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Obstacles and Drivers for Sustainable Innovation Development and Implementation in Small and Medium Sized Enterprises

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Small and medium-sized enterprises (SMEs) play a vital role in the economic development and provide most of new jobs. At the same time, SMEs are contributing factors in environmental degradation due to their high numbers and their cumulative effect. In this context, broad application of sustainable innovations to SMEs becomes a priority task.

The article presents results of a study conducted in Lithuania seeking to analyse obstacles and drivers for implementation of sustainable innovations in small and medium sized enterprises. For analysis, enterprises have been divided in two groups: SMEs with experience in development/ implementation of sustainable innovations and SMEs without such experience. To check reliability of results and to compare SME opinions in different countries, results of the study conducted in Lithuania have been compared to those of three similar studies carried out in other countries.

Key words: *sustainable innovation, sustainable development, sustainability performance, small and medium size enterprises.*

1. Introduction

To a great extent, the economies of developed countries are built on the activities of small and medium-sized enterprises (SMEs) and the role of SMEs in the context of sustainable development is very important. According to the Small and Medium Enterprise Outlook published by the Organisation for Economic Co-operation and Development (OECD), SMEs account for 60-70 % of employment in most of OECD countries and contribute more than half of GDP to the EU (OECD 2000). In Europe, SME share is more than 90% (Hillary 2000). In Lithuania, 99.5 % of all enterprises are SMEs (Statistics Department of Lithuania 2011).

SMEs make a significant impact on the environment (DG ENTR 2004). The European Commission estimates that SMEs taken together could be responsible for up to 70 % of all industrial pollution (DG ENTR 2004). However, several studies show that most of thesmall enterprise owners tend to be ignorant of their enterprise's environmental impact (Environment Agency 2005; 2003; 2002; Hillary 2000).

To reduce an impact on the environment, SMEs have an opportunity to use their technological flexibility and knowledge to adapt their economic strategies to these new challenges for minimisation of pollution (Holger et al. 2010), but most SMEs have little knowledge or interest in environmental issues (Hillary 2000), and generally, they have difficulties when it comes to integrating the environmental aspects into their activities (Leistner 1999; Bradford and Fraser 2008; Drake et al. 2004; Hillary 2000; Pimenova and van der Vorst 2004; Revell and Blackburn 2005; Tilley 1999). SMEs often believe that the national and local government should take a lead in environmental issues, because they believe that an environmental issue is a case for larger enterprises (Revell and Rutherfoor 2003, Drake et al., 2004). Moreover, the literature analysis indicates that research in the area of sustainable development, including innovation process and methodologies to

tackle environmental problems, is largely focused on big enterprises (Laurinkevičiūtė and Stasiškienė 2010; Aiyjub at al. 2009; Revell 2007; Drake et al. 2004; Verheul 1999; Bianchi and Noci 1999; Merritt 1998; Rowe and Hollingsworth 1996). According to Hillary, such approaches that meet the needs of large enterprises do not, in general, work in SMEs (Hillary 2000).

The business case for sustainability is stressed in a number of policy documents that expound encouragingly on the opportunities arising from green consumerism, the cost benefits of efficiency gains and the good publicity that can result from environmentally sound business practices (DTI 2000; Revell 2007). The enterprises engaged in development and implementation of sustainable innovations are engines of sustainable development, they enable business to achieve higher level of resource efficiency and productivity as well as improvement of life quality. According to Jakubavičius, traditional factors of production based on economic growth are insufficient and high productivity can only be based on innovation and industrial activities (Jakubavičius et al. 2008). There is no doubt that the market drivers have a potential to encourage environmental action, but several research studies show that SMEs in reality often perceive the market more as a barrier than a driver for good environmental practice (Revell 2007; Drake et al. 2004; Rutherfoord et al. 2000; Hillary 2000). This is one of the reasons why SMEs are somewhat sceptical of the "business case for sustainability" (Revell and Blackburn 2005).

The objective of this article is to analyse the main obstacles and incentives for development and implementation of sustainable innovations in SMEs.

2. Research methodology

In connection with the international project "Sustainable Production through Innovation in Small and Medium Sized Enterprises" (SPIN), being implemented in the framework of the Baltic Sea Region Programme 2007-2013, the Institute of Environmental Engineering (APINI), Kaunas University of Technology in collaboration with the Ministry of Economy, Lithuanian Chambers of Commerce, Industry and Crafts, non-governmental organizations and SMEs conducted a survey "Sustainable Production through Innovation in SMEs".

The objective of this survey was to collect and analyse information about SMEs' innovative product or process development and to identify main barriers/ incentives for development and implementation of sustainable innovations. Sustainable innovation could be defined as a process where sustainability considerations (environmental, social and financial) are integrated into company systems from idea generation to R&D, production and commercialisation (Charter and Clark 2007). This applies to products, processes, services and technologies, as well as new business models.

Questionnaire of the survey was distributed electronically using several means: different industry related websites and mailing lists of collaborating organisations. Questionnaire was also filled out by the enterprises that participated in the SPIN project events, such as international conferences "Sustainable innovations in packaging sector" and "Sustainable innovations in construction sector", training seminars for SMEs on development of sustainable innovations and other events organised by APINI during the survey period. Filled out questionnaires from these events constituted 47 % of all survey responses.

To assess the current situation concerning sustainable innovation development and implementation in Lithuanian SMEs, respondents have been asked to provide quantitative information concerning the number of sustainable innovations developed/ implemented in a 3 year period (2008 - 2010). To avoid misleading information, respondents have been asked to provide a brief description of implemented innovations. For analysis of barriers and incentives for development and implementation of sustainable innovations, respondents had to answer several questions where they had an opportunity to rate the importance of particular barriers/ incentives on the scale from 1 (not important) to 5 (very important). Most of the questionnaires have been filled out by managers or owners of the SMEs. Only in few cases questionnaires have been filled out by employees responsible for energy/ environmental issues.

Response rate of the survey was calculated using the Kardelis methodology (Kardelis 2007). Precise calculation of the total response rate was not possible due to the fact that the questionnaire was made accessible electronically on the Internet. However, assuming that most of the respondents have been approached by e-mail (mailing lists of co-operating organisations such as Lithuanian Confederation of Industrialists and Lithuanian Chambers of Commerce), the total calculated respondent rate of about 9 % could be considered as fairly accurate. The respondent rate among participants in the conferences and training sessions organised in the framework of the project SPIN and other events organised by APINI during the survey period was 42 %.

3. General results of the survey

The survey respondents represented both manufacturing and service sectors. Geographically, the survey respondents covered the following regions: Kaunas, Vilnius, Šiauliai, Klaipėda, and Alytus. Manufacturing enterprises contributed almost 85 % of responses. In terms of business type, 84 % of respondents were manufacturing enterprises and 16 % represented service providers. The following business sectors have been involved in the survey:

construction companies - 18%, food and drink industry - 14 %, packaging - 11 %, energy - 9 %, furniture - 7 %, agriculture - 5 %, chemical industry - 4 %. High representation of construction and packaging sectors in the survey could be explained by the fact that relatively high percentage of respondents participated in the international conferences devoted to sustainable innovation issues in these sectors.

Survey results have revealed that only 33 % of SMEs have identified particular environmental problems and 35 % do not know how these problems could be solved or do not have sufficient resources.

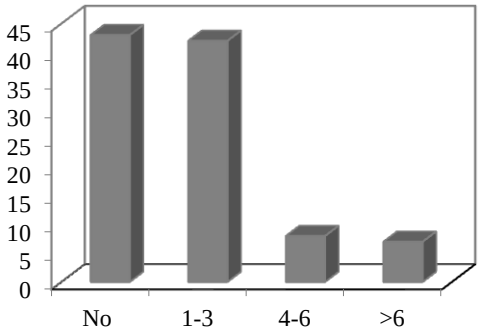

Fig. 1. Number of sustainable innovations implemented in surveyed SMEs in 2008-2010

Survey analysis has proved that currently sustainable innovation development and implementation in SMEs is a slow process. 43 % of respondents stated that they did not develop/ implement a single sustainable innovation (Fig. 1). Similar number of SMEs stated that they implemented 1 to 3 sustainable innovations. Slightly more than 10 % of SMEs implemented 4 or more sustainable innovations in 2008-2010.

4. Obstacles for development and implementation of sustainable innovations in SMEs

To make analysis of the obstacles more objective, obstacles have been analysed in two different perspectives, i.e. responses of enterprises that have experience in development/ implementation of sustainable innovation and enterprises that do not have such experience have been studied separately. Results of the obstacle analysis are presented in Figs 2 and 3.

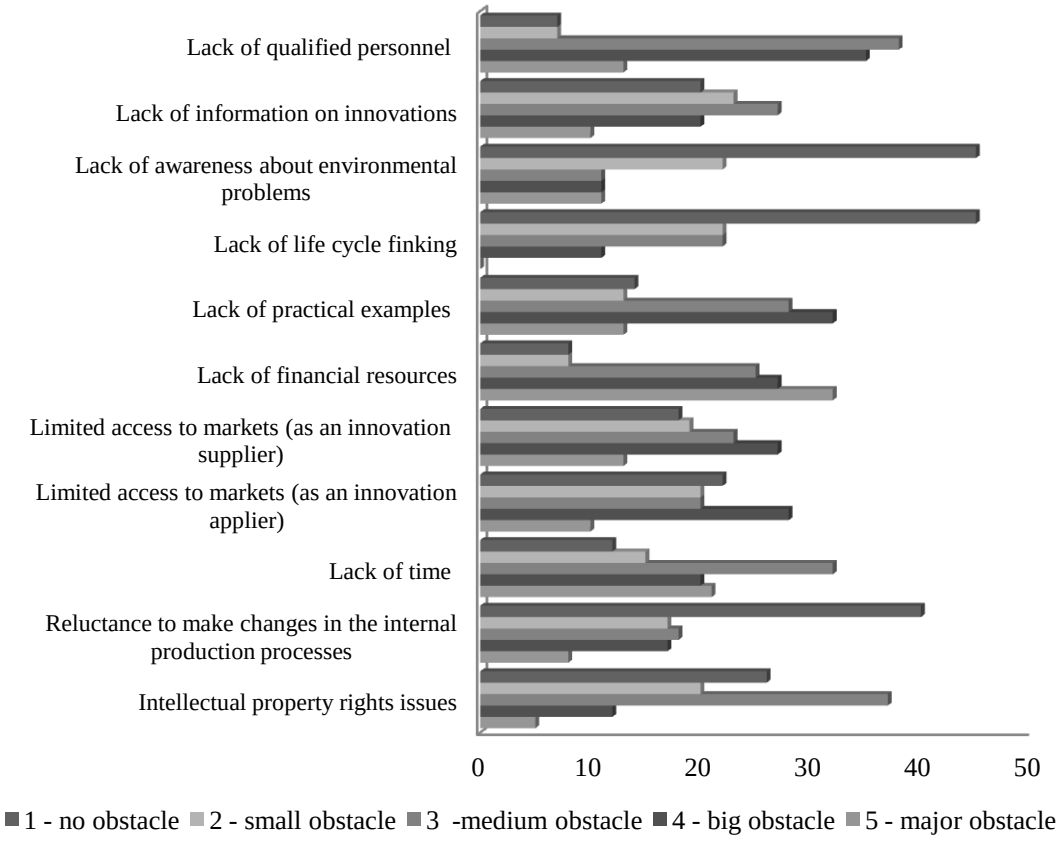

Fig. 2. Obstacles for development and implementation of sustainable innovations in enterprises that have implemented at least one sustainable innovation

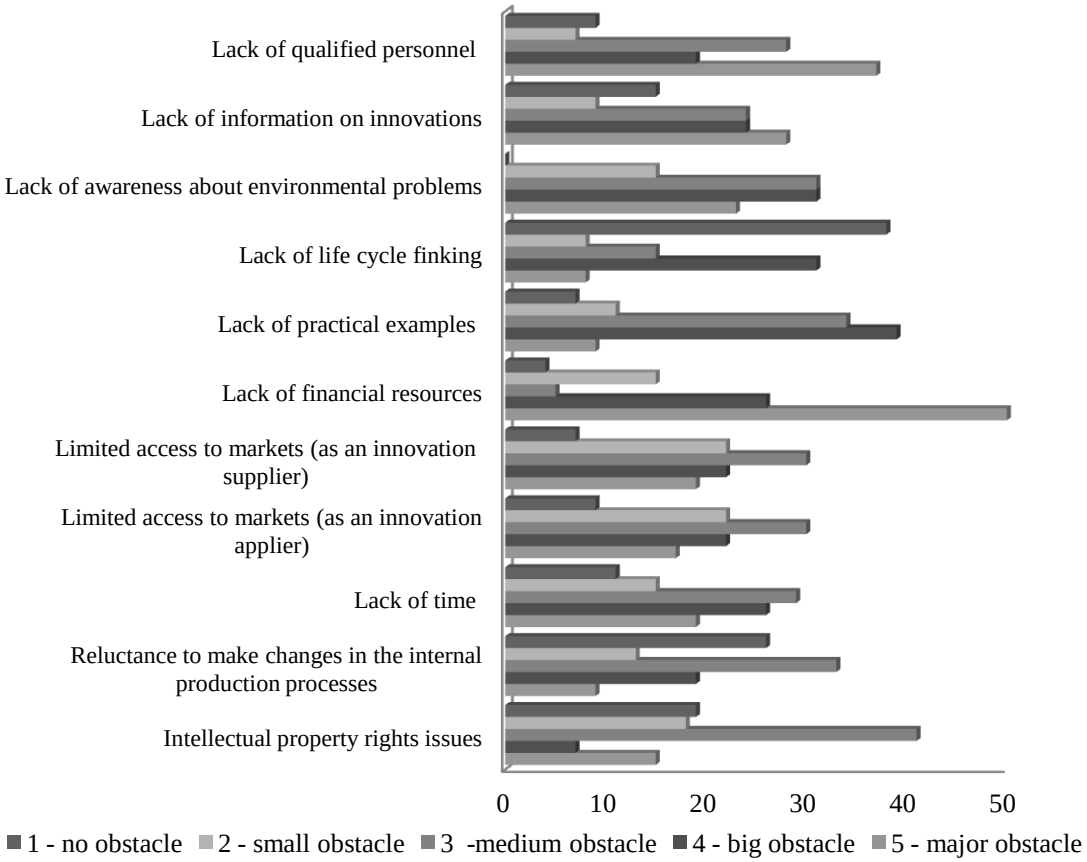

Fig. 3 *Obstacles for development and implementation of sustainable innovations in enterprises that have not implemented a single sustainable innovation*

Lack of financial recourses was identified as the most important barrier for development and implementation of sustainable innovations in Lithuanian SMEs. An interesting observation is that 50% of SMEs without experience in the area of sustainable innovations consider the lack of financial recourses to be a major obstacle in comparison to 34% of SMEs that have implemented at least one sustainable innovation. One of the arguments explaining this difference could be a possible experience of SMEs in use of special public funding programmes available for innovation implementation.

Lack of time is a second obstacle that is perceived by SMEs as an important obstacle for development and implementation of sustainable innovations. More than 40% of respondents have indicated that this obstacle is of a big or major importance. The reason is that environmental responsibilities in SMEs are often left for the individual consideration of the top manager, possibly because they are not considered important enough to be delegated to another staff member or were delegated as a task without sufficient time. This obstacle became particularly important during the economic crisis when SMEs had to reduce the staff number to a minimum to be able to survive under harsh market conditions.

Obstacles related to both awareness and lack of the information about sustainable innovations are also considerably important for SMEs. Not surprisingly, research results show that these barriers are more significant in SMEs that have no experience in sustainable innovation development/implementation.

In terms of human resources, i.e. lack of qualified personnel, the views of SMEs having experience in sustainable innovation development and implementation and those that do not have it differ slightly. This obstacle is considered to be a major obstacle by 13 % of respondents in the first group of enterprises and 27 % in the second. When percentage of respondents in both enterprise groups is calculated by summing up responses in the categories “big obstacle” and “major obstacle”, the cumulative numbers are 47% and 46 %, respectively. This barrier is coupled with limited availability of information about sustainable innovations and their potential in improving economic, environmental and social performance of enterprises, lack of practical examples as well as scarce possibilities for SMEs to obtain necessary training and technical assistance.

Not surprisingly, lack of life cycle thinking has been ranked by SMEs as a least significant obstacle for sustainable innovation development/ implementation. Life cycle thinking and strategic planning are seldom a case in SMEs as yet. Short-

term planning prevails and problems are being tackled when enterprises are forced to do so. The low ranking of this obstacle by SMEs also confirms the fact that co-operation between SMEs and research organisations is very limited, because a life cycle approach is well elaborated by scientific community and various methodologies that could be used for sustainable innovation development in enterprises have been created and successfully tested.

It is reasonable to assume that lack of competence and awareness of environmental sustainability in SMEs is one of the key barriers that prevent SMEs to engage in a sustainable innovation development process. SMEs are generally not motivated or able to make decisions that would improve their environmental performance.

5. Incentives for development and implementation of sustainable innovations in SMEs

Incentives for sustainable innovations are the key factors influencing SMEs sustainability performance improvement. Incentives can be external (e.g. regulations, financial incentives, technical assistance, market conditions) and internal (e.g. gaining competitive advantage, costs savings). Analysis of effectiveness of particular incentives can be found in literature sources, but systematic comparison of their effectiveness is limited. For example, some authors have looked over the impact of regulations on SME environmental improvement (Hillary 2004; Masurel 2007; Williamson et al. 2006), on education (Cloquell-Ballester et al. 2008) or on financial incentives (Clement and Hansen 2003).

A study of Lithuanian SMEs focused on several external and internal incentives. The results of the survey are presented in Figs 4 and 5. As in a case of barriers, incentives have been analysed in two SME groups: enterprises that have experience in sustainable innovation development and implementation and SMEs that do not have such experience.

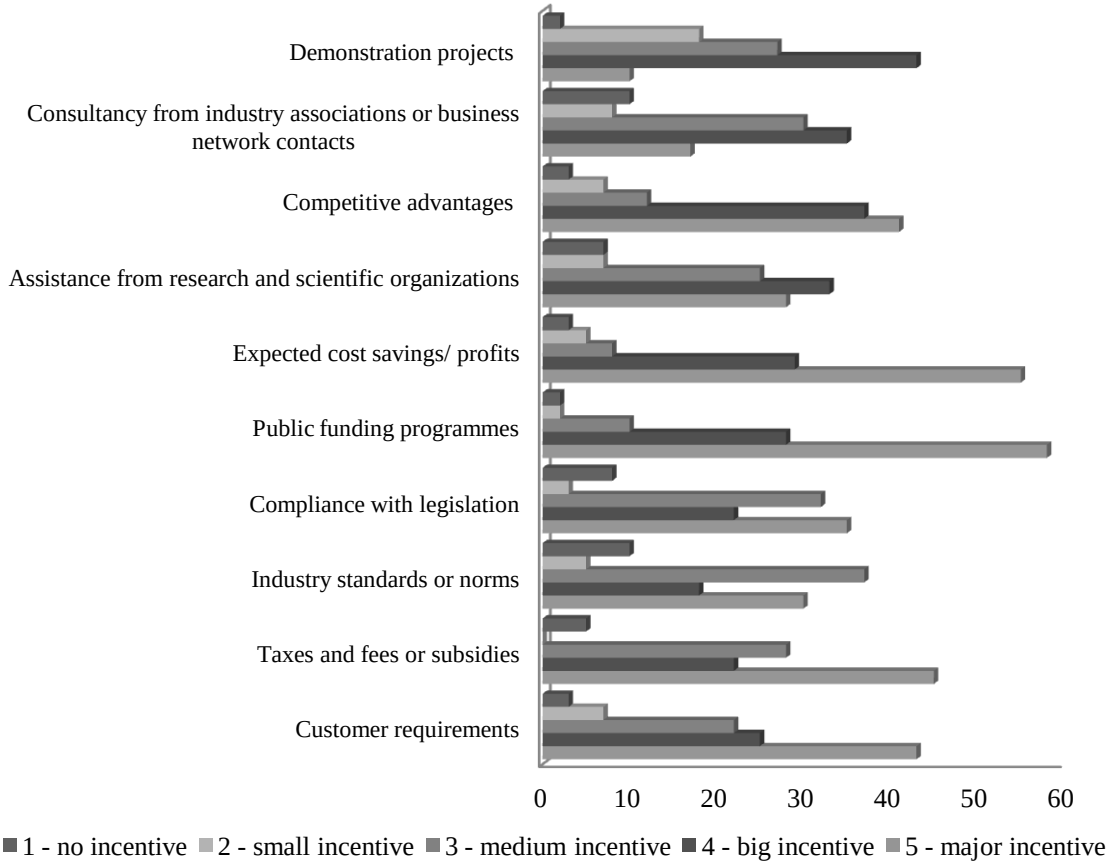

Fig. 4. Incentives for development and implementation of sustainable innovations in enterprises that have implemented at least one sustainable innovation

Incentives related to finances are considered by SMEs to be of great importance in the context of sustainable innovation development/ implementation. This includes availability of public funding programmes dedicated for innovations and tax/ fee/ subsidy system in the country. 60% of respondents have indicated that public funding programmes are a determining factor for sustainability investment development/ implementation. Over 50 % of respondents perceive taxes, fees and subsidies as a major incentive. It could be stressed that differences in opinions between enterprises that have experience in development/ implementation of sustainable innovations and those without it are negligible.

Customer requirements appear to be the second strongest external incentive. This opinion is shared by 43 % of respondents in both SME groups. In terms of external pressure, the role of legal framework, i.e. compliance with legislation as well as industry standards and norms is also very important. However, opinions on this point among enterprises that have experience in sustainable innovation development/ implementation and those without any experience are slightly different. 35 % of enterprises in the first group perceive this incentive as major in comparison to 21 % in the second group. Similarly, 30 % and 19 % of respondents in the respective groups consider industrial standards and norms as an incentive of major importance. This leads to an assumption that some of sustainable innovations have been implanted because enterprises have been forced to look for measures to ensure legal compliance or to comply with industrial standards. This fact confirms that right legal framework conditions combined with industrial standards and norms could be an effective external incentive.

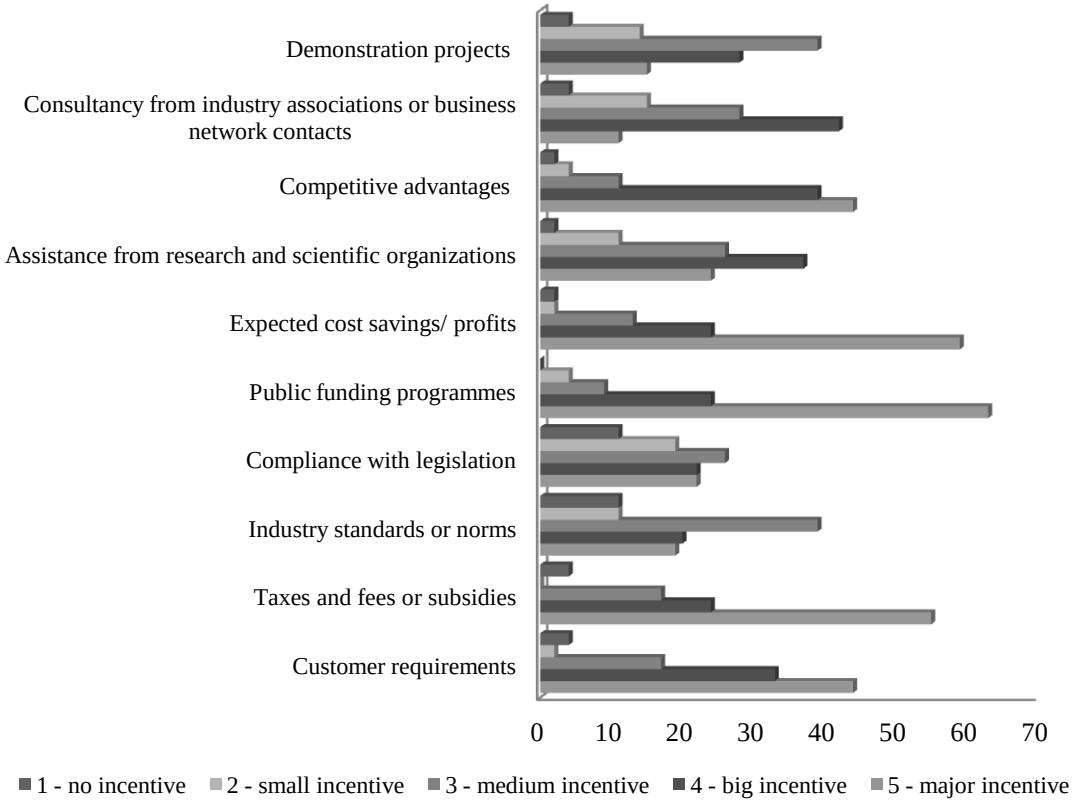

Fig.5. Incentives for development and implementation of sustainable innovations in enterprises that have not implemented a single sustainable innovation

As to external technical assistance, SMEs favour assistance from research and scientific organisations in contrast to consultancy from industrial associations and business network contacts. Demonstration projects seem to be least effective external incentives. This confirms an assumption that benefits demonstrated elsewhere have a limited impact on behaviour of SMEs concerning sustainable innovation development and implementation.

Internal incentives such as cost savings/ profits associated with implementation of sustainable innovations play a particularly important role in influencing SME behaviour in terms of sustainable innovation development and implementation. Almost 60 % of respondents consider this incentive as a major one. Gaining competitive advantage in the market is also considered by SMEs to be a strong incentive (more than 40% of all respondents). Overall, internal incentives are the second strongest after financial incentives.

6. Study results in comparison with the results of similar studies conducted in other countries

To check reliability of results and to compare SME opinions in different countries, results of the study conducted in Lithuania have been compared to those from other three similar studies carried out in the UK (Pimenova and van der Vorst 2004), London (Revell et al. 2008, Revell et al. 2010) and Hon Kong (Studer et al. 2006). Generally, results are consistent, but some small differences have been observed and briefly presented in this section.

A response rate in Lithuania was approximately 9 % in comparison to 10.3 % in the Pimenova and van der Vorst study, 9% in the Revell et al. study and 5 % in the Studer et al. study.

In the Lithuanian study, manufacturing enterprises represented 84 % of all respondents and service providers - 16 %. This is similar percentage to the study by Pimenova van der Vorst. All studies confirmed that SMEs generally are reluctant to admit their impact on the environment. For example, Pimenova and van der Vorst say that only 20 % of SMEs believe that they have environmental problems. In Lithuania this percentage is slightly higher – 33 %.

Financial obstacles have been identified as important obstacles for sustainable innovation development and implementation in all studies concerned. In Lithuania, this obstacle is considered as a major one by over 40 % of SMEs. However, Pimenova and van der Vorst indicate that financial obstacles are generally considered of medium importance by SMEs.

One of the differences in SME opinions in the studies conducted in Lithuania and abroad is about obstacles related to awareness and information. Generally, Lithuanian SMEs tend to underestimate the importance of this obstacle in comparison to other studies. For example, 31 % of respondents generally perceive low degree of environmental awareness and education as a significant obstacle in the Studer et al. study (Studer et al. 2006). 45 % of enterprises in the Revell et al. study reported that they need more information on how to be environmentally-friendly (Revell et al. 2008). In Lithuania, less than 20 % of SMEs have indicated environmental awareness as a major obstacle and less than 20 % SMEs believe that they lack information on sustainable innovations.

In terms of external incentives, financial incentives (generally identified as significant in all studies concerned) have been followed by incentives related to legal framework: 28 % of SMEs in Lithuania indicated that compliance to legal requirements is a major incentive for sustainable innovation development/ implementation. Other studies show similar results: 31 % in the Pimenova and van der Vorst study, 35 % in the Studer et al. study and 35 % in the Revell et al. study. Similar percentage of SMEs perceives the customer requirements as a major incentive. In comparison to 43 % of respondents that consider this incentive to be of major importance in Lithuania, customers or supply chain needs and requirements are a significant incentive for 33 % of SMEs that responded in the Studer et al. study.

In terms of technical assistance, Lithuanian SMEs expect more assistance from research and scientific organisations (26% - major incentive, 35 % - big incentive), while other studies conducted abroad are in favour of assistance from business networks, e.g. one of the findings in the Revell et al. study was that 70 % of respondents agreed that businesses should not act alone but together in networks to tackle environmental issues, and 67 % agreed that trade associations and networks should play more of a role in helping businesses and becoming environmentally-friendly. In Lithuania, consultancy from industry associations and business network has been perceived as a major incentive by 10 % of respondents and 38 % believe that this is a big incentive.

7. Conclusions

SMEs play a major role in the economic growth and provide most of new jobs. At the same time, SMEs pose serious environmental problems due to their high number and cumulative effect. To survive in the rapidly changing business environment, SMEs have to be flexible, dynamic and open. In this context, there is an evident need for more intensive development and implementation of sustainable innovations.

Theoretically, there is a big potential for improvement of sustainability performance in SMEs. However, the process of sustainable innovation development and implementation in SMEs is too slow due to a number of obstacles. Financial obstacles followed by lack of time and qualified personnel have been identified as the most significant one in the development and implementation of sustainable innovations. Obstacle analysis has revealed that life cycle thinking is not a case in Lithuanian SMEs as yet, where short-term planning prevails.

SME behaviour concerning sustainable innovation development/ implementation is influenced by different incentives. Incentives related to finances (availability of public financial support as well as tax/ fee/ subsidy system externally and cost savings/ profits associated with implementation of sustainable innovations internally) are considered by SMEs to be of big importance. These incentives are followed by customer requirements, compliance with legislation and possibilities to gain competitive advantage. In terms of technical assistance, Lithuanian SMEs expect more assistance from research and scientific organisations. There is a need to strengthen co-operation between business and research organisations. Taking into account experience from other countries, strengthening of business networks is also needed.

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References

Aiyub K, Arfin K, Awang A and Md.Jahi J. 2009. Environmental Performance in Small and medium Sized Enterprises (SMEs) Certified to ISO 14001 in the United Kingdom. Internal Business Management 3 (1):7-14. ISSN :1993-5250

Arbačiauskas, V., Gaižiūnienė, J, Laurinkevičiutė, A, Židonienė S. 2010. Sustainable Production through Innovation in Small and Medium Sized Enterprises in the Baltic Sea Region. Environmental research, engineering and management, 1(51) 57-64. Kaunas, Technologija. ISSN 1392-1649.

Baltic Sea Region Programme 2007-2013. Available: http://www.eu.baltic.net/ (accessed January 2012).

Bianchi, R. and Noci, G. (1998),'Greening SMEs' Competitiveness', Small Business Economics, 11: pp. 269-281. http://dx.doi.org/10.1023/A:1007980420087

Bradford, J, Fraser, E. D. G. 2008. Local authorities, climate change in small and medium enterprises: identifying effective policy instruments to reduce energy use and carbon emissions. Corporate Social Responsibility and Environment Management 15(3) 156-172. http://dx.doi.org/10.1002/csr.151

Charter, M., Clark, T., 2007. Sustainable Innovation. The Centre for Sustainable Design.

Clement K, Hansen M, 2003, "Financial incentives to improve environmental performance: a review of Nordic public sector support for SMEs" European Environment 13 (1) 34-47 http://dx.doi.org/10.1002/eet.308

Cloquell-Ballester, VA., Monteverde-Díaz, R., Cloquell-Ballester, VA,, Torres-Sibille, A .C .2008. Environmental education for small and medium-sized enterprises. Methodology and e-learning experience in the Valencian region. Journal of Environmental Management 87 (2008) 507–520 http://dx.doi.org/10.1016/j.jenvman.2007.01.041

Department of Trade and Industry (DTI). 2000. Sustainable Development Strategy.

DG ENTR.2004. Public Policy Initiative to promote the Uptake of environmental Management Systems in small and medium-sized Enterprises – Final Report of the BEST Project Expert Group.

Drake, F, Purvis, M, Hunt, J. 2004. Meeting the environmental challenge: a case of win-win or lose-win? A study of the UK baking and refrigeration industries. Business Strategy and the Environment 13 (3) 172-186. http://dx.doi.org/10.1002/bse.401

Environment Agency, 2002 'NetRegs Benchmarking Surve 2002'.

Environment Agency, 2003 'NetRegs SM-Environment 2003'

Environment Agency, 2005 'NetRegs SM-Environment 2005',

Hillary R, editor. Introduction: SMEs and the environment. London: Greenleaf Publishing; 2000. p. 11–22.

Hillary R. 1995, Small Firms and the Environment: a groundwork status report. Groundwork, Birmingham.

Hillary, R, 2000. Small and Medium-sized Enterprises and the Environment (Greenleaf Publishing, Sheffield, UK).

Hillary, R. 2004 'Environmental Management Systems and the Smaller Enterprise' Journal of Cleaner Production, 12: 561-569 http://dx.doi.org/10.1016/j.jclepro.2003.08.006

Holger, R., Bliesner, A., Dreuw, K.,Klinke, s., Schmitt, M., Masson, T. 2010. How to advance Innovation for Sustainable Management in SMEs. Available: http://www.egovmonitor.com/node/7873/ (accessed April 2011).

Jakubavičius, A., Jucevičius, R., Jucevičius, G., Kriaučionienė, M., Keršys, M. 2008. Inovacijos versle procesai, parama, tinklaveika. Vilnius.

Kardelis, K. 2007.Mokslinių tyrimų metodologija ir metodai. Šiauliai. ISBN 9955-655-35-6

Laurinkevičiūtė, A, Stasiškienė, Ž. 2010. Sustainable Development Decision-Making Model for Small and Medium Enterprises. Environmental research, engineering and management, 2 (52) 14-24.learning experience in the valencian region.Journal of Environmental Management 87. p. 507-520

Leistner, M. 1999. The Growth and Environment Scheme. Greener Management International, issue 27, p79.

Lithuanian Department of Statistics. Available: http://www.stat.gov.lt (accessed January 2011).

Masurel, E. (2007),'Why SMEs Invest in Environmental Measures: Sustainability Evidence from Small and Medium-Sized Printing Firms', Business Strategy and the Environment, 16(3)190-201 http://dx.doi.org/10.1002/bse.478

Merrit, Q. (1998), 'EM into SME won't go? Attitudes, awareness and practices in the London Borough of Croydon' Business Strategy and the Environment, 7(2): pp. 90-100.

Pimenova, P., van der Vorst, R., 2004. The role of support programmes and policies in improving SMEs environmental performance in developed and transition economies. Journal of Cleaner Production 12 (6) 549-559. http://dx.doi.org/10.1016/j.jclepro.2003.07.001

Revell A, Stokes D, Chen H, 2008. Small businesses and the environment: turning over a new leaf? Queen's university Belfast http://www.crrconference.org

Revell A, Stokes D, Chen H, 2010. Small businesses and the environment: turning over a new leaf? Business strategy and the environment, 19, 273-288.

Revell, A., Rutherfoord, R., 2003. UK environmental policy and the small firm: broadening the focus. Business Strategy and the Environment 12 (1) 26-35. http://dx.doi.org/10.1002/bse.347

Revell, A., 2007, 'The Ecological Modernisation of Small Firms in the UK's Construction Industry', Geoforum, 38(1): pp. 114-126. http://dx.doi.org/10.1016/j.geoforum.2006.07.006

Revell, A., Blackburn, R. A., 2005 'The business case for sustainability? An examination of small firms in the UK's construction and restaurant sectors'. Business Strategy and the Environment 16 (6) 404-420. http://dx.doi.org/10.1002/bse.499

Rowe, J. and D. Hollingsworth (1996) "Improving the Environmental Performance of Small and. Medium-Sized Enterprises", Eco-Management and Auditing, 3(2):97-107 http://dx.doi.org/10.1002/(SICI)1099-0925(199607)3:2<97::AID-EMA42>3.0.CO;2-L

Rutherfoord, R, Blackburn RA, Spence LJ. 2000. Environmental management and the small firm: an international comparison. International Journal of Entrepreneurial Behaviour and Research 6(6): 310–325. http://dx.doi.org/10.1108/13552550010362750

SPIN project website Available: www.spin-project.eu (accessed January 2011).

Studer S, Welford R and Hills Peter 2006. Engaging Hong Kong Businesses in Environmental Change: Drivers and Barriers. Business Strategy and the Environment Bus. Strat. Env. 15, 416–431

The OECD Small and Medium Enterprise Outlook 2000. Enterprise, industry and services.

Tilley, F., 1999. The gap between the environmental attitudes and the environmental behaviour of small firms. Business Strategy and the Environment 8 (4) 238-248. http://dx.doi.org/10.1002/(SICI)1099-0836(199907/08)8:4<238::AID-BSE197>3.0.CO;2-M

Verheul, H. (1999),'How Social Networks Influence the Dissemination of Cleaner Technologies to SMEs', Journal of Cleaner Production, 7: pp. 213-219. http://dx.doi.org/10.1016/S0959-6526(99)00079-7

Williamson D, Lynch-Wood G, Ramsay J, 2006, "Drivers of environmental behaviour in manufacturing SMEs and the implications for CSR" Journal of Business Ethics 67 (3) 317-330 www.dti.gov.uk/sustainability/strategy/ (accessed 26/06/06)

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Darniųjų inovacijų diegimo kliūtys ir skatinantys veiksniai mažose ir vidutinėse įmonėse

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Aplinkos inžinerijos institutas, Kauno technologijos universitetas

(gauta 2012 m. vasario mėn., priimta spaudai 2012m. birželio mėn.)

Mažų ir vidutinių įmonių (MVĮ) vaidmuo ekonomei šalies plėtrai ir darbo vietų kūrimui yra labai svarbus, tačiau kartu MVĮ sukelia reikšmingą neigiamą poveikį aplinkai. Pagrindinis šio sektoriaus įmonių uždavinys – veiksmingai kurti ir diegti darniąsias inovacijas.

Straipsnyje aptarti Lietuvoje atliktos apklausos „Darniosios gamybos inovacijos mažų ir vidutinių įmonių plėtrai“ rezultatai, susiję su kliūtimis ir skatinančiais veiksniais, darančiais įtaką darniųjų inovacijų kūrimui ir diegimui MVĮ. Atliekant analizę, įmonės buvo suskirstytos į dvi grupes: MVĮ, turinčias patirties darniųjų inovacijų kūrimo ir diegimo srityje, ir MVĮ, kurios tokios patirties neturi. Siekiant patikrinti gautų rezultatų patikimumą ir palyginti MVĮ požiūrį, susijusį su kliūtimis ir skatinančiais veiksniais, tyrimo rezultatai buvo palyginti su kitose šalyse atliktų panašių studijų rezultatais.

Buvo nustatyta, kad darniųjų inovacijų kūrimo ir diegimo procesas Lietuvos MVĮ yra lėtas dėl įvairių kliūčių. Apklausos rezultatai parodė, kad darniųjų inovacijų kūrimą ir diegimą labiausiai riboja finansinės kliūtys ir personalo išteklių problemos.

MVĮ veiklai darniųjų inovacijų srityje didžiausią įtaką daro galimybės gauti finansinę paramą kurti ir diegti darniąsias inovacijas, taip pat su darniųjų inovacijų diegimu susijusios galimybės sumažinti sąnaudas. Kiek mažiau svarbūs skatinantys veiksniai: vartotojų poreikių tenkinimas, atitiktis teisiniams reikalavimams ir galimybės padidinti konkurencingumą. Dauguma apklausoje dalyvavusių MVĮ akcentavo bendradarbiavimo su mokslo institucijomis svarbą ir glaudesnio bendradarbiavimo poreikį.