THE ROLE OF ENVIRONMENTAL MANAGEMENT SYSTEMS IN PROMOTING SUSTAINABLE DEVELOPMENT AT HIGHER EDUCATION INSTITUTIONS

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Abstract:

Since the 1990s, environmental management systems (EMSs) have been implemented across many industry sectors throughout the world. Originally designed as management tools for heavy polluting industries to reassess their production processes in order to curb environmental pollution, environmental management systems have started to conquer the service sector. Recently, higher education institutions have also shown increased interest in implementing voluntary EMSs. Universities are thereby responding to a transformation process within the higher education sector. As major education centers of future leaders, higher education institutions are not only expected to engage in teaching and research, but they are increasingly facing pressure from various stakeholders to recognize their critical role in the promotion of Sustainable Development.

Globally, two major formal environmental management system schemes can be found in the tertiary education sector: the ISO 14001 standards and the Eco Management and Audit Scheme (EMAS) of the European Union. This study aims to assess the potentials of such environmental management systems for universities, and elaborates their role in the promotion of Sustainable Development. While the primary target of EMSs lies in the achievement of legal compliance and efficiency gains (cost reduction), they also trigger

indirect effects for the organization. Therefore, the work not only takes into account the direct environmental impact but also the potential greening effects of EMS on administration, teaching, research as well as cooperation with industry. The study sets out to reveal the scope and limits of environmental management systems and therefore contributes to the academic debate on the significance of EMS for higher education institutions.

I. Introduction

Since the 1990s many industrial companies across various industries have opted for the implementation of environmental management systems (EMSs). In an attempt to increase global competitiveness and to ensure the legal compliance of the manufacturing sector, governments around the world have stepped up measures aimed at enabling heavy polluting industries to meet emerging environmental standards. Thousands of enterprises have chosen voluntary EMS schemes such as ISO 14001 standards or the Eco-Management and Audit Scheme (EMAS) in order to reduce their environmental burden while simultaneously improving their business opportunities, thereby responding to a growing environmental public concern and increased environmental awareness among consumers as well as other stakeholders. For the manufacturing industry legal compliance, cost pressure, and efficiency gains play a decisive role in adapting EMSs (Melnyk et al., 2003; Steger, 2000). While originally EMSs were designed as management tools to curb environmental impacts in heavy polluting industries, the late 1990s saw the emergence of EMSs in the service sector. Across the globe, a rising number of enterprises from the service sector have started to implement EMSs to improve their overall efficiency, signal their environmental consciousness and enhance their green image. While manufacturing mainly focused on processes in the area of production, the service sector found administration to be a fruitful area for environmental improvements.

Also universities have launched similar initiatives to enhance environmental performance and to create a more sustainable higher education sector. Academic institutions have increasingly shown interest in implementing voluntary formal EMSs, such as the ISO 14001 standards or the EMAS. Universities have also taken a crucial role in the promotion of Sustainable Development. First, universities are the main centers of education for future generations of leaders. When former graduates enter the job market and take over important decision making positions, they can look back to several years of education on their campuses. Consequently, universities serve as multipliers of ideas and concepts. Second, universities contribute decisively to the exploration and understanding of global environmental challenges. Higher education institutions (HEIs) claim to be at the forefront of innovative research and are a major source of knowledge. Changes in the study programs, shifts in their curricular or redirecting research funding may have long term consequences. Third, under the paradigm of entrepreneurial universities, higher education institutions are urged to draw a part of their financial resources from the private sector by establishing links to industry. Since the private sector has already realized the potentials of green products, a closer partnership between the higher education sector and industry may bring synergies and provide a further boost to the greening of the economy and society. Fourth, although the direct environmental impacts of universities are low compared to those of industry, higher education institutions may contribute decisively to strengthening environmental protection by implementing policy instruments and regulations that aim to change the long term behavior of students, faculty and staff. Compared to the manufacturing sector, universities may thus achieve substantial results by addressing indirect environmental impacts.

The implementation of voluntary environmental management schemes among market-oriented companies has been discussed thoroughly in the scientific literature, and several studies have analyzed the application of EMSs throughout various economic sectors (Halkos

& Evangelinos, 2002; Harter & Homison, 1999; Henriques & Sadorsky, 1996; King & Lenox, 2000; Nakamura et al., 2001; Videras & Alberini, 2000; Welch et al., 2002; Arora & Cason, 1995; Bansal & Hunter, 2003; Darnall, 2003). Due to its global applicability, ISO 14001 has drawn the most scholarly attention, whereas studies on EMAS are less abundant (Welch et al., 2002). In general, scientific studies on the implementation of formal EMS in private enterprises are plentiful, while academic literature on the implementation of EMS in the higher education sector is limited (Adomßent et al., 2008; Krizek et al., 2012; Portocarrero, 2007; Delakowitz & Hoffmann, 2000; Müller et al., 2005; Ferreira et al., 2006; Gilch et al. 2004). This study seeks to contribute to the ongoing discussion on EMSs in the tertiary education sector. The present work aims to reveal the potentials of environmental management systems for universities, and elaborates their role in the promotion of Sustainable Development. While the primary target of EMSs lies in the achievement of legal compliance and efficiency gains, they also trigger indirect effects for the organization. Therefore, the work not only takes into account the direct environmental impact but also the potential greening effects of EMSs on administration, teaching, research as well as cooperation with industry. Furthermore, the study sets out to reveal the scope and limits of environmental management systems and therefore contributes to the academic debate on the significance of EMSs for higher education institutions. The study is structured as follows. Section two will provide the theoretical framework for exploring the socio-economic motives of universities to voluntarily implement costly and complex formal environmental management systems. Section three starts with a historic account of EMSs in the higher education sector, and then explores the application of such schemes at HEIs. This part elaborates the potentials but also the pitfalls of implementing EMSs at universities. Section four elaborates the ongoing trends in greening universities, while section five draws conclusions from observations.

II. Theoretical Considerations

With intensifying global economic interaction, international standards have increasingly gained importance. In a world of fragmented markets, international standards help to reduce trade barriers and ease international operations by increasing transparency. The application of international standards translates into significant technological, economic and social benefits. Consequently, attempts to implement globally accepted standards and the formation of frameworks for internationally applied procedures can thus be seen as responses to tackle the challenges of globalization. For globally operating companies, compliance to internationally applied and recognized standards ensures market access and increases the level of trust of consumers and investors. International standards represent strategic tools to ensure that most demanding challenges are dealt with at an international level and daily operations are accomplished more efficiently (King & Lenox, 2001; Bansal & Hunter, 2003; Darnall, 2003). While the manufacturing sector has started to realize the importance of international standards, the service sector has experienced some delays in following this trend (Ruiz-Tagle, 2006; Nakamura et al., 2001). Also, universities are unable to isolate themselves from societal development and global challenges, such as globalization or environmental deterioration. Universities are confronted with mounting pressure from global competition and their operations are increasingly scrutinized by the public. Now, universities not only have to serve society by educating young leaders and advancing scientific knowledge, but they also face increasing pressure from various stakeholders, such as government authorities, regulators, environmental groups and the public. Since universities are increasingly competing on an international scale, the decision making processes of higher education institutions are consequently increasingly shaped by international standards and regulations. With the rise of public environmental awareness, international standards in the field of environmental

protection have emerged. Environmental standards are mainly applied to ensure legal compliance, improve overall environmental performance, minimize risks, spur innovation, enhance efficiency, motivate staff and also signal environmental commitment to business partners. As governments concentrate on establishing frameworks for improving academia-industry cooperation, the existence of a formal and certified EMS represents a strong signal to various stakeholders, including those of the private sector. However, since environmental issues are complex and interconnected, the traditional reactive end-of-pipe approach to tackling environmental problems has turned out to be ineffective. An effective EMS not only considers the specific circumstances of the organization, but also has to be flexible in its adoption to appropriately address environmental issues.

The implementation of a formal EMS is based on cost-benefit calculations. The higher the expected economic or social benefits for the organization, the more likely it will be to decide in favor of implementation of an EMS. However, the decision making process is influenced by a series of factors, such as the ownership of the organization, its size, competition among the higher education sector, the core competences of the university, the legal framework within which it operates, the level of public environmental awareness as well as the need to build up a green image (Arora & Cason, 1995; Halkos & Evangelinos, 2002; Levy & Marans, 2012). Since universities are increasingly applying market oriented management principles, the implementation of a voluntary EMS provides an option as long as benefits from the implementation succeed implementation and verification costs (Vernon et al., 2009; Sharp, 2002).

Nowadays, universities have to deal with various demands and challenges, such as environmental compliance, campus sustainability, cost pressure, resource conservation and preservation, environmental stewardship, environmental education and research, as well as the need to improve and report environmental performance. Obviously, the higher education

sector has never been more receptive to the implementation of environmental management than it is now. Consequently, an EMS represents a useful management tool for the higher education sector.

III. The Higher Education Sector and EMSs

The Emergence of EMSs in the Higher Education Sector

Five years after the first international discussion of the deterioration of the global environment at the *Stockholm Conference (UN Conference on Human Environment)* in 1972, the *Intergovernmental Conference on Environmental Education* in Tiflis (1977) saw the drafting of the first international declaration on environmental education. Although limited in its scope by focusing on the promotion of environmental teaching, research, and training, the agreement set the starting point for efforts in the higher education sector towards greening its operations. When the *Brundtland Report* (1987) introduced the concept of *Sustainable Development*, environmental efforts in the higher education sector were still rare. While the term Sustainable Development provided an interesting field for research, calls for an application of principles of Sustainable Development on campuses were limited. The first declarations and international agreements were signed in the early 1990s, mainly as an effort to respond to rising public environmental awareness. The *Talloires Declaration* (1990), for instance, provides a comprehensive framework for the establishment of an international network of colleges and universities to promote Sustainable Development (Wright, 2004). As of 2013, over 430 universities and colleges from more than 40 countries have signed the declaration. With the 1992 *Rio Earth Summit,* global environmental challenges were elevated to the highest political levels and the implementation of the UN action plan *Agenda 21* contributed to raising the general level of environmental consciousness within the global higher education sector, however, mainly resulting in a series of environment related

conferences. At this time research concentrated on the principles of Sustainable Development but only a few higher education institutions launched attempts to green their operations and campuses (Wright, 2002). The 1993 *Kyoto Declaration on Sustainable Development* calls "universities to seek, establish and disseminate a clearer understanding of Sustainable Development" and urges them to implement concrete action plans along with the establishment of monitoring and reporting mechanisms. In 1994, the *Association of European Universities (CRE)* introduced the *Cooperation Programme in Europe for Research on Nature and Industry* (*Copernicus Charta*), called the higher education sector to actively take the role of a green leader and thus spur the creation of a more sustainable society (Wright, 2002: 118). Under this Programme, universities should bundle their resources to strengthen their environmental commitment since, due to their expertise in various fields of research, they are crucial players. The Charta called for a participatory approach, with the involvement of students, faculty, staff, employees and researchers. Although the list of signatories has steadily increased, progress is hard to assess since there still exists no reporting mechanism. While the growing list of environmental declarations and international agreements on Sustainable Development in the Higher Education sector underlines the growing commitment among academic institutions to integrate ecological concerns into their operations, most agreements lack a binding target system and fail to include effective reporting and monitoring mechanisms. On the contrary, the integration of a formal EMS requires a strong environmental commitment from the participating organization.

Why Adopt an EMS?

EMSs are systematic instruments that are designed to identify the environmental impacts of companies and organizations and provide measures to improve overall environmental output by setting priorities, implementing performance targets, and launching

environmental projects and programs. Formal EMSs include certification and monitoring mechanisms, and seek quantification of environmental improvements. Consequently, universities considering the deployment of an EMS have to take into account several aspects before decision making. A series of questions will already be raised in the initial phase: What are the main environmental concerns? (As universities are largely unaware of all ongoing environment related processes on the site the initial environmental review often works as an eye-opener for many institutions.) Which framework and which model is the most suitable for the university? What are the benefits of a formally certified or an informal uncertified model? What are the expected costs of the EMS? Who is the responsible body for the EMS?

While EMSs are widely applied in numerous industry sectors - particularly where suppliers along the entire supply chain are confronted with strict environmental standards - they are still uncommon among colleges and universities. However, over the last decade, the higher education sector has taken a more responsible approach to dealing with environmental challenges. While the trend of greening campuses is a global one and can be observed in several regions throughout the world (particularly in Europe and the U.S.A.), the speed and intensity of progress varies greatly. As of 2012, a total of 47 universities (see Table 1) from 14 different countries in Europe had instituted an EMS (Disterheft, 2012). With 17 higher education institutions that have implemented an EMS, Germany takes the biggest part, followed by Sweden (7) and the United Kingdom (6). The most frequently applied instruments are ISO 14001 and EMAS. Whereas ISO 14001 is equally distributed over small, medium and large HEIs, the latter is mainly found at smaller and medium sized universities (under 10,000 students). Out of the 47 European universities, six had more than one system implemented. Five of these six introduced both ISO and EMAS. While informal EMSs are relatively equally distributed around Europe, ISO 14001 is more common among Northern European universities (12 institutions), whereas EMAS is more dominant in Western Europe

(15 institutions). This matches findings from studies on the geographical distribution of EMSs in companies (Steger, 2000).

Table 1: European Universities with an EMS in place. Source: Disterheft (2012).

European Universities with an EMS at the campus – University name, EMS type implemented and implementation approach (additional info to Fig. 2).

Nr.	Country	Name	EMS	Implementation approach
1	Austria	Austrian Marketing University of Applied Sciences	ISO 14001 + EMAS	PA[a]
36		University of Natural Resources and Life Sciences, Vienna	EMAS	n/a
2	Denmark	Aalborg University	ISO 14001	Mix of TDA[b] and PA
3		University of Copenhagen	Energy management	Mix of TDA and PA
4	Germany	Freie Universitaet Berlin	ISO 14001	Mix of TDA and PA
5		Berlin School of Economics and Law	ISO 14001	PA
6		Technische Universitaet Berlin/Max-Volmer-Institut	EMAS	PA
7		University of Bremen	EMAS	PA
8		University of applied sciences Cologne	ISO 14001 + EMAS	PA
9		Technical University Dresden	EMAS	PA
10		University of Applied Sciences Eberswalde	EMAS	PA
11		University of Applied Sciences Landshut	EMAS	PA
12		University of Applied Sciences Luebeck	EMAS	PA
13		Leuphana University Lueneburg	EMAS	PA
14		University of Osnabrueck	Similar to EMAS	PA
15		University of Paderborn	EMAS	PA
16		University of Applied Sciences Trier	EMAS (in process)	PA
17		University of applied Sciences Zittau/Goerlitz	EMAS	PA
38		University of Bielefeld	ISO 14001	n/a
39		University of applied sciences Bremen	EMAS	n/a
40		Brandenburg University of Technology Cottbus	EMAS	n/a
18	Greece	University of Macedonia	EMAS	PA
19		University of the Aegan	ISO 14001 + EMAS	PA
20	Poland	University of Economics Poznan	EMAS	TDA
21	Portugal	IPC - Politechnic Institute of Coimbra, ESAC	EMAS (suspended)	PA
22	Slovenia	University of Maribor	Life Cycle Assessment	PA
23	Spain	Barcelona Tech (UPC)	ISO 14001 in process	TDA
24		UAM - Autonomous University of Madrid	Oficina Ecocampus	PA
25		UPV - Polytechnical University Valencia	ISO 14001 + EMAS	PA
26	Sweden	University of Gävle	ISO14001	Mix of TDA and PA
27		University of Gothenburg	ISO 14001 + EMAS	Mix of TDA and PA
28		Umea University	ISO 14001 in process	PA
29		Swedish University of Agricultural Sciences	ISO 14001 at some departments	Mix of TDA and PA
42		Mid Sweden University	EMAS at one department	n/a
43		University of Boras	ISO 14001 in process	n/a
44		Mälardalen University	ISO14001	n/a
30	United Kingdom	University of Glamorgan	ISO 14001	TDA
31		Leeds Metropolitan University	ISO 14001	TDA
32		Nottingham Trent University	EcoCampus	Mix of TDA and PA
33		University of Plymouth	ISO 14001	TDA
45		University of Gloucestershire	ISO 14001	n/a
46		University of Leeds	Similar to ISO 14001	n/a
34	Switzerland (non EU)	École Polytechnique Fédérale de Lausanne (EPFL)	RUMBA	No data
35		ETH - Swiss Federal Institute of Technology Zurich	ISO 14001 + RUMBA	TDA
37	France	University of Bordeaux	EcoCampus	n/a
40		Brandenburg University of Technology Cottbus	EMAS	n/a
41	Luxembourg	University of Luxembourg	Non-formal EMS in process	n/a
47	Norway (non EU)	Norwegian University of Life Sciences)	ISO 14001	n/a

[a] PA: Participatory approach.
[b] TDA: Top-down approach.

As of now, a total of 29 European tertiary educational institutions have registered with EMAS, 19 of which are located in Germany (see Table 2). The country's higher education sector with a total of 395 higher education institutions educates some 2.2 million students and employs over 570,000 staff (Hochschulrektorenkonferenz, 2011; Hochschulkompass, 2013). In 1999, the Hochschule Zittau/Görlitz was the first European University to register with EMAS. Given that several academic institutions are in the process of preparation for EMAS registration (the University of Hohenheim, Fachhochschule Trier, the University of Kassel and the Catholic University Eichstätt-Ingolstadt), interest in EMAS has not diminished over the years.

Several countries have introduced national standards and schemes for companies and organizations. Since its introduction in 2005, the United Kingdom's EcoCampus has attracted about a third of the higher education institutions, covering about 40% of the country's strongest universities regarding their research capacities (Russell Group). EcoCampus consists of a complete package for the higher education sector to promote sustainability and establish an EMS (Eco Campus). Several universities are ISO 14001 certified (Glamorgan, Elmwood College, University of Wales College of Medicine, Leeds Metropolitan University) and several more are preparing to register with EMAS. However, some others aim to implement an EMS without the wish to formally certify (e.g., Oxford Brookes, Sheffield, Sunderland, Cambridge and Hertfordshire).

Across the globe similar schemes can be found such as the Higher Education 21 (UK), the EMS Self-Assessment Checklist (USA), the Auditing Instrument for Sustainability in Higher Education (Netherlands), the Osnabrück University model (Germany), Öko-Profit (Germany/Austria) and the Sustainable University model (Mexico).

Table 2: List of EMAS certified German Higher Education Institutions. Source: Author's compilation.

Year of 1st EMAS Certification	Name of University	Federal State	Students	Staff	Annual Budget (in €m)	Third-party funding (in €m)	Excellence Program	ISO-14000 certified	Copernicus Charta
(in progress)	Trier University of Applied Sciences (Environment Campus Birkenfeld)*	RP	15,260	n.a.	102	n.a.			
2012	University of Kiel	SH	24,189	3,328	228.6	90.0	X	X	
2012	Hochschule Esslingen – University of Applied Sciences	BW	6,079	1,000	30.0	n.a.			
2011	University of Hohenheim	BW	8,458	2,048	122.0	27.8			
2011	University of Tübingen	BW	27,132	10,000	395.0	94.0	X		
2011	Hochschule Harz – University of Applied Sciences	ST	3,300	n.a.	n.a.	2.5			
2010	Brandenburg University of Technology Cottbus	BB	6,752	119	51.8	34.0			X
2010	Eberswalde University for Sustainable Development	BB	1,800	44	7.9	4.0			X
2009	Hochschule Osnabrück – University of Applied Sciences	NI	11,000	744	105.0	n.a.			
2008	Cologne University of Applied Sciences	NRW	21,000	1,000	130.0	12.0			
2004	Freie Universität Berlin	BE	28,500	4,000	274.0	106.0	X	X	X
2004	University of Bremen	HB	19,524	3,359	278.6	86.0	X		X
2004	Lübeck University of Applied Sciences	SH	4,143	320	17.8	5.0			X
2003	Bremen University of Applied Sciences	HB	8,273	n.a.	n.a.	n.a.			
2003	University of Technology Dresden	SN	35,336	8000	500.0	204.0	X		
2002	University of Applied Sciences Landshut	BY	4,313	100	n.a.	1.0			
2000	Leuphana University Lüneburg	NI	6,982	930	79.1	1.3			X
2000	University of Paderborn	NRW	18,500	2,210	165.0	11.1			
2000	Bielefeld University	NRW	18,546	1,262	220.0	53.5	X	X	X
1999	Hochschule Zittau/Görlitz – University of Applied Sciences	SN	3,750	490	n.a.	n.a.			X

* EMAS implementation in process

** EMAS implemented but not certified yet

Source: Authors' compilation

In a survey of 206 colleges and universities (mainly from the United States) from the year 2006 about 15% had an EMS in place, while about 63% of the respondents were in the process of developing an EMS or showed interest in implementing one (The Coalition for Conservation and Environmental Education, 2006). The initial driver for universities to implement an EMS was the need for a more effective management framework for

environmental, health and safety issues and to promote environmental stewardship (49%), followed by the need to better track environmental performance (40%) and by the perception of a regulatory advantage (38%). About 36% saw benefits from cutting operational costs. A look on the current priorities of EMS implementation shows an overall growth in importance of priorities. While compliance management still tops the priorities (63%), energy conservation (56%) replaced pollution prevention (52%) and in addition renewable energy (26%) saw a significant growth in importance (The Coalition for Conservation and Environmental Education, 2006). As the study shows, initial and present drivers may change during the implementation process. This may be due to a change in the overall context but could also be due to internal learning processes taking place at those university that apply an EMS.

The Role of EMS in the Higher Education Sector

There is no doubt that the time spent at universities and the education received on the campus leaves a strong imprint on future decision makers. A society's commitment to protecting the environment and conserving resources must therefore be based on an education that integrates principles of Sustainable Development.

At present, the tertiary education sector is undergoing substantial reform as academic institutions are increasingly exposed to global competition and have to bear more self responsibility for their operations. Over the past decades, we could observe a substantial change in the role of higher education institutions. Universities face mounting pressure from various stakeholders, such as government authorities, students, the public, industry actors and environmental groups. Across the globe higher education institutions have implemented management practices to deal with financial limitations and they now operate more like companies than research organizations. Governments encourage universities to establish links

with the industry sector and universities have to take into account the marketability of their research output. The role of modern universities has extended from providers of education and research to organizations that are scrutinized for their social and environmental involvement (von Richter, et al. 2000). However, HEIs are operating in an increasingly tense network of domestic and international environmental regulations and they face rising public environmental awareness. In times of decreasing budgetary support from the state, fulfilling all demands provides major obstacles, and many HEIs have responded with the integration of an environmental management system. However, unlike manufacturing industries, we do not expect heavy direct environmental impact from the tertiary sector. With its expertise, know-how and brain power, the tertiary education sector plays a significant role in solving current challenges. It further takes a vital role in educating the future elite who may in the long run change decision making structures (Stoltenberg, 2009; von Richter, 2000; Jucker, 2002).

The Struggle for Dominance: ISO 14001 vs. EMAS

It must be noted that neither ISO 14001 nor EMAS were initially designed for educational institutions. Moreover, ISO 14001, as the most recognized scheme, offers no official guidance for universities. Nevertheless, ISO 14001 and EMAS are the two major formal EMSs that can be found at universities across the globe.

The ISO 14001 series includes various aspects of environmental management and provides tools for organizations and enterprises to identify and control their environmental impact and constantly improve their environmental performance. The main benefits from the ISO 14001 include reduced cost of waste management, reduced consumption of energy and materials, lower distribution costs, and improved corporate image among regulators, customers and the public. Over the last years the number of certifications to ISO standards in the areas of information security, environmental management, energy management, and the

sector-specific areas of food safety, medical devices and automotive appliances increased significantly (ISO Survey, 2011). As of the end of 2011, some 267,457 ISO 14001:2004 certificates had been issued, a growth of 6% (15,909) over the year before. The dominant position of ISO 14001 is underlined by its global geographical distribution and its deployment in 158 countries. Interestingly, China tops the list of countries with the most ISO 14001 certificates (81,993), followed by Japan (30,397) and Italy (21,009) (see Table 3). Three of the Top 6 countries with the most ISO 14001 certificates are located in Asia. China also topped the list of countries regarding the growth of ISO 14001 certificates in 2011 (12,209), followed by Italy (3,945) and France (2520). South Korea (1,244) ranks fifth and Singapore (684) seventh (see Table 4).

Table 3: Top 10 countries for ISO 14001 certification. Source: Source: ISO Survey, 2011.

Top 10 Countries for ISO 14001 Certification (2011)	
1. China	81,993
2. Japan	30,397
3. Italy	21,009
4. Spain	16,341
5. United Kingdom	15,231
6. Republic of Korea	10,925
7. Romania	9,557
8. France	7,771
9. Germany	6,253
10. U.S.A.	4,957

Table 4: Top eight countries for ISO growth. Source: ISO Survey, 2011.

Top 8 Countries for Growth of ISO 14001 Certification (2011)	
1. China	12,209
2. Italy	3,945
3. France	2,520
4. Romania	2,139
5. Republic of Korea	1,244
6. United Kingdom	885
7. Singapore	684
8. Canada	550

Among all the sectors of ISO 14001 application, unsurprisingly education does not rank top but comes in 37th place with 853 certificates (ISO Survey, 2011).

ISO and EMAS share common values, aims and principles, as they are both formal and voluntary instruments that call on the environmental responsibilities of enterprises and organizations to commit themselves to the conservation of natural resources and the protection of the environment. Both schemes seek to raise awareness among all participants by setting out measures to achieve environmental targets. Furthermore both schemes include a monitoring system for target achievement.

However, aside from these similarities, the two schemes vary in many aspects, such as their participatory approach. While EMAS is mainly implemented via a participatory approach, the implementation of ISO 14001 has shown mixed results (Disterheft, 2012). While for ISO 14001 any approach is appropriate, EMAS requires the participation of the students, faculty and staff. EMAS requires an environmental review and calls for an open dialogue with external stakeholders and the integration of the employees is of vital concern

for EMAS.

While ISO 14001 was designed to develop into a global tool for implementing EMS, EMAS was at first developed by the EU as a management instrument for enterprises located in the European Union to evaluate, to report and to enhance environmental performances of enterprises and organizations. Consequently, a major difference between ISO 14001 and EMAS lies in their target groups. While ISO mainly targets industrial companies and actors in the service sector, EMAS is open for all organizations from the public and private sectors. Originally designed for the manufacturing sector, amendments to EMAS (EMAS II) extended the range of application to actors from the service sector. The latest revision (EMAS III), which went into effect in early 2010, further extended its application and opened EMAS to organizations and enterprises located outside the EU (The European Commission, 2009). However, not a single entity beyond the EU borders has opted for EMAS so far.

Although Chapter 4 of the ISO standards was incorporated into EMAS (with the same wording), the EMAS certification is more demanding. ISO 14001 only takes into account direct environmental aspects, such as volumes of waste, water consumption, wastewater, and noise, while EMAS also includes indirect effects on the environment (e.g., transportation, influence of a product on up- and downstream processes in the supply chain, disposal of products, financial distribution, and environmental transparency). Key areas of EMAS are energy efficiency, material efficiency, water, waste, biodiversity and emissions (see Table 5).

Table 5: EMAS Concentrates on Six Environmental Key Areas.

The Six Environmental Key Areas of EMAS	
Key Area	*Input/Impact*
Energy efficiency	total direct energy use; percentage of total annual consumption of energy produced by the organization from renewable energy sources
Material efficiency	annual mass-flow of different materials used
Water	total annual water consumption
Waste	total annual generation of waste; total annual generation of hazardous waste
Biodiversity	use of land
Emissions	total annual emission of greenhouse gases; total annual air emission

While ISO 14001 has its main focus on optimizing management processes, EMAS participants oblige themselves to continuous environmental improvements, expressed by ever tightening environmental targets that are laid out in a framework which is revised regularly. Under EMAS, environmental performance is measured quantitatively, such as emission reduction, waste reduction, and reduction of water consumption, and participants can gain benefits from increased resource and energy efficiency as well as waste reduction. This helps organizations to notice environmental improvements in monetary terms. However, in order to ensure the creditability of improvements, EMAS requires validation by independent verifiers. Unlike ISO 14001, EMAS requires the publication of environmental statements in order to improve its environmental communication and inform the public about the environmental performance of the organization. Under ISO 14001 the publication of environmental policy is voluntary and it acts more as a framework of guidelines for organizations on how to implement an environmental management system by providing criteria for such a system.

EMAS has a stronger focus on the full legal compliance of the participating organization

with relevant environmental legislation, while for ISO 14001 a mere commitment to comply is sufficient. As a consequence, registration under EMAS signals a strong environmental commitment as it requires the introduction of a well-defined environmental management system. Every organization that carries the EMAS logo has gone through several steps before registration (see Table 6). All EMAS registered organizations are enlisted in a European wide and publicly accessible register (The European Commission, 2013b).

Table 6: The Steps to EMAS Registration

Steps to EMAS Registration	
1.	Environmental Review
2.	Environmental Policy
3.	Environmental Programme
4.	Environmental management system
5.	Environmental audit
6.	Environmental statement
7.	Registration by competent body and use of the EMAS logo

While the ISO 14001 series remains the most recognized environmental management scheme, EMAS has steadily gained importance within the European Union. In 2012, numbers of EMAS registered bodies in the EU had already reached 4,581 organizations and 8,171 sites. Of all the EU countries, Germany has the most EMAS registered organizations (1,336), followed by Spain (1,258), Italy (1,134) and Austria (260) (The European Commission, 2012a). Still, most EMAS registered units are from the manufacturing industry (630), followed by the service sector (210) (The European Commission, 2012b). As of 2013, the number of EMAS registered educational bodies amounted to 130, among which there are 29 EMAS registered tertiary education institutions (The European Commission, 2013a).

IV. Greening the Universities

Environmental Efforts

Although environmental action is determined by the specific strategy of the individual institution, most universities apply an approach that covers a wide spectrum of areas, such as governance and administration, curriculum/study programs, research and innovation, and daily operation. Since the selection of appropriate steps to tackle the environmental impact follows cost-benefit calculations, there is often a bias towards short-term objectives while much needed long term projects are put on the waiting list. Initial focus is often placed on measures aimed to enhance the environmental performance of daily operations, and projects that promise short-term benefits are prioritized (Shriberg, 2002), such as implementing measures to reduce water, energy and paper usage, set up a paperless office, curb the production of waste and increase efforts in recycling. Green procurement programs have been installed to extend environmental responsibilities to external suppliers (stationery suppliers, copy shops, cafés, cleaning companies, etc.) Some established platforms for the internal exchange of chemical substances and others have set measures to draw their electricity needs from renewable energy distributors. However, environmental action is not only limited to direct environmental impacts (see Table 7). The drafting of environmental regulations for new buildings, promoting public transport (job tickets), organizing public lectures about environment related issues and organizing environmental exhibitions for the public helps to address environmental challenges. More interestingly, the introduction of an EMS not only triggered responses in the administration and research, but the curriculum also saw a clear greening process.

Table 7: Direct and Indirect Environmental Impacts of HEIs.

Direct and Indirect Environmental Impacts of Universities	
Direct environmental impacts	Indirect environmental impacts
- Greenhouse gas emissions	- Study programmes
- Waste water	- Research projects
- Solid waste	- Publications
- Contamination of soil	- Funding of green projects
- Use of natural resources	- Distribution of budget/funds
- Noise	- Long term planning
- Smell	- External suppliers, sub-contractors
- Environmental accidents	- Use of public transport
- Impacts on biodiversity	

As a direct result of the implementation of an EMS, several universities have launched mandatory courses in ecology for all students (e.g., UAS Bremen, Landshut and Zittau/Görlitz), announced the introduction of a new master program entitled "Sustainability, Society and the Environment" (University Kiel, FH Esslingen) or extended environment related course offerings. Several universities have set out targets for environment related research projects and publications. Particularly, technical universities and universities of applied sciences appear to be receptive to green concepts and ideas, as they seem to have recognized new areas of cooperation with industry. In Germany, all of the EMAS registered universities show strong capabilities of drawing third-party funding. Furthermore, some universities have set out targets for environment-related third-party funding, e.g., HS Bremen (30%) and HS Zittau (44%).

Obstacles for the Implementation of an EMS

Despite the potential benefits, universities may face several hurdles on their way to certification with a formal EMS, such as high administrative and implementation costs and a lack of financial incentives (Bero et al., 2012). The establishment of an EMS results in considerable initial costs and triggers significant operational costs before return on investments can be achieved. The installation of an EMS represents a rather complex administrative issue, particularly when the communication channels between departments are weak and environmental impacts have to be identified for the first time. Furthermore, universities often show fragmented decision-making structures, and institutional conservatism and inertia provide major obstacles in implementing EMSs. In most cases the initial effort for the implementation of an EMS derives from a small but highly-motivated group of individuals. However, successful certification is only achievable with the support of senior decision makers. The implementation of a university-wide formal EMS represents a cross-department issue and requires the existence of a well-organized communication network among relevant actors. A low priority on environmental issues combined with a lack of awareness and support from senior management seems to be a substantial obstacle in the implementation of EMSs. The academic institution's senior administration and management (86%) have been identified as the most important stakeholder of the EMS, followed by the staff of environmental, health and safety (75%), the faculty (36%) and students (32%). Interestingly, regulators (25%) have received low consideration as important stakeholders (The Coalition for Conservation and Environmental Education, 2006). Universities also regularly face issues of breaking down the abstract term of sustainable development to realizable and measurable targets. Since individual universities act rather autonomously when it comes to the implementation of an EMS and information sharing among peers is limited, the framing of an appropriate target system represents a challenging task. However, the

strongest resistance can be expected at the beginning of the implementation process (Ghisellini and Thurston, 2005). The installation of a coordinator may ease resistance since he/she is not only in charge of operating, maintaining and developing the EMS but also acts as mediator between the involved parties and thus may reduce resistance against unpopular policies by informing a large number of the staff.

V. Conclusion

Universities face mounting pressure from various stakeholders, and budgetary restraints force them to implement managerial practices and bundle their human and financial resources in order to concentrate on their core competences. Internationally competing HEIs have to monitor major trends in order to stay competitive and to be able to recruit outstanding faculty and students. Rising levels of public environmental awareness as well as an ever tightening network of environmental legislation and regulations pressure HEIs not only to comply with existing regulations but also to apply a more pro-active approach to tackling environmental challenges. Also, the implementation of voluntary formal EMSs at various universities across the globe needs to be understood in that context.

Two major schemes with a large influence could be identified: ISO 14001 and EMAS. While EMAS is more comprehensive and more rigid than ISO 14001, geographical distribution clearly underlines the global dominance of ISO. Regardless of their implemented model, universities opt for an EMS for similar reasons, namely legal compliance, the reduction of operating costs, achieving efficiency gains and enhancing their green image. Since universities strictly apply cost-benefit calculations for decision making to implementing EMSs, environmental focus is laid on short-term environmental projects in order to reap maximum financial benefits. In most cases, the environmental measures set out follow a conventional end-of-pipe approach. At the university level a systematic linkage of efforts

between administration and operational management with research and teaching is often missing. As a consequence, the greening efforts of the operational management usually outpace the progress of the greening of the curriculum and research. Efforts to green the curriculum, implement environment-related classes and study programs or re-direct the research focus lag behind.

While a formal EMS may not be vital for sound environmental management, it enhances the overall transparency of an organization and is supportive of increases in staff motivation through the participatory approach. Most universities that have implemented an EMS have realized changes in the curriculum and the focus of research, expressed by the offering of new environment-related study programs, obligatory ecology classes and/or environmental projects with the participation of students. However, not every university that seeks to set itself up as a symbol of tackling the current environmental challenges may opt for a scheme that requires costly third-party verification of its achievements. Unwanted binding commitments and external review of internal processes can be avoided by implementing informal environmental standards.

Also in Taiwan, universities face mounting pressure due to rising operational costs, accelerated by a sharp decline in student numbers and a rising public environmental awareness. Interestingly, among the over 170 Taiwanese Universities, 22 have signed the *Talloires Declaration*, but not a single one has opted for a formal binding EMS. Although the implementation of environmental protection measures at universities is strongly encouraged by the government, environmental action shows only slow progress due to its low priority at the university level and a top-down approach. Unlike in Germany, where several certification projects under EMAS were mainly driven by students' commitment, participatory environmental projects are rare so far. However, the high percentage of ISO 14001 certified private enterprises in Taiwan provides hope that in the near future formal environmental

management schemes may play a bigger role in the local higher educational sector.

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