAS III - A premium management instrument." last access (30-03-2011); http://ec.europa.eu/environment/emas/pdf/factsheet/fs_EMAS2to3.pdf

European Comission (2010d). "The ERASMUS programme - studying in Europe and more." last access (18-04-2011); http://ec.europa.eu/education/lifelong-learning-programme/doc80_en.htm

European Comission (2011a). "Overview EMAS across the years." last access (15-04-2011); http://ec.europa.eu/environment/emas/pictures/Stats/2011-03%20Overview%20of%20the%20take-up%20of%20EMAS%20across%20the%20years%202.JPG

European Comission (2011b). "Overview EMAS in the participating countries." last access (15-04-2011); http://ec.europa.eu/environment/emas/pictures/Stats/2011-03%20Overview%20of%20the%20take-up%20of%20EMAS%20in%20the%20participating%20countries%202.JPG

European Commission (2010). "EMAS "; last access (31-06-2010); http://ec.europa.eu/environment/emas/index_en.htm

European Commission (2008). "EMAS and ISO/EN 14001: differences and complementarities." last access (30-05-2010); http://ec.europa.eu/environment/emas/pdf/factsheet/fs_iso_en.pdf

Evangelinos, K. I.; Jones, N. and Panoriou, E. M. (2009). "Challenges and opportunities for sustainability in regional universities: a case study in Mytilene, Greece." *Journal of Cleaner Production*, 17: 1154-61.

Ferreira, A. J. D.; Lopes, M. A. R. and Morais, J. P. F. (2006). "Environmental management and audit schemes implementation as an educational tool for sustainability." *Journal of Cleaner Production*, 14(9-11): 973-82.

Ferrer-Balas, D.; Buckland, H. and de Mingo, M. (2009). "Explorations on the University's role in society for sustainable development through a system transition approach. Case-study of the Technical University of Catalunia (UPC)." *Journal of Cleaner Production*, 17: 1075-85.

Florin, P. and Wandersman, A. (1990). "An introduction to citizen participation, voluntary organizations, and community development: Insights for empowerment through research." *American Journal of Community Psychology*, 18(1): 41-54.

Fowler, F. J. J. (2002). *Survey Research Methods*. Thousand Oaks: SAGE Publications.

Graham, A. C. (2004). Report on Higher Education Sustainability Activities. Cambridge.

Hansen, J. A. L., Martin (2006). "Agents of change: universities as development hubs." *Journal of Cleaner Production*, 14(9-11): 820-29.

Harvey, L. (2000). "New realities: The relationship between higher education and employment." *Tertiary Education and Management*, 6(1): 3 - 17.

Helling, K. and Cosack, T. (2007). "Zero-Emission-Campus. Successes and experiences of the Environmental Campus Birkenfeld." *Sustainable Campus Conference*; last access; http://www.international-sustainable-campus-network.org/fileadmin/downloads/Panel_A1_Klaus_Helling.pdf

Hill, M. M. and Hill, A. (2009). *Investigação por questionário*. Lisbon: Edições Sílabo.

Holyoak, L. (2001). "Participation and Empowerment in Organizations: Modeling, Effectiveness and Applications." *Leadership & Organization Development Journal*, 22(3): 139-42.

Howell, R. E.; Olsen, M. E. and Olsen, D. (1987). *Designing a citizen involvement program: A guidebook for involving citizens in the resolution of environmental issues*. Western Rural Development Center.

IAU (2003). "International Conference on Education for a Sustainable Future - General Report," In *Report on Higher Education Sustainability Activities*, ed. A. C. Graham, 10. Cambridge: Massachusetts Institute of Technology.

Institut fuer Umweltkommunikation, P. D. (2009). "Sustainable University - Project details." last access (17-05-2010); http://www.leuphana.de/en/institute/infu/unesco-chair/chair-activities/sustainable-university-project-details.html

International Association for Public Participation (2007). "Spectrum of public participation." last access (27-01-2011); http://www.iap2.org/associations/4748/files/IAP2%20Spectrum_vertical.pdf

ISO (2011). "ISO 14000 essentials." last access (02-01-2011); http://www.iso.org/iso/iso_catalogue/management_and_leadership_standards/environmental_management/iso_14000_essentials.htm

ISO Central Secretariat (2009). The ISO Survey - 2008. Geneva.

Leal Filho, W. ed. "*Sustainability at Universities - Opportunities, Challenges and Trends*." Frankfurt: Peter Lang, 2009.

Lehmann, M.; Christensen, P.; Thrane, M. and Jørgensen, T. H. (2009). "University engagement and regional sustainability initiatives: some Danish experiences." *Journal of Cleaner Production*, 17(12): 1067-74.

Lidgren, A.; Rodhe, H. and Huisingh, D. (2006). "A systemic approach to incorporate sustainability into university courses and curricula." *Journal of Cleaner Production*, 14(9-11): 797-809.

Lozano, R. (2010). "Diffusion of sustainable development in universities curricula: an empirical example from Cardiff University." *Journal of Cleaner Production*, 18(10): 637-44.

Lozano, R. (2006a). "Incorporation and institutionalization of SD into universities: breaking through barriers to change." *Journal of Cleaner Production*, 14(9-11): 787-96.

Lozano, R. (2006b). "A tool for a Graphical Assessment of Sustainability in Universities (GASU)." *Journal of Cleaner Production*, 14(9-11): 963-72.

Lukman, R. and Glavic, P. (2007). "What are the key elements of a sustainable university." *Clean Technology & Environmental Policy*, 9: 103-14.

Magalhães Hill, M. and Hill, A. (2009). *Investigação por questionário*. Lisbon: Edições Sílabo.

Nicolaides, A. (2006). "The implementation of environmental management - Towards sustainable universities and education for sustainable development as an ethical imperative." *International Journal of Sustainability in Higher Education*, 7(4): 414-24.

Noeke, J. (2000). "Environmental management systems for universities - A case study." *International Journal of Sustainability in Higher Education*, 1(3): 237-51.

OECD (2001). "Citizens as partners - OECD Handbook on information, consultation and public participation in policy-making," In *Governance*, ed. OECD. Paris: OECD Publications Service.

Oelreich, K. V. (2004). "Environmental Certification at Maelardalen University." *International Journal for Sustainability in Higher Education*, 5(2): 133-46.

Peglau, R. (2011). Personal communication about fundings in German universities. Dessau. 18-03-2011

People & Planet (2011). The People & Planet Green League 2010. Oxford, P. P. Limited.

Pereira, A. (2006). "SPSS - Guia prático de utilização," In. Lisbon: Edições Sílabo.

Roorda, N. (2010). Sailing on the wind of change - The Odyssey to Sustainability of the Universities of Applied Sciences in the Netherlands. PhD thesis. International Centre for Integrated assessment and Sustainable

development (ICIS);Maastricht University

Sammalisto, K. and Brorson, T. (2008). "Training and communication in the implementation of environmental management systems (ISO 14001): a case study at the University of Gaevle, Sweden." *Journal of Cleaner Production*, 16: 299-309.

Sharp, L. (2002). "Green campuses: The road from little victories to systemic transformation." *International Journal of Sustainability in Higher Education*, 3(2): 128-45.

Simkins, G. and Nolan, A. (2004). "Environmental Management Systems in Universities." last access (17 May 2010); http://www.eauc.org.uk/environmental_management_systems_in_universities_a

Stakeholder Forum for a Sustainable Future (2011). "Earthsummit 2012." last access (20-02-2011); http://www.earthsummit2012.org/index.php/about-us

Steger, U. (2000). "Environmental management systems: empirical evidence and further perspectives." *European Management Journal*, 18(1): 23-37.

Tashakkori, A. and Teddlie, C. (1998). *Mixed Methodology - Combining Qualitative and Quantitative Approaches*. Thousand Oaks: SAGE Publications.

Tauchen, J. and Brandli, L. L. (2006). "A Gestão Ambiental em Instituições de Ensino Superior: Modelo para implantação em campus universitário." *Gestão & Produção*, 13(3): 503-15.

UN Department of Economic and Social Affairs- Division for Sustainable Development (2009). "Commission on Sustainable Development

"*;* last access (20-02-2011); http://www.un.org/esa/dsd/csd/csd_index.shtml

UNCED (1992). *Agenda 21, Ch. 36: Promoting Education and Public Awareness and Training*. Rio de Janeiro: United Nations.

UNECE (2001). "Aarhus Convention - Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters." last access (20-02-2011); http://www.unece.org/env/pp/

UNEP (1972). "Declaration of the United Nations Conference on the Human Environment." *United Nations Conference on the Human Environment*; last access; http://www.unep.org/Documents.Multilingual/Default.asp?documentid=97&articleid=1503

UNESCO (1997). "Declaration of Thessaloniki." *International Conference on Environment and Society: Education and Public Awareness*; last access;

UNESCO (1977). "Tbilisi Declaration - Final Report." *Intergovernmental Conference on Environmental Education*; last access; http://unesdoc.unesco.org/images/0003/000327/032763eo.pdf

UNESCO (2010). "UN Decade of Education for Sustainable Development " *Education;* last access (20-02-2011); http://www.unesco.org/en/education-for-sustainable-development/decade-of-esd/

UNESCO (1998). "World Declaration on higher education for the twenty-first century: Vision and Action." *World Conference on Higher Education*; last access; http://www.unesco.org/education/educprog/wche/declaration_eng.htm#world%20declaration

United Nations (2009). "Commission on Sustainable Development

"*;* last access (20-02-2011); http://www.un.org/esa/dsd/csd/csd_index.shtml

United Nations (2002). "Press Conference about the Ubuntu Declaration." last access (06-09-2010); http://www.un.org/events/wssd/pressconf/020901conf1.htm

United Nations Statistic Division (2010). "Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic groupings." last access (01-03-2011); http://unstats.un.org/unsd/methods/m49/m49regin.htm#europe

Universidad Autonoma de Madrid (2011). "ECOCAMPUS." last access (11-02-2011); http://www.uam.es/servicios/ecocampus/especifica/default.html

University Leaders for a Sustainable Future (2010). "Talloires Declaration Institutional Signatory List." last access (06-09-2010); http://www.ulsf.org/programs_talloires_signatories.html

Velazquez, L.; Munguia, N.; Platt, A. and Taddei, J. (2006a). "Sustainable university: what can be the matter'." *Journal of Cleaner Production*, 14(9-11): 810-19.

Velazquez, L.; Munguia, N.; Platt, N. and Taddei, J. (2006b). "Sustainable university: what can be the matter?" *Journal of Cleaner Production*, 14(9-11): 810-19.

Velazquez, L. M., Nora; Platt, Alberto; Taddei, Jorge (2006). "Sustainable university: what can be the matter'." *Journal of Cleaner Production*, 14(9-11): 810-19.

Wätzold, F. (2009). "Explaining differences in EMAS participation rates across Europe: the importance of institutions, incomplete information and path dependence." *European Journal of Law and Economics*, 28(1): 67.

Weenen van, H. (2000). "Towards a vision of a sustainable university." *International Journal of Sustainability in Higher Education*, 1(1): 20-34.

World Commission on Environment and Development; Brundtland, G. H. and Khalid, M. (1987). Our Common Future. Oxford.

Wright, T. S. A. (2002). "Definitions and frameworks for environmental sustainability in higher education." *International Journal for Sustainability in Higher Education*, 3(3): 203-20.

Wright, T. S. A. (2006). "Giving "teeth" to an enviornmental policy: a Delphi Study at Dalhousie University." *Journal of Cleaner Production*, 14(9-11): 761-68.