



ENVIRONMENTAL MANAGEMENT SYSTEMS EXPERIENCE AMONG LATVIAN CONSTRUCTION COMPANIES

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Abstract. At the present stage of development in Latvia, as well as around the world, essential influence on the enterprise work has the idea of sustainable development. The concept of sustainable development has become widespread amongst government agencies, politicians, corporations and other organizations throughout the world. By the end of 2007, around 129,031 organizations worldwide have implemented environmental management systems (EMS) and certified it according to ISO 14001. About 100 of them are located in Latvia and 40 of them are construction companies. There is a lack of national evaluations of ISO 14001 in many countries, but in many countries no complete lists of the national certified / registered sites exist at all. In Latvia a list of ISO 14001 sites has been compiled and regularly updated by the Latvian association for Quality. In spite of the fact that in Latvia increase using of ideas of ecological manufacture and environmental management, nevertheless there has been no any serious scientific study of Latvian experience of ISO 14001. The purpose of this study is to describe experiences and effects of EMS in construction companies, based on study conducted for the construction industry in Latvia. The results show that ISO 14001 often leads to reduced environmental impact, especially in the area of waste. A strong driving force behind implementation is the expected improvement of the organizations' images. Legal compliance tends to be difficult to implement, but on the other hand, it works well in daily practice. To develop EMS into Sustainability Management Systems, the two most important challenges are to improve the coordination between the EMS and the organizations' strategies and to improve learning process and direct participation of all employees.

Keywords: environmental management system, ISO 14001, construction industry, sustainable development, survey.

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1. Introduction

The experience of the 20th century has visibly demonstrated that solving of ecological problems, which are caused by separate subjects of economy – economic development of companies, is possible only by applying systematic approach. It is necessary to search new ways of more effective ecological problem solving on company and state level. At the present stage of development, as well as around the world, essential influence on the enterprise work has the idea of sustainability development. The concept of sustainable development has become widespread amongst government agencies, politicians, corporations and other organizations throughout the world.

The attempts to solve the existing ecological problems by applying administrative and state regulatory methods have not lead to the anticipated results. Obvious is the need to find fundamental, new approaches for ecological problem solving that would allow merge economic and ecological stability of companies. The experience of foreign and local companies indicates that such a combination can be ensured by environmental management. The priorities of the 21st century were outlined in 1992 in Rio de Janeiro (Brazil), by declaring that “environmental management is to be considered the dominant of sustainable development and at the same time the highest priority of production process and entrepreneurship” (Agenda 21 ... 1992). Environmental management is part of the concept of strategic management and involves safe management of economic activities that helps attain optimal correlation with efficient environmental protection.

An EMS consists of a collection of internal policies, assessments, plans and implementation actions. Once an organization implements an EMS, it can be certified to the ISO 14001 standard. Developed by the International Organization for Standardization (ISO) in 1996, ISO 14001 adoptions require certification by an independent third party auditor, who helps to ensure that the EMS conforms to the ISO 14001 standard. In preparation for certification, an organization must characterize the procedures and plans that form its EMS.

Tambovceva (2008) offers their own definition of the term: “Environmental management is the planning, implementation and control of strategic, tactical and operational measures for prevention, reduction and elimination of damage caused to the environment as well as purposeful usage of market advantages gained thereof”.

The goal of environmental management is to lessen the negative impact of economic activity on environment and to ensure ecological safety of production processes, as well as production of environmentally and to human health friendly production. Implementation of the given tasks has to go hand in hand with attainment of other priority goals of the company, including preservation of its current and long-term competitiveness. Environmental management increases the liability of the company not only through production of safe and harmless products, but also using reasonable use of natural resources and selection of environmentally friendly technologies.

In recent years, an increasing number of private and public-sector organizations have been engaged in the implementation and use of environmental management systems (EMSs). By the end of 2007, around 129,031 organizations worldwide had an EMS certified according to ISO 14001, the global EMS standard, and thousands more had adopted uncertified EMSs

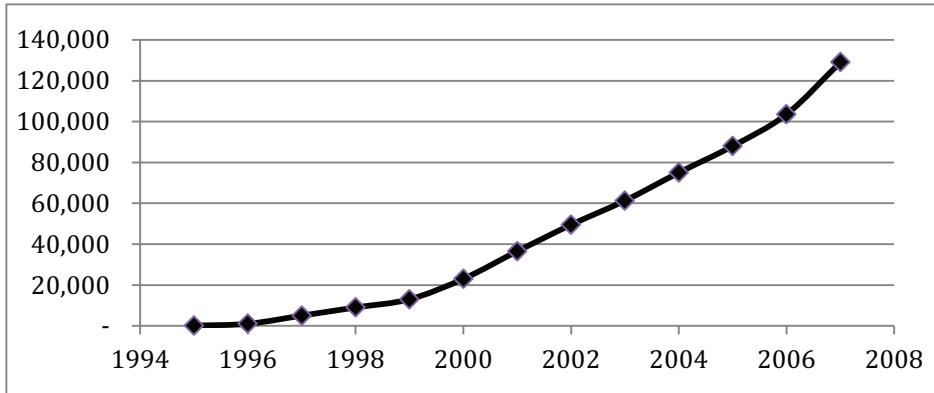


Fig. 1. Worldwide number of ISO 14001 certifications 1995–2007

(ISO World 2007). Moreover about 5,389 organizations in Europe had registered an EMS according to Eco-Management and Audit Scheme (EMAS) (EMAS 2007). Within the last five years, the number of organizations certified according to ISO 14001 in Latvia has doubled. The first organizations have received the certificate in 1997. In the first 3 years their quantity has reached 20. Strong growth of quantity of the certificated organizations was observed till 2005. To date about 100 of certified according to ISO 14001 companies are located in Latvia. Since 2005 in Latvia also there is a possibility to register an EMS according to EMAS. Worldwide number of ISO 14001 certifications are shown in Fig. 1.

There is a lack of national evaluations of ISO 14001 in many countries. But in many countries no complete lists of the national certified / registered sites exist at all. In Latvia, since April 2003, a list of ISO 14001 sites has been compiled and regularly updated by the Latvian Quality Association. This presented the opportunity to conduct a national study, which would also be of interest for communicating experiences and effects from organizations working with ISO 14001 to other organizations. Additionally, the ISO 14001 standard is currently being reviewed. An investigation of the interpretation and translation of the different elements in the standard ISO 14001 is therefore of interest.

Construction is not an environmentally friendly process by nature and has large environmental impact. It is estimated that buildings account for about 40% of the materials entering the world's economy each year and for 25% of the world's usage of wood (Kein *et al.* 1999). Large volumes of waste result from the production, transport, use of construction materials and products. It is clear that construction companies need to use systematic approach to environmental management. As well as in other branches it is better to use worldwide popular standard in construction too. ISO 14001 standard today is well established throughout the world. In Latvia, the ISO 14001 standard was adopted as a national voluntary standard in 1996, but now ISO 14001: 2004 version is used.

The purpose of this study is to explore and describe experiences and effects of EMS in construction companies, based on study conducted for the construction industry in Latvia. The paper describes a study of all certified according to ISO 14001 companies in Latvia referable to construction industry only.

2. Methodology

There has been no any serious scientific study of Latvia's experience with EMS. The aim of the all certified with ISO 14001 companies research was to explore and describe experiences and effects obtained by Latvian organizations working with ISO 14001 in order to generate knowledge about the contributions of EMS implementations. Different sources of data collection methodologies have been used: 1) literature review– study and evaluation of the normative documents and published scientific papers connected with EMS, ISO 14001, existing evaluations of EMS etc. in the context of sustainable development; 2) national questionnaire survey of construction companies.

The informative materials comprise reference scientific studies from the international specialty literature, documents and reports of different research projects, own research works inclusively, statistical data and information. It is commonly assumed, that implementation of ISO 14001 or EMAS leads to both improved environmental management and economic competitiveness of the organization. However, the relationship between environmental management and economic and environmental performance is complex (Schaltegger, Synnestvedt 2002).

Literature review was carried out in order to establish the theoretical background and practical examples of the general drivers and barriers encountered when implementing the environmental management systems. Many researchers evaluate how the implementation of EMS influences the environmental performance, and costs of companies, as well as barriers of implementation. Grybaitė and Tvaronavičienė (2008) investigated approaches to measurement of sustainable development adopted by international organizations, or institutions. Besides many in-depth case-studies, there are evaluation studies with empirical data of a qualitative and / or quantitative nature from numerous registered or certified organizations; see, for example, Zackrisson *et al.* (2000); Welch *et al.* (2002); Ammenberg and Hjelm (2003); Andrews *et al.* (2003), Schylander and Martinuzzi (2007), Šelih (2007) etc. Schylander and Zobel (2003) examined methods used to investigate EMS effects. Bansal and Hunter (2003), as well as Darnall (2006) have evaluated the reasons why organizations adapt the EMS. Strachan *et al.* (2003) reviewed the environmental management system motivation literature and found that an EMS can bring benefits to organizations. Birke (2003) and Freimann & Walther (2001) wrote critical summaries about EMSs in Germany. Freimann and Schwedes (2000) summarized experiences of German EMAS companies through a presentation of the empirical results of different German questionnaires and case studies. In addition to that Steger (2000) took a review of smaller, mostly German, but also other European, empirical investigations of EMS in order to assess the impact that the EMSs have had on organizations. He could see no differences in environmental performance between EMAS, ISO 14001 or organizational specific systems. Pecher *et al.* (2002) performed 13 evaluation studies meta-analysis concerning EMAS, Cleaner Production, EcoProfit and environmental state subsidies. The environmental performance of the organizations explored Rondinelli and Vastag (2000) and Steger (2000). Kirkland and Thompson (1999), Hillary (2000), Berthelot *et al.* (2003) and Strachan *et al.* (2003) investigated also barriers for implementing an EMS. Šelih (2007) investigated current environmental management trends based on study of construction companies in Slovenia and reported how the construction SMEs perceived obstacles to the

EMS implementation. Many of the examined evaluations showed that there is a positive effect on environmental performance, although the effect is hard to quantify.

For the purpose of studying the experience of Latvian companies when identifying the importance and the potential of ISO 14001 the authors used survey. The design of the questionnaire has been inspired by Schylander and Martinuzzi (2007). Some questions, descriptions and justifications were formulated in exactly the same way. The questionnaire consisted of 26 questions concerning company's basic information, general questions on ISO 14001, and integrated management systems, environmental and economic effects etc. Basic data about certified organization count were taken from the Latvian Quality Association web-site. The questionnaire period was from 2007 November to 2008 May. The questionnaire was sent by e-mail or by post to the environmental manager or person responsible for environment issues. Total count of contacted respondents was 40 and authors received 25 answers, consequently response rate is 63%.

Construction and real estate industry is very specific. Many smaller companies are sub-contractors of large companies, and they execute some parts of large enterprise's projects. Due to the fact they have fulfilled all requirements, including those relating to environmental protection. Even if such companies do not have ISO 14001 certification, however, working in projects with large companies are forced to comply with all relevant requirements. Therefore, it can be assumed that any response can be represented in all the realities of construction companies.

3. Research findings and discussion

In order to do comparative analyses, basic data on the respondents as well as on the certified organizations were collected (see Table 1).

Table 1. Basic data about the respondents and the certified organization

Feature	Data within this study
Title of respondent	20% – Environmental manager 36% – Quality manager 44% – Other (departmental manager, logistic manager, office manager etc)
Size of organizations	81% – Small and medium sized enterprises (less than 250 employees) 19% – Large enterprises (250 employees and more)
Year of ISO 14001 implementation	1997–2008

Below, some of the most important findings from the questionnaire are presented and related to existing research within the field.

3.1. Motives of an ISO 14001 implementation

We asked the organizations how important different stated driving forces were for decision to implement the ISO 14001 to illuminate whether the driving forces of implementation are similar to those in the motivation literature, but also to compare our result with similar

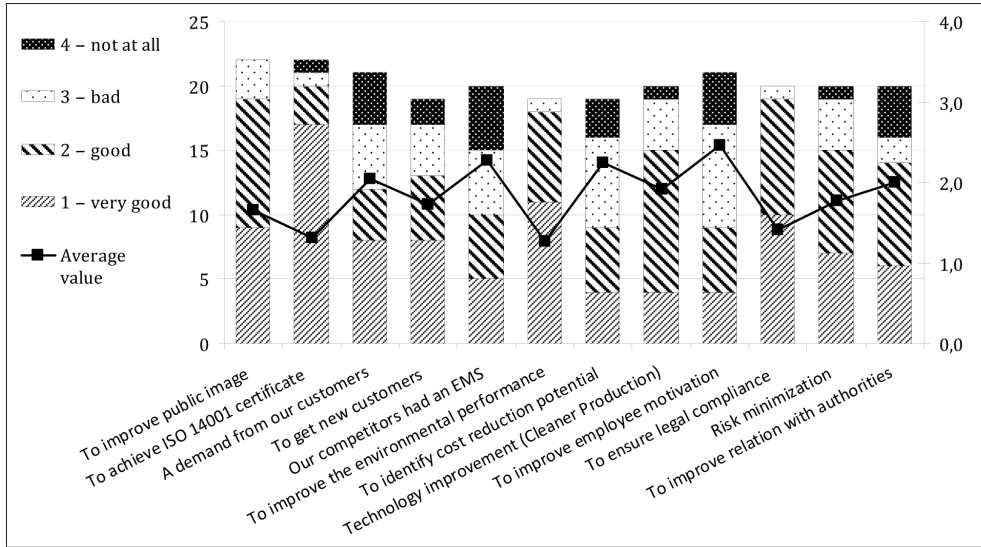


Fig. 2. Motives of ISO 14001 implementation

studies. Further, we asked the organizations how well these expectations were fulfilled (not at all, bad, good, good, very good). The results are shown in Fig. 2. The right y-axis shows the averages of how the respondents assessed their expectations. The left y-axis shows received benefits; the values are expressed in terms of number of organization.

The most important point in our study was to improve public image. But the high expectations are not always reached. It means that the organizations primarily expect external recognition of their ISO 14001 activities. Also, in identifying potentials for cost reductions, the high expectations have not been fulfilled for nearly half of the companies. This can be explained by the fact that either expectations were too high or there were some weak points in the implementation phase. Ensuring legal compliance is another strong driving force that seemed to be fulfilled by the implementation. Further, improvements in environmental performance, a systemization of environmental activities and risk minimization also seem to be achieved by the implementation.

A similar study, based on 93 certified Swedish organizations, concluded that the most significant motive for implementing ISO 14001 was “corporate image” and 89% of the respondents indicate it as important or very important. In the Swedish study the following four highest valued motives for an implementation were: marketing advance (84%), customer pressure (65%), relations with communities (63%) and relations with authorities (62%) (Poksinska *et al.* 2003). This indicates that Swedish organizations are primarily expecting external benefits from an ISO 14001 implementation, which coincide with our results from Latvia.

3.2. The standard ISO 14001

One aim of our study was to investigate how difficult the application and understanding of the different elements of the ISO 14000:2004 standard was during the implementation phase.

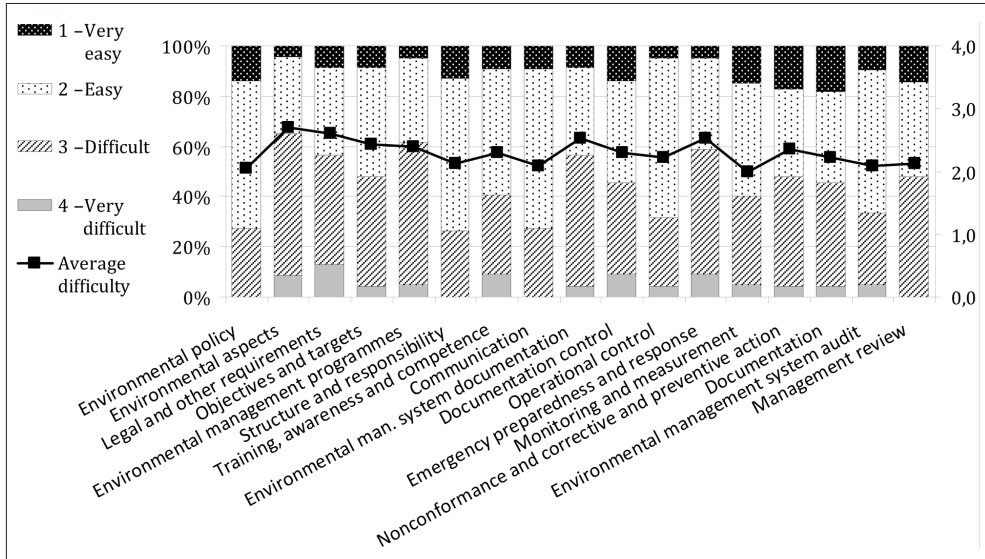


Fig. 3. Difficulties in the implementation of the elements of ISO 14001

International standards, especially ISO 9001 and ISO 14001, have received a lot of criticism for being bureaucratic and hard to translate into practical work. In the current review process of the ISO 14001 standard, one discussion is about improving the clarity of the ISO 14000:2004 texts. We asked respondents about each of ISO 14001 standard part implementation. The right y-axis shows the averages of how the respondents assessed difficulties in the implementation of the elements of ISO 14001. The left y-axis shows each of ISO 14001 standard part; the values are expressed in terms of percentage of respondents answering to concrete position. The results are shown in Fig. 3.

There are two main findings. Firstly, the environmental policy seems to be the easiest element in the standard to translate into practical work. Only 1% of the respondents consider it very difficult and 19% as a difficult. Secondly, the most difficult element in our study was Environmental management system documentation: 3.5% of the respondents marked this as very difficult and another 46% as difficult.

Legal and other requirements on the one hand seem to be a difficult element: 3% of the respondents marked this as very difficult and another 36% as difficult. On the other hand, the results of our study show that legal and other requirements are difficult to handle in the implementation phase, but the effort seems to pay back after the implementation. This coincides with our earlier results about perceived expectations from an ISO 14001 system, since the expectations in ensuring legal compliance are well fulfilled.

3.3. Economic effects

In this study, respondents were also asked about costs for building and running the ISO 14001 system, cost savings and direct incomes as an effect of the ISO 14001 implementation.

Table 2 shows the organizations' assessment of different costs related to ISO 14001 implementation and certification.

Table 2. The organizations' assessment of average costs for implementing ISO 14001

Costs	Average costs in Euro	% of costs
Building the ISO 14001 – internal costs	3765	31.5
Building the ISO 14001 – consultant costs	3608	30.2
Certification costs	4570	38.3
Sum of costs for building the system	11943	100

The average cost to build an ISO 14001 system is assessed by the organizations to be about €11,943 on average, where 31.5% is attributable to internal costs, 30.2% consultants' fees and 38.3% certification costs. The yearly cost for running the system is assessed by the organizations to be €3,650 on average. However, costs could be influenced by the size of the organization. In our study this value is very relative. The reason is that the most of organizations did not present real information or did not answer this question at all. Many respondents motivated the reason of non-answers on business secret.

What are then the economic benefits of implementing an ISO 14001? Only half of respondents gave answer on this question. 56% of the respondents did not assess cost savings. 12% of respondents saw cost savings till €1000, 4% saw cost savings of €1,000 to €2,000 etc. The most important contribution to these cost savings was lower costs for waste, since the organizations had started to fraction and sort their waste. Resource optimization was another cost saving, which is related to a more efficient use of packaging, raw materials and energy in the processes.

We also asked the respondents about direct income as a result of the implementation of ISO 14001. Again approximately only half of respondents gave answer on this question. 68% of the respondents could not see any direct income as a result of the implementation of ISO 14001. However, the assessed direct incomes are in average terms €3,000. These results indicate that the primary economic reason for working with an ISO 14001 is cost savings rather than direct incomes.

3.4. Environmental effects

Environmental effects of ISO 14001 can be divided into environmental awareness and direct environmental effects. It is confirmed by many other studies. A summary of all results according to environmental effects from our study is presented in Fig. 4.

Likewise, as in other national studies, our study shows that direct environmental effects, e.g., energy, waste, transports, consumption of raw material, etc., can be seen in improvements within waste and recycling. From these activities, the organizations have also realized considerable cost-savings by reducing and fractioning their waste (64% of respondents). Most of the respondents (60%) noticed improvement in energy consumption / CO₂ emission, and consuming of the raw material. On the other hand, an implementation of ISO 14001 does not seem to influence emissions to soil and transports to any larger extent. In-depth analyses

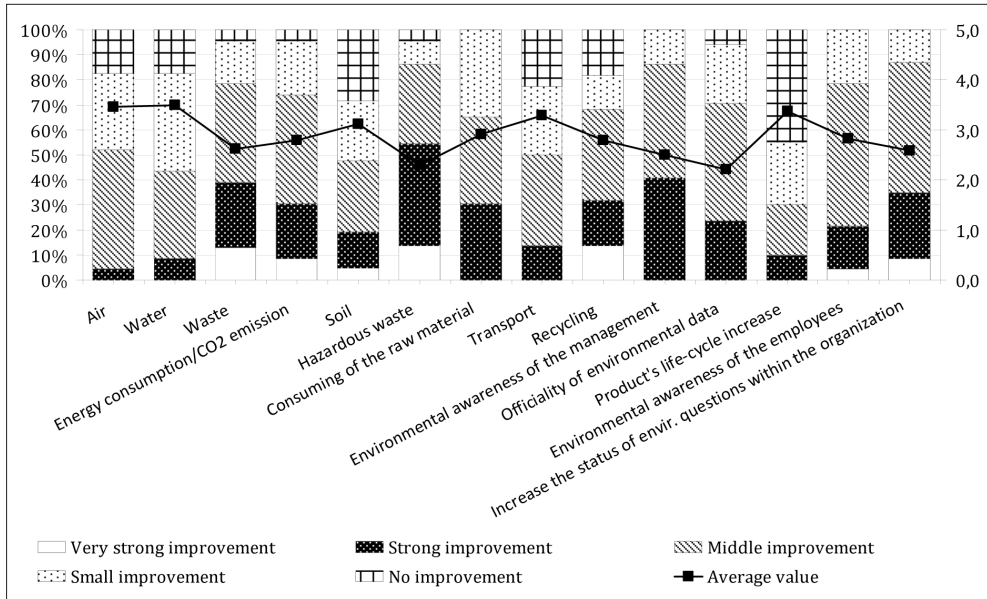


Fig. 4. Environmental effects of ISO 14001 in Latvia

show high correlations within the direct effects between the awareness of environmental issues and improvements in energy consumption and waste, but no correlations to the sizes of the company.

Our results also show that an ISO 14001 does not seem to influence product related activities. Only 8% of the respondents have recognized a very strong increase and 16% strong increase in involvement of life-cycle assessments of their products as an effect of the implementation of ISO 14001.

Fig. 4 also shows how the organizations assess environmental improvements as an effect of ISO 14001 implementation. We observed that one large contribution of ISO 14001 was awareness of environmental issues, i.e., 76 % of the respondents have observed middle, strong or very strong improvements of environmental issues within the organization recognized since the ISO 14001 implementation. Our results also show that an ISO 14001 does not seem to influence product related activities, only 8% of the respondents have recognized a strong increase in involvement of life-cycle assessments of their products.

3.5. The standard ISO 14031

In the environmental management literature, there is a wide variety of practical guidelines for choosing relevant indicators: in the standards (the international standard for Environmental Management System, ISO 14001, and the European Eco-Management and Audit Scheme, EMAS) given in the sustainability literature as well as in the general environmental literature. There is an idea that having an environmental management system (EMS) will improve the performance of a company over time, and that this improvement can be monitored and

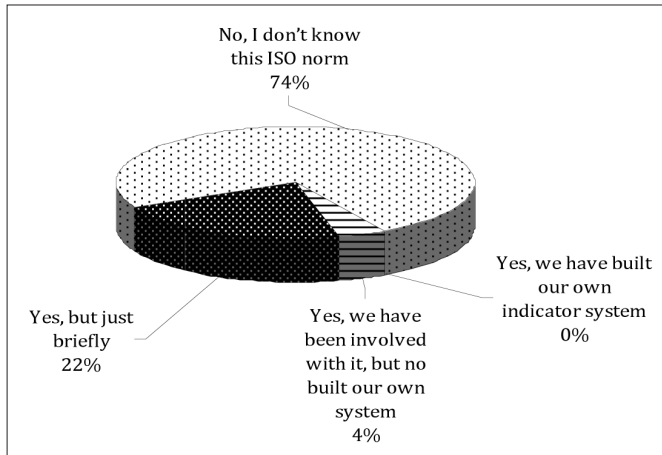


Fig. 5. Knowledge and usage of the standard ISO 14031

influenced by the help of specific indicators. However, the standardized environmental management systems and audits do not automatically lead to improved performance (Ammenberg, Hjelm 2003; Zobel 2007). In practice, each sector and each company can make their own selection from over hundreds of examples of suggested indicators (LVS EN ISO 14031 2001; Scherpereel *et al.* 2001; Morhardt *et al.* 2002).

One way may be to use the standard ISO 14031 – Environmental Performance Evaluation. By using this standard, companies can introduce cost-effective, non-bureaucratic and process-related indicators that help to clarify the link between management efforts and actual improvements. We asked the companies about their knowledge and usage of ISO 14031. The results are shown in Fig. 5.

The results show that more than half of respondents, i.e. 74% are not familiar with the ISO 14031 standard. No one has built their own indicator system based on this standard. 22% of respondents heard about ISO 14031 as a part of the ISO 14000 family, but just briefly. It means that they don't know about it too. It seems that ISO 14031 not to be well known in Latvia. It is also similar to many other investigations. But during recent years this standard became more and more popular.

3.6. Integration with other management systems

One of the ways of realizing sustainable development principles and corporate social responsible enterprise at the level of an organizational unit is implementation of normalized systems elaborated by International Organization for Standardization (ISO). Systems integration is becoming one of the most popular catch - phrases in business today. The proliferation of management systems standards, such as ISO 9000, ISO 14000 and OHSAS 18000, has made it very difficult and costly for most organizations to manage all of these separately. Instead of having several separate management systems, organizations see benefits such as timesaving and reduced costs in integrating systems.

Zwetsloot (1995) argues that integration of quality, environmental, health and safety management can give positive synergy effects. For instance, working carefully and safely with hazardous materials is relevant both for the environment and the working conditions.

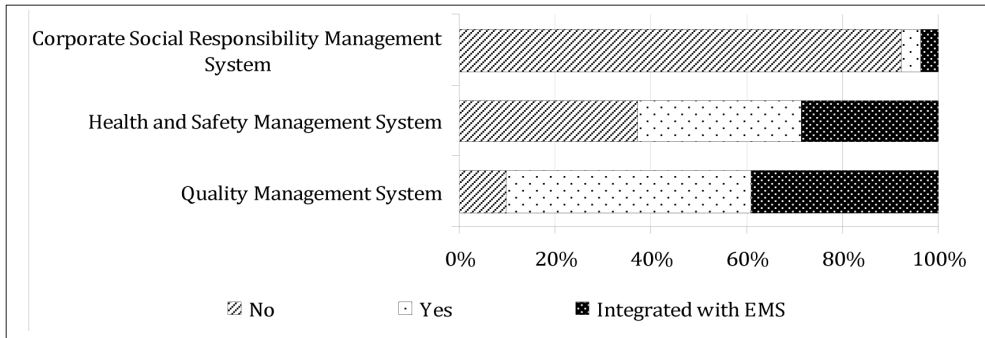


Fig. 6. Integration of ISO 14001 with other management systems

The environmental impact of products is a vital aspect not only of environmental management but also of quality management. Good “housekeeping” is important for all three areas. Zwetsloot (1995) states that positive synergy aspects are: better definitions of opportunities and problems, better understanding of the advantages and disadvantages of potential solutions, and clearly defined deterrents.

The majority of the respondents said that they found advantages in integrating their management systems. 76% of the organizations, participated in our study, have integrated their EMS certified by ISO 14001 with other management systems. 64% have integrated their ISO 14001 with a Quality management system, mainly ISO 9001; 40% have integrated their ISO 14001 with a Health and Safety Management System, and 4% with Corporate Social Responsibility Management System (see Fig. 6).

Usually as advantages of integrated management systems are the following, there is only one source of documentation and joint external and internal audits. Disadvantages of working with integrated systems are, according to the respondents, a high degree of bureaucracy, complexity and high resource demands. That coincides with the results of our study. Zeng *et al.* (2010) used questionnaire survey and interview discussions to explore motivations and benefits obtained in implementing an integrated management system (IMS) for enterprises in China. They found that the main motivations for implementing IMS were: “To satisfy customers’ requirements”, “To respond to government’s appeal” and “To cope with stress from competitors” and the significant benefits achieved were: “Simplify certification process”, “Decrease management costs” and “Decrease paper work”.

One possible explanation for the high number of integrated management systems in Latvian construction enterprises may be that Latvia is very small country and there are not so many consultants here. Simple fact is that many consultants have previously been implemented ISO 9000 systems and therefore could easily to integrate it with ISO 14001 and / or OHSAS 18000.

3.7. Sustainability Management Systems

Different strategies can be adopted for developing the EMS according to ISO 14001 system into a sustainability management system. It may be environmental management focusing on increasing its eco-effectiveness (Schaltegger *et al.* 2003), or synchronization with the central

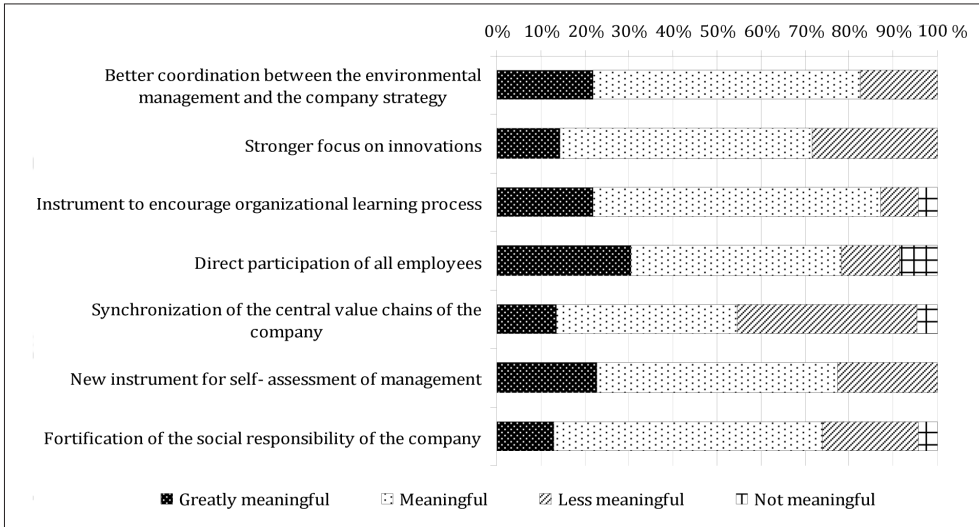


Fig. 7. From EMS to Sustainability Management Systems

value-chains of the companies (Birke 2003), or environmental and social responsibility objectives including in their value-creating statements, processes and products (Dobers, Wolff 2000).

We asked the Latvian companies about their attitudes concerning different strategies for developing ISO 14001 into a sustainability management system. The results are summarized in Fig. 7.

About 81% of the organizations estimated it greatly meaningful or meaningful to develop the ISO 14001 system into a sustainability management system through a better coordination between environmental management and company’s strategy. About 80% see the Instrument to encourage organizational learning process as a very important. 76% of respondents see Better coordination between the environmental management and the company strategy as an important. 72% believe that direct participation of all employees influences EMS developing in to Sustainability Management Systems. 48% of respondents see the need for better synchronization of the EMS and the central value chains of the company. However, even if there is a strong will to develop EMS towards a sustainability management system, there is still a long way to go before a sustainability management system can be applied in reality. Our study results are similar to Dobers and Wolff (2000), Freimann and Walther (2001), Birke (2003), Schaltegger *et al.* (2003) and Schylander and Martinuzzi (2007).

4. Conclusions

The purpose of this study was to explore and describe experiences and effects of ISO 14001 in Latvian construction enterprises, based on study conducted for the construction industry in Latvia. The percentage of returned questionnaires is high (63%) and gives us an insight into the quality and environmental management trends in Latvian construction companies.

As similar studies conclude, our results show that organizations primarily expect an external recognition of the EMS activities, such as public image. ISO 14001 also fulfils many of the expectations within other important motives regarding legal compliance, improvement of environmental performance and systemization of environmental activities.

The most important contribution of ISO 14001 discerned in our study, but also in other similar studies, is that it raises the awareness of environmental issues. Another main benefit is that ISO 14001 ensures legal compliance. Our study shows that direct environmental effects can be seen in improvements within waste and energy consumption / CO₂ emission, and consuming of the raw material. From these activities, the organizations have also realized considerable cost-savings by reducing and fractioning their waste. In-depth analyses show that it is not correlations to the sizes of the company. All companies are focusing on waste control, energy saving and air / water pollution reduction. Differences between large companies and SMEs were found in energy saving, that are more important for large companies. Also the count of integrated management systems in large companies is bigger than in SMEs.

The majority of the responding organizations are working with integrated management systems; mainly they have integrated their ISO 14001 with a Quality management system. In order to drive organizations effectively into Sustainability Management Systems, the three most important challenges are: to improve the coordination between the EMS and the organizations' strategies; to use it as instrument to encourage organizational learning process and to direct participation of all employees are necessary. A good EMS allows companies to find ways for the limitation of their environmental impacts and the reduction of the costs or the increase of the productivity. Moreover, it helps them to find ways to improve their organizational efficiency and effectiveness.

One of the ways that help organizations to evaluate the EMS can be ISO 14031. By using this standard, companies can introduce cost-effective, non-bureaucratic and process-related indicators. However, one significant conclusion of our study is that the most of organizations in Latvia do not have knowledge about the ISO 14031 standard.

In our study we asked respondents about costs for building and running the ISO 14001 system, cost savings and direct incomes as an effect of the ISO 14001 implementation. Unfortunately approximately only half of respondents gave answer on these questions. Many respondents motivated the reason of non-answers on business secret. However, costs could be influenced by the size of the organization. Nonetheless the results indicate that the primary economic reason for working with an ISO 14001 is cost savings rather than direct incomes. The most important contribution to these cost savings was lower costs for waste, since the organizations had started to fraction and sorts their waste. Resource optimization was another cost saving, which is related to a more efficient use of packaging, raw materials and energy in the processes.

It is important to note that the fact that the environmental managers were those who filled in the questionnaire may have influenced the results. The findings would probably be different if we had asked other employees with different responsibilities in the organizations. On the other hand, environmental managers were chosen as the respondents, since they are the people with an overview of environmental issues.

The results of our study are similar to the results of other author's studies, not only in construction industry, but also in power industry, transport / transit, service and trade etc.

References

- Agenda 21. 1992. Report of United Nations Conference on Environment and Development (UNCED). Brazil.
- Ammenberg, J.; Hjelm, O. 2002. The connection between environmental management systems and continual environmental performance improvements, *Corporate Environmental Strategy* 9(2): 183–192. doi:10.1016/S1066-7938(02)00011-8
- Ammenberg, J.; Hjelm, O. 2003. Tracing business and environmental effects of environmental management systems – a study of networking small and medium-sized enterprises using a joint environmental management system, *Business Strategy and the Environment* 12(3): 163–174. doi:10.1002/bse.357
- Andrews, R.; Amaral, D.; Darnall, N.; Rigling-Gallagher, D.; Edwards, D.; Hutson, A.; D' Amore, C.; Sun, L.; Zhang, Y.; Keiner, S.; Feldman, E.; Fried, D.; Jacoby, J.; Mitchell, M.; Pflum, K. 2003. *Environmental Management Systems: Do They Improve Performance?* National Database on Environmental Management Systems. University of North Carolina at Chapel Hill: Chapel Hill NC.
- Bansal, P.; Hunter, T. 2003. Strategic explanations for the early adoption of ISO 14001, *Journal of Business Ethics* 46: 289–299. doi:10.1023/A:1025536731830
- Berthelot, S.; McGraw, E.; Coulmont, M.; Morrill, I. 2003. ISO 14000: Added Value for Canadian Business?, *Environmental Quality Management* 2: 47–57. doi:10.1002/tqem.10109
- Birke, M. 2003. Nachhaltiges Wirtschaften und Organisationsanalytische Bringschulden, in Brentel, H.; Klemisch, H.; Rohn, H. *Lernendes Unternehmen – Konzept und Instrumente für eine zukunftsfähige Unternehmens und Organisationsentwicklung*. Wiesbaden, 27–43.
- Darnall, N.; Jolley, J. G.; Handfield, R. 2008. Environmental Management Systems and Green Supply Chain Management: Complements for Sustainability?, *Business Strategy and the Environment* 18: 30–45. doi:10.1002/bse.557.
- Darnall, N. 2006. Why firms mandate ISO 14001 certification, *Business and Society* 45: 354–381. doi:10.1177/0007650306289387
- Dobers, P.; Wolff, R. 2000. Competing with soft issues – from managing the environment to sustainable business strategies, *Business Strategy and the Environment* 9: 143–150. doi:10.1002/(SICI)1099-0836(200005/06)9:3<143::AID-BSE239>3.0.CO;2-C
- EMAS. 2007. Evolution of Net EMAS Registrations. April 2007. Available from Internet: <http://europa.eu.int/comm/environment/emas/pdf/5_5artic1es.pdf> [cited 3 May 2007].
- Freimann, J.; Schwedes, R. 2000. EMAS Experiences in German Companies: A Survey on Empirical Studies, *Eco-Management and Auditing* 7(3): 99–105. doi:10.1002/1099-0925(200009)7:3<99::AID-EMA135>3.0.CO;2-X
- Freimann, J.; Walther, M. 2001. The impacts of corporate environmental management systems: a comparison of EMAS and ISO 14001, *Greener Management International* 36: 91–103.
- Grybaitė, V.; Tvaronavičienė, M. 2008. Estimation of sustainable development: germination on institutional level, *Journal of Business Economics and Management* 9(4): 327–334. doi:10.3846/1611-1699.2008.9.327-334
- Hillary, R. 2000. *Small and Medium-Sized Enterprises and the Environment*. Greenleaf Publishing: Sheffield, UK.
- ISO World. 2007. The number of ISO 14001 Certification of the world. December 2007. Available from Internet: <<http://www.ecology.or.jp/isoworld/english/analy14k.htm>> [cited 3 May 2008].
- Kein, A. T. T.; Ofori, G.; Briffet, C. 1999. ISO 14000. Its relevance to the construction industry of Singapore and its potential as the next industry milestone, *Construction Management and Economics* 17(4): 449–461. doi:10.1080/014461999371376

- Kirkland, L.; Thompson, D. 1999. Challenges in designing, implementing and operating an environmental management system, *Business Strategy and the Environment* 8: 128–143. doi:10.1002/(SICI)1099-0836(199903/04)8:2<128::AID-BSE193>3.0.CO;2-N
- LVS EN ISO 14031:2001. 2001. Environmental management – Environmental performance evaluation – Guidelines. Latvian Standard. Riga, Latvia. 32 p.
- Morhardt, J. E.; Baird, S.; Freeman, K. 2002. Scoring corporate environmental and sustainability reports using GRI 2000, ISO 14031 and other criteria, *Corporate Social Responsibility and Environmental Management* 9(4): 215–233. doi:10.1002/csr.26
- Pecher, A.; Tschulik, A.; Martinuzzi, R.-A. 2002. EMAS – an instrument for environmental communication (examining EMS-evaluation studies), in *Enviro-Info – International Conference Informatics for Environmental Protection, Vienna, Österreich, September*.
- Pokinska, B.; Dahlgaard, J.; Eklund, J. 2003. Implementing ISO 14001 in Sweden: Motives, benefits and comparison with ISO 9000, *International Journal of Quality & Reliability Management* 20: 585–606. doi:10.1108/02656710310476543
- Rondinelli, D.; Vastag, G. 2000. Panacea, Common Sense, or Just a Label? The value of ISO 14001 Environmental Management Systems, *European Management Journal* 5: 499–510. doi:10.1016/S0263-2373(00)00039-6
- Schaltegger, S.; Burritt, R.; Petersen, H. 2003. *An Introduction to Corporate Environmental Management – Striving for Sustainability*. Greenleaf Publishing: Sheffield, UK.
- Schaltegger, S.; Synnøestvedt, T. 2002. The link between green and economic success: environmental management as the crucial trigger between environmental and economic performance, *Journal of Environmental Management* 65: 339–346.
- Scherpereel, C.; Van Koppen, K.; Heering, F. 2001. Selecting environmental performance indicators: the case of Numico, *Greener Management International* 33: 97–114.
- Schylander, E.; Martinuzzi, A. 2007. ISO 14001: experiences, effects and future challenges: a national study in Austria, *Business Strategy and the Environment* 16: 133–147. doi:10.1002/bse.473
- Schylander, E.; Zobel, T. 2003. Environmental effects of EMS: evaluation of the evidence, in *Proceedings from the Conference Evaluation of Sustainability European Conference EASY-ECO 2: Vienna*.
- Steger, U. 2000. Environmental Management Systems: Empirical Evidence and Further Perspectives, *European Management Journal* 1: 23–37. doi:10.1016/S0263-2373(99)00066-3
- Strachan, P.; Sinclair, I.; Lal, D. 2003. Managing ISO 14001 implementation in the United Kingdom Continental Shelf, *Corporate Social Responsibility and Environmental Management* 1: 50–63. doi:10.1002/csr.29
- Šelih, J. 2007. Environmental Management Systems and Construction SMEs: a case study for Slovenia, *Journal of Civil Engineering and Management* 3: 217–226.
- Tambovceva, T. 2008. *Assessment models and development of Ecologically Oriented Entrepreneurship Management in Latvia*: Doctoral Thesis. Riga Technical University.
- Welch, E. W.; Mori, Y.; Aoyagi-Usui, M. 2002. Voluntary adoption of ISO 14001 in Japan: Mechanism, Stages and Effects, *Business Strategy and the Environment* 11: 43–62. doi:10.1002/bse.318
- Zackrisson, M.; Enroth, M.; Widing, A. 2000. *Environmental Management Systems – Paper tiger or a powerful tool*, IVF Research Publication 00828. Industrial Research Institutes in Sweden: Stockholm.
- Zobel, T. 2007. The ‘Pros’ and ‘Cons’ of Joint EMS and Group Certification: a Swedish Case Study, *Corporate Social Responsibility and Environmental Management* 14: 152–166. doi:10.1002/csr.125
- Zwetsloot, G. 1995. Improving cleaner production by integration into management of quality, environment and working conditions, *Journal of Cleaner Production* 1–2: 61–66. doi:10.1016/0959-6526(95)00046-H
- Zeng, S.; Tam, V.; Le, K. N. 2010. Towards Effectiveness of Integrated Management Systems for Enterprises, *Engineering Economics* 21(2): 171–179.

APLĪNKOS APSAUGOS VADYBOS SISTEMŲ TAIKYMO PATIRTIS LATVIJOS STATYBOS ĮMONĖSE

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Santrauka. Šiuo Latvijos plėtros etapu, kaip ir visame pasaulyje, įmonių veiklą veikia tvarios plėtros idėjos. Tvarios plėtros koncepcija visame pasaulyje plačiai paplito tarp politikų, korporacijų, vyriausybių ir kitų organizacijų. 2007 m. pabaigoje apie 129 tūkst. organizacijų visame pasaulyje įdiegė aplinkos apsaugos vadybos sistemą (AAVS) ir sertifikavo ją pagal ISO 14001 standartą. Iš to skaičiaus apie 100 įmonių yra įsikūrę Latvijoje, 40 iš jų yra statybos įmonės. Daugelyje šalių iš viso nėra įmonių, sertifikuotų pagal šį standartą. Latvijoje pagal ISO 14001 standartą sertifikuotų įmonių sąrašą sudaro ir nuolat atnaujina Latvijos kokybės asociacija. Nepaisant to, kad Latvijoje vis labiau plinta ekologinės gamybos ir aplinkosaugos valdymo idėjos, iki šiol nebuvo jokių rimtų mokslinių studijų apie Latvijos patirtį naudojant ISO 14001 standartą. Šio straipsnio tikslas – nustatyti aplinkos valdymo sistemos poveikį statybos įmonėms, remiantis tyrimais, atliktais Latvijos statybos pramonėje. Rezultatai parodė, kad ISO 14001 dažnai sumažina poveikį aplinkai, ypač taršą atliekomis. Stipri AVS įgyvendinimo varomoji jėga – noras pagerinti organizacijos įvaizdį. Sistemą įgyvendinti sudėtinga, tačiau tai pasiteisina kasdienėje veikloje. Norint AVS integruoti į tvarumo valdymo sistemą, AVS darbą reikia suderinti su organizacijos strategijomis, pagerinti mokymo procesą ir įtraukti visus darbuotojus.

Reikšminiai žodžiai: aplinkos apsaugos vadybos sistema, ISO 14001, statybos pramonė, tvarioji plėtra, tyrimas.

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