THE ENVIRONMENTAL CREDITWORTHINESS ASSESSMENT METHODOLOGY

Metodologija presojanja okoljske bonitete

Vesna Čančer
University of Maribor, Faculty of Economics and Business
vesna.cancer@uni-mb.si

Miroslav Rebernik
University of Maribor, Faculty of Economics and Business
rebernik@uni-mb.si

Jožica Knez-Riedl
University of Maribor, Faculty of Economics and Business
jozica.knez@uni-mb.si

Abstract
This paper aims to offer a review of existing theoretical bases of the measurement and assessment of environmental creditworthiness, particularly on the level of enterprises. Its objective is also to examine the possibilities of the multi-criteria assessment of environmental creditworthiness by enterprises themselves (“internal rating”). Following the prescriptive approach, it delineates the particularities of a frame procedure for the multi-criteria assessment of environmental creditworthiness. The credibility of eco-ratings depends not only on the quality of information sources and the choice of sensible environmental indicators, but also on the transformation of data into local and aggregate values that are understandable to decision makers.

Keywords: environmental creditworthiness assessment, enterprise, multi-criteria decision making, prescriptive approach, social responsibility

Izvleček
V prispevku podajamo pregled teoretičnih osnov merjenja in presojanja okoljske bonitete, in sicer predvsem na ravni podjetij. Cilj prispevka je proučiti možnosti večkriterijskega presojanja okoljske bonitete v podjetjih samih (t. i. interni rating). Upoštevamoč preskriptivni pristop, razčlenjujemo posebnosti okvirnega postopka za večkriterijsko presojanje okoljske bonitete. Ugotavljamo, da je kredibilnost ekoratingov odvisna ne le od kakovosti informacijskih virov in izbire okoljskih indikatorjev, ampak tudi od transformacije podatkov v odločevalcem razumljive lokalne in agregirane vrednosti.

Ključne besede: presojanje okoljske bonitete, podjetje, večkriterijsko odločanje, preskriptivni pristop, družbena odgovornost

1 Introduction
In seeking ways to link economic and environmental performance, firms adopt environmental standards when trying to remain competitive or gain a competitive advantage. As a result, they are interested in environmental best practices and environmental creditworthiness (EC), also known as eco-rating, of others and of themselves (Knez-Riedl, 2002, p. 169). The motives for eco-rating assessment are various. Some environmentally conscious enterprises want to choose their partners based on their environmental profile or en-

This research is part of the research program P5-0023: Entrepreneurship for Innovative Society, supported by the Public Agency of the Republic of Slovenia for Research Activity.
vironmental performance; prudent enterprises check both existing and potential business partners either by themselves (“internal” or “in-house” rating) or using external ratings provided by several rating agencies. The number of external rating agencies specializing in eco-ratings is increasing all over the world. As ratings are important for several reasons, especially strategic business decisions, the importance of the environmental bottom-line raises the quest for information about environmental performance, environmental impact, and especially environmental risks. Thus, the level of disclosure in environmental reports is critical.

At the same time, the importance of so-called green investing is also increasing. In this context, banks in particular have been developing several assessment approaches for environmental risks. The information they are providing are of different explanatory power, depending on criteria and sub-criteria taken into account. Eco-rating approaches are mainly sector- or activity-specific approaches (ADFIAP, 2009). For example, licensed assessors provide eco-rating construction assessments, packaging eco-assessment ratings, and sustainability ratings for mobile phones in the mobile service industry; at the level of national economies, an eco-rating certification program for eco-tourism has already been developed.

Building a green portfolio involves emphasizing not only environmental risks. Investors (both individual and institutional) are equally aware of environmental opportunities. They are determined to raise their stakes in the market of opportunities for potential profit offered by investing in solar and wind power, marine and geothermal energy, power storage, smart grids, hydrogen and fuel cells, green transport, green buildings, and the waste sector (Hanna, 2010). Thus, profit still matters because, in the long run, a company cannot ensure its own sustainability unless it is generating an excess of income over the costs.

The concepts of the creditworthiness of a firm vary, as do the approaches to its assessment. The main objectives of this paper are as follows:

- To review existing theoretical bases of the measurement and assessment of EC, particularly in enterprises, and
- To examine the possibilities of the multi-criteria assessment of EC in enterprises for internal rating.

The research methodology used in this paper includes a literature review—a thorough search for relevant papers in international databases, conference proceedings, and official documents, together with their interpretation in web sources. As a result of our exploratory and descriptive research, we compile an array of environmental indicators of EC, the ecological dimension of the other qualitative factors and indicators should be analyzed and assessed (e.g., of site, business program, products/services, technology, investments, strategies, innovations, knowledge, management quality) (Knez-Riedl & Vezjak, 1997).

2 Selected Viewpoints of the Environmental Creditworthiness Assessment

Most current methods for ECA deal with both risks and opportunities. In addition to risk awareness, the contemporary concept of creditworthiness is oriented toward the conscious search for perspective business partners. In the last two decades, the cognition that it is not enough to use only a financial analysis as a predominant analytical method and the financial measures as the main analytical tool has been brought into force. Therefore, some approaches, known and used especially in the field of marketing and strategic management (e.g., SWOT analysis, portfolio method, life-cycle approach) seem to be appropriate for ECA (Knez-Riedl, 2002, p. 171).

The EC can be assessed either implicitly or explicitly. In the case of a lack of appropriate databases or of an undeveloped environmental information system, it is assessed implicitly. The data describing the ecological profile of a firm are extracted from the existing databases for each of other relevant factors for assessing creditworthiness (Knez-Riedl, 2002, pp. 172–174). An ecological balance sheet enables quicker and improved insights into the ecological profile of a firm by calculating what is known as the environmental indicators.

In addition to the development of the environmental ratios systems, which present the quantitative factors and indicators of EC, the ecological dimension of the other qualitative factors and indicators should be analyzed and assessed (e.g., of site, business program, products/services, technology, investments, strategies, innovations, knowledge, management quality) (Knez-Riedl & Vezjak, 1997).

2.1 Environmental Indicators

The OECD’s work on environmental indicators (OECD, 2003) concluded that they are cost-effective and valuable tools as they strengthen the countries’ capacity to monitor and assess environmental conditions and trends so as to increase their accountability and evaluate how well they are satisfying their domestic objectives and international commitments. Similar conclusions can be drawn for firms.

Environmental indicators should be a tool for decision making and control over a firm itself and for its partners. They demonstrate the level of ecological awareness and the impact of a firm on the environment. They are mainly
distinguished into indicators about materials, packaging, energy, water, and waste. In addition, they can be classified as emissions, cost indicators, and investments. Several industries have developed specific, relevant indicators.

According to Biswas et al. (1998), ecometrics are indicators that reflect either environmental attributes, such as a concentration or temperature, or an effect anticipated to have an environmental consequence, such as a discharge, the selection of a given material, or the use of a product. Economic, technical, and societal factors are often embedded into these measures. Ecometrics have been proposed for applications in areas as diverse as ecolabeling, new product design, marketing, internal and external corporate reporting, and credit screening (Biswas et al., 1998). Specific indicators for given decision makers, industrial sectors, products, and services are required.

Indicators, categorized as micrometrics, have been developed for firm-wide (as well as for local and product-based) assessments. They include materials intensity, energy consumption, and emission data—often from lifecycle perspectives—scaled with respect to unit of production, gross domestic product (GDP) per capita, and other normalization variables. Micrometrics are oriented to a given product and industry and might indicate consumption through the lifecycle as measured by material and energy intensity or waste and toxic release emissions. Eco-indicators are a subset of microecometrics and can be used to evaluate firms according to environmental criteria (Biswas et al., 1998).

From a firm management point of view, several dimensions are relevant for constructing indicators for environmental policy making, including waste minimization, reduced consumption of non-renewable resources; energy efficiency; shared responsibility; environmental training; targets and objectives set beyond minimum compliance; public disclosure; sustainable development; habitat conservation; research and development, British Standard 7750² (BS7750), and Eco-Management and Audit Scheme (EMAS); worldwide standards; compensation for environmental damage; and legislative compliance and liability on environmental issues (Olsthoorn et al., 2001).

Olsthoorn et al. (2001, p. 3) delineated the function of environmental indicators inside and outside the firm to different users—namely, corporate manager, production plant manager, market manager, purchasing manager, environmental authorities, authorities (national), investors and shareholders, and consumers. The authors highlighted the notable need for standardization (to make sense of environmental information) and aggregation of environmental information for both external as well as internal users. In this paper, we can conclude that, when indicators are developed, they supplement each other; however, the need for standardization and the aggregation of environmental information still exists. Multi-criteria decision analysis can therefore be used for the aggregation of environmental information.

2.2 Broader Approaches to and Contexts of Environmental Creditworthiness Assessment

In this article, EC is understood in the context of sustainable development. Our exploration of ECA is therefore included in the sustainability and social responsibility context. Spangenberg (2002) underscored the lack of comprehensive frameworks consisting of a limited number of selected indicators based on a standardized, transparent, and methodologically sound basis permitting cluster indicators in meaningful ways to suggest policy priorities. It can be concluded that, for the environmental and social impacts of economic policies, a number of indicators have been developed, mainly based on the notion of preserving the capital stocks of social and environmental capital (OECD, 2001a, 2001b).

Greater awareness of (process and product) sustainability in recent years (i.e., before the 2008+ crisis) has led to the development and implementation of a wide range of instruments for measuring, evaluating, and comparing environmental performance. According to Proto et al. (2007), eco labeling has become a fundamental benchmarking system for enterprise sustainability performance and guidance in consumer choice. The improvement of organizational, environmental, social, and ethical performance contributes to various actions toward sustainability via three dimensions: economic, environmental, and social (i.e., the “triple-bottom-line” approach).

Many approaches and tools can be used to integrate environmental aspects into eco-rating assessments that have been or are being developed. Criteria structured into sub-criteria use a variety of information. For example, the Dow Jones Sustainability Index (SAM, 2012) covers economic, environmental, and social dimensions. The environmental dimension relies upon the following criteria: biodiversity; business opportunities financial services/products; business risk in large projects/export finance; climate change governance; climate strategy; electricity generation; environmental footprint; environmental policy, management system; environmental reporting; transmission and distribution; and water-related risks.

In recent years, a firm’s environmental performance has been dealt with within the concept of corporate social responsibility (CSR). The literature on social responsibility indicates that such interest in CSR has increased the realization of the social necessity to develop holistic aims and objectives as well as the contemporary consideration of economic, social, environmental, and ethical aspects in the formulation of corporate guidelines (Menz, 2010).

² BS7750 is a specification for an environmental management system. The system is used to describe the company’s environmental management system, evaluate its performance, and define policy, practices, objectives, and targets as well as provide a catalyst for continuous improvement (Quality Network, 2006).
The 2011 World Resources Forum revealed the need for effective steps toward a resource-efficient green economy. These steps depend not only on technical knowledge, but also on institutional changes and social innovation; therefore, they call for consideration of the social sciences and humanities perspectives. Assessment methods and resource-use indicators, among other topics, have been dealt with. Additional issues (e.g., values, emotions, mindsets, and underlying driving forces for consumption, such as status) should also be considered in addition to quantified data and indicators (SAGUF, 2011).

Our suggestion for enterprises is to follow the Roadmap to a Resource-Efficient Europe (EC, 2011) and include the adapted resource-efficiency indicators3 in the model for ECA.

3 Multiple Criteria Assessment of Environmental Creditworthiness

Taking into account multiple dimensions, ECA by its very nature cannot have one unambiguously optimal solution. We can determine the ideal solution, which usually does not exist in real life. Real-life alternatives can be compared, and the best solution from among them selected. Almost two decades ago, Munda (1995) pointed out that sustainability assessment must be based on multi-criteria analysis. Based on the performed investigation, it can be concluded that ECA must be based on multi-criteria decision making (MCDM)4 as well.

As even the use of well-defined traditional quantitative procedures can oppress effective decision making and given that decision theories—particular game theory—are based on the unreal assumption that a decision maker is always perfectly rational, Raiffa (1994) suggested using a prescriptive approach to decision making: Instead of regarding people as perfectly rational individuals, we develop systematic decision-making procedures based on a combination of normative theories, cognitive aspects, and behavioral aspects—namely, the structural components of decision making in practice.

Considering the prescriptive approach to decision making, we present the framework for MCDM (Čančer, 2007), which includes the following steps: define the problem, eliminate unacceptable alternatives, structure the problem, measure the local values of alternatives, weigh the criteria, synthesize, rank, and conduct a sensitivity analysis. We will delineate the particularities of the framework for the multi-criteria assessment of EC in a step-by-step manner.

First Step: Define the problem

When a problem arises, we should describe it accurately by defining relevant criteria—namely, environmental factors and indicators—and alternatives. When building a multi-criteria model for the ECA in enterprises, alternatives include enterprises or groups of them. The characteristics of indicators can be described using the SMART concept: They should be simple, measurable, accessible, relevant, and timely. Moreover, they should be administratively practical and cost-effective to populate (Department of the Environment and Heritage, 2006). These should be taken into consideration when choosing the criteria in the definition of the multi-criteria problem—that is, the ECA.

It has already been reported that attempts to develop indicator sets often fail to gain broad support because their developers invest too much effort in specifying the indicators and not enough in understanding the issues and objectives for which the indicators are intended to inform (Department of the Environment and Heritage, 2006). The choice and use of environmental indicators by companies also depend to some—perhaps large—extent on the type of firms; their sector, size, and proximity to environmentally sensitive consumer markets; the time horizon involved; the type and degree of external environmental regulations; and the corporate culture of the organization (Olsthoorn et al., 2001).

Among the OECD categories of environmental indicators, in our opinion, sectoral environmental indicators (SEI) are the most appropriate for being adapted for ECA in a particular enterprise. Enterprises can consider SEI when designing firms’ indicators. SEI are designed to help integrate environmental concerns into sectoral policies, and each set focuses on a specific sector (e.g., transport, energy, household consumption, tourism, agriculture). Indicators are classified following an adjusted pressure-state-response model reflecting sectoral trends on environmental significance; their interactions with the environment (including positive and negative effects); and related economic and policy considerations.

Among environmental performance indicators, the ones linked to qualitative objectives can come to the forefront when designing the set of indicators for ECA, particularly with respect to the eco-efficiency of human activities.
They can be adapted for the use on the firms’ level (e.g., emissions per unit of value added⁶ instead of GDP, relative trends of waste generations, and value-added growth). Environmental performance indicators for policies, programs, or initiatives need to be clearly related to the objectives they are meant to measure.

Among environmental indicators, management indicators⁵ yield complementary information that often explains the environmental performance as quantified by the physical, economic, or impact indicator. We would like to underscore that the first class of management indicators, corresponding to those described in the International Business Environmental Barometer (Belz & Strannegård, 1997), is designed for the measurement of perceptions, attitudes, and strategies toward the environment (Olsthoorn et al., 2001). In the second broad class of management indicators, the information is based on quantified, verifiable information. Examples include environmental investments, running costs pertaining to environmental protection (fees, personnel expense, fines, energy, maintenance), number of employees with specific environmental tasks, number of reported incidents, and degree of compliance with regulations.

The European Eco-Management and Audit Scheme (EMAS) can be helpful when constructing the core indicators that can be used in all companies. In the first version (available since 1995), EMAs originally restricted to companies in industrial sectors; since 2001 it has been open to all economic sectors, including public and private services. In our opinion, the core indicators suggested in the EU Regulation (European Parliament, Council, 2009) can be included in the structure for the ECA in organizations.

**Second Step: Eliminate unacceptable alternatives**

We should define the requirements for the alternatives. We assess all possible alternatives; when the alternative does not fulfill the requirements, it is defined as unacceptable and should therefore be eliminated. It has already been reported that the selection of environmental indicators depends on the companies’ characteristics. Similarly, the set of alternatives is also defined by considering the type of firms as well as their sector, size, and proximity to environmentally sensitive consumer markets.

**Third Step: Structure the problem**

In the multi-criteria assessment of EC, both quantitative and qualitative factors of EC, together with relevant environmental indicators, should be structured in the hierarchical model. Each problem consists of a goal (ECA), criteria (factors), often levels of sub-criteria (indicators), and alternatives (enterprises). In a hierarchy, criteria can be structured in more levels so that lower levels specify sets of sub-criteria related to the criterion of a higher level. Considering the logic of requisite holism (Rebernik & Mulej, 2000), the criteria can be structured into two levels: factors and indicators. When differentiating between quantitative and qualitative factors, they can be structured into three levels.

**Fourth Step: Weighting criteria**

We have to establish the criteria’s importance in order to define the weights of the criteria by using the methods based on the ordinal (e.g., SMARTER), interval (e.g., SWING and Simple Multi-attribute Rating Approach) and ratio (e.g., AHP⁸) scale or through direct weighting (Bouyssou et al., 2000; Helsinki University of Technology, 2008). Professionals from several fields who are capable if inter-disciplinary cooperation should be involved in this step.⁹ They can respond the questionnaires and then coordinate their judgments with other respondents. Establishing group priorities is well supported by the group decision-making upgrades of computer programs for MCDM.

In the ECA, we want to achieve diversification among the criteria’s importance. The calculation methodology of Kinder, Lydenberg and Domini—one of the world’s first rating agencies that specializes in the analysis and assessment of corporate social performance considering the multidimensionality of CSR—has already been criticized because almost all factors have the same weight (Menz, 2010). Obviously, in a sector comparison, social, societal, and environmental aspects are of differing relevance. For example, in the energy and chemical industry, environmental issues play a more important role, whereas in the textile and toy industry as well as in food and beverage manufacturing social factors often come first (Menz, 2010). Not all sectors are affected by the same level of economic, environmental, and social problems.

**Fifth Step: Measure alternative values**

This step involves judging the preferences to alternatives and the calculation of the values of alternatives with respect to each criterion on the lowest-level indicators.

---

⁵ Value added is often advocated because it supposedly reflects the contribution of manufacturing activity to the global welfare, as measured by, for example, the national GDP (Olsthoorn et al., 2001).

⁶ Management indicators provide information on the organization's capability and efforts in managing matters such as training, legal requirements, resource allocation, documentation, and corrective action, which have or can have an influence on organizations' environmental performance (Olsthoorn et al., 2001).

⁷ Core indicators focus on performance in the following key environmental areas: (i) energy efficiency; (ii) material efficiency; (iii) water; (iv) waste; (v) biodiversity; and (vi) emissions. Each core indicator is composed of a figure A indicating the total annual input/impact in the given field, a figure B indicating the overall annual output of the organization, and a figure R indicating the ratio A/B (European Parliament, Council, 2009).

⁸ We have already used the AHP methodology to assess business partners’ creditworthiness (Čančer et al., 2003).

⁹ However, decision makers are often not aware of the relationships among different factors and indicators taken into account for the goal fulfillment.
We can measure the local alternatives’ values by making pair-wise comparisons (e.g., measuring local values of alternatives with respect to qualitative or intangible criteria) or by using value functions.\(^{10}\) According to the authors’ experience, value functions are especially applicable when exact (e.g., financial) data are available for alternatives with respect to a particular criterion.

Value functions have already been successfully used in measuring eco-efficiency, such as being applied to the evaluation of the pollution emissions of an industrial plant and to cleaning up a polluted site\(^{11}\) (Beinat, 1997). According to the characteristics of an indicator, experts can determine increasing or decreasing, exponential, linear, or piecewise linear value functions. For example, value functions for lead pollution, the reduction of organic matter, cost and time, as well as the environmental concentration of topsoil, surface water, and groundwater are constructed as decreasing, piece-wise linear, or linear ones.

Professionals from several fields should be involved in this step as well; in particular, those with skills in their own professions as well as the ability to engage in interdisciplinary cooperation are of great importance when making pair-wise comparisons or defining value functions (the type, lower and upper bounds). Expert judgments are necessary in order to fill any information gaps.

**Sixth and Seventh Steps: Synthesize and rank**

Aggregation transforms data to allow for a better understanding or interpretation of the data by different groups or for different purposes. Due to the large multiplicity of data and measurement units used to describe business activities, methods are needed to integrate various parameters from different levels of analysis. According to Olsthoorn et al. (2001), the most frequently used methods are linear programming-based methods (such as data envelopment and the productive efficiency method) or, more generally, multiple criteria analysis.

In synthesis, the additive model is usually used to obtain the aggregate (overall, global) alternatives’ values. Using the alternatives’ ranking, we can select the most appropriate alternative(s), eliminate the alternative(s) with the lowest final value, or compare the alternatives with respect to their aggregate values.

The creditworthiness assessment results enable us to perform benchmarking to either detect the best alternative or construct the ideal alternative and then compare the considered alternatives with the alternative that fulfills the benchmark criteria (Čančer, 2005). The detailed presentation of results should be chosen in order to determine the considered alternatives’ value and rank with respect to each indicator and factor.

Although in MCDM the additive model is usually used in synthesis, some authors (in the field of sustainable development as well) warn that a simple addition will not be feasible for minimizing trade-offs and exploiting synergies among criteria. According to Stangenberg (2002), the likely best-known interlinkage indicator is eco-efficiency, which is an example of the integration of economic and environmental objectives. Interactions among criteria can be considered by using other approaches, such as the multiplicative model (Bouyssou et al., 2000) or the discrete Choquet integral (Čančer, 2010; Grabisch, 1995; Marichal & Roubens, 2000).

**Eighth Step: Analyze sensitivity**

Sensitivity analysis is used to investigate the sensitivity of aggregate alternatives’ values to changes in the criteria weights. It also enables assessors to detect the key success and failure spheres of a firm’s environmental performance.

**4 Conclusion**

Given the great diversity of industries, stakeholders, and applications, it is not possible to unify different approaches to environmental indicators into a single set of indicators. National and international organizations and institutions can offer only the framework for the development of the ECA model at the firm level; they cannot prescribe a list of the indicators that should be included in the companies’ model for ECA—not only because companies are privately run, but also because indicators should vary among companies according to their industry, previous environmental activities, location, etc. Therefore, it is impossible to design a uniform selection of eco-indicators for all enterprises.

Even when indicators are agreed upon (e.g., within organizations of a particular sector) and data are available, expertise and specialist knowledge are still required to interpret data results (Department of the Environment and Heritage, 2006), not to mention the whole range of tacit knowledge (Polanyi, 1966/1983) and organizational routines (Nelson & Winter, 1982). The ECA based on the multi-criteria methods seeks to integrate objective measurements with value judgments and manage subjectivity.

The proposed multi-criteria ECA methodology offers several advantages. The prescriptive approach by using the above mentioned group of methods based on assigning weights is computer supported. Although the transformation of data into local and aggregate values is obtained using easy-to-use software (see, e.g., Helsinki University of Technology, 2008; Zopounidis & Pardalos, 2010), multi-criteria methods do not replace the experience of various professionals; however, such methods are invaluable when defining and structuring the problem (i.e., ECA) in criteria weighting and in measuring local alternatives’ values. Multi-criteria ECA methodology enables us to take into account

---

\(^{10}\) Value functions map the scores profile of an alternative into a (local) value, usually normalized from 0 to 1. The 0 and 1 values are associated with two real or hypothetical score profiles, which represent the best and worst situations considered (Beinat, 1997).

\(^{11}\) This assessment aimed at determining the expert-value functions.
multiple more or less conflicting criteria (i.e., factors and indicators of EC). It also helps decision makers confront other participants’ judgment, understand the aggregate alternatives’ values, and use them in the activities toward sustainability and social responsibility.

Another advantage of MCDM is that it enables group decision making; moreover, it has become a developing tendency in MCDM. Namely, building models for ECA, assigning weights to criteria, and measuring local values of alternatives are the steps of the MCDM in which different interested parties and interdisciplinary professional expertise should contribute. Value functions are effective in integrating expert judgments and decision-maker values, especially when appropriate assessment techniques for environmental decision problems can be applied (Beinat, 1997). Expert-based value functions are able to reproduce expert opinions.

However, firms should be aware that socially responsible and, in this context, environmentally responsible companies cannot necessarily achieve better economic development than other firms. Menz (2010) pointed out that the consideration of social and environmental factors is also directly associated with higher costs because, for example, extensive health and safety measures of modern, environmentally friendly production facilities are expensive, which could result in a company’s decrease in profitability and competitiveness. As the side effects caused by entrepreneurial activity (for example, air and water pollution, health impairments) are often not or not fully borne by the polluter (imperfect internalization of external effects), less responsible companies could benefit economically at the expense of society.

The credibility of eco-ratings depends on the quality of information sources and the choice of sensible environmental indicators. Still, indicators or ratios are not enough. Information and indicators should contribute to high-quality analyses and resulting findings as well as recommendations and suggestions. In terms of analyses, different types are in use (for example, integrated analyses, portfolio analyses) in addition to staggered approaches (ADFIAP, 2009). The multi-criteria assessment of EC proposed in this paper presents such a methodology that can bring about more reliable results.

Finally, we cannot overlook the fact that environmental performance is only one dimension of the triple-bottom-line concept, and environmental assessments and reports are just a part of sustainability assessments and reports. What’s more, the preparation of integrated reporting occurs before launching an international integrated reporting framework (IIRC, 2012). In this context, all three reports (economic, environmental, and social) should be unified into one report. However, the connectedness between them should be professionally analyzed and interdependencies explained. Environmental creditworthiness assessment methodology can be instrumental in this endeavor.

5 References
companies involved in the sustainability revolution.
Petersfield, NH: Harriman House Ltd.


Vesna Čančer holds a PhD in economic and business sciences and is an associate professor of quantitative economic analyses at the University of Maribor’s Faculty of Economics and Business. Her research focuses mainly on multi-criteria decision making, creative problem solving, creditworthiness assessment, business process optimization, and environmental management. She has authored and co-authored a number of recent articles, book chapters, and papers.

Dr. Vesna Čančer je izredna profesorica za predmetno področje kvantitativnih ekonomskih analiz na Ekonomsko-poslovni fakulteti Univerze v Mariboru. Raziskovalno se ukvarja predvsem z večkriterijskim odločanjem, ustvarjalnim reševanjem problemov, presojanjem bonitete, optimizacijo poslovnih procesov in okoljskim upravljanjem. Je avtorica in soavtorica številnih člankov, poglavij v knjigah in objavljenih prispevkov na konferencah.

Miroslav Rebernik, PhD, is a professor of business economics and entrepreneurship at the Faculty of Economics and Business, University of Maribor. He was a visiting professor at Portland State University and a recipient of a Fulbright research fellowship at Babson College. He has participated in more than 80 national and international conferences. He participates in peer reviews and editorial boards for Business & Economics Review, Journal of Small Business Management, International Journal of Entrepreneurial Venturing, Economic Review: Journal of Economics and Business and the Journal of Global Entrepreneurship Research. He is the head of the research program for Entrepreneurship for Innovative Society, leads the research team Global Entrepreneurship Monitor Slovenia, and is co-editor of Slovenian Entrepreneurship Observatory.


Jozica Knez-Riedl, PhD, is full professor of business economics, environmental economics, and responsible entrepreneurship lecturing at Slovenian and foreign universities. In 2000, she published first Slovenian book about the topic as well as several papers in international scientific journals and other publications. She is a reviewer for international scientific journals. For her scientific work in the field of CSR and the promotion of CSR, she was awarded the HORUS award by the Slovenian Institute IRDO in 2009.

Dr. Jožica Knez-Riedl je redna profesorica za poslovno ekonomiko, okoljsko ekonomiko in odgovorno podjetništvo, kar predava na domačih in tujih univerzah. Leta 2000 je objavila prvo slovensko knjigo o boniteti podjetja, sicer pa številne članke v mednarodnih revijah in druge publikacije. Je recenzentka pri mednarodnih znanstvenih revijah. Za svoje znanstveno delo na področju družbene odgovornosti in njeno promocijo je leta 2009 prejela nagrado Horus, ki jo podeljuje slovenski inštitut IRDO.