

ENVIRONMENTAL MANAGEMENT IN SLOVENIAN INDUSTRIAL ENTERPRISES - EMPIRICAL STUDY

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Stimulated with the firm belief that environmental management helps enterprises to achieve business success, expressed by a majority of managers in the sample enterprises, we present the results of an empirical study in the Slovene processing industry. The purpose of our research work is to identify, analyse and present the importance of the environment in business decision-making, the role of environmental management in strategic decision-making and its distribution across the business functions; environmental performance in business processes; the use of the methods for environmentally oriented business decision-making and the developmental tendencies of environmental management in Slovene enterprises of the processing industry. We define the key drivers of environmental management and their effect on the environmental behaviour of these enterprises. We present and interpret data indicating that environmental management is caused not only by compliance and regulation, but also by competition and enterprises' own initiative.

1. INTRODUCTION

Environmental management in Slovenia has already been studied at the macro level (see, e. g. Černe, 1995, Radej et al., 1999). Since industrial sector is identified as a driving force of environmental pollution in Slovenia (Ministry of the Environment and Spatial Planning, 1998), we deal with environmental management in Slovene enterprises of the processing industry. Top managers and environmental managers, pollution prevention experts as well as the experts from different enterprise business fields (for example purchasing, production and services, research and development, and human resources) from 79

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enterprises in the Slovene processing industry took part in our inquiry during November and December 2001.

The purpose of our research work is to identify, analyse and present the importance of the environment in business, the role of environmental management in strategic decision-making and its distribution across the business functions; environmental performance of business processes; the use of the methods for environmentally oriented business decision-making, the use of eco-efficiency measures and the developmental tendencies of environmental management in the enterprises of the Slovene processing industry. The research is founded on entrepreneurial politics, strategic management, environmental management, economics, entrepreneurial planning and analysing as well as qualitative and quantitative methods for business decision-making. We emphasise the following parts of our research work:

- Together with defining the causes for the increasing influence of the environment in business we introduce the transformation of numerical values into verbal values, needed for the causes' classification.
- To ascertain the role of environmental management in business decision-making, we analyse its importance for business strategy and its distribution across the business functions. We deal with special working groups for environmental problems as well.
- We define the key drivers of environmental management by determining and ranging the causes for environmental investment programs.
- To research whether environmental performance in Slovene enterprises of the processing industry is improving, we analyse different indicators, for example the role of design for environment, the product and packaging development, the selection and control of supply chains and the production processes selection.
- Further, we analyse the use of the tools and methodologies for environmental management: environmental assessment (see, e. g. Pregrad and Musil, 1996), environmental benchmarking (see, e. g. Szekely et al., 2000), eco-efficiency measures (see, e. g. De-Simone and Popoff, 1997; Callan and Thomas, 2000), and models – scenarios of the business processes (see, e. g. Meško et al., 1995; Epstein, 1996; Beinat, 1997; Čančer 1998a, 1998b, 2000, 2001). Stimulated with the expressed managers' need for some completed tools and methodologies for environmental management, we recommend them the method for environmentally oriented business decision-making that has already been applied in Slovene enterprises (Čančer, 2001). We explain how to include the results of the above mentioned method in other decision-making methods.

Following the results of our empirical study, the conclusions regarding the purposes of our research are written.

2. ENVIRONMENTAL MANAGEMENT IN BUSINESS DECISION-MAKING

2.1. Importance of the environment in business

Almost all (97.5%) of the sample enterprises evaluate that the influence of the environment in business is increasing. They evaluated the role of nine causes for the increasing influence of the environment in business where 1 means the most important and 9 the least important role. Analysing the results of the causes for the increasing influence of the environment in business, numerical values can be transformed into verbal values. We define these causes as:

- strongly important when the number of numerical values 1, 2 and 3 presents at least one third of the number of numerical values for the considered cause,
- moderately important when the number of numerical values 4, 5 and 6 presents at least one third of the number of numerical values for the considered cause and
- weakly important when the number of numerical values 7, 8 and 9 presents at least one third of the number of numerical values for the considered cause.

The causes for the increasing influence of the environment in business and their importance are presented in Table 1.

Environmental regulation and globalisation is the most important cause in the Slovene processing industry since the numerical value 1 was given by 54.4% of the sample enterprises. Since numerical values 1, 2 and 3 were given by 79.7% of the sample enterprises, we can define environmental regulation and globalisation as a strongly important cause for the increasing influence of the environment in business. Standards are the second most important cause since the numerical value 2 was given by 34.2% of the sample enterprises.

The above mentioned and emerging markets for qualitative, environmentally friendly products can be defined as strongly important causes as well. According to the results of the evaluation in Table 1, we can evaluate business success as a weakly to moderately important cause for the increasing influence of the environment in business.

Table 1: Causes for the increasing influence of the environment in business

Cause for the increasing influence of the environment in business	Numerical value			Verbal value
	Mode	Percentage of enterprises	Importance	Percentage of enterprises
<i>Environmental regulation and globalisation</i>	1	54.4	STRONG	79.7
<i>Standards</i>	2	34.2	STRONG	60.8
<i>Emerging markets for qualitative, environmentally friendly products</i>	1	21.5	STRONG	48.1
<i>Changed customer expectations</i>	1	17.7	STRONG	36.7
	4	17.7	MODERATE	34.2
<i>Competitiveness</i>	2	15.2	STRONG	32.9
	4	15.2	MODERATE	35.4
<i>Greater consumer awareness</i>	1	21.5	MODERATE	38.0
	(5*)	20.3		
<i>Business success</i>	8	11.4	MODERATE	35.4
	(5*)	10.1	WEAK	36.7
	(9*)	10.1		
<i>Expectations of employees</i>	8	25.3	WEAK	48.1
<i>The public availability of environmental data</i>	9	24.1	WEAK	38.0

*Note: The second most frequently occurring numerical value for the considered cause.

Similarly, Table 2 shows that the most frequently perceived cause for environmental activities in enterprises is performance in accordance with compliance or regulation, followed by performance in accordance with standards, and pollution prevention and environmental improvement.

Market-related causes like customer satisfaction and new opportunities in marketing are perceived as weaker initiators of environmental activities. Only a quarter of the sample enterprises perform environmental activities for business results.

However, when the frequencies of environmental influence on firms' goodwill and the covering of business and pollution prevention goals are considered, the comprehension of the environmental influence on business success increases.

Only around a fifth of the sample enterprises perform environmental activities because of consumers' environmental awareness and - similarly - because of the environmental awareness of employees.

Table 2: Causes for environmental activities in enterprises.

Cause for environmental activities in enterprises	Percentage of enterprises
<i>Performance in accordance with compliance and regulation</i>	93.7
<i>Performance in accordance with standards</i>	72.2
<i>Pollution prevention and environmental improvement</i>	63.3
<i>Environmental activities influence firm's goodwill</i>	55.7
<i>Customer satisfaction</i>	44.3
<i>Covering of business and pollution prevention goals in some fields</i>	38.0
<i>Ecology is a strategic potential</i>	32.9
<i>New opportunities in marketing</i>	31.6
<i>Business results</i>	26.6
<i>Environmental awareness of consumers</i>	22.8
<i>Environmental awareness of employees</i>	19.0

2.2. Environmental management in business strategy

Environmental management is becoming very important for business strategy. Of a sample of 79 enterprises surveyed, three quarters claim that the environment is a central strategic issue. Managers ascribe to the environment different roles in strategic decision-making.

Figure 1. shows that more than a half of them see the environment as an important part of strategic decisions, almost one fifth see the environment as a vital part of strategic decisions. The same proportion considers the environment mainly because of the regulatory compliance. The environment is occasionally considered in 6.3% of the sample enterprises.

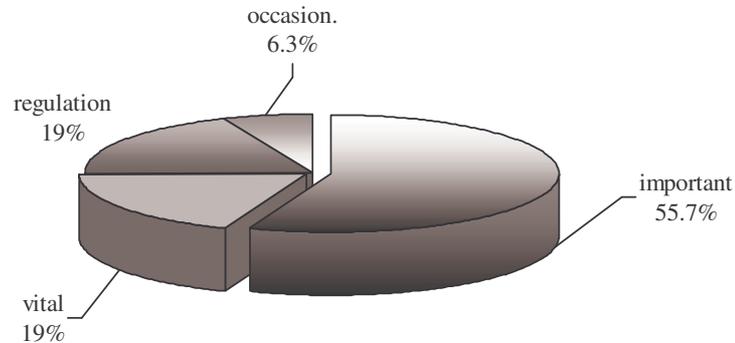


Figure 1. Roles of the environment in strategic decision-making.

Special working groups that deal with environmental problems were formulated in 62.0% of the sample enterprises in top management, first level management and mainly in middle management, respectively. The proportions of these enterprises for the management process levels are depicted in Figure 2.

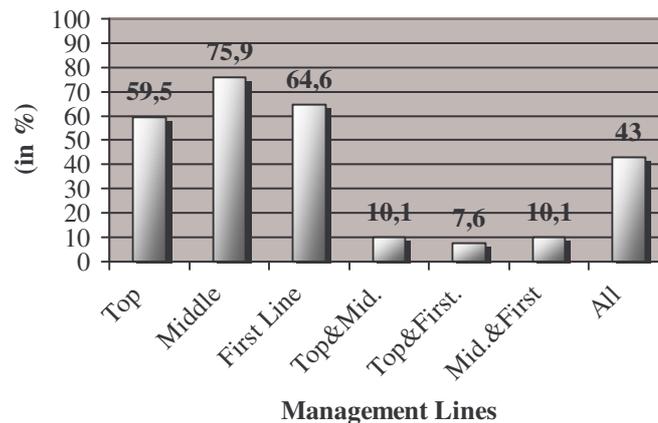


Figure 2. Enterprises with special working groups that deal with environmental problems

2.3. Distribution of environmental management across the business functions

Figure 3. shows the importance of environmental management in the following business functions: in human resources, finance and accounting, logistics, marketing, research and development; in purchasing environmental

management is important in approximately two thirds of the sample enterprises - that means that enterprises are aware of environmentally oriented supply management; in production it is important in almost all of the sample enterprises where experts and managers emphasise also service supported production.

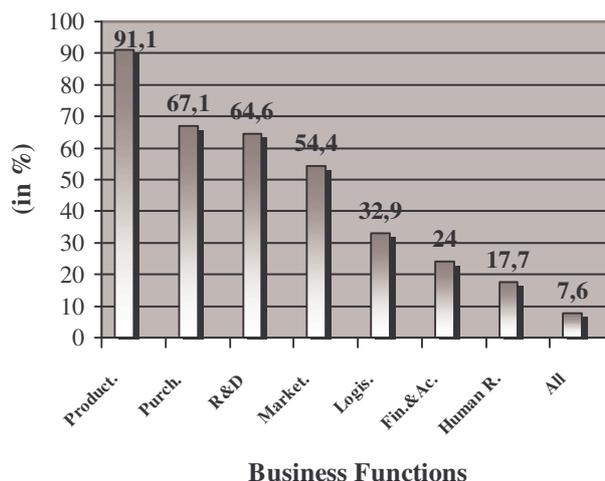


Figure 3. Environmental management in business functions.

However, the data about the importance of environmental management in business functions show a shift from additive environmental protection that is characterised by the removal of wastes and emissions after they appear in the production process (see, e. g. Pregrad and Musil, 1996) to integrated environmental protection that is characterised by the rational use of raw materials and by the prevention of wastes and emissions or by their return into the circular flows of transformation processes (see, e. g. Pregrad and Musil, 1996; Reijnders, 1996).

3. ENVIRONMENTAL PERFORMANCE IN BUSINESS PROCESSES

83.5% of the sample enterprises invest in environmental programs that contribute to the environmental performance. With Figure 4 we can determine the causes for environmental program investments that contribute to the environmental performance in enterprises in the current and in the next investment period following the percentage of the enterprises that determine the considered cause.

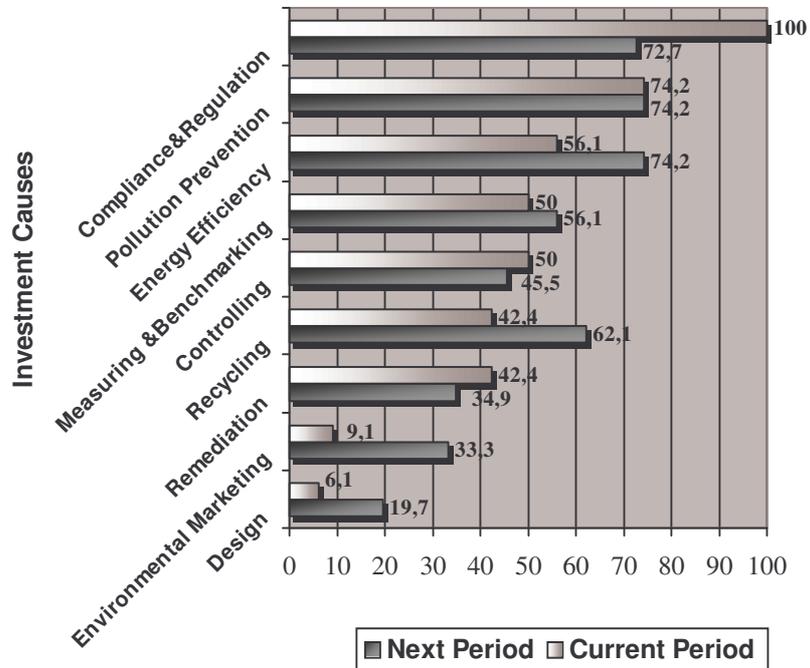


Figure 4. Causes for the environmental investment programs in enterprises

Environmental management is being driven mainly by compliance and regulation because all of the investing enterprises see compliance and regulation as the cause for the environmental program investments, pollution prevention, which is determined as the cause for environmental investments in the next investment period by the same percentage of enterprises, and energy efficiency. The drivers of environmental management in the next period are, according to the causes for environmental investments, pollution prevention and energy efficiency, compliance and regulation, and recycling. In the next investment period will also increase the proportion of the enterprises that determined the following causes for environmental investment programs: measure performance and benchmarking, design and environmental marketing. Enterprises determined 10% more causes for environmental investments in the next investment period.

Increasing roles of design and especially of environmental marketing show that environmental management is becoming a competitive issue. Moreover, environmental performance of the firm is evaluated as the key factor of

competitive advantage in 38.0% of the sample enterprises in the Slovene processing industry.

Lent and Wells (1994) concluded that the increasing role of design for environment shows that it could be the next step in product development. Our research results show that environmental criteria are included in the design process of new or redesign of old products in 81.0% of the sample enterprises. Three quarters (74.7%) of the enterprises claim that environmental management and total quality management are in synergy. Further, almost all (94.9%) of the sample enterprises evaluate the importance of environmental consideration in both product and packaging development and design as very important or important. In both product and packaging development and design, the environment is included with ISO 14001 (see, e.g. ISO14000 Infocenter) in some enterprises. More than three quarters (77.2%) of the enterprises in our sample select and control the suppliers that supply them with environmentally friendly elements of the business process.

Environment is extremely important in the production processes selection: it is considered in 92.4% of enterprises.

Growing environmental investments, new investment program patterns, an increasing role of pollution prevention, energy efficiency, recycling, environmental purchasing, environmental marketing and design for the environment indicate that environmental performance in Slovene enterprises of the processing industry is improving.

4. TOOLS AND METHODOLOGIES FOR ENVIRONMENTAL MANAGEMENT

43.0% of the enterprises in our sample use the tools and methodology for environmental management in business decision-making. 86.1% of the sample enterprises express the need to use the completed tools and methodologies for environmental management, e.g. measures that bring together environmental and business performance, and financial indicators of success. Approximately one quarter (26.6%) of the sample enterprises simulate the effects of environmental activities on business results with models, used as scenarios of the business process.

Stimulated with the expressed managers need for basic and completed tools and methodologies for environmental management we can recommend them the method for environmentally oriented business decision-making, so that business

results of enterprises are increased and environmental performance is improved (Čančer, 2001). This method is based on simulations where optimisation models of total business processes (Meško et al., 1995; Čančer, 2000) are used as scenarios. It enables the decision-makers in enterprises to consider different fields of integrated environmental protection (Čančer, 1998b) and to treat the environmental activities as connected functions. Using the described optimisation models, we completed the decision-making tools with some eco-efficiency measures (Čančer, 2001).

It is important to mention that the simulation results can show managers the possibilities for income increasing and costs decreasing, caused by decisions for environmental protection and improvement in these enterprises, even in a short run. Furthermore, the models that are used as scenarios of the business process can be completed with new possibilities of environmental performance in different simulations. The described method has already been applied in Slovene enterprises of the processing industry.

As economic and environmental goals may conflict in a short term, the decision makers should consider multicriteria decision-making methods (see, e. g. Dyer et al., 1992; Vincke, 1992; Logical Decisions, 1999). Using the described method for environmentally oriented business decision-making we can perform simulations for different alternatives when different environmentally oriented business decisions are included in the business process.

Optimal values obtained by the described method in different simulations can be included as the quantitative values of the attributes. Besides quantitative eco-efficiency measures, the ecological dimension of qualitative factors should be included in the decision-making process. The Analytic Hierarchy Process technique (see, e. g. Saaty, 1990, 2001; Forman and Gass, 2001) can be recommended to choose the most preferred environmentally oriented business alternative.

Table 3. presents the percentages of the sample enterprises that consider the fields of environmental assessment as the management tools in business decision-making. The greatest proportion of the sample enterprises consider emissions into the environment and their control and monitoring. Managers emphasise that environmental performance of suppliers is very problematic if a supplier is a monopolist. The field of public relations and information on environmental issues is least considered in the sample enterprises of the Slovene

processing industry. 11.4% of the sample enterprises consider all of the environmental assessment fields.

Table 3. Fields of environmental assessment in business decision-making.

Environmental assessment field	Percentage of enterprises
<i>Emissions into the environment, their control and monitoring</i>	86.1
<i>Selection and rational use of raw materials, water management</i>	84.8
<i>Minimisation, recycling, transport and disposing of waste</i>	83.5
<i>Selection and rational use of energy sources</i>	77.2
<i>Noise</i>	70.9
<i>Selection of new production processes, changes in old production processes</i>	55.7
<i>Education</i>	55.7
<i>Accident procedures, emergency preparedness</i>	48.1
<i>Environmental performance of suppliers</i>	26.6
<i>Public relations and information on environmental issues</i>	26.6
<i>All</i>	11.4

Environmental benchmarking perform 38.0% of the sample enterprises, 76.7% among them are benchmarking inside their industry, 30.0% are looking outside their industry and 20.0% at global leadership firms.

Almost three quarters (72.2%) of the experts found developing eco-efficiency measures a very difficult process, while the others found it a difficult process. No one (!) evaluated this development as an easy process.

All of the sample enterprises use compliance or regulation related measures. Almost a half (46.8%) of the enterprises uses the measures of impact on the environment. Approximately a third of the sample enterprises use the measures connecting environmental performance to the market (35.4%) and environmental performance or efficiency related measures (31.6%). Risk measures use 17.7% of the sample enterprises.

67.1% of the sample enterprises think that their environmental performance effects customer satisfaction. However, only 36.7% of the sample enterprises ascertain the changes in sale due to their environmental activities. According to our sample results we can conclude that the necessity of environmental marketing has to be proved in one third of the Slovene processing industry and that environmental marketing management must be initiated or seriously improved in two thirds of the Slovene processing industry.

Further, 65.8% of the sample enterprises include environmental costs in the products' cost-price.

38.0% of the sample enterprises measure the financial effects of their environmental performance. This means that in other enterprises of the Slovene processing industry the benefits of financial measurement have to be presented and proved.

A great stimulus for our research work on environmentally oriented business decision-making is the firm belief of 73.4% of the sample enterprises that environmental management helps enterprises to achieve business success.

5. CONCLUSIONS

Following the results of our research on environmental management in enterprises of the Slovene processing industry we can conclude that environmental management is becoming very important part of business strategy. Environmental experts and managers evaluate that the influence of the environment in business is increasing. Performance in accordance with compliance or regulation, standards, pollution prevention and environmental improvement, and goodwill are most frequently emphasised causes for environmental activities in enterprises. Market-related causes are less important drivers of environmental management at the moment. Business success is defined as weakly to moderately important. Most managers can still not connect business goals and results with environmental prevention and improvement.

Research findings regarding the importance of environmental management in business functions show a shift to integrated environmental protection with emphasised importance of environmental management in production, purchasing, research and development, and marketing. The increasing role of design for the environment, the importance of environmental consideration in the production processes selection in almost all of the sample enterprises, as well as the selection and control of suppliers in the majority of the sample enterprises indicate integrated environmental protection.

Although regulatory compliance is still a key force in environmental investment programs, new investment patterns reflect the new drivers of environmental management: pollution prevention is the surprising finding and it reflects higher environmental awareness, whereas energy efficiency, recycling as well as new efforts to measure and benchmark environmental performance may reinterpret environmental management as a contributor to eco-efficiency.

Environmental performance of the firm is evaluated as the key factor of competitive advantage in the minority of the sample enterprises. However, increasing roles of design and especially of environmental marketing show that environmental management is becoming a competitive issue. Further, the increasing role of design for the environment shows that it could be the next step in product, packaging and process development.

Growing environmental investments, new investment program patterns, an increasing role of pollution prevention, energy efficiency, recycling, environmental purchasing, environmental marketing and design for the environment indicate that in Slovene enterprises of the processing industry environmental management could decrease costs and increase eco-efficiency. However, methods of environmentally oriented business decision-making and the measures of the consequences of environmentally oriented business decisions on business success and on the environment have to become more sophisticated.

Around two fifths of the sample enterprises that use the tools and methodology for environmental management, perform environmental benchmarking and measure the financial effects of their environmental performance, an additional quarter of them that simulate the effects of environmental activities on business results with the models - scenarios of the business process, as well as two thirds of them that include environmental cost in the cost price, clearly indicate that they consider the environment not only as a competitive issue but that environmental management is becoming the enterprises' own initiative.

REFERENCES:

1. Beinart, E. (1997), *Value Functions for Environmental Management*, Kluwer Academic Publishers, Dordrecht, Boston, London
2. Callan, S. J., Thomas, J. M. (2000), *Environmental Economics and Management: Theory, Policy and Applications*, The Dryden Press, Sea Harbor Drive – Orlando
3. Černe, F. (1995), *Toward Consensus: A Study of Environmental Management Strategies Acceptance*, CEEC - Croatian Environmental Education Centre etc., Zagreb
4. Čančer, V. (1998a), *Simulation of the Environmentally Managed Business Process with Optimisation Model*, Doctoral Dissertation, Faculty of Economics and Business, Maribor

5. Čančer, V. (1998b), "The Possibilities of Including the Integrated Environmental Protection into the Business Process Optimisation Model", *Naše gospodarstvo*, Vol. 44, No. 5-6, pp. 685-698.
6. Čančer, V. (2000), "Environmental Management of Business Processes", *Management - Journal of Contemporary Management Issues*, Vol. 5, No. 2, pp. 83-97.
7. Čančer, V. (2001), "How to gain and maintain Eco-Efficiency as a Competitive Advantage of the Enterprise in Economy in Transition: A Practical Case", in: *Proceedings of the 4th International Conference on Enterprise in Transition*, Split – Hvar: Faculty of Economics, Split, pp. 1439-1453.
8. DeSimone, L. D., Popoff, F., with the World Business Council for Sustainable Development (1997), *Eco-efficiency: the business link to sustainable development*, MIT Press, Cambridge - Massachusetts, London - England
9. Dyer, J. S., Fishburn, P. C., Steuer, R. E., Wallenius, J., Zionts, S. (1992), "Multiple Criteria Decision Making, Multiattribute Utility Theory: the Next Ten Years", *Management Science*, Vol. 38, No. 5, pp. 645-654.
10. Epstein, J. M. (1996), *Measuring corporate environmental performance: best practices for costing and managing an effective environmental strategy*, McGraw-Hill, New York etc., with The IMA Foundation for Applied Research, Montvale
11. Forman, E. H., Gass, S. I. (2001), "The Analytic Hierarchy Process – An Exposition", *Operations Research*, Vol. 49, No. 4, pp. 469-486.
12. ISO 14000 Infocenter, *International Environmental Management Standard*, Internet: <http://www.iso14000.com>
13. Lent, T., Wells, P. R. (1994), "Corporate Environmental Management Survey Shows Shift from Compliance to Strategy", in: *Environmental TQM*, McGraw-Hill, New York etc.
14. Logical Decisions (1999), *Logical Decisions for Windows - Decision Support Software*, Logical Decisions, Golden, Colorado
15. Meško, I., Čančer, V., Meško, T. (1995), "Decision Support Scenario of the Multiphase Production Process", in: *Proceedings of the 2nd International Conference Design to Manufacture in Modern Industry*, Maribor: Faculty of Mechanical Engineering, part 1, pp. 309-318.
16. Ministry of the Environment and Spatial Planning (1998), "Environment in Slovenia 1996", in: *State of the Environment in Slovenia 1996*, Report according to para. 75 and 76 of the Environment Protection Act, Ljubljana:

Republic of Slovenia, Ministry of the Environment and Spatial Planning, pp. 253-256.

17. Pregrad, B., Musil, V. (1996), "Technology and integrated environment Protection", in: *Quality for European Integration*, University of Economics, Poznan, pp. 199-202.
18. Radej, B., Pirc Velkavrh, A., Globevnik, L. (1999), *Indicators on Environment and Development*, Institute of Macroeconomic Analysis and Development, Ministry of Environment and Spatial Planning, Water Management Institute, Ljubljana
19. Reijnders, L. (1996), *Environmentally Improved Production Processes and Products: An Introduction*, Kluwer Academic Publishers, Dordrecht
20. Saaty, T. L. (1990), *Multicriteria Decision Making: The Analytic Hierarchy Process*, RWS Publications, Pittsburgh
21. Saaty, T. L. (2001), *Decision Making with Dependence and Feedback - The Analytic Network Process*, RWS Publications, Pittsburgh
22. Szekely, F., Vollmann, T., Ebbinghaus, A. (2000), *Environmental Benchmarking: Becoming Green and Competitive*, Stanley Thornes, Cheltenham
23. Vincke, Ph., (1992), *Multicriteria Decision-Aid*, Wiley, Chichester

UPRAVLJANJE UTJECajem NA OKOLIŠ U SLOVENSKIM INDUSTRIJSKIM PODUZEĆIMA – EMPIRIJSKO ISTRAŽIVANJE

Sažetak

Na temelju čvrstog uvjerenja da upravljanje utjecajem na okoliš pomaže poduzećima u postizanju poslovnog uspjeha, koje je iskazala većina anketiranih menagera, u ovom se radu prezentiraju rezultati empirijskog istraživanja slovenske prerađivačke industrije. Cilj je ovog istraživanja identificiranje, analiza i prezentacija značaja upravljanja utjecajem na okoliš u strateškom odlučivanju. Međutim, jednaka se pažnja posvećuje i ulozi upravljanja utjecaja na okoliš u poslovnim funkcijama, utjecaju poslovnih procesa na okoliš, korištenju metoda orijentiranih prema ekološki odgovornom poslovnom odlučivanju i razvojnim tendencijama upravljanja utjecajem na okoliš u slovenskim prerađivačkim poduzećima. Osim toga, u radu se identificiraju i ključni pokretači upravljanja utjecajem na okoliš i njegovog efekta na ponašanje istraživanih poduzeća. Pritom se može reći da postoje indikacije kako upravljanje utjecajem na okoliš nije isključivo posljedica poštovanja zakona i državne regulacije, već da proizlazi i iz efekata tržišne konkurencije, ali i vlastite inicijative poduzeća.

