Implementing and Maintaining an EMS at the University of Applied Sciences Zittau/Görlitz, Germany

1 Introducing EMS in a University

The University of Zittau/Görlitz

The University of Applied Sciences (Fachhochschule) Zittau/Görlitz, was founded in 1992 based on a former well renowned University School of Engineering for Electronics and Information Processing. It is located in the eastern part of the Federal State of Saxony right where the Polish, Czech and German borders meet. The University is resident at two locations, Zittau and Görlitz, with a distance of 35 km between them. The university has some 400 employees and close to 4,000 students. The Zittau campus has a focus on engineering and natural sciences, while the Görlitz campus is dealing with social and computer sciences (see Box 5.1). At present (2004) 5,000 m^2 of new laboratories and lecture halls are being built. The external funding for R&D amounts to ca. 4.2 Mln. Euro p.a; of this some 25% is environmentally related.

Educational institutions in Germany currently suffer several problems such as limited budgets and, in some parts of Germany, the consequences of limited demographic growth. Eastern Germany also experiences a considerable out-migration of young people to the west. The serious threats posed by reduced student numbers after 2007/08 and increasing competition means that universities need to pursue strategies to make themselves more attractive.

One way to fight this negative trend is to develop an individual university profile. The University of Zittau/Görlitz chose to do so by focusing on a policy of sustainability and introduce an environmental management system. The policy, valid over a seven years period, has the following components:

- Improved image.
- Cost and resource efficiency.
- Improved understanding of internal processes.
- Multiplier function of students and staff.
- Social-economical responsibility.
- Authenticity.

Box 5.1 The University of Zittau/Görlitz

Number of Students:	1998	**3,302**
	2003	**3,808**
Number of Employees:	1998	**419**
	2003	**414**

Zittau campus: 28,121 m^2
Departments of Architecture and Infrastructure, Energy and Technical Systems, Process Engineering, Mathematics/Natural Sciences

Görlitz campus: 5,711 m^2
Departments of Social Transformation Processes, Languages, Business and Management Information Computer Sciences

At the same time we have to do our business and daily work – like all institutions of higher education – embedded in a framework of restrictions and legal requirements. This includes e.g. legal health and safety standards, restrictions for the handling of chemical and hazardous substances, and the process of integrating the "Bologna" requirements into curricula.

Introducing and Running the Environmental Management

The EMS was introduced in three steps. The University senate decided on the new environmental policy in 1995. In 1997 an Environmental Management Working Group started to work. The first environmental check (internal and external validation/certification audits) was conducted in 1998. Certification according to EMAS, with the formation and implementation of the EMS was concluded in March 1999. Zittau/Görlitz then became the first university in the world to be certified.

In the following years considerable work has been done to maintain the EMS. A second audit and certification was made in 2001, now according to EMAS II. External Supervisory Audits were carried out in 2002 and 2003. From 1999 on students' work has been an important part of the environmental management at the university (See Table 5.1).

The annual monitoring of specific energy, material and waste flows as well as the determination of specific emissions resulting from individual university processes provided us in the beginning with fix starting points (reference values) in the work. These values have later allowed us to determine where we stand, and where we need to improve our actions, as a group, or conduct research.

The success of environmental management is determined by the inclusion of as many as possible active participants. This has been possible by a variety of actions in the course of introducing our environmental guidelines, and has strengthened and stabilised these guidelines. Periodic audits, inspections and project work have been conducted to test and realise the environmental strategy since we first started the EMS in 1998.

The Validation/Certification Process

Every three years a validation/certification audit has to be carried out by an external environmental verifier. These are supported by annual external supervisory audits. In addition annual internal audits are carried out assisted by students at regular intervals.

The external audit, following the EMAS II requirements, includes:

- The compliance with regulations.
- The EMS and the organisation.
- The eco-audit and results.
- The environmental declaration.
- The dependence, authenticity and accuracy of data and information.

According to the environmental management documentation the EM working group has to coordinate the schedule and the audit procedure. All relevant information for the validation has to be made available to the external verifier. This includes:

- Documentation of the EMS.
- The EMS manual & the university administrative manual.
- Environmental impact data.
- Occupational safety documents.
- Documents of the internal audit.
- The annual environmental declarations.

Table 5.1 *Implementing EMS. Time schedule and individual steps of implementing the EMS at the Fachhochschule (The University of Applied Sciences) Zittau/Görlitz.*

1995	1st Senate decision	
1997	Founding of the Environmental Management working group	
1998	First environmental check 1998 – Formation and implementation of the EMS Validation and registration of the EMS (March 1999)	
1999	Audits at relevant areas	Assisted by student's project works
2000	Audits at relevant areas and buildings inspection	
2001	Second Validation according the new EMAS Requirements (VO EG 761/2001 [EMAS II])	Assisted by student project works Audits by students
2002	Audits in relevant areas External Supervisory Audit	
2003	Audits in relevant areas External Supervisory Audit	
2004	Audits in relevant areas	

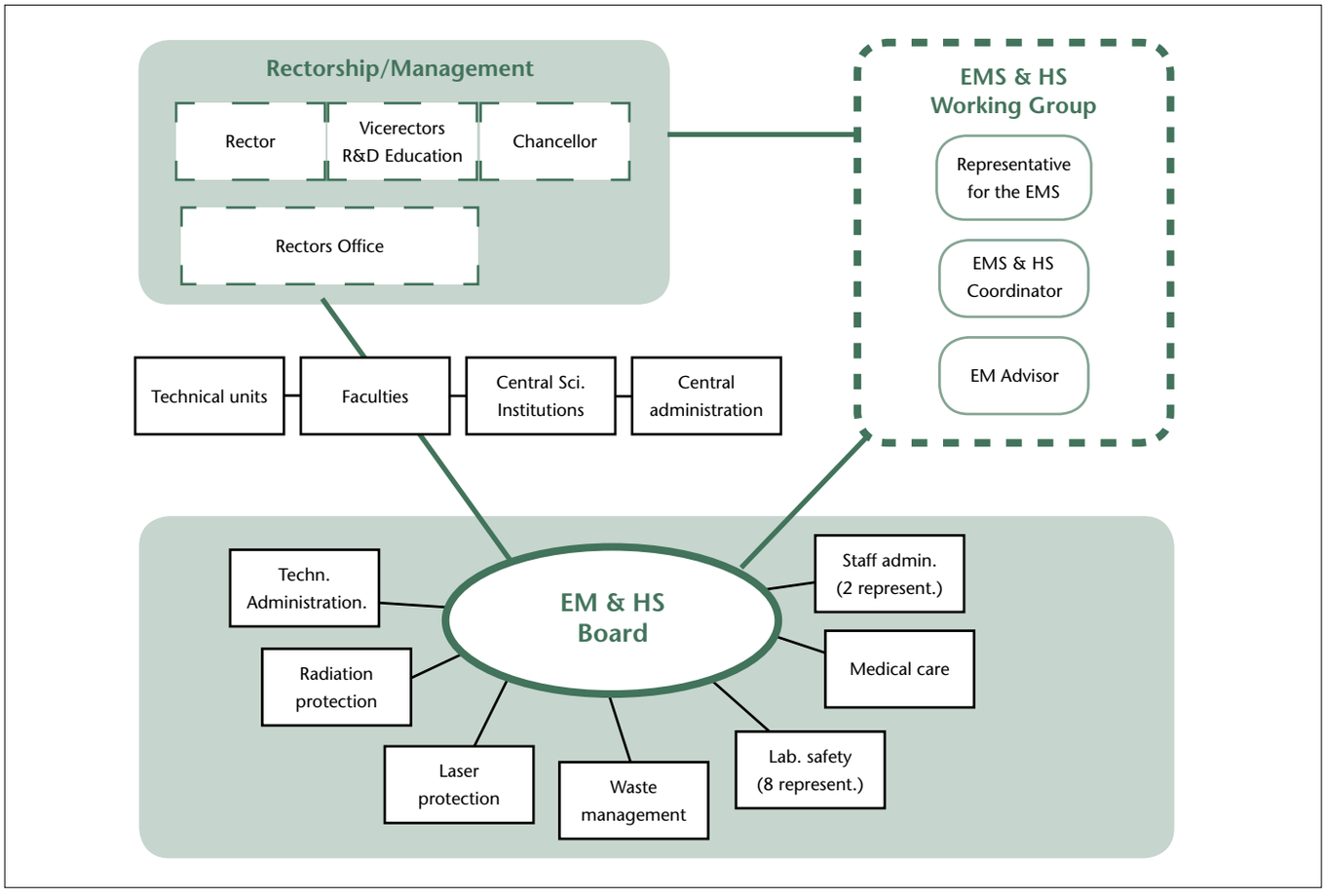

Figure 5.1 *Organisation of the Hochschule Zittau/Goerlitz's EM and health and Safety management.*

As a result of this evaluation process the verifier presents a draft conclusion abstract. In addition to the documentation check an on-site survey has to be organized which includes among other items:

- Inspection of laboratories and other relevant facilities.
- Inspection of buildings and relevant technical equipment.
- Data check.
- Interviews of students and employees (not announced).

Finally the verifier explains the results of all audits and evaluations to the university's management and – if the validation audit was successful – he validates the EMS and the environmental declaration. In case of any serious discrepancies, it is the duty of the university to agree with the verifier on solutions for correction within a given time period.

The following citation from the environmental verifier in 2003 shows that our motivation to implement the EMS was performed in a proper way. "The Hochschule Zittau/Goerlitz regards Environmental Management not simply as positive advertising, but uses it as a guideline for organizing and modelling its commitments in teaching and research ." [The interim report 2003 of the environmental verifier.]

Organisation and Documentation of EMS at the University

The EMS was established at the university by a staff position, a Commissioner for EM. It has proved to be an efficient way to organise and maintain the environmental management system. In addition a number of EM work groups were created. These have been responsible for planning and organisation of the measures and evaluations required according to regulations EC 1836/93 (EMAS I, valid until March 2001) and EC 761/2001 (EMAS II, valid since April 2001). The work groups have been very efficient and will certainly be retained in the future.

A board for Environmental protection and Health & Safety was established in 2002 as part of the University. It consists of the representatives for the EMS, the safety inspectors, and

the radiation protection representative (because the University Zittau/Görlitz is operating a small nuclear reactor for education and research with an engine power of 10 Watt). Also included is the staff council.

The internal documentation, required according to the EMAS regulation, has been integrated in the exiting university administrative manual. This has proved to enable an effective handling of the EMS. We were able to use synergies between older relevant documents and the new environmental process instructions, and other EMS documents. In chapter 6 in the administration manual the EMS manual has been structured in five sections:

0 Edition and Modification of the EMS Manual.
1 Management Tasks in the Environmental Sector.
2 Environmental Protection at the Hochschule Zittau/Görlitz (FH).
3 Preparation and und Handling of Environmental Documents.
4 Internal Environmental Audits/Implementation of the Eco-Audit Scheme.
5 External Survey/Validation/Registration.

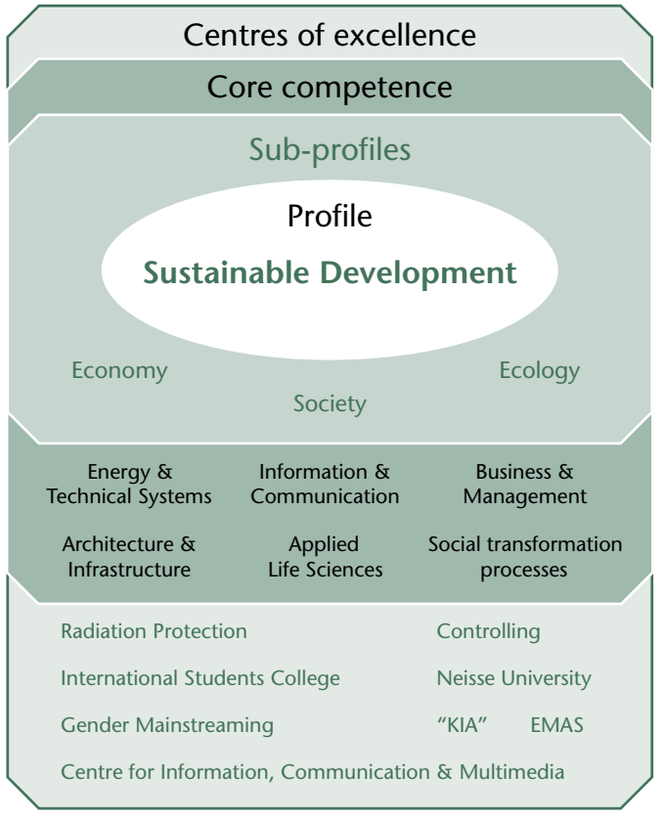

Figure 5.2 *The strategic profile of Sustainable Development of the University of Zittau/Görlitz.*

The external documentation is summarised and integrated in our annually published environmental declaration according to the EMAS requirements.

Sustainable Development Policy of the University

In July 2002 the senate of the Hochschule Zittau/Görlitz passed the "Strategic Profiling Concept" officially declaring "Sustainability" as a dominating guideline in its education and research policy (see Figure 5.2). As a result the university is involved in a variety of initiatives in both social-economic and cultural areas of communal SD. The sustainability profile is based on three sub-profiles (economy, ecology, society) and 6 core competences (which are more or less reflecting the individual faculties) and is completed by centres of excellences. All SD-linked elements are supported by the central management of he university.

2 Environmental Work

Energy and Carbon Dioxide Emissions

The environmental goal within the first category of the EMS is reduced electric energy consumption. This goal combines a high environmental relevance with a large capacity for economizing.

The value of absolute electric energy consumption in 2003 in the University was approximately on the 1998 level. From one side this is not so satisfying; the potential for savings from proper use of illumination in seminar and lecture rooms was perhaps not met. On the other side construction work and addition of new laboratories built in former tank garages (big halls without insulation) should lead to increased consumption. During 1999–2001 part of the heating was provided by direct eclectic energy. Heat consumption showed similar trends.

In 1999 and 2000, a student project work was run to identify measures, particularly construction measures, to improve the heating economy in the former tank garages now turned into laboratories. The project was very successful, and the students reported to the university top management (rector, vice rectors and chancellor). Several of the proposed measures were implemented in 2002, including reconstruction of the roofs and floors, heat isolation, replacing large doors by small ones, etc. The positive results were seen as decreasing heat energy consumption (see Figure 5.3).

The university's specific CO_2 emissions from fossil fuel were calculated, considering the emissions as a result of electric and heat energy consumption, on the basis of the municipal energy mix. The value for 2003 of 1,548 tonnes is larger than the average for Germany; the local energy mix contains about 80% fossils.

Water

Comparison with higher education institutions of similar size as Zittau/Görlitz in Germany proved water consumption values to be good or very good for the period 1998 to 2002. Annual water consumption per student and staff shows an overall decreasing trend. The water included in the report drinking water, used (grey) water and sewage (black water). Deionized water for laboratory purposes was not included. Efforts to identify weak points are made difficult by a lack of sufficient numbers of water meters within particular buildings.

Increasing and decreasing consumption periods were accounted for by the study periods, the spring and fall terms each of which lasts 4 months. Also construction and maintenance of sanitary facilities lead to fluctuating water consumption. The 2003 increase in the all over water consumption was accounted for by high water consuming R&D experiments and additional construction work.

Water consumption data is available at:
http://www.hs-zigr.de/verwaltung/ag-um/index2.htm.

Materials and Waste (Waste Separation and Disposal)

The second environmental category in the EMS deals with material flows within the university, including purchase of materials and waste management. The two issues are, of course, connected to each other.

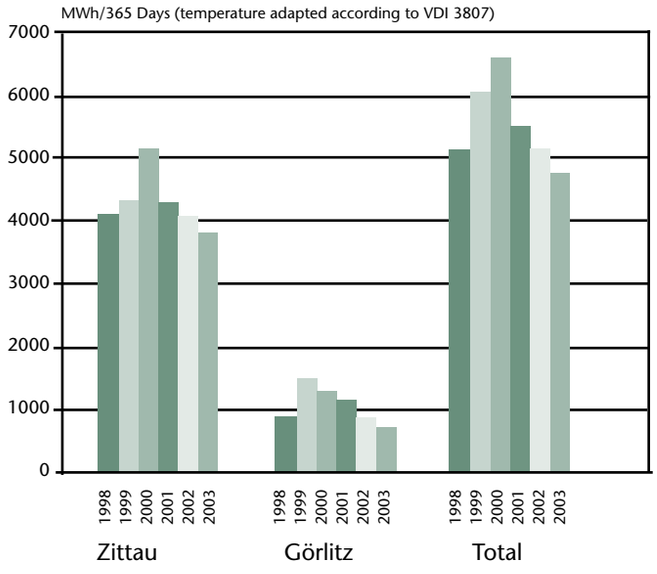

Figure 5.3 Heating consumption values of the Hochschule Zittau/Goerlitz. *The graph shows improvement of energy efficiency as a function of time due to the realisation of technical measures on former highly energy consuming tank garages now used as laboratories. More information can be obtained from: http://www.hs-zigr.de/verwaltung/ag-um/index2.htm*

A collecting system for different fractions of waste, including glass, biological waste, light weight plastics and metals was introduced in all buildings. This is known as "Dual System Waste Removal" in Germany. All waste containers in the lecture halls and seminar rooms were clearly marked to make waste collection and recycling easy (see Figure 5.4).

Since 2002 the university has switched to using recycled (RC) office paper. The new RC office paper was not first accepted everywhere, due to such as expected printer problems, technical difficulties with copy machines, fear of allergies (!), additional costs and so on, but in the end the prejudices were shown to be groundless. We managed to find a contractor offering RC office paper 10% cheaper than conventional chlorine bleached white paper. Amongst other reason the economic benefit caused the Rector to finally implement RC office paper all over the university. The university has received an award (The Office Paper Future Prize) of the German Environmental Protection Agency (Deutsches Umweltbundesamt) for this commitment.

Hazardous and Toxic Materials

Efforts were made to find substitutes for hazardous and toxic materials used. Still many of these substances are necessary in lecturing and demonstration as well as for research, particularly in chemistry and biotechnology courses, and thus remain on campus. With the help of a registration and monitoring system for handling and storage of hazardous materials, backed by occupational operating and safety instruction guidelines, organisational measures for a safe and secure way of dealing with these materials have been met.

All of the university facilities including laboratories, offices and workshops are continuously evaluated and updated for a legally required formal inventory of hazardous and toxic materials. All hazardous and toxic materials which need to be controlled and especially those which require even higher standards of control and surveillance (e.g. materials with cancerogenic properties) are collected according to internal regulations of the university and disposed of in an environmentally correct manner by certified companies.

3 Introducing EMS in the University Everyday World

Information and Communication

Staff and students of the university are continuously invited to become active in the environmental management process. A number of events are used as a platform for information and motivation, e.g. meetings of the university senate, assemblies of personnel and staff and Faculty colloquia. On these

Figure 5.4 *Garbage collecting system for separate waste fractions according to the German Dual System (DSD).*

occasions we inform about the state-of-the-art of the EMS and invite everyone to exchange views on the environmental performance within the university.

We also communicate with comparable institutions outside the university. An important objective is to continuously optimize and adapt the management system to varying external conditions such as legal requirements and stakeholder demands.

Information on the environmental management of the university is made through electronic publications (Internet), workshops and seminars open to the public, newspaper articles and publications in scientific journals. An important channel is the annually published EM declaration of the university.

A special and today well-known event is our annual Environmental Protection Day linked to United Nations Day of the Environment (June 5). We started this in 2001 focusing on (global) energy demand and supply including nuclear energy as well as the disposal of radioactive waste, an issue of highly political importance, but too often discussed emotionally rather than by considering scientific, economic and social facts. The 2001 seminar also featured well-known lecturers, e.g. by Prof. Stefan Rahmstorf, researcher in the field of global climate change. The 2002 seminar focused on biotechnology and bioethics (the university has started a new Bachelor course in biotechnology) and in 2003 we organized an elective short course for students on sustainable development in the framework of the Baltic University Programme, and a colloquium on the prevention of flooding, in the aftermath of the so called "Century Flood" of August 2002. This caused enormous damage particularly in the State of Saxony where the Hochschule Zittau/Goerlitz is located.

Table 5.2 *Environmental oriented studies. Lectures, courses and other areas of study in various faculties of the Hochschule Zittau/Görlitz. The lecture course on Fundamentals of Ecology and Environmental Protection, an integral part of the curricula of all faculties, is marked in the middle column.*

Faculty	Course of Study	Focal point Education	Individual Lectures	Dissertations	Projects
Architecture, Construction Engineering		x	x	x	x
Electrical Engineering		x	x		
Computer Sciences			x		x
Mechanical Engineering	x		x	x	x
Mathematics/ Natural Sciences	x	x	x	x	x
Social Sciences			x		x
Languages			x		
Economics	x		x	x	x

Education and Research – Greening the Curricula

In the education at the University environmental issues are introduced both in special programmes and as parts in all programmes.

According to a decision of the university senate in 1993 all students, no matter what their specific studies are, have to participate in a one semester (2 classroom hours) lecture as an integral part of their individual courses curricula (see Table 5.2). This lecture course, which is quite unique amongst German universities, addresses biological, ecological, technical, social and economical concerns and dynamically refers to current events. During an academic year an average of 500 students of various faculties and courses attend the lectures.

A four years study programme on "Ecology and Environment Protection" leads to an academic degree Diploma in Engineering. The programme includes (1) technical environmental protection, such as waste management and recycling technique, (2) natural conservation and spatial planning, and (3) environmental and sustainable oriented business management with particular consideration of health and safety risk management.

The university arranges open lectures on the fundamentals of ecology, environmental protection and sustainability with both theoretical and practical subjects. The students become more aware of socio-economic and ecological issues and understand better complex interrelations between natural and an-

thropogenic processes. Some of those participating in the lectures may serve as multipliers in their future professions and private lives and may, thus, constructively contribute to environmental protection and sustainable development. Finally all faculties offer projects, which include environmental subjects within the scope of their individual study programmes, and projects for which interdisciplinary work is called for.

The research profile of the university also mirrors an interest for environmentally relevant fields of teaching and research. These include Building construction and the environment, Energy efficiency and the environment, Nuclear safety, and Protection of the natural environment and natural resources.

Students Participation in EM

> *Tell them, and they will forget,*
> *Demonstrate, and they will remember,*
> *Involve them, and they will understand.*
>
> Confucius

This guiding idea has been a key principle for education at the University of Zittau/Görlitz and the implementation and maintenance of the university EMS. The principle of practical learning, and taking over individual responsibility by being actively involved, has been part of the university environmental policy since 1998. This shall be achieved by "qualifying and enabling students to play an active role in a continuous process of improving the environmental performance of the Hochschule Zittau/Goerlitz, thus, to promote their potential of creativity and innovation" .

Between 1997 and 2003 an annual average of 30 to 40 students, mainly of the "Ecology and Environmental Protection" course, were participating in all steps of the university EMS by either assisting in internal audits or performing projects focusing on the improvement of the environmental performance. The student projects have become both an integral part of the curriculum (courses on Life Cycle Assessment and Environmental Management) and part of the annual environmental checks within the EMS of the university. Students have, under supervision of lecturers, been involved with i.a.:

- Acquisition and determination of the university energy and water consumption.
- Managing waste production and emissions using defined environmental measures and codes.
- Participation in preparation, maintenance and application of an administrative disposal guideline.
- Studies on technical measures on specific facilities in order to improve energy efficiency.

Students from the "Ecology and Environmental Protection" programme have since 2003 formed small teams (10 students yearly) carrying out project studies on EM or related issues on both internal university and external industrial (in particular SMEs) related tasks. Thus one team worked in 2003 on a two semester project in cooperation with a regional market garden (SME) to reduce its consumption of heating energy. The students were able to develop an ecological sound and economical favourable solution in designing a new type of wooden chips fuelled heating installation. The company installed this system in the summer of 2004.

Students always have been and still are playing an important role in preparing and assisting internal audits of the university environmental and safety management system. Those exercises aim to enable students to apply theoretical knowledge, from lectures or in the literature, in solving practical problems. Results are presented and discussed in seminars and are integrated into the EM documentation and programme.

4 Results of the Environmental Management Work

Cost Savings and Expenses Related to the EMS

So far the economic consequences of the environmental management has not been systematically monitored. Cost reductions have so far not been the predominant motivation for universities to implement an EMS. Of course, this will be and in parts has already been changed.

We may however estimate savings due to improved energy management. The costs (for both electricity and heating) have up to 2004 stayed on the 1998 level although the number of students have increased since then by approximately 20%, new laboratories and lecture halls with an equivalent of about 15% of the all over university area have started to operate, and the energy price has increased by nearly 15%. The relative cost saving linked to the EMS is then approximately 20%.

The re-organisation and re-contracting of waste disposal as a result of the environmental checks has also lead to substantial cost savings. Higher safety and risk reduction on the handling of hazardous substances and biological materials have also led to lower costs.

Costs for the implementation and the maintenance of the EMS may be summarised as:

- Labour costs for personnel (approximately 50% of an academic position for coordination once the EMS has been implemented, and an additional ca. 0.25% equivalent to various personal involved in the EMS working group).

- Costs for the external environmental inspector (ca. 6,000 Euro every 3 years for the validation audit and ca. 2,000 Euro for the annual audits).
- Costs for public relations (publishing of the annual environmental declaration, events and presentations etc., approximately 5,000 Euro p.a.).
- Costs for technical measures (these have not been specified).

Other Benefits Related to the EMS

Organisations are repeatedly reporting other than economic benefits from implementing an EMS. These include improved understanding of internal processes, improved information and communication, motivation and quality of teaching and research. An organisation, not only a university, which properly applies EM and related management systems such as QM and health & safety management may achieve other advantages. These include the ability for quicker and more flexible reactions towards modified market situations and better conditions to meet stakeholder expectations.

In the case of institutions of higher education competing in a situation of negative demography factors which forces, too, into the race for competition.

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Internet Resources

Eco-campus.net

http://www.eco-campus.net

Copernicus Campus – The University Network for Sustainability

http://www.copernicus-campus.org

Environmental Management at Hochschule Zittau/Goerlitz

http://www.hs-zigr.de/verwaltung/ag-um/index2.htm