

Training and communication in the implementation of environmental management systems (ISO 14001): a case study at the University of Gävle, Sweden

Kaisu Sammalisto ^{a,*}, Torbjörn Brorson ^b

^a *University of Gävle, 801 76 Gävle, Sweden*

^b *International Institute for Industrial Environmental Economics, IIIEE, Lund University, Sweden*

Received 3 March 2006; accepted 24 July 2006

Available online 28 September 2006

Abstract

Training and communication are essential elements in the implementation of environmental management systems (EMS). This study is based on two main questions: (i) What methods for training and communication will support the implementation of EMS at a university? and, (ii) How did faculty and staff perceive the training and communication activities? The study includes a literature review, a case study of methods for training and communication, and results of a semi quantitative survey of the perception of training and communication. All activities took place at the University of Gävle (Sweden). The University of Gävle was certified according to ISO 14001 in 2004. Practical experiences from the implementation of EMS in industry were used as reference.

The literature review indicates that training is a key factor during implementation of EMS, and that training may change attitude and behaviour among managers and employees. Similar conclusions can be drawn from this study. The case study, and practical experiences from industry, indicate that similar methods of EMS training and communication can be shared by industry and universities. However, “academic freedom” and “critical thinking” may result in the need for more interactive training methods at a university than in industry. The results of the survey indicate that the training and communication have increased awareness of environmental issues. A deeper understanding of the personal role in the EMS was also observed. It can be concluded that the EMS training and communication team has a demanding task to introduce the concept of indirect environmental aspects at a university. Lecturers and researchers should be convinced that the greening of a college involves more than, for example, reducing the consumption of paper. The main role of EMS at a university should be to focus on indirect environmental aspects, for example, to introduce environmental and sustainability issues in courses and research.

© 2006 Elsevier Ltd. All rights reserved.

Keywords: Environmental management; University; Training; Communication; Awareness; Sustainable development

1. Background

1.1. Swedish governmental EMS directive

As a step to support sustainable development in society, the Swedish Government has since 1996 issued Directives addressed to public agencies requiring the implementation of

environmental management systems (EMS). The Directives declare that public agencies should implement the core elements of the EMS, such as identification of significant environmental aspects and establishment of environmental policy and objectives. ISO 14001 was recommended as a template but the Directives did not require third party certification of the EMS. By the end of 2005 fourteen out of 240 Swedish public agencies had achieved ISO 14001 certification and/or EMAS registration. For different reasons most of the public agencies have, so far, chosen not to apply for the official certificate. Currently they “self-declare” the EMS status in their

* Corresponding author. Tel.: +46 26 648794; fax: +46 26 648828.

E-mail address: kaisu.sammalisto@hig.se (K. Sammalisto).

annual environmental management reports to the Swedish Government. However, there is a growing interest in EMS within the public sector and of roughly 3700 ISO certified Swedish organisations there are an increasing number of municipalities, hospitals and other public organisations. According to the Directives, the systematic approach to environmental issues may later on be expanded to also include other aspects of sustainability, i.e. social, ethical and economic issues [1,2]. EMS at Swedish universities and other public agencies can, in this context, be seen as an example of an important tool in the aims for a sustainable society [3]. Fig. 1 shows the role of a university, or other institution for higher education, in this process.

In two previously published studies the experiences of steps 1 and 2 are reported [4,5]. This study is focussed on step 3 at the University of Gävle in Sweden. The study describes methods for training and communication in the implementation of EMS and the perception of such activities. Step 4 will be analysed in a coming study.

1.2. Roles of training and communication in EMS

The current number of ISO 14001 certificates that have been issued globally is over 100,000 [6]. Many of the ISO 14001 certificates and experiences are found in industrial settings. Practical experiences and a number of studies show that commitment from managers and employees is essential during implementation and maintenance of the EMS [7–10]. It is rather common that organisations try to utilise existing resources within the frame of a limited budget to provide training and communication. Some companies, however, spend a substantial amount of time and resources on education and information. For example, in one global company with about 100 sites, the number of hours per employee per year allocated to environmental, health and safety training was on average around 4.0 [11]. In this same company, during 1998–2004, 86 sites were certified according to ISO 14001. Company statistics showed that during the implementation of ISO 14001, the training hours increased by a factor of 2 to 5 at many of the individual sites. As a result of the training, site managers often reported positive effects from ISO 14001, for example, increased awareness and improved environmental performance [11].

Typical elements of the general training for employees include environmental policy, environmental aspects, company procedures, instructions and non-conformity reporting [12–14]. Employees that have key roles for influencing environmental impacts and the organisation's EMS receive more detailed

training. The training and communication serve at least two purposes: to teach people about company policies and everyday procedures, but also to change the attitudes of individuals and create increased awareness about environmental issues [13,15–17]. A similar approach could be used during implementation of ISO 14001 at a university or other public agency. The strong emphasis ISO 14001 places on training and communication as a means of realising changes and continuous improvement can be found in paragraphs 4.4.2 and 4.4.3 [18].

As indicated above, there are a number of published case studies concerning the implementation of ISO 14001 in industrial companies. Some overviews describing the application of environmental management systems at university settings are also available [19–24]. However, methods and perceptions of environmental training and communication in association with implementation of EMS, in industry and universities, are discussed very little in the literature. The following quote concerning occupational health and safety can serve as a starting point for this study: “Various laws and regulations require the dissemination of occupational health and safety information but little is known of the effectiveness of such efforts” [25].

1.3. Objective of the study

The knowledge about implementation and certification of EMS (ISO 14001) at universities is rather limited. The overall objective of this paper is to focus on the role of training and communication in the implementation of an EMS. The perception and effectiveness of the training is also addressed. The study is based on two main questions:

- What methods for training and communication will support the implementation of EMS at a university?
- How did faculty and staff perceive the training and communication activities?

2. Methods

The study is based on the following activities:

- A literature review concerning effects of training in the implementation of EMS (ISO 14001) in industry and other organisations.
- A case study concerning training and communication in the implementation of EMS at the University of Gävle.
- A survey among staff concerning perception of training and communication during implementation of EMS at the University of Gävle.

The approach of the study is practical, positivistic and quantitative, although some qualitative elements are present. A significant input comes from the authors' experiences with the implementation of EMS in several industrial companies. The principal author has also previously studied EMS implementation in Small and Medium Sized Enterprises [26] and Swedish universities and co-ordinated, as Dean for Environmental Management, the EMS implementation at the University of Gävle.

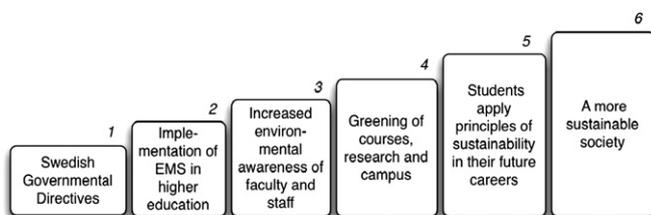


Fig. 1. The role of EMS in higher education in the steps towards a more sustainable society. Source: Sammalisto and Arvidsson [5].

2.1. Literature review

The literature review is mainly based on peer-reviewed articles in scientific databases published between 2000 and 2006 concerning the role of training in the implementation of environmental management systems in different organisations. The key words used in the search were ISO 14001, environmental management or sustainability together with implementation, and/or training and/or communication and/or awareness.

2.2. Case study

The explorative case study in a real-life context [27,28] is based on the implementation of an EMS at the University of Gävle. In 2004 the university had about 750 faculty and staff and 13,000 full and part time students, corresponding to about 6400 students on a fulltime basis [29].

2.3. Survey

A survey questionnaire was distributed to faculty and staff by email. The objective of the survey was to evaluate the perception of environmental training and communication as elements of the implementation of the EMS. The questionnaire focused on the following topics:

- Awareness, e.g., if the respondent was familiar with the intentions of the environmental policy, objectives and EMS procedures.
- Attitude, e.g., if the respondent perceived that the EMS had affected the daily work, if he/she had support from managers and supervisors, and if he/she perceived a personal responsibility to contribute to the university's environmental activities.

The participants were also offered an opportunity to make individual comments. In total 856 questionnaires were distributed by email.¹ The survey and analysis software program Business Intelligence 7.1 (BI-BASE 7.1) was used and the questionnaire included 21 pre-coded questions plus space for individual comments. A reminder was sent out to the participants a week after the first email. Because the principal author of the report was active in the implementation of ISO 14001 (e.g., training the faculty and staff, coordinating environmental committees, coaching students, etc.), some precautions were taken to avoid bias caused by personal involvement. The questionnaire was anonymous and the results were initially calculated using BIBASE and then in MS Excel. The initial compilation of data was reported in Erenlöf et al. [30].

All departments of the university participated in the survey. The response rate was 36.8%. The following functions, as defined by the respondents, were represented in the survey

(% of total respondents): managers (6%); environmental co-ordinators (1%); lecturers (49%); administrative staff (35%); laboratory staff (2%); service functions (5%); and others (12%).² All ages were equally represented in the study with an exemption of the 40–49 age group which was somewhat under represented as compared to the University's overall age distribution (30% at the university compared to 24% in the survey). At the time of the survey the EMS was still in the implementation phase. A number of procedures were not yet implemented and all involved persons were not yet fully aware of their roles in the EMS.

3. Results

3.1. Environmental training in the implementation of EMS

The role and effects of training in the implementation of EMS are discussed in a limited number of papers published between 2000 and 2006. Some experiences of environmental training in association with EMS in industry are presented, but literature concerning methods and contents of training and communication in the implementation of EMS at universities is rather limited. Table 1 provides an overview of methods for and experiences of environmental training and communication in different types of organisations during the implementation phase of an EMS.

From Table 1 it can be observed that training is considered to be a key factor for successful implementation of EMS in industry and municipalities, that the majority of the employees should be included in the training and that training may change environmental behaviour. Studies that reflect EMS at universities point out that increased awareness and shared values are important factors in the greening of campuses.

3.2. Implementation of ISO 14001 at the University of Gävle

3.2.1. From commitment to certification

The initial environmental review was conducted in 1995 and the university's first environmental policy was published in 1996. In 1998 the university received the Swedish EMS Directives and in 2001 the University Board decided to aim for certification of the EMS according to ISO 14001 [31]. The University Board and management stated that the main aim of the EMS was to put emphasis on indirect environmental aspects, such as education and research. Training was considered essential for the success of the EMS project. As a target 80% of faculty and staff³ were to participate in environmental training.

Communication was seen as another important success factor. A variety of implementation activities were planned and the environmental review was updated in 2002. Education, travel,

¹ The 856 e-mail addresses to which the questionnaire was sent correspond to 735 individuals and 672 fulltime equivalents faculty and staff in May 2004. The 315 responses correspond to a response rate of 36.8% based on the 856 mails that were distributed.

² Since a person can represent more than one function at the same time, the total adds up to more than 100%.

³ Faculty and staff include all those employed by the university in different capacities. The total of 100% trained was considered impossible to reach due to all the different forms of employment in the organisation.

Table 1
Review of papers concerning the role and effects of environmental training in the implementation of EMS

Author and type of study	Main results and conclusions.
Babakri et al. [38]. Survey (I) Chattopadhyay [39]. Literature study (I) Daily and Huang [7]. Literature review (I) del Brio et al. [40,41]. Survey (I) Wee and Quazi [9]. Literature review and survey (I) Zutshi and Sohal [42,43]. Literature review, survey and interviews (I)	Training identified as a critical key factor for EMS implementation and changes in attitude.
del Brio et al. [40]. Survey (I)	In about 70% of the ISO 14001 certified companies more than 75% of management and staff participated in environmental training.
Strachan et al. [14]. Case study (I)	Strong commitment does not mean having structured training programmes. EMS creates behavioural changes and increased competence.
Burström von Malmberg [16]. Review of research and experiences from municipalities (M)	EMS important for communication (communicative action) and learning (organisational learning).
Beard and Rees [15]. Case study (M)	EMS transfers environmental rhetoric to change in the organisational culture.
Rondinelli et al. [13]. Case study, literature study, interviews (I)	ISO 14001 certification had one of its strongest impacts on behaviour. Increased awareness. Once the change in attitudes begins, it becomes difficult if not impossible to quantify the degree to which ISO 14001 certification was the causal factor.
Schulte et al. [25]. Literature review with focus on occupational health and safety (I)	Training raises awareness about health and safety issues.
Summers Raines [8]. Survey (I)	EMS spontaneously provides results of increased environmental awareness.
Zeng et al. [10]. Survey (I)	Training enhanced environmental awareness.
Moore et al. [44]. Collaborative inquiry (H)	Fundamental rethinking of university role required.
Cortese [3]. Vision paper (H)	Universities have responsibility to increase the awareness, knowledge and skills for sustainable future.
Dahle and Neumayer [45]. Survey and interviews (H)	Lack of awareness of sustainability concept the most important barrier to campus greening.
Herremans et al. [20]. Two surveys (H)	Proper commitment requires participation of everybody. Shared values created through communication activities.
Lozano [17]. Discussion paper (H)	All stakeholders must receive proper information and skills and reinforcement of them continuously.
Koester et al. [21]. Case study (H)	Summer course and workshops for faculty on basic concepts of environmental science and interaction between environment and society.
von Oelreich [46]. Case study (H)	The environmental policy aimed at increasing the awareness of employees. Activities included a letter to all employees and a training course.
Price [23] Case study (H)	Environmental awareness training to all faculty, staff and students.
Viebahn [24]. Case study (H)	Environmental training courses for staff offered.
Thomas [47]. Literature review (H)	There is a need for development of curricula concerning sustainability, but few institutions show acceptance. Increase in awareness would require training in some form.
Wright [48]. Review of definitions and frameworks for sustainability in higher education (H)	One university has policy that will facilitate ecological literacy among faculty, students and community through various activities.

The studies reviewed in this study may include additional results and findings. The table above only summarises results that are of special interest for this study. I, Industry; M, Municipality; H, University/higher education. Source: The authors.

procurement and use of resources were identified as significant environmental aspects. The review resulted in a revision of the policy and new environmental objectives and targets were introduced.

Implementation of ISO 14001 was successful and the university was certified in 2004. Some examples of improvements during 2004 are shown below [32]:

- Procedures were implemented for purchasing, handling of chemicals and hazardous waste.
- Procedures were implemented to improve the emergency preparedness.
- Paper consumption was reduced by 21%. The cost of waste handling was reduced by 20%. The use of heating was reduced by 2.5%.
- Educational programs that include environmental and sustainability aspects have increased by 34%.
- 85% of applications for research funding were assessed for environmental and sustainability aspects.

- Procedures were established to ensure that suppliers and tenants are informed about the university's environmental ambitions.

3.2.2. Organisational aspects of training and communication [33]

3.2.2.1. *EMS Project Team*⁴. A Dean for Environmental Management was appointed by the University President to coordinate the implementation of ISO 14001 (50% appointment). A part-time Project Team was introduced that consisted of the following persons: the Dean for Environmental Management; two lecturers experienced in supervising environmental management and auditing students in companies; a staff person involved in the procurement and service department of the university; a representative of the Student's Environmental Committee to provide student's perspectives on the project and to establish contacts and input to and from students; and a representative of industry to provide external feedback and to share industrial experiences with ISO 14001 implementation.

3.2.2.2. *Environmental Council*. The President appointed an Environmental Council in February 2002. The role of the Council is to support environmental activities in the different departments of the university. It consists of environmental coordinators representing each of the eleven university departments, the members of the Project Team and student representatives. The Dean for Environmental Management is the chairperson of the council. The environmental co-ordinators serve as communication links between each department and the Environmental Council. Their contribution is largely based on personal commitment to environmental issues. Maximum of 5% of the working time could be dedicated to the work as environmental co-ordinators.

3.2.3. Target groups for the environmental training

3.2.3.1. *Training of the Environmental Council*. The members of the Environmental Council had various backgrounds and knowledge of environmental issues. Experience and knowledge of environmental management systems, according to the structure of ISO 14001, was limited for the majority of the Council members. To establish a common ground, and to train the environmental co-ordinators in ISO 14001, a training programme was organised. A number of industrial companies were willing to act as mentors for the university, but this opportunity was used only minimally due to lack of time on the part of those involved at the university. The Council members received a CD with a basic environmental training course [34], and a compendium [35], as background material for the self-studies. Training sessions that lasted from one half to four hours were conducted as a part of the Council meetings. Table 2 shows the agenda for the training programme.

Environmental issues, for example, greening of curricula, training of faculty and staff, communication, recycling,

nonconformities and improvements as well as questions and feedback from the departments, are discussed at the Council meetings. This could be regarded as a form of continuous training. Finally, introduction to the updated version of ISO 14001 [18] was provided to the Council.

3.2.3.2. *Training of the Management Group*. The University Management Group consists of 23 persons. The President has the overall responsibility for environmental management, policy and legal compliance. Everyday work within the frameworks of legislation and ISO 14001 is delegated to the different members of the Management Group. Each manager (or comparable function) is responsible to manage environmental issues in his/her organisation. The Dean for Environmental Management is responsible for the co-ordination of the implementation and maintenance of ISO 14001. An important task is to frequently inform the Management Group about the progress of the different activities. EMS is therefore discussed frequently in the Management Group at the initiative of the Dean for Environmental Management. Typical issues that are brought up are:

- environmental aspects, policy and strategy (in connection with the annual reviews);
- legal and other requirements;
- curricula and environmental issues;
- organisation, resources and training; and,
- results of internal and external environmental audits including feedback and improvements that have been completed and that are required.

To introduce ISO 14001 to the Management Group a training session was organised. The training included the basics of EMS and experiences from the implementation of the system at another university. The managers also participated in the general training for their faculty and staff (see below). Finally, the Management Group, together with the Environmental Council and other key persons, received an introduction to environmental legislation that is relevant to the university. The latter activity continues with updates twice yearly.

3.2.3.3. *Training of faculty and staff*. Training of faculty and staff was cascaded down in each department according to a shared training programme. The different departments were able to modify the training to suit their character provided that the main ingredients of the content were retained. A training package was made available for the lecturers (in most cases the environmental co-ordinators). The training included, for example:

- Introduction to environmental/sustainability issues.
- Introduction to EMS. Direct and indirect environmental aspects of the University of Gävle.
- Interactive game ("Space trip" game).
- Group discussions.

3.2.3.4. *Training of new employees and students*. New employees receive a copy of the environmental policy when they first receive their keys, and are informed about the structure

⁴ The organisation of the implementation process is described at the university's home page <http://www.hig.se/miljo/>.

Table 2
Training of the Environmental Council

Training module	Purpose of the training	Literature
<i>Spring 2002</i>		
Motivation for environmental work, Introduction to ISO 14001, certification and environmental review.	To provide an introduction to the certification project together with the management group of the university.	Material provided by the lecturers at the university.
Environmental terminology A description of operations at each department. A guided tour of the waste handling facilities of the university.	To learn what environment, environmental aspects, environmental management system, environmental impact, to start thinking of the department as a unit and to prepare for the environmental review.	Material provided by the lecturers at the university and the industry representative.
An introduction to environmental terminology and a description of operations at each department.		
A guided tour of the waste handling facilities of the university.		
Environmental review ^a	How to conduct the environmental review at each department and the entire university.	Brorson et al. [35].
Environmental training and communication.	To prepare the environmental co-ordinators how to conduct training and to facilitate communication activities.	Training package Sammalisto [49].
<i>Autumn 2002</i>		
Evaluation of environmental aspects.	Provide common ground for the evaluation of environmental aspects and establish how to conduct the evaluation.	Support of an external consultant.
Environmental policy and objectives for the university.	To prepare a revised outline of policy and objectives to the Management Group and the University Board.	ISO 14001 standard.
Environmental targets.	To prepare a proposal for the Management Group and the University President ^b .	Material provided by the lecturers at the university, and the industry representative.
<i>Spring 2003</i>		
Environmental audits.	Some of the environmental co-ordinators went on to further training to be able to function as internal auditors within other departments of the university.	Brorson et al. [35].

^a A survey concerning travelling patterns and use of paper and energy was conducted among the university faculty and staff as a part of the environmental review. The reply rate was 57%.

^b Since 2005, targets are taken by the different departments based on the university objectives. Source: The authors.

of the EMS and relevant policies and procedures during the introduction at their department. First-year students receive the University's environmental policy in their welcome package and receive additional environmental information at the beginning of their studies. The same information package is also provided to all foreign students arriving at the university.

3.2.3.5. Training of environmental auditors. Internal environmental auditors were appointed and trained in auditing methods. Several of the environmental co-ordinators were trained as auditors together with a number of representatives from local industry and the municipality of Gävle. The auditor training lasted for three days conducted over a three-month period and included:

- Environmental auditing in theory and practice.
- How to plan the environmental audit.
- How to conduct the audit (document review, interviews, site inspection).
- How to report the environmental audit.

The course included practical assignments to be completed between course days and a requirement to conduct an internal

audit within their own organisation. Currently there are seven internal environmental auditors at the university. In addition to that, students may participate in internal audits based on their studies in environmental management and the auditors' course.

3.2.4. Communication

During the implementation of the EMS significant emphasis was placed on communication of environmental issues. The main target groups were students, faculty, staff, the Environmental Council, the Management Group and the Board of the University. Several channels were used for communication, for example internal and public websites, information booklets, department meetings and other meetings. To communicate some of the core elements of the EMS (i.e. environmental policy, objectives and targets), draft documents were posted for consultation and input on the website. In addition, information and discussions were arranged at different levels of the university. Continuous review of all education programmes and courses for their coverage of environmental and sustainability issues was initiated. Discussions concerning environment and the university's curricula were taken up in regular departmental meetings chaired by the President

and/or the Dean for Environmental Management. The Dean for Environmental Management also organised meetings concerning the practical aspects of implementation of ISO 14001.

The university magazine (Högaktuellt), the student magazines (DassHögtryck, Gefla Högtryck), and the university homepage were used for communication purposes. The complete documentation of the environmental management system was placed at the environmental homepage on the university website. In addition, the environmental co-ordinators forwarded information and decisions from the Environmental Council to the different departments and vice versa. Staff mail was used on a few occasions to focus on special issues. An environment theme day (Framtidseko, 'Future echo') was arranged. The activities included panel debates, exhibitions, participation of local companies, competitions, and speeches by interesting performers. The day ended with activity where the current batch of environmental and science students met with previous batches.

3.3. Perception of training and communication

As described above a substantial amount of activities took place to create commitment to the EMS and to provide information about its utilisation in daily work. This gives rise to two important questions: Were the resources allocated to training and communication adequate? Was the content of the training relevant to the needs of the participants? The survey among staff and faculty resulted in the following observations.

3.3.1. Participation in training

Several training opportunities were offered to faculty and staff of the ten departments of the university including the Office of Student Affairs. In average 73% of respondents reported that they participated in environmental training. Four departments showed a rather low participation rate ($\leq 62\%$ of employees). The participation rate in the other six departments was $\geq 78\%$. 86 persons (28.5%) provided a reason for not attending the training. Lack of time was indicated by 36%, lack of motivation by 13%, and holiday or sick leave by 7%. The remaining 44% indicated "other" as a reason for not attending the training.

3.3.2. Relevance of the environmental training

About 60% found the environmental training "very relevant" or "relevant" (Fig. 2). The reported relevance of training varied from about 30% to 84% between departments.

3.3.3. Awareness and attitude

Participation in training showed a positive correlation with the awareness of the key elements of the EMS. Generally the knowledge about the environmental policy, objectives, routines and documents could be considered as high (Fig. 3). More than 82% of staff and faculty were aware of the policy. About 83% of the persons reported that they knew where to find the documents and procedures related to the EMS. This can be considered a high level of awareness since many of the documents were not yet fully implemented. Sixty-three percent of the persons claimed awareness of the specific

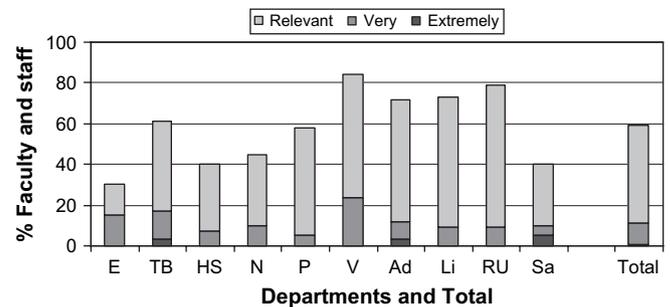


Fig. 2. Reported positive perception of the relevance of the environmental training. Department of Business Administration (E), Department of Technology and Built Environment (TB), Department of Humanities and Social Sciences (HS), Department of Mathematics, Natural and Computer Sciences (N), Department of Education and Psychology (P), Department of Caring Sciences and Sociology (V), Administrative department (Ad), Library (Li), The Offices of the President and Education and Research (RU), The Office of Student Affairs (Sa). Source: The authors.

EMS procedures that affected the daily work. With reference to industry the figure appeared to be realistic at that stage of the implementation of the EMS. It should also be noted that about half of faculty and staff stated that they were not affected by the EMS.

Participation in training showed a correlation with a more positive attitude towards the EMS. Overall, 52% faculty and staff claimed in the survey that they were motivated to actively work with environmental issues at the university. Within five departments the reported motivation was quite high ($>60\%$). Low motivation ($<35\%$) was reported from three of the departments.

3.3.4. Support from managers and supervisors and personal responsibility

According to studies of EMS in industry and other organisations (Table 1) involvement and support from top management is essential for a well functioning EMS. This is also clearly manifested in the ISO 14001 standard. In a section of the questionnaire faculty and staff were asked about how they perceived the support from managers and supervisors. Support for environmental work varied from "very little" to "great". On average 74% (range 28–93%) of the persons reported support from their managers and supervisors.

The personal involvement ("own responsibility") in the EMS was considered as high (on average 84%; range 57–100%).

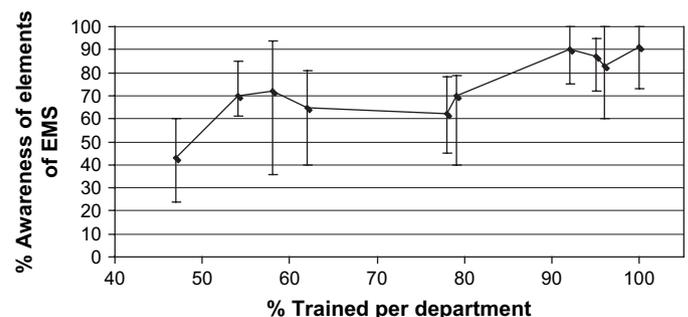


Fig. 3. Awareness of environmental policy, objectives, procedures and EMS documentation as a function of participation in training per department. Source: The authors.

The motivation for environmental issues appeared to be somewhat higher than the sense of personal connection to the EMS. This would indicate that some people were motivated although they did not always see the connection to their own work. Low personal responsibility was reported by persons working at departments where the connection to the EMS was not perceived as obvious.

3.3.5. Circumstances that interfere with the ambitions for environmental work

The factor that was most frequently reported as interfering with the personal ambitions was the “lack of time” (Fig. 4). “Personal interest” in environmental issues was perceived as a circumstance that contributed positively to the engagement (63% of the participants). Less than 10% of faculty and staff stated that “lack of information”, “knowledge” and “support” were greatly limiting their personal environmental ambitions. Nonetheless, a majority of the individuals indicated that there was sufficient “information” (73%), “support” (79%), “knowledge” (78%) and “personal interest” (91%) to be engaged and to participate in the environmental work at the university.

3.3.6. Contribution to sustainable development

The final question in the survey dealt with the views of personal contribution to sustainable development. A number of persons indicated that they contributed to sustainable development but many others did not indicate any contribution at all (Fig. 5). People in functions such as “education”, “research”, “collaboration with society” and “service” recognised a potential to contribute to sustainable development. On the contrary, several persons in the same functions concluded that they could not contribute, did not know, or considered the topic as not relevant.

4. Discussion and conclusions

4.1. Training and communication are important elements of the EMS

Implementation of ISO 14001 will, to a major or minor extent, change the everyday life of many employees in

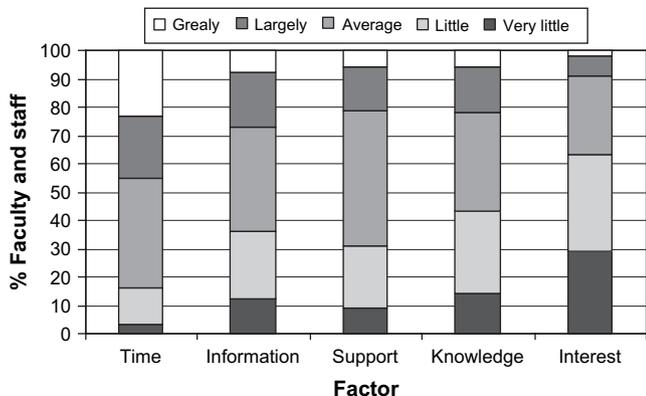


Fig. 4. Circumstances reported as interfering with personal ambitions for environmental work. Source: The authors.

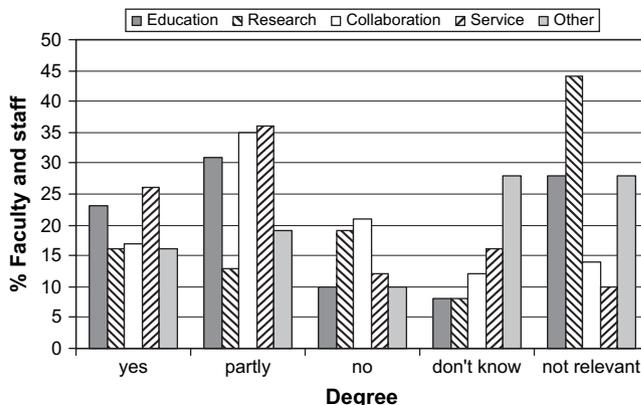


Fig. 5. Perceived contribution to sustainable development. Source: The authors.

a company or other organisation. Policies, objectives, procedures, instructions and many other elements of the standard will be introduced and all managers and employees are expected to understand his/her role in the system. The intention of this study was to present methods of EMS training and communication at a university and to analyse how staff and faculty perceived the training. Some of the most relevant findings are commented upon below.

4.1.1. Top management commitment and external drivers

In all organisations top management commitment is essential for the implementation of the EMS. At the University of Gävle the combination of the Swedish EMS Directives, and the decision by the University Board to strive for the ISO 14001 certification, triggered the implementation of the EMS. Another prerequisite was that an effective organisation for implementation and maintenance of the EMS was created. Similar experiences of commitment and external drivers are shared by industry. In industry, requirements from customers are examples of important external drivers for the implementation of EMS.

4.1.2. Focus on the significant environmental aspects

Manufacturing companies need to manage a number of direct environmental aspects, for example, emissions to water and air. Information about such issues will therefore become a natural part of the training, and the employees will easily understand the interaction between the EMS and the everyday work. At a university there also exist a number of direct environmental aspects, for example, hazardous waste at the laboratory facilities. However, indirect environmental aspects will dominate in many of the university departments. Such indirect aspects are, for example, associated with knowledge, awareness and action competence. Students and researchers will hopefully, later in life, apply the environmental knowledge to their professional and private spheres (see Fig. 1). This may result in a considerable positive environmental impact for the coming decades.

The EMS implementation team has an important task to introduce the concept of indirect environmental aspects at a university. To convince lecturers and researchers that the

greening of the university involves the introduction of future oriented environmental and sustainability issues in courses and research is an interesting and challenging task.

4.1.3. *Methods for training*

Environmental training is one of the critical factors in the implementation of EMS in industry and other organisations. According to the literature review (Table 1), and experiences from industry, the general training should include the majority of the managers and employees. In addition to that, certain functions will need more detailed knowledge about the EMS.

This study shows that training methods inspired by industrial experiences can successfully be applied in a university setting. There are, however, some differences in organisational hierarchies and learning traditions in industry as compared to a university. Training of lecturers and researchers may therefore need to be adjusted to the academic traditions. For example, a culture of “loyalty to discipline” rather than to the employer, “academic freedom” and “critical thinking” [36] may result in a need for more interactive training methods. Discussions and seminars may therefore be used instead of traditional one-way teaching methods. Informal training and information can also be provided during regular meetings. Finally, members of the EMS training team should also be prepared to participate in lengthy, and sometimes complicated and interesting, discussions concerning all kinds of environmental and sustainability issues.

4.1.4. *Methods for communication*

Several methods for the communication of the EMS were applied at the University of Gävle. There is nothing in this study that supports a different approach to communication at a university compared to industry.

4.1.5. *Perception of training and communication*

Environmental training and communication resulted in increased awareness about environmental issues and a deeper understanding of the individual roles in the EMS. Also, positive changes in attitudes toward environmental issues were observed among faculty and staff. For a number of different reasons some individuals did not recognise their personal connection with the EMS and did not see any personal contribution to sustainable development.

4.1.6. *Greening of curricula*

The challenges for the EMS project team will certainly increase when indirect environmental aspects are introduced and the concepts of greening of curricula and sustainable development are presented. It can be difficult to motivate busy lecturers and researchers to participate in environmental activities that may not traditionally be connected to their field of expertise and where future environmental consequences are difficult to foresee and monitor. Special skills are therefore needed when communicating with lecturers and researchers. Further, a methodology will be needed to motivate faculty members to assess the content of current courses and research projects. The aim should be to seek possibilities to introduce

environmental and sustainability issues into teaching and research. In many cases the connection between the EMS is obvious, e.g. in the natural sciences, health sciences and economic fields, whereas in others it may be harder to find sufficient reason to introduce environmental aspects. It should be emphasised that the aim is not, of course, to require all courses and research projects to address indirect environmental aspects, only those where the connection is natural and relevant.

4.1.7. *EMS at universities*

EMS as specified in the International Standard ISO 14001:2004 is a rather new tool to be applied in public agencies. Some of its requirements may appear to be provocative, or too normative, for university faculties representing different disciplines and academic traditions. Despite of these concerns, and based on the experiences from the University of Gävle, the authors are convinced that the standard can be applied as a tool to provide structure for environmental issues at any university. A well-structured EMS will increase environmental awareness among staff, faculty and students, and the relevance of environmental issues in the university context can be developed further. This is one way in which the higher education institutions can make an important contribution to the sustainable development of society. Therefore, the question of how the awareness of environment and sustainability issues can result in concrete action in university courses and research programs needs to be studied further.

4.2. *Epilogue*

Implementation of EMS at the University of Gävle has resulted in improved environmental performance. Increased environmental awareness and a more structured way to manage environmental issues have contributed to the improvements. In addition, internal and external environmental audits play an important role to identify non-conformances and to introduce corrective actions. It can also be observed that the environmental management reviews often results in constructive discussions concerning the overall environmental strategy of the university and the function of the EMS. Examples of ongoing initiatives to improve the EMS are:

- The register of significant environmental aspects has already been updated two times and there is now more focus on the indirect environmental aspects of education and research.
- The University Board updated the environmental policy and introduced a comprehensive policy for environment and sustainable development in December 2005. One of the drivers for the proposed expansion of the policy is the recently revised Swedish Higher Education Act where sustainable development is highlighted [37].

What will then be the future of the environmental management system at the university? Of course you could quote the old line that says that “top management commitment is essential for the implementation of the EMS” and hope for the best.

However, as observed in industry, management commitment certainly is an important success factor, but if the EMS fails to be integrated in the overall management system problems will sooner or later occur. If the short run people may be satisfied by “doing things in the right way”, but in the longer perspective it is more essential to “do the right things”.

If the EMS in industry, for example, contributes to savings, legal compliance, business opportunities and customer satisfaction, top management will keep focus on the system. There are numerous examples that if an important customer requires that the supplier should be able to show compliance with ISO 14001, the system will be implemented. In the framework of a university savings and legal compliance are obvious driving forces for the implementation of the EMS, but words like “business opportunities” and “customer satisfaction” are probably not used too frequently in association with environmental issues. However, in the case of the University of Gävle, the Swedish Government can be seen as a customer and therefore the Government directives to implement EMS triggered, although not enforced, the certification process. Without this external driving force the implementation might have been a bit more difficult. Finally, training and communication are very important activities, in industry and at universities, to continually inform and motivate management and employees about internal and external driving forces and to demonstrate the practical and economical benefits of the EMS.

Acknowledgements

A special thanks to BSc students Catrine Erenlöf and Pär Flodin at the University of Gävle for their contribution to the survey.

References

- [1] SNV. Deltagande myndigheter (Participating agencies and institutions), <<http://www.naturvardsverket.se/miljoledning/>>; [accessed 22.04.05].
- [2] SOU. Integrering av miljöhänsyn inom den statliga förvaltningen (Integrating environmental considerations in public office). Stockholm: Delbetänkande från miljövårdsberedningen.; 1996. p. 112.
- [3] Cortese AD. The critical role of higher education in creating a sustainable future. *Planning for Higher Education* 2003;31(3):15–22.
- [4] Sammalisto K. From government directive to sustainable development in Swedish universities. Does an EMS give results? The proceedings of the third EMSU conference in Monterrey, Mexico; June 2004.
- [5] Sammalisto K, Arvidsson K. Environmental Management in Swedish higher education. Directives, driving forces, hindrances, environmental aspects and environmental co-ordinators in Swedish universities. *International Journal of Sustainability in Higher Education* 2005;6(1):18–35.
- [6] Peglau R., The number of ISO14001/EMAS registration of the world, c/o Federal Environmental Agency, Germany, From ISO World, <<http://www.ecology.or.jp/isoworld/english/analy14k.htm>>; [accessed 14.09.06].
- [7] Daily BF, Huang S. Achieving sustainability through attention to human resource factors in environmental management. *International Journal of Operations and Production Management* 2001;21(12):1539–52.
- [8] Summers Raines S. Implementing ISO 14001—an international survey assessing the benefits of certification. *Corporate Environmental Strategy* 2002;9(4):418–26.
- [9] Wee YS, Quazi HA. Development and validation of critical factors of environmental management. *Industrial Management and Data Systems* 2005;105(1):96–114.
- [10] Zeng SX, Tam CM, Tam VWY, Deng ZM. Towards implementation of ISO 14001 environmental management systems in selected industries in China. *Journal of Cleaner Production* 2005;13(7):645–56.
- [11] Brorson T. Environmental and Sustainability Reports 1998–2004. Sweden: Trelleborg AB.
- [12] Brorson T, Almgren R. ISO 14001 för små och medelstora företag (ISO 14001 for small and medium sized enterprises). Stockholm, Sweden: SIS Förlag; 2006.
- [13] Rondinelli DA, Vastag G. Panacea, common sense, or just a label? The value of ISO 14001 environmental management systems. *European Management Journal* 2000;18(5):499–510.
- [14] Strachan PA, McKay SI, Lal D. Managing ISO 14001 implementation in the United Kingdom Continental Shelf (UKCS). *Corporate Social Responsibility and Environmental Management* 2003;10(1):50–63.
- [15] Beard C, Rees S. Green teams and the management of environmental change in a UK county Council. *Environmental Management and Health* 2000;11(1):27–38.
- [16] Burström von Malmborg F. Environmental management systems, communicative action and organizational learning. *Business Strategy and the Environment* 2002;11(5):312–23.
- [17] Lozano Rodrigo. Incorporation and institutionalization of SD into universities: breaking through barriers to change. *Journal of Cleaner Production* 2006;14:787–96.
- [18] SIS. Svensk standard SS-EN ISO 14001, Environmental management systems - Requirements with guidance for use (ISO 14001:2004). Stockholm: Swedish Standards Institution; 2004.
- [19] Delakowitz B, Hoffmann A. The Hochschule Zittau/Gorlitz. Germany's first registered environmental management (EMAS) at an institution of higher education. *International Journal of Sustainability in Higher Education* 2000;1(1):35–47.
- [20] Herremans I, Allwright DE. Environmental management systems in North American universities, What drives good performance? *International Journal of Sustainability in Higher Education* 2000;1(2):168–81.
- [21] Koester RJ, Eflin J, Vann J. Greening of the campus: a whole-systems approach. *Journal of Cleaner Production* 2006;14:769–79.
- [22] Noeke J. Environmental management systems in Universities—A case study. *International Journal of Sustainability in Higher Education* 2000;1(3):237–51.
- [23] Price JT. Preaching what we practice: experiences from implementing ISO 14001 at the University of Glamorgan. *International Journal of Sustainability in Higher Education* 2005;6(2):161–78.
- [24] Viebahn P. An environmental management model for universities: from environmental guidelines to staff involvement. *Journal of Cleaner Production* 2002;10(1):3–12.
- [25] Schulte PA, Okun A, Stephenson CM, Colligan M, Ahlers H, Gjessing C, et al. Information dissemination and use: critical components in occupational safety and health. *American Journal of Industrial Medicine* 2003;44:515–31.
- [26] Sammalisto K. Developing TQEM in SMEs. Management Systems Approach, Licentiate thesis, IIIIEE. Lund: Lund University; 2001.
- [27] Voss C, Tsikriktsis N, Frohlich M. Case research in operations management. *International Journal of Operations Management* 2002;22(2):195–219.
- [28] Yin RK. Case study research: design and methods. 3rd ed. London: Sage Publications; 2003.
- [29] Högskolan i Gävle. Årsredovisning 2004 (Annual report 2004), Gävle.
- [30] Erenlöf C, Flodin P. Förändringsarbete i organisation (Changing an organisation.), BSc thesis, University of Gävle, Sweden.
- [31] Högskolan i Gävle. Högskolestyrelsens Protokoll (2001:6) (The proceedings of the University Board).
- [32] Högskolan i Gävle. <http://www.hig.se/miljo/pdf/higs_miljomalsarbete_2004.pdf>; [accessed 18.01.06].
- [33] Högskolan i Gävle. Miljöorganisation (Environmental organisation), <http://www.hig.se/miljo/pdf/miljoorganisation_2005_01_19.pdf>; [accessed 28.07.05].

- [34] GEFO. Miljögrund—grundläggande miljöutbildning (Environmental basis—a basic environmental course). Stockholm: Stiftelsen Gemensamma Fonden; 1999.
- [35] Brorson T, Larsson G. Miljöledning Kompendium (Environmental management Compendium). Stockholm, Sweden: EMS AB; 2000.
- [36] Sammalisto K. Implications of university management and leadership on EMS implementation in Swedish institutions of higher education, Working paper, IIIIEE. Lund University; 2003.
- [37] SFS. (1992:1434), Högskolelag (The Higher Education Act), Revised SFS 1992:1434. Stockholm: Department of Education; 1992.
- [38] Babakri KA, Bennett RA, Franchetti M. Critical factors for implementing ISO 14001 standard in United States industrial companies. *Journal of Cleaner Production* 2003;11(7):749–75.
- [39] Chattopadhyay SP. Improving the speed of ISO 14000 implementation: a framework for increasing productivity. *Managerial Auditing Journal* 2001;16(1):36–9.
- [40] del Brío JÁ, Junquera B. Level of implementation of the ISO 14001 standard in Spanish industrial companies. *Eco-Management and Auditing* 2001;8(4):193–9.
- [41] del Brío JÁ, Fernández E, Junquera B, Vázquez CJ. Motivations for Adopting the ISO 14001 Standard: A Study of Spanish Industrial Companies. *Environmental Quality Management* 2001;10(4):13–28.
- [42] Zutshi A, Sohal AS. Adoption and maintenance of environmental management systems—critical success factors. *Management of Environmental Quality* 2004;15(4):399–419.
- [43] Zutshi A, Sohal A. A study of the environmental management system (EMS) adoption process within Australasian organisations—2. Role of stakeholders. *Technovation* 2004;24(5):371–86.
- [44] Moore J, Pagani F, Quayle M, Robinson J, Sawada B, Spiegelman G, et al. Recreating the university from within: collaborative reflections on the University of British Columbia's engagement with sustainability. *International Journal of Sustainability in Higher Education* 2005;6(1): 65–80.
- [45] Dahle M, Neumayer E. Overcoming barriers to campus greening, A survey among higher educational institutions in London, UK. *International Journal of Sustainability in Higher Education* 2001;2(2):139–60.
- [46] von Oelreich K. Environmental Certification of Mälardalen University. *International Journal of Sustainability in Higher Education* 2004; 5(2):133–46.
- [47] Thomas I. Sustainability in tertiary curricula: what is stopping it happening? *International Journal of Sustainability in Higher Education* 2004; 5(1):33–47.
- [48] Wright TSA. Definitions and frameworks for environmental sustainability in higher education. *International Journal of Sustainability in Higher Education* 2002;3(3):203–20.
- [49] Sammalisto K. A basic environmental training for the University of Gävle. Unpublished; 2002.

Kaisu Sammalisto is a Licentiate of Technology from Lund University, MBA from Uppsala University, MSc Eng. Åbo Akademi and a PhD student at the International Institute for Industrial Environmental Economics at Lund University. She was working as Dean for environmental management and education at the University of Gävle in Sweden during the EMS implementation 2001–2005. She has previously studied EMS implementation in SMEs and continues her studies of the same in university settings.

Torbjörn Brorson (PhD, MSc) is Adjunct Professor in Environmental Management and Auditing at the International Institute for Industrial Environmental Economics (IIIIEE), Lund University, Sweden. Brorson has been working for 18 years in leading environmental positions in multinational industrial companies.