Adoption of environmental management systems and standards in Norwegian education and nursing

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Abstract

Purpose – The aim of this paper is to explore the driving forces and cost/benefit effects of introducing environmental management systems (EMS) and standards in education and nursing in five of the largest Norwegian cities. The relevant standard is the *Eco-Lighthouse* program which offers a Norwegian environmental certificate.

Design/methodology/approach – Multivariate analyses of data on motivating factors and perceived costs/benefits from reported EMS adoption from a survey going to executives in 391 schools and 87 nursing homes.

Findings – The study confirms that EMS adoption is driven by resources and capabilities, rather than simply institutional pressure, and that managers in nursing and education perceive reduced costs and other benefits from EMS adoption. The *value added* of the *Eco-Lighthouse* certification is ambiguous.

Research limitations/implications – Since the study builds on survey data on perceived effects from EMS adoption, a potential limitation is non-representativeness, although sampled and un-sampled institutions are similar in relevant respects. Moreover, since data are cross-sectional, dynamic effects from EMS adoption is difficult to assess.

Originality/value – The paper corroborates results from previous studies. A novelty in the study is its attempt to control for the effect of *rationalization* and/or *social desirability bias* in effects reporting. The likely impact of *rationalization*/*social desirability bias* is in general positive but not significant in analyses of cost reductions, although both positive and significant in analyses of other benefit effects.

Keywords – Cost/benefit effects, driving forces, environmental management systems and the *Eco-Lighthouse* program, institutional and resource-based theory

Paper type – Research paper

1. Introduction

The aim of this paper is to explore driving forces and cost/benefit effects of introducing environmental management systems (EMS) and standards in education and nursing in five of the largest cities in Norway.[1] The study focuses on the *Eco-Lighthouse* program (ELH) which is a voluntary environmental scheme to help local manufacturing producers and service providers to change the complex environmental agenda into a manageable process. The target groups are private and public organizations, especially small and medium sized enterprises. The *Eco-Lighthouse* program offers a public Norwegian environmental certificate.[2] The program has defined 72 categories of certification standards. The most relevant standards for nonmarket organizations being: Office, kindergarten, youth center, nursing home and library. In total, 3200 private businesses and organizations have been awarded an *Eco-Lighthouse* certificate.[3] In larger and more complex organizations, the international environmental standards like ISO 14001 and EMAS are alternatives to an Eco-Lighthouse certification.

In Norway, municipalities are important local service providers and are responsible for primary schools, kindergartens, primary health care, nursing homes and water-sewage and waste management. Moreover, municipalities support different voluntary activities to heighten climate and environmental awareness in their own organizations and the local community. More than 50% of Norwegian municipalities are taking part in the ELH-program, appointing local officers and setting up collaborative activities with neighboring municipalities to organize courses for local certifiers and to market efforts of the ELH-scheme. These activities are supposed to raise environmental awareness and contribute to regional cooperation and collaboration between public and private partners. Municipalities are searching for tools to develop climate plans and reporting systems on energy, goods purchasing, transport and waste management. In addition, local authorities have wanted to improve their reputation by building environmental awareness into their service provisions.

The study considers institutional theory and resource-based theory to explore organizations' drivers for implementing environmental management systems and standards in public organizations. We focus on two important service sectors, education and nursing, which have extensive interactions with clients and users, and which together make up nearly half of local spending budgets. The data consists of responses to a survey going to executives in 391 schools and 87 nursing homes in Oslo, Bergen, Trondheim, Stavanger and Kristiansand. Importantly, as reporting is likely biased due to a process of rationalization and/or social desirability (Fischer, 1993), the data allow us to take into account directors' attitudes towards the environment. In addition it allows us to control for the impact of service sector and city specific confounding effects in multivariate analyses.

The paper is structured as follows: First, a brief literature review summarizes previous research and presents three hypotheses to be tested. Next, the data, the relevant variables and the research design are presented. The main findings are presented in the subsequent section. Finally, the paper ends with conclusions, some discussion with previous findings, limitations and recommendations.

2. Literature review and hypotheses

2.1 Institutional theory

Institutional theory holds that businesses operating within similar social frameworks and norms often behave similarly to gain social approval (DiMaggio and Powell, 1983; Scott, 2001). One may assume that both private and public organizations adopt voluntarily environmental management systems (EMSs) in response to perceived institutional pressure from external actors. These EMSs provide a general framework and includes environmental policy and procedures, training programs, environmental auditing and reporting routines. Further, an organization can decide to have their EMS validated by a third –party and receive an environmental certification like ISO 14001 or an *Eco-Lighthouse* certificate.

Hoffman (2001) proposes three institutional actors as the most important in influencing voluntary environmental activities in organizations: Regulatory, market and social actors. We outline our approaches along these lines, but bearing in mind that most research on environmental issues have been developed in the context of private businesses. Nonmarket service providers adopting EMSs and standards are still an under-researched area. These organizations are likely influenced and motivated in ways different from that of actors in the private sector.

2.1.1 Regulatory influence

Regulatory influence theory postulates that businesses are investing in voluntary actions to influence the regulatory system (Maxwell and Decker, 1998).To prevent legal sanctions , firms are implementing proactive environmental actions to manage their environmental challenges. However, the motivation of public organizations under the direct supervision of local authorities might be different from that of private firms. Nonmarket organizations are not profit-seeking, but focused on achieving policy goals

2.1.2 Market influence

Organizations may adopt environmental management practices for a variety of economic reasons, for instance in order to satisfy market demand. An ELH certificate would represent a signal to market participants concerning the firm's commitment to the natural environment and their adherence to accepted environmental standards. Certification helps to overcome asymmetries between customers and service providers.(Christmann and Taylor, 2006) Such information affects an organization's reputation and would act as a response to increasing consumer demand for green products and services (Khanna and Damon, 1999). Public service providers with an environmental certificate might be more attractive for clients with great awareness of the natural environment. On the other hand, one would not expect a strong market influence on public service providers.

2.1.3 Social responsibility

In addition to regulatory and market pressure, private and public organizations are subject to pressure from society. Environmental and community groups, media and trade associations

demand improved actions to reduce organizations environmental impact. These constituents in the social system influence the norms and change the public perception about the environment. Like market actors, these social actors have increased their environmental awareness due to increasing public information on environmental issues. Delmas and Toffel (2004) argue that organizations are likely to mimic behavior of other firms that are tied to them through contacts and networks between private and public groups. Public service providers like education and nursing are in charge of services for broad population groups. Their perception is influenced by media stories and public environmental information. Institutional pressure from societal actors are expected to influence both market and nonmarket organizations to implement voluntary environmental management practices.

In summary, with institutional theory as a backdrop, the following hypothesis is put forward:

Hypothesis 1: Organizations in education and nursing stress the importance of external political legitimization and social responsibility and are implementing voluntary environmental management systems and standards.

2.2 Resource-based theory

So far our discussion has proposed that adoption of environmental management systems and standards is driven by institutional influence. But firms heterogeneity in acquiring and deploying resources and management practices, put emphasis on internal organization and resources (Delmas and Toffel, 2004).These views are in line with resource-based theory: Business performance is driven by firms' use of their strategic resources. Focusing on environmental issues, studies have indicated that an organization's complementary resources related to labor and capital, may facilitate the adoption of environmental management systems and standards (Darnall *et al*., 2008).Top management commitment and budget allocations for environmental activities, are examples on complementary resources which facilitate adoption of EMSs.

2.2.1 Top management commitment

Top management commitment is a critical element when implementing an environmental strategy (Cordano and Frieze, 2000). Top management commitment may increase the consciousness about environmental issues among line managers and employees, and are important to explain why businesses undertake voluntary environmental management practices. Implementing the basic elements of an environmental management system, including environmental review, environmental policy and objectives and continuous improvement, can create new ways of thinking.

In a dynamic environment organizations are not always operating at peak efficiency (Andrews *et al*., 2001). Therefore, implementation of EMSs and other voluntary environmental activities can help organizations to identify cost-effective opportunities and avoid organizational failures. (Gabel and Sinclair-Desgagne, 1993).Continuous improvement

requires that line managers identify environmental aspects and cost-effective opportunities in their day-to-day activities. To support line managers in their struggle to reach environmental objectives, the top management organizations may appoint environmental managers who have the overall responsibility for environmental matters. Organizations with persons who have specific responsibilities for environmental matters are more likely to implement the core elements of an EMS than are organizations without environmental managers.

2.2.2 Budget allocations for environmental activities and research

When a firm undertakes new strategic directions to reduce its environmental impact, internal resources are needed to succeed. By investing in environmental activities and research, the top management demonstrates commitment to the natural environment. In the business sector, knowledge-based capital is critical to sustained competitive advantage (Porter and van der Linde, 1995). Investments in environmental research generate knowledge-based capital which is difficult to replicate and firms may get a first-mover advantage. In either case, one would expect that organizations with environmental budget allocations, be they public or private business entities, can commit to voluntary environmental practices more easily than organizations without such budgets.

From a resource-based theoretical viewpoint a second hypothesis is suggested:

Hypothesis 2: Organizations in education and nursing with complementary environmental resources are implementing voluntary environmental management systems and standards.

2.3 Effects of environmental management systems and standards on organizations performance.

Since implementation of environmental management started in the nineties, researchers have explored the motivations of EMS adoptions and the effects of environmental management systems on organizations' performance (King *et al*, 2005). It has generally been assumed that proactive environmental activities lead to improved business and environmental performance, but the effects have been hard to quantify and the empirical evidence is mixed (Schaltegger and Synnestvedt, 2002).

U.S. and European empirical studies on the motives of EMS adoption and the links between EMSs and business performance have mainly focused on private businesses. Most research has been conducted within one sector and/or one country, with only a few studies taking on a global context. We hardly find any empirical research on the effects of EMSs adoption in nonmarket organizations like education and nursing among these studies.

We limit our literature review on this point to three publications: The first one focusing on private firms in a global context (Darnall *et al*., 2008), the next comparing environmental performance in ISO 14001-certified and non-certified companies in Sweden (Zobel, 2009),

and lastly, a report on private and public *Eco-Lighthouse* - certified organizations in Norway (NTNU, 2009).

Darnall *et al*. (2008) studied the adoption of environmental management systems in manufacturing industries in Canada, Germany, Hungary and the United States from the perspective of both institutional and resource–based theory. Their results confirm that both institutional pressure and resources and capabilities encourage businesses to adopt comprehensive EMSs. However, facilities that were mainly driven by their resources and capabilities rather than institutional pressure, were the more likely to obtain improved business performance.

Zobel (2009) compared environmental performance in ISO 14001-certified and non-certified companies in Sweden. In some cases certifications had positive effects on environmental performance, but improvements were relatively small and limited. In most cases it was not possible to find any effects at all.

The Industrial Ecology Program at the Norwegian University of Science and Technology has been analyzing environmental reports from private and public *Eco-Lighthouse* organization over the last years. In their latest report (NTNU, 2009), aggregated results based on 1012 environmental reports showed the following: Eco-Lighthouse certified offices, hotels and schools tended to perform better than national average figures in terms of energy usage. Further, the total percentage of sick leaves in ELH organizations was about half a percentage point below the national average figure.

While the results from the cited studies are somewhat limited for our purpose, a natural hypothesis is nevertheless the following:

Hypothesis 3: Comprehensive environmental management systems and standards among organizations in education and nursing lead to improved performance in terms of cost/benefit effects in the institution at hand and in the institutions' surroundings.

3. Data and research design

The present study puts to use data from a survey to executives in Norwegian nursing homes and schools in five large Norwegian municipalities.[4] Institutions within these two service sectors were chosen as units of analysis since they naturally engage in extensive day-to-day contact with their environments (students and their parents, nursing home patients and their relatives). Moreover, these sectors are by far the largest in terms of local expenditures, with primary education making up 22 per cent, and old age care/nursing 27 per cent of total local government spending (Statistics Norway, 2009). As such, nursing homes and schools should provide a natural focal point for studying particularly wide stakeholder involvement, from e.g. clients, contractors, unions and local governments themselves, and for analyzing perceived effects of organizational choices within the very core services under Norwegian local government jurisdiction.

Survey questionnaires were administered to 478 institutions in mid-February 2010 and by mid-March, 39 percent had responded.[5] The survey asked questions on which societal actors are perceived to be influential for implementing an EMS (a five-point likert scale) and questions on relevant internal resources of institutions; on implemented elements of an EMS; on the institutions certification status; and on perceived costs and benefits of EMS adoption (all binary variables). Table A1 in the appendix gives details on disaggregated populations, samples and response rates, as well as variation in the core variable of interest, namely whether the institution at hand is *Eco-Lighthouse* certified or is in the process of being certified.[6]

The multivariate analyses include as dependent variables indicators (i.e. dummy variables) for the adoption of various EMS components (eg. the adoption of "Routines for assessing legal requirements") and indicators for perceived costs or benefits in different areas (eg. in energy consumption or reputation). Descriptive statistics for these and additional independent variables (eg. whether one has “a budget for environmental activities”) used in the ensuing analyses are given in table A2 in the appendix.

Since the analyses for the most part will be focusing on variation in binary variables (e.g. the choice or non-choice of individual EMS elements; reports of positive or non-positive effects from EMSs), logistic regressions will be employed in multivariate analyses. That is, we model

$$\text{Logit} \equiv \text{L} \equiv \log\left(\frac{P}{1-P}\right) = a + b_1 \cdot X_1 + b_2 \cdot X_2 + \cdots + b_n \cdot X_n ,$$

where P is the probability of e.g. a choice of a particular EMS element or the probability of a positive effects report, b_1, b_2,…, b_n are coefficients of the impacts of explanatory variables X_1, X_2,…, X_n respectively. In this way one ensures that predicted probabilities will lie in the [0,1] region, and that one may estimate the impacts of explanatory variables (the bs) correctly (in terms of statistical significance tests; see e.g. Gujarati and Porter , 2009: 553-558). We take a two-sided $p<0.15$ in t-tests to indicate a significant relationship.

Unfortunately, no publically available records of Eco-Lighthouse certification exist against which to assess overall or group specific sample rates. The relatively low response rates may imply that certification sample rates are biased estimates of true population rates. However, in earlier analysis there is no indication that sampled institutions are dissimilar to un-sampled institutions with respect to certain important characteristics, and we do not find any evidence of Eco-Lighthouse certified institutions being under- or overrepresented in our sample.[7] One may therefore conclude that our data is not skewed in any obvious direction.

Before presenting the results of our analysis, we point out some obvious weaknesses of our data and design and also underline some strengths. First, assertions of general representativeness notwithstanding, ours is a *small N* study. Viewed together with the fact that variables are measured with some imprecision, as one may expect in a self-reported survey, results from multivariate analyses should be interpreted with some caution. Second, our data does not in principle allow us to interpret statistical effects measures as causal relationships. For instance, in analyses of propensities to implement certain elements of an EMS, unless one

is confident that all relevant variables are accounted for, one can only talk about *differences* in propensities between certain organizations (e.g. in terms of their use of internal resources). As such, statistical effects are merely *partial correlations*, although in some cases one may alleviate some endogeneity problems by way of including fixed effects for municipality and sector in multivariate analyses.

Third, measures of organizational choices and their effects are *self-reported which* are likely to be biased in an absolute-positive direction if respondents fall victim to a process of *rationalization and/or desirability bias* , i.e. if there is a tendency to exaggerate the impact of organizational choices, or if they give what may be perceived as socially desirable answers (Fischer, 1993). In its turn one may assume that such a tendency depends upon the importance that respondents attach to outcomes.

In the ensuing multivariate analyses of effects of EMSs the regressions offer control for the value each individual respondent attaches to environmental issues (via the "environmental awareness", variable *EA*). Importantly, survey questions ask of effects from environmental management actions *specifically*, thereby in principle avoiding problems of confounding influences from other omitted variables. These two features of the effects analysis design (i.e. control for rationalization/social desirability tendencies and EMS specific effects questions) suggests that one in certain situations may interpret effect results with some confidence.[8]

4. Results

This section presents first the driving forces behind the introduction of voluntary environmental management system and standards in order to explore the first hypotheses. Specifically, the analysis looks at perceptions of who are the important influencing actors (regulators, markets and society). Secondly, in order to assess both the first and the second proposed hypothesis, possible effects of both external pressure and internal resources and capabilities on the propensity to implement elements of an environmental management system, are taken into account. Lastly, the third hypothesis is looked into and the analysis explores perceived cost/benefit effects of introducing an EMS, and specifically the perceived effects of an Eco-Lighthouse certification. The latter point is important: Since an EMS may or may not be validated by a third-party recognized body, our design in principle allows us to disentangle the *value added* of certification in itself from the working elements of a management system.

There are four main findings to be mentioned: EMS adoptions are driven by pressure from political and administrative authorities, although clients and the media are also influential. Next, EMS adoption in nursing and education has much to do with internal resources and capabilities, and is not simply driven by institutional pressure. Further, managers in nursing and education perceive cost reduction and other beneficial effects from EMSs adoptions, i.e. a more comprehensive EMS is associated with reports of cost reductions and in most areas with reports of other benefits. The *value added* of an *Eco-Lighthouse* certificate is ambiguous.

4.1 The driving forces of voluntary environmental management systems and standards implementation.

In Figure 1 are displayed responses to each item of a question on driving forces for introducing environmental activities. Respondents rated each actor representing regulatory pressure, market pressure and social responsibility (Hoffman, 2001) as having "very weak", "weak", "some", "strong" or "very strong" influence, recoded to a 1-2-3-4-5 numerical scale in the figure.

[FIGURE 1 HERE]
Figure 1. The influence of different actors in implementing environmental activities.

Respondents view the influence of local political and administrative authorities (two upper items in figure 1) as quite important (score > 3, i.e. more than "some" influence), while users, employees, environmental organizations, the media and other authorities (national and regional) verge on having at least "some" influence on average (score > 2.5). This is broadly consistent with our first hypothesis and previous studies (GRIP, 2002): Organizations in education and nursing are first and foremost at the hands of top level political and administrative direction when contemplating environmental action, although with an eye to the inputs of important societal and cliental groups, as suggested by the "social responsibility" pressure.

The first and second hypotheses ask whether successful implementation of an EMS hinges both on external political legitimization and on the allocation of certain complementary resources (Darnall *et al*., 2008).Tables 1a and 1b display detailed results from logistic regressions of adoption of individual elements (*EMS1-EMS8*) of an environmental management system.[9] These regressions offer control for the possible confounding effect of influence from actors and groups discussed above: It is conceivable that the outside influence of certain actors or groups has a direct effect on propensities for introducing different elements of an EMS (i.e. independently of formal organizational choices). To simplify the analysis, it includes controls for the influence from "political and administrative authorities", "societal actors" and "internal actors" respectively.[10]

As can be seen both in tables 1a and 1b, as compared to the reference case (no-one in charge of environmental issues) the presence of a person in charge of environmental issues who is *also* part of the management is mostly associated with a higher probability of implementing an individual EMS-element. On the other hand, simply having a person in charge *outside* management is seldom associated with a higher implementation propensity. Nevertheless, patterns on this point are broadly consistent with the assertion (Hypotheses 2) that designated responsibilities for environmental issues *coupled with* clear commitment on the part of the top management, is associated with higher propensities for EMS implementation.

Table 1a. Logistic (logit) regressions of implementation of EMS elements (*EMS1-EMS8*). [TABLE 1a HERE]

Table 1b. Logistic (logit) regressions of implementation of EMS elements (*EMS1-EMS8*). [TABLE 1b HERE]

The same broad pattern applies to the impact of budgetary allocations for environmental activities: In the analyses of implementation of "measureable environmental goals", a "continuous process of evaluation", "environmental reporting to management" and an "accounts system… for environmental activities" estimated impacts are all positive and significant (*b*s in the third row). Thus, budgetary allocations for environmental activities seem by and large to be associated with higher propensities for EMS implementation.

Our results confirm that EMS adoption in nursing and education is mainly driven by their resources and capabilities rather than institutional pressure and congruent with findings to those of Darnall *et al*., (2008). Political and administrative authorities may be an important driver in the start-up stage, but later on the EMS adoption is driven by the organizations` complementary resources and capabilities. Organizations which have a management person in charge of environmental issues, is mostly associated with a higher probability of implementing EMS- elements. The same broad pattern applies to the impact of budgetary allocations for elements in an EMS adoption.

4.2 Perceived effects from implementing environmental management systems and standards.

We will now look into the third proposed hypothesis and explore perceived cost/benefit effects of introducing an EMS, and specifically the perceived effects of an Eco-Lighthouse certification.

To this end a compound index measuring the comprehensiveness of the EMS is constructed. Specifically, an additive index, *EMS*, is constructed, comprised of the sum of individual elements analyzed in table 1a and 1b. In addition, anlyses include indicators for *Eco-Lighthouse* (*ELH*) and *Green Flag* (*GF*) certifications.[11] As noted earlier, we also construct an index, *EA*, measuring "environmental awareness" to control for possible rationalization/social desirability bias in effect reporting. Specifically, the *EA variable* is an additive index of scores from five questions gauging the value each respondent attaches to environmental issues. The dependent variables in these analyses are responses to questions on perceived cost reductions in five different areas and benefits "from implementation of EMSs and standards".[12] Tables 2 and 3 show results from the logistic regression analysis.

Table 2. Logistic (logit) regressions of cost reductions of *EMS*s and standards implementation (*A1-A5*).
[TABLE 2 HERE]

As seen in table 2, a more comprehensive EMS (i.e. an increasing number of *EMS* elements) is associated with higher propensities for reporting (EMS specific) cost reductions in the "goods consumption", "refuse management" and "sick leaves" areas (*b*s>0) and significant. Our results on reduced costs for "sick leaves" is congruent with findings to those of NTNU (2009) referred to in section 2.3.

The *value added* of an Eco-Lighthouse certificate is ambiguous, with a negative coefficient on cost reductions for "energy and goods consumption" and "refuse management, and positive coefficient for "travel/transport" and "sick leaves". None of these coefficients were significant. The value added of an Eco-Lighthouse certificate is negative and almost significantly so for "refuse management". The last result is presumably due to stricter and more costly standards (in infrastructure, supervision etc.) accompanying an Eco-Lighthouse waste management standard.

The value added of a Green Flag certification is positive and significant for cost reductions in "sick leaves", which may not be surprising since it puts more emphasis on involvement and environmental awareness at the workplace (see note 11).

Table 3. Logistic (logit) regressions of benefits of *EMS*s and standards implementation (*B1-B7*).
[TABLE 2 HERE]

Analogously to Table 2, the benefit effects of a more comprehensive EMS displayed in Table 3 are also always positive, and are significantly positive in terms of a "better reputation", "better working conditions", "better management systems" and "increased environmental awareness among employees" and among "users/relatives" . Results from Table 3, and the patterns found in Table 2, is broadly consistent with the proposition of our third hypothesis: Comprehensive EMSs among organizations in education and nursing leads to improved performance both in terms of cost7benefit effects in the institution at hand in some of the institutions' surroundings.

Regarding the effect of *rationalization* or *social desirability bias* , i.e. if there is a tendency to exaggerate the impact of organizational choices, analyses control for the value each individual respondent attaches to environmental issues (via the "environmental awareness", variable *EA*). One may note from table 2 and 3 that the coefficient for the *EA*- index measuring "environmental awareness" among the respondents is positive in all analyses (save for the "sick leaves" item) and significant in some cases. The implication is that especially "environmentally aware" respondents view effects as greater for given levels of certifications and EMS comprehensiveness.

Our results show that the effect of rationalization/social desirability in reporting on perceived benefits on EMS adoption are positive and significant for some benefit effects , such as

"better reputation", "increased awareness among employees and clients" etc.),and positive but not significant on the cost reduction effects(save for "refuse management").

5. Discussion, limitations and recommendations

Our study confirms that EMS adoptions are driven foremost by signals from top-level political and administrative authorities. However, schools and nursing homes also look to clients (students, patients and their relatives) and societal actors (the media, NGOs, unions) when contemplating EMS adoptions. These results are broadly consistent with proposition of our first hypothesis and with findings in previous studies (GRIP, 2002).

Next, our study confirms that EMS adoption in nursing and education is driven much by resources and capabilities, and not simply by institutional pressure. EMS adoptions are clearly associated with the organizations' complementary resources and capabilities like top management commitment and environmental budgetary allocations. Organizations with a management person in charge of environmental issues are more likely to implement EMS elements than are organizations without such a setup. The same broad pattern applies to the impact of budgetary allocations for environmental management activities. These results are consistence with the proposition of our second hypothesis and congruent with findings to those of Darnall *et al*., (2008).

In the multivariate controlled analyses we find that managers in nursing and education perceive cost reduction effects from EMSs adoptions. A more comprehensive EMS (i.e. an increasing number of EMS elements) is associated with higher propensities for reporting cost reductions in the "goods consumption", "refuse management" and "sick leaves" areas. Further, a more comprehensive *EMS* have also significantly benefits in terms of a "better reputation", "better working conditions", "better management systems" and "increased environmental awareness among employees" and among "users/relatives".

The patterns found in our multivariate analyses, are broadly consistent the findings in Zobel (2009) and with the proposition of our third hypothesis: Comprehensive environmental management systems among organizations , leads to improved performance both in terms of cost/benefit effects in the institution at hand, and some effects in the institutions' surroundings.

The *value added* of an *Eco-Lighthouse* certificate is ambiguous .The coefficients on cost reductions for "energy and goods consumption" and "refuse management were negative, and with positive coefficients for "travel/transport" and "sick leaves". But none of these coefficients were significant. Our result is in general not congruent with findings to those of NTNU (2009). Further, the coefficients for benefits were negative in the "reputation" and "user awareness" areas and positive for the "better management systems" and "increased cooperation with NGOs and the business sector". However, none of these estimates were significant.

To assess the effect of *rationalization* and/or *social desirability bias* , i.e. the tendency to exaggerate the impact of organizational choices (Fischer, 1993) , the analyses control for the value each individual respondent attaches to environmental issues via the "environmental awareness" indicator(EA-index). The coefficients for the *EA*- index were positive in all analyses (save for the "sick leaves" item). The implication is that especially "environmentally aware" respondents view effects as greater for given levels of certifications and EMS comprehensiveness. Specifically, results show that the impact of rationalization and/or social desirability bias is positive and significant in analyses of benefit effects ("better reputation", "increased awareness among employees and clients") but not significant in analyses of cost reduction effects (save for the "refuse management" item). Therefore, one may have more confidence in the cost reduction effects than the benefit effects.

Three limitations of our study should be noted. First, self-reported data may be biased in that respect the respondents may have a tendency to exaggerate the perceived impacts of EMS adoption. Even though the analysis seeks to control for such tendencies by way of including an indicator for "environmental awareness", a follow up with case studies and/or interviews with key persons could reduce such worries from using survey data. On another note self–reported data also means that respondents may self-select to the sample. There is of course always the danger that the sample is not representative, but we have no indication that this is so in the present case: Sampled institutions are not dissimilar to un-sampled institutions with respect to relevant characteristics.

This brings us to the second limitation of the study. The present survey data does not allow for exploring the question of whether Eco-Lighthouse certification has any real impact on the environment or not. For this purpose one would have needed figures on energy usage and other environmental indicators. Such information was asked for in the questionnaire, but just a few respondents were able to supply these quantitative numbers (see note 8). A standardized reporting system for schools and nursing homes on energy usage, goods purchasing and waste management, would have been preferable. With such data, our results could have been compared more directly with those of the NTNU (2009) study.

Lastly, since the present survey data was collected for a panel of organizations at a single point of time, it does not allow for analysis of the dynamics in implementing EMSs standards. Previous studies have shown significant relationships between implemented environmental actions in one period and cost/benefit effects some time later on (Hart and Ahuja, 1996). We recommend surveys like ours to be repeated in the near future to get time series data and possibilities to test lagged relationships.

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Appendix

Table A1. Number of survey responses [n], number of institutions [N], response rate [%] and number of *Eco-Lighthouse* certified institutions [*ELH* (=1)] . By sector and municipality.
[TABLE A1 HERE]

Table A2. Descriptive statistics for analysis variables.
[TABLE A2 HERE]

Notes

[1] Our results are based on findings in a project financed by the *Norwegian Association of Local and Regional Authorities* (*KS*) which has a specific program supporting research in large cities (*KS Program for Storbyrettet Forskning*). The authors would like to thank the *KS* for funding our project, "Miljøledelse i bykommuner", under the auspices of this program.

[2] See www.miljofyrtarn.no.

[3] *ELH* certification numbers (in brackets) for the five cities in our project are: Oslo (675), Trondheim (206), Bergen (177), Kristiansand (142) and Stavanger (101).

[4] The surveyed municipalities were Kristiansand, Stavanger, Trondheim, Bergen and Oslo, with populations ranging from around 80,000 inhabitants in Kristiansand to almost 600,000 in Oslo. The survey was financed by the *Norwegian Association of Local and Regional Authorities* (KS), under the *Program for storbyrettet forskning*, and is documented in KS (2010). Survey questionnaires were returned by directors or executives in charge of environmental issues in nursing homes and principals/assistant principles or executives for environmental issues in schools. Oslo – which is both a municipality and a county – is responsible also for county-tier secondary education (high schools).

[5] Comparable surveys conducted by the Norwegian Business School (BI) have achieved response rates of around 30 per cent, see for instance GRIP (2002).

[6] Respondents were asked whether "their institution has a environmental management system in place", were a response of "yes" or "in the process of establishment" would lead to follow up question on whether the said system is certified and whether it is certified in a certain manner (*Eco-Lighthouse* being one of the alternatives). See KS (2010:64, Question 6). Hence the variable *ELH*=1 if the response to the last question is "*Eco-Lighthouse*" and 0 otherwise.

[7] Moreover, response patterns over time are quite similar for ELH institutions and non-ELH institutions (KS: 23-24).

[8] Ideally, one would like more objective measures of effects (changes in energy consumption in *kWh*, say) and relate these to exogenous variations in organizational choices (making use of a natural experiment or a plausible instrument variable for organizational choices). In practice, and at any rate for a survey like the present one, such figures are largely inaccessible. In fact, in the present study only 25 out the total of 186 responding institutions (13 per cent) reported figures for energy consumption.

[9] Respondents simply asked whether they have implemented the said elements (*EMS1-EMS8*). See Table A2 in the Appendix..

[10] This seems reasonable since a factor analysis reveals that influences (as measured in Figure 1) can be grouped into these three dimensions or factors. The cited individual indicators are the variables that have the highest loadings on the respective factors. .

[11] *Green flag* is not a program for environmental management and certification .The program is implemented in 36 schools in our sample and linked to the curriculum and community. Further it encourages children and youth to take an active role in how their school can be run for the benefit of the environment. Compared to the *Eco-Lighthouse* program, *Green flag* puts more emphasis on pedagogical aspects and involvement than implementing actions than to reduce the environmental impact from energy usage, goods consumption, transport and waste management.

[12] Details for analysis variables are given in Table A2 in the Appendix.

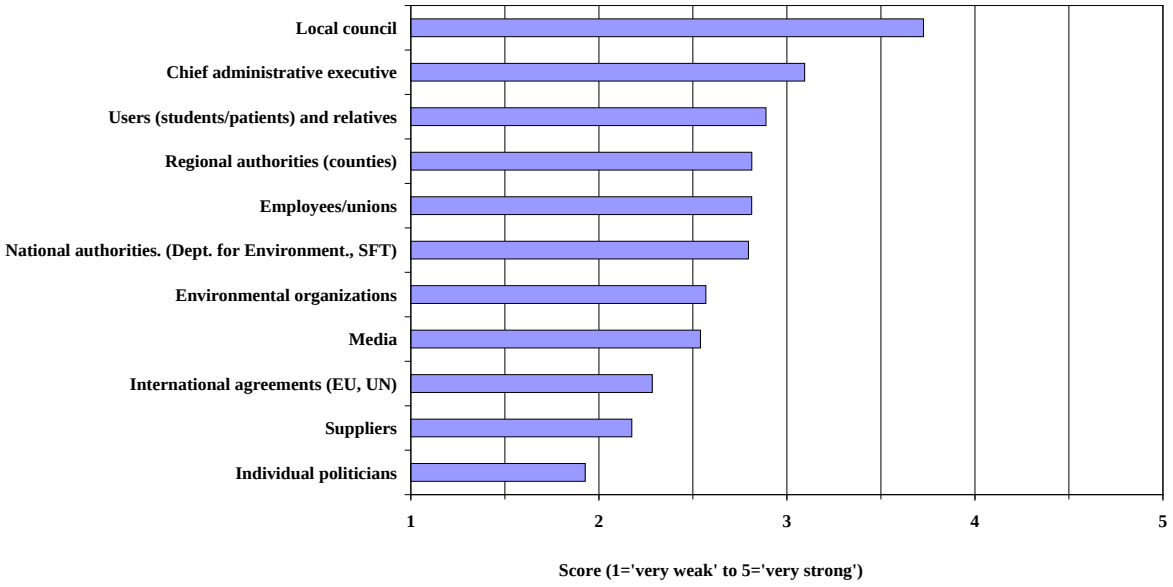

Figure 1. The influence of different actors in implementing environmental activities.

Table 1a. Logistic (logit) regressions of implementation of EMS elements (*EMS1-EMS8*).

	"Routines for assessing legal requirements" (=1)	"General assessment of environmental issues" (=1)	"Codified environemntal policy" (=1)	"Measurable environmental goals" (=1)
Employee *outside* management w/ specific environm. responsibilities (=1)	0.58 (0.42)	**2.83** **(0.01)**	0.73 (0.35)	**1.49** **(0.06)**
Employee *in* management w/ specific environm. responsibilities (=1)	**1.09** **(0.08)**	**1.94** **(0.00)**	**1.77** **(0.01)**	**1.63** **(0.01)**
Budget for environmantal activities (=1)	0.71 (0.31)	-0.58 (0.46)	0.53 (0.40)	**1.01** **(0.14)**
Indicator for influence from "political and adminstrative authorities (=1) (a)	**0.47** **(0.08)**	0.23 (0.45)	0.13 (0.64)	-0.16 (0.58)
Indicator for influence from "societal actors" (=1) (b)	-0.33 (0.32)	-0.42 (0.27)	-0.19 (0.57)	0.37 (0.26)
Indicator for influence from "internal actors" (=1) (c)	0.12 (0.65)	0.27 (0.37)	0.37 (0.17)	0.23 (0.41)
N	115	118	115	118
p(Likelihood Ratio)	0.00	0.00	0.00	0.00
Fixed effects for municipality and sector	yes	yes	yes	yes

Coefficients with p<0,15 in *t*-tests in bold. (a) indicated by a positive response to the question on influence from "National authorities" (*A6*); (b) indicated by a positive response to the question on influence from "Media" (*A8*); (c) indicated by a positive response to the question on influence from "Employees/unions" (*A5*)

Table 1b. Logistic (logit) regressions of implementation of EMS elements (*EMS1-EMS8*).

	"Environmental training programs" (=1)	"Continuous process of improvement" (=1)	"Environemntal reporting to management" (=1)	"Accounts system for asessing environemntal activities" (=1)
Employee *outside* management w/ specific environm. responsibilities (=1)	0.66 (0.39)	**1.44** **(0.05)**	0.75 (0.30)	0.34 (0.76)
Employee *in* management w/ specific environm. responsibilities (=1)	0.69 (0.28)	**1.32** **(0.03)**	**0.94** **(0.12)**	**1.94** **(0.03)**
Budget for environmantal activities (=1)	0.44 (0.43)	**1.52** **(0.04)**	**1.05** **(0.08)**	**1.79** **(0.01)**
Indicator for influence from "political and adminstrative authorities (=1) (a)	0.25 (0.34)	0.13 (0.63)	0.00 (0.99)	0.00 (0.99)
Indicator for influence from "societal actors" (=1) (b)	0.22 (0.48)	-0.08 (0.81)	0.10 (0.73)	-0.16 (0.64)
Indicator for influence from "internal actors" (=1) (c)	-0.18 (0.49)	0.08 (0.76)	0.18 (0.46)	0.26 (0.39)
N	115	117	117	113
p(Likelihood Ratio)	0.04	0.00	0.01	0.00
Fixed effects for municipality and sector	yes	yes	yes	yes

Coefficients with p<0,15 in *t*-tests in bold. (a) indicated by a positive response to the question on influence from "National authorities" (*A6*); (b) indicated by a positive response to the question on influence from "Media" (*A8*); (c) indicated by a positive response to the question on influence from "Employees/unions" (*A5*)

Table 2. Logistic (logit) regressions of effects of *EMS*s and standards implementation (*A1-A5*).

Cost reductions (=1) in:	Energy con-sumption	Goods con-sumption	Travel/ transport	Refuse management	Sick leaves
No. of EMS elements, *EMS* (a)	0.29 (0.20)	**0.54** **(0.04)**	0.21 (0.23)	**0.50** **(0.03)**	**0.89** **(0.01)**
ELH certification, *ELH* (=1)	-0.22 (0.84)	-1.21 (0.35)	2.11 (0.42)	-1.56 (0.15)	0.48 (0.71)
Grønt Flagg certification, *GF* (=1)	1.69 (0.31)	0.19 (0.90)	1.08 (0.60)	0.78 (0.59)	**6.99** **(0.03)**
"Environemntal awareness" index, *EA* (b)	0.07 (0.63)	0.15 (0.29)	0.21 (0.23)	**0.24** **(0.09)**	-0.08 (0.66)
N	61	60	53	60	55
p(Likelihood Ratio)	0.08	0.17	0.00	0.09	0.02
Fixed effects for municipality and sector	yes	yes	yes	yes	yes

Coefficients with p<0,15 i Wald Chi Square tests in bold. (a) indicated by the sum of positive responses in the questions on implemented *EMS* elements (*EMS1 -EMS8*). (b) Indicated by the sum of scores in the questions on personal opinions on environemntal issues (*PO1 -PO5*). All regression include indicators for municipality and sector (schools and nursing homes).

Table 3. Logistic (logit) regressions of effects of *EMSs* and standards implementation (*B1-B7*).

	"Better reputation" (=1)	"Better working conditions" (=1)	"Better mangement systems" (=1)	"Increased environm. awareness among employees" (=1)	"Increased environm. awareness among users/ relatives" (=1)	"Increased cooper-ataion with local environm. organi-zations" (=1)	"Increased cooper-ation with business sector" (=1)
No. of EMS elements, *EMS* (a)	**1.92 (0.02)**	**0.45 (0.02)**	**0.48 (0.03)**	**0.50 (0.03)**	**0.32 (0.13)**	0.23 (0.18)	0.54 (0.28)
ELH certification, *ELH* (=1)	-3.85 (0.50)		0.64 (0.60)		-0.53 (0.70)	12.25 (0.97)	9.65 (0.98)
Grønt Flagg certification, *GF* (=1)	-0.70 (0.90)		-1.22 (0.31)		1.41 (0.35)	12.99 (0.97)	10.55 (0.97)
"Environemntal awareness" index, *EA* (b)	**1.22 (0.01)**	**0.28 (0.04)**	**0.57 (0.00)**	**0.45 (0.00)**	**0.26 (0.06)**	0.09 (0.45)	0.26 (0.45)
N	42	52	52	59	58	61	61
p(Likelihood Ratio)	0.00	0.00	0.00	0.00	0.07	0.23	0.62
Fixed effects for municipality and sector	no	no	no	no	no	no	no

Coefficients with p<0,15 i Wald Chi Square tests in bold. (a) indicated by the sum of positive responses in the questions on implemented *EMS* elements (*EMS1 -EMS8).* (b) Indicated by the sum of scores in the questions on personal opinions on environemntal issues *(PO1 -PO5*).

Table A1. Number of survey responses [n], number of institutions [N], response rate [%] and number of *Eco-Lighthouse* certified institutions [*ELH* (=1)] . By sector and municipality.

	Nursing homes				Schools				Total			
Municipality	n	N	%	*ELH* (=1)	n	N	%	*ELH* (=1)	n	N	%	*ELH* (=1)
Trondheim	6	16	(38)	0	31	54	(57)	0	37	70	(53)	0
Oslo	13	27	(48)	4	61	164	(37)	23	74	191	(39)	27
Bergen	15	21	(71)	1	25	93	(27)	2	40	114	(35)	3
Stavanger	3	11	(27)	2	11	44	(25)	1	14	55	(25)	3
Kristiansand	5	12	(42)	5	16	36	(44)	0	21	48	(44)	5
Total	42	87	(48)	12	144	391	(37)	26	186	478	(39)	38

Table A2. Descriptive statistics for analysis variables.

Question/variable:	min.	mean	max.	std.dev.	n
Influential actors (Q4): (a)					
International agreements (EU, UN)	1.00	2.28	5.00	0.96	134
National authorities. (Dept. for Environment., SFT)	1.00	2.80	5.00	1.00	137
Regional authorities (counties)	1.00	2.81	5.00	1.08	134
Local council	1.00	3.73	5.00	0.92	139
Individual politicians	1.00	1.93	5.00	0.95	137
Chief administrative executive	1.00	3.09	5.00	1.30	138
Environmental organizations	1.00	2.57	5.00	1.00	137
Employees/unions	1.00	2.81	5.00	1.07	139
Users (students/patients) and relatives	1.00	2.89	5.00	1.08	135
Suppliers	1.00	2.18	5.00	0.95	137
Media	1.00	2.54	4.00	0.86	137
Internal resources (Q2, Q3):					
Employee *outside* management w/specific environm. responsibilities (=1)	0.00	0.23	1.00	-	152
Employee *in* management w/specific environm. responsibilities (=1)	0.00	0.49	1.00	-	152
Budget for environmantal activities (=1)	0.00	0.24	1.00	-	154
Reported EMS elements and EMS index (Q8):					
EMS1: "Routines for aseesing legal requirements" (=1)	0.00	0.65	1.00	-	125
EMS2: "General assessment of environmental issues" (=1)	0.00	0.72	1.00	-	129
EMS3: "Codified environemntal policy" (=1)	0.00	0.48	1.00	-	122
EMS4: "Measurable environmental goals" (=1)	0.00	0.59	1.00	-	128
EMS5: "Environmental training programs" (=1)	0.00	0.38	1.00	-	124
EMS6: "Contious process of improvement" (=1)	0.00	0.57	1.00	-	127
EMS7: "Environemntal reporting to management" (=1)	0.00	0.46	1.00	-	127
EMS8: "Accounts system for asessing environ. activities" (=1)	0.00	0.28	1.00	-	122
EMS: Index for Environemntal management system comrehensiveness	0.00	3.95	8.00	-	132

(a) Responses on a five point "very weak" to "very strong" scale were recoded into scores on a 1 (="very weak") to 5 (="very strong") scale.

Table A2, continued. Descriptive statistics for analysis variables.

Question/variable:	min.	mean	max.	std.dev.	n
Certification (Q6):					
ELH: Eco-Lighthouse certification (=1)	0.00	0.20	1.00	-	186
GF: Grønt Flagg (=1)	0.00	0.19	1.00	-	186
Index for "environmmental awareness" (Q13):					
EA: index for "environmental awareness" (a)	-2.00	6.71	10.00	2.64	129
Area cost reductions from EMS indicators (Q11): (b)					
A1: in energy consumption (=1)	0.00	0.63	1.00	-	64
A2: in goods consumption (=1)	0.00	0.33	1.00	-	63
A3: in travel/transport (=1)	0.00	0.22	1.00	-	55
A4: in refuse management (=1)	0.00	0.44	1.00	-	63
A5: in sick leave rates (=1)	0.00	0.19	1.00	-	58
Benefits from EMS indicators (Q12):					
B1: "Better reputation" (=1)	0.00	0.68	1.00	-	44
B2: Better working conditions (=1)	0.00	0.69	1.00	-	54
B3: "Better mangement systems" (=1)	0.00	0.66	1.00	-	53
B4: "Increased environm. awareness among employees" (=1)	0.00	0.92	1.00	-	61
B5: "Increased environm. awareness among useres/ relatives" (=1)	0.00	0.85	1.00	-	60
B6: "Increased cooperataion with local environm. organi-zations" (=1)	0.00	0.25	1.00	-	63
B7: "Increased cooperation with business sector" (=1)	0.00	0.03	1.00	-	63

(a) Based on the followig five assertions (*EA1 -EA5*): "Environmental and climate problems are quite serious and they are some of the greatest problems society is faced with", "Stricter regulation is required in order to solve environemnetal and climate problems", "Technological development is required in order to solve environemnetal and climate problems", "Voluntary measures, such as EMS, are required in order to solve environemnetal and climate problems" and "I think of environemnetal and climate problems as more important after we have started working with EMS". Responses were given on a four point "disagree" to "agree" scale, recoded to a numerical -2 (="disagree") to 2 (="agree") scale. The resulting *EA* score is the sum of scores for responses given to the individual assertions. (b) Questions (*A1 -A5*) on perceived cost reductions is recoded form an original "cost reductions"- "no change"-"cost increases" scale, since less than nine per cent reprorted "cost increases" for any one item.