

Review paper

SUSTAINABILITY BALANCED SCORECARD AND ECO-EFFICIENCY ANALYSIS*

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Abstract. *The use of a Balanced Scorecard enriched performance measurement system in a way that, in addition to traditional financial measures, appear performance measures classified in the consumer perspective, internal business processes and innovation and learning perspective. All the research represented, are related to environmental and sustainable development aspects, which is seen as critical success factors in creating a positive company image in contemporary business. Therefore, the question of corporate sustainability objectively requires the establishment of relationships between sustainable development and its measurement and monitoring. The aim of this paper is to indicate on the importance of applying the Balanced Scorecard as an open system that can be involved the interests of all stakeholders, when are vital to the success of business strategy. Special attention will be focused on analyzing the relationship between Sustainability Balanced Scorecard, which allows the management by simultaneous improvement of the of environmental, social and financial aspects of business and eco-efficiency analysis, as an instrument for the assessment and control of appropriate key performance measures for environmental and economic aspects, as the main aspects of sustainability.*

Key Words: *Sustainability Balanced Scorecard, sustainable development, eco-efficiency analysis.*

INTRODUCTION

The last decade of the 20th century was marked by the intensification of globalization of world economy, supported by the activity of technological, development of the Internet

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as a global information network, and political factors, the liberalization of trade and capital flows. However, alongside with such developmental moments in the global economy, governments of industrialized countries, scientific and professional community and the many industry organizations have expressed concern that if the pace of economic growth continues to exceed the absorptive capacity of the Earth, such growth would lead to irreversible environmental degradation, which would ultimately limit the possibility of further development and increasing prosperity of the population.

With increasing awareness of the unsustainability of current models of growth and development, the attention of the scientific community began to be directed towards defining the concepts and methods for achieving sustainable development. One of these concepts is the concept of eco-efficiency, which in the simplest interpretation represents the integration of two of the three key components of sustainable development, economic and environmental.

To the business sector after the Earth Summit in Rio de Janeiro were assigned an important role in achieving sustainable development and recommended implementation of a new business concept that would allow sustainable achievement of the following benefits: (1) "Benefits from reducing the current costs of poor environmental performance, (2) Benefits from reducing potential future costs of poor environmental performance, (3) Reduced costs of capital, (4) Benefits from increased market share and improved or protected market opportunities, (5) Benefits from enhanced image" (Skantze, 2005, p. 4).

Thereupon, the application of eco-efficient strategies, as a set of methods by which environmental damage from economic activities will reduce, by simultaneously boosting shareholder value, is important for improving the environmental aspects of corporate performance as a key determinant of creating a corporate image, positive business results, increasing the level of corporate competitiveness and marketability of corporate products and services.

Balanced Scorecard as a performance measurement system represents an open system that supports the adoption of eco-efficient decisions. Such its function was particularly come into the expression by improving the conventional Balanced Scorecard involvement of sustainability issues. However, the efficiency in the implementation of this function is conditioned by the realization of access to new data which can be reached only by applying eco-efficiency analysis.

Consistent with the established objective, this paper is structured as follows. After introduction, in the the first part of the paper the attention will be focused on understanding major features of the concept of eco-efficiency. In the second part of the paper will be explained the integration of sustainability dimensions in the Balanced Scorecard. After pointing to the Sustainability Balanced Scorecard as the framework for the analysis of eco-efficiency, in the final part will be performed a synthesis of key considerations.

BASIC FEATURES OF THE CONCEPT OF ECO-EFFICIENCY

In the literature a number of definitions of the concept of eco-efficiency are differentiated to date. For example, according to the opinion of some authors, the realization of eco-efficiency represents an objective necessity and the first step that can not be bypassed on the way to sustainable development. As a result, more efficient use of resources at the

micro and macro level is necessary in order to achieve the objectives of sustainable growth and development. On the other hand, there are not small number of authors who represent the traditional belief that environmental degradation is a consequence of market failures that are reflected in the inability of the market to determine true value and to determine the proper allocation of environmental resources. Thereupon, the main purpose of applying the concept of eco-efficiency is the correction or neutralize of market failures in a way that implies reducing the use of resources in production and consumption.

After the Earth Summit in Rio de Janeiro in 1992 it came to specifying the role of the concept of eco-efficiency as an instrument which will serve to the companies to implement Agenda 21 and to determining its importance as a management philosophy "which encourages business to search for environmental improvements that yield parallel economic benefits", and which is "focuses on business opportunities and allows companies to become more environmentally responsible and more profitable" (WBCSD, 2000, p. 4). Today the generally accepted definition of eco-efficiency is: "Eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the earth's estimated carrying capacity" (WBCSD, 2000, p. 9).

Despite of the existence of different definitions of eco-efficiency it is noticeable that all those in the final interpretation indicate on a key feature of this concept: basically, eco-efficiency represents a wise application of natural resources, apropos by increasing the productivity of the resource application, it contribute to decreasing the ecological footprint of the society.

In contemporary, dynamic business environment, the potential benefits of applying the concept of eco-efficiency are reflected in the increase of efficiency of economic activity taking into account the environmental goals and reduce pressure on the use of non-renewable natural resources and reducing pollution levels. Eco-efficiency is therefore "more of a business concept than resource efficiency, which merely considers the relationship between inputs and outputs, irrespective of economic factors. As a result the idea of eco-efficiency can be linked easily to mainstream business concerns such as productivity and profitability" (James, 2000, p. 9).

In the discussions conducted on the concept of eco-efficiency the attention of explorers for a long time focused on answering the question: if eco-efficiency contributes to improving efficiency in resource application, to what level should increase efficiency in resource application in order to reach the long-term environmental and economic benefit from the change of current, unsustainable model of production and consumption of resources.

In this regard the four concepts differentiated, the concepts that can also serve as a useful instrument of economic policy makers of one country in promoting eco-efficiency at the macro level. These concepts include the following:

1. Factor Four concept represents a very important instrument in making decisions at the macro and micro level, whereas it lay down the objective for improving the efficiency in resource application. Namely, according to the opinion of researchers at the Wuppertal Institute, the benefits of more efficient application of resources can be achieved "either by generating more products, services and quality of life from the available resources, or by using less resources to maintain the same standard" (Environment and Sustainable Development Division, ESCAP, 2007, p. 16). Essentially, Factor Four concept includes the

changes in production and consumer models to the extent necessary to enable the realization of the path of sustainable growth and development.

2. In contrast to the Factor Four concept, Factor 10 concept is more oriented towards reduction of resources application or consumption and decreasing the ecological footprint of the one society.

This concept is characterized by that, in order to achieve the defined objectives, sets a request to developed countries to find ways to reduce the current consumption of resources tenfold, or in other words to achieve the same production volume reduce the rate of resource consumption to 10%. Otherwise, at a given rate of consumption of scarce resources, the production costs will increase and consequently prices of products, which could alternatively contribute to increasing pressure on resource application and declining rates of economic growth.

3. Factor X concept share many common features with the previously mentioned concepts. Basically, with it exerts the quantification of the achieved level of dematerialization of the economy and its promotion. For example, if the placed value of Factor X is high, then a placed level of eco-efficiency which would be achieved is high.

4. And finally, Decoupling concept its base find in the OECD Environmental Strategy for the First Decade of the 21st Century adopted by the OECD Environmental Ministers 16 May 2001. Namely, the main purpose of defining this strategy is reflected in providing "clear directions for environmentally sustainable policies in OECD Member countries, and guiding the future work of the OECD in the field of environment" (OECD, 2011, p. 3).

In order to improve cost efficiency and implementation of environmental policies of OECD members, in the Strategy defines five goals, among which important place accrues to decoupling environmental pressures from economic growth. Achieving this objective with "continuing to satisfy human needs, requires an integrated effort addressing consumption and production patterns, including encouraging more efficient resource use" (OECD, 2001, p. 11). Therefore, it may be noted that, without sufficient improvements in eco-efficiency, simply certainly that economic growth will cause accelerated environmental degradation.

It may be noted that the concept of eco-efficiency, as a business concept that contributes to achieving more value with less impact, is not only narrowly focused on improving environmental and financial performance of the company, but is also aimed towards improving the quality of life as fundamentally important element of sustainable development. It is noteworthy that the adoption of the concept of eco-efficiency within a company itself does not contribute to achieving the sustainability of their operations. Namely, the efficiency of this concept application is largely determined by the characteristics of the socio-economic system, the degree of economic development, and especially by the level of development of the institutional system within which companies operate. This implicitly indicates on the important role of government in creating an enabling environment that will contribute to maximum effectuation of the benefits of applying the concept of eco-efficiency at the micro and macro level, as well.

INTEGRATING THE SUSTAINABILITY DIMENSION IN THE BALANCED SCORECARD

One of the most complex conditions of successful implementation of management control system is its integration with the developed business strategy. The overall process of strategic planning is a framework, within which, among other things, it is necessary to determine the critical success factors, draw up strategic plans, defining their functions, inspect the actual and projected size, identify and analyze the convergence of these differences is the size or corrections to the plans themselves.

The control instrument, which has exercised an influence on business management in the past two decades is the Balanced Scorecard, BSC. The aim of the BSC is a translation of business strategy in a coherent and connected set of operational objectives and harmonized system of performance measures that will be controlled to achieve the set goals. For each activity are characteristic of certain performance measures whose target values are determined and displayed in the Balanced Scorecard. This system allows companies to focus on financial and nonfinancial measures and monitoring of short-and long-term performance, providing relevant information base for managing the process of value creation in the enterprise. Following the strategy, objectives, activities and performance measures can determine whether the organization is moving towards effective implementation of formulated and developed business strategies.

Several reasons contributed to the intensification of the implementation of the BSC, from the evident shortcomings of traditional performance measures, which provide only a historical, not current perspectives, through directing too much managers attention to return on capital investment, especially when the EVA is one of the key performance measures, discourage managers from business expansion, especially when need for a strong investment capital, to the neglect of agents that affect the success or failure of business enterprises. Simply, many activities affect financial results, but they are not covered by financial reporting. Satisfaction of customers, for example, affect the financial results, productivity, growth and organizational learning. Many companies have therefore established a mathematical correlation between the satisfaction of customers, employees and financial performance of companies. Others have developed a dynamic computer simulation based on the BSC, which are amazingly accurate in predicting the success of the company. In addition it retains an interest in short-term performance, by the financial perspective, the BSC clearly reveals the causes of superior long-term corporate performance.

The use of the BSC as a performance measurement system is enriched by the addition to traditional financial measures of performance measures appear grouped into three perspectives – the consumer perspective, internal business processes and innovation and learning perspective. The four perspectives provide a balance between short and long term goals, internal and external measures, planned outcomes and their causes, and the balance between objective and subjective measures. Each of the perspectives of the Balanced Scorecard must be directly or indirectly connected with others, as well as the overall corporate strategy. Strategy is the starting point which caused the tasks in the sphere of financial management. To achieve these objectives, the company has seen its relations with customers and create new values within them. Creating value for customers stems from the efficient operation and quality of internal processes, and their own internal processes can not operate effectively without adequate learning and innovation within the company. Causal relationship is moving in the opposite direction. Thus, improving op-

erational measures leading to improved financial measures, as a logical consequence of the successful functioning of basic operations. Recognition of these relationships is critical to the successful implementation of Balanced Scorecard (Novičević, Antić and Stevanović, 2006, pp. 68-75).

The importance of BSC is increased by connecting the various management processes, such as defining the goals of a company as a whole, defining the goals of individuals, groups and organizational units, coordination of different organizational units with the overall corporate strategy, communications and education, linking strategies and strategic planning to resource allocation and budgeting, the use of information systems for new types of reporting and the use of performance measures from higher levels of management in order to take appropriate organizational changes. In this sense, the BSC allows a company to optimize their management processes and focuses on the implementation of selected business strategy. This system provides a framework for managing of the strategy implementation and also allows to change strategic directions in response to changes in the environment (Kaplan and Norton, 2001, p. 230).

The introduction and use of BSC begin by defining the vision and mission of a company. With these three elements procure a framework for setting strategic goals, which in turn allows the analysis of specific business and enterprise environments. When examining the internal strengths and weaknesses, opportunities and threats from the external environment, it is important application of the SWOT analysis, to guide the strategic objectives and critical factors for each area of business. Prior to reverse phase or feed-back for reanalysis, conducted to determine the key performance indicators. BSC is one of the most abundant instruments used for this purpose.

Achieving high-performance of enterprise involves consideration and attributing high importance of factors, such as satisfying customers' needs, a high degree of cooperation between employees and top management, leadership, availability of financial and technological resources and the like. Ranking of critical success factors for important changes facing companies with different challenges and strengthening competition. In such a changing environment, companies should take care in the following moments: a strong market orientation and relevant skills, effective management, strong management support in achieving goals, high organizational skills and the management coherence, greater availability and better access to resources (Ghosh, Liang, Meng and Chan, 2001, p. 209).

Criticality of a factor is committed to fulfillment of certain characteristics, among which are especially important: the possibility of indicating the success or failure of the organization, the impact on profit or loss, the opportunity to represent changes in the competitive environment, the implementation of emergency action due to changes in factors, measurability or the possibility of direct or indirect quantification.

More represented research, are related to environmental and sustainable development aspects. These factors are increasingly seen as a critical success factor in creating a positive company image in the modern economy.

Despite the fact that conventional Balanced Scorecard consider non-financial and non-quantitative questions concerning, for example, environmental aspects of sustainability, it essentially and explicitly does not consider the interests of stakeholders, the issues of ecological-efficiency and sustainability, and related strategic objectives. However, into the Balanced Scorecard can be involved the interests of all stakeholders, as are of vitality importance for the efficacy of the business unit strategy.

Sustainability management, together with the BSC on the integrative way try to resolve the problem of participation of multinational corporations in sustainable development. It assumes that, in order to contribute to sustainable development, is preferably to improve corporate performances in all three sustainability dimensions - economic, environmental and social – at the same time. Although these three categories of sustainability performance can be conflicting, pragmatic business approach to managing corporate sustainability involves identifying and realizing opportunities for their simultaneous improvement in order to achieve significant corporate contribution to sustainability.

The question of corporate sustainability imposes restoration the relations between sustainable development and its measurement and monitoring. From an environmental perspective, the advantage of balanced performance measurement system consists in its pointing out the relationship between long-term resources and capabilities, including sustainability issues, and short-term financial results. The merely existence of chains of cause and consequence between resources geared towards sustainability, capability and appropriate activities discourse that the Balanced Scorecard should not only make environmentally induced costs, but all direct and indirect outcomes as important performance measures. By introducing such modifications inside the concept of Balanced Scorecard opportunities for the development of the Sustainability Balanced Scorecards-SBSC are created.

Sustainability Balanced Scorecard provides management with simultaneous improvement of environmental, social, and financial business goals. "The most popular formulation for this new view of performance is the Triple Bottom Line" (Dan Montgomery and Rohm, 2000, p. 2). It "involves planning, managing, and reporting on business results in three areas: economic (sales, profits, ROI, jobs created, cash flow), environmental (impacts on air, water, waste, biodiversity, energy use) and social (product responsibility, community impacts, labor practices, human rights)" (Dan Montgomery and Rohm, 2000, p. 2).

Special eligibility of the concept of BSC to integrate all three dimensions of sustainability resulting in a position to consider factors, which can not be expressed financially, environmental and social factors. Therefore, SBSC help implementing factors, such as environmental or social, within the core of business management.

Practically, there are several ways in which sustainability issues can be included within the concept of Balanced Scorecard. One possible way refers to the redesign of existing perspectives, the second refers to the addition of key new perspectives and the third indicates on the possibility of formulating specific environmental, or social Scorecard.

At a time when the connection between business and environmental approaches as the critical factor of success, the company management must focus on specific strategic dimension of the organization. Shortly thereafter, in the strategic planning process creates the space for the development of BSC strategic map. Strategy maps are actually tools for internal communications indicating causal relationships between the different goals. By designing a strategy map enables the definition of performance measures as indicators of the degree of fulfillment of objectives.

While the inclusion of environmental factors in the BSC of a company, it is necessary to consider: 1) how actions of enterprise influence the environment, and 2) how the environment influence the activities of the enterprise. Following the original BSC model, managers can gain valuable information how on economic events within enterprise, and on environmental performance. Although BSC has to fit the specific objectives and selected strategies of companies, there are certain objectives that are common to most

organizations. Target performance must point to a way of creating value for current and future target groups. Also, one must point out the best way of strengthening the internal capacity, for purposes of investment in human resources, systems and procedures, in order to achieve sustainable superior performance (López-Valeiras Sampedro, Beatriz González Sánchez, Carlos Yáñez López and Rodríguez González, 2010, p. 179).

After identifying financial goals, it is necessary to determine the drivers of values that allow the agents to achieve the proposed objectives. Customer perspective indicates a segment of customers who need to be focused formulated strategy. In this context, environmental factors play an important role in creating the company's reputation from the perspective of its stakeholders, and are a key factor for achieving better financial results. Consequently, they must identify the objectives of internal business processes. Formulating strategies and developing relationships with preference relations to the environment, may be a need for a completely new internal processes.

In the winemaking industry, for example, an environment variable that is vital to the production process, and vice versa. It is therefore necessary to consider two kinds of factors, both internal and external. Internal factors, factors within the production process, are directly related to the environment. In this context, four factors can be identified four factors in accordance with which to set targets for: consumption of raw materials, chemical substances used in the production process and the percentage of waste, which in turn determine the fourth, the fulfillment of existing procedures. Business in accordance with legal regulations and establishing harmonious relationship with the environment, causing a positive opinion and preference of stakeholders, and thus improving the image and reputation of the company.

When it comes to external factors, stresses the importance of global warming. Cultivation of vineyards, for example, is the agricultural activity whose efficiency largely depends on weather conditions. Thence, it is needs that decisions be supported by careful monitoring of climate change and their involvement in strategic planning. Only in this way can improve the production process and the competitiveness of the organization.

Eventually, the area of "learning and growth" is directed at targets associated with investments in training employees, introducing new technologies and to advance organizational procedures and the like. In the said company for the production of wine, the main goal is the preparation and training of employees to work in an environmentally sustainable manner. In accordance with better education and training of employees, introduced the innovation in the internal business processes. Training and nurture provides new knowledge on the use of sustainable technologies, with parallel strengthening of environmental awareness and organizational culture. Management of a winery, for example, may decide on the training of workers to achieve sustainable levels of pesticide in their vineyards. This means, among other things, training for driving, more efficient use of machines, achieving the optimum speed and intensity in the application of phytosanitary products and the like. Because this type of training, workers would be able to reduce the amount of pesticides and fuel, thereby reducing the negative impact on the environment, and organization expenses.

SUSTAINABILITY BALANCED SCORECARD AS A FRAMEWORK OF ECO-EFFICIENCY ANALYSIS

The comprehension of resources geared towards sustainability, skills and activities, Balanced Scorecard requires a completely new information. For example, at the process of reducing the emission of toxic gases, it is not enough only one parent of information. Parameters such as the relationship between the desired manufacturing process and process emissions, cannot be reported only by financial indicators. This leads to setting up a very relevance question: what are the key dimensions and indicators that describe the viability and effectiveness of environmental protection?

Efficiency is not only related to financial and technological aspects. Divers aspects, like environmental and economic, can be composite. The negative effects within the environmental dimension involve all of the negative environmental impacts, while net profit is oft used to refer to the creation of economic value. Eco-efficiency maybe read as a relation or a causal link between the creation of economic value and environmental impact. Economic value added and an additional impact on the environment may post at different moments. To inhibit erroneous analysis of eco-efficiency, a question of time should be with attention considered.

Environmental influences of companies in monetary terms are correlated with corporate environmental indicator measured in physical units. Their integration can be performed by measuring eco-efficiency, which combines the measurement of economic performance with measuring the impact of businesses on the environment in the form of the coefficient (the index) which can be expressed as follows (UN ESCAP, 2009):

$$\text{Eco-efficiency coefficient} = \frac{\text{Sales returns}}{\text{Environmental impact}}$$

Noticeable, any measurement of eco-efficiency requires financial information to calculate the numerator and non-financial information on the influence on the environment, to calculate the denominator.

Environmental impact involve viewpoint of product or service creation and viewpoint of product or service consumption or access. The generally applicable indicators for product/service value, economic output, are: "quantity of goods or services produced or provided to customers, net sales, value added of benefit (GDP per capita), cost associated with an environmental burden (traffic congestion costs)" (UN Division for Sustainable Development, 2001). Those pertain to the environmental influence in product/service creation (environmental cost) are: "pollution emissions (greenhouse gas emissions, ozone depleting substance emissions, etc.), resource-used (energy, materials, or water consumption), cost associated with an environmental burden (traffic congestion costs)" (UN Division for Sustainable Development, 2001).

Many companies integrate the concept of eco-efficiency into their business strategy, product innovation, marketing and operational activities. Eco-efficiency is also promoted as a concept that may affect consumer buying behavior, given the wide range of products available in the market. Indicator of eco-efficiency at the micro-level is a combination of measures of economic performance and measure of the impact of the company on the environment in the form of the coefficient, which can be illustrated by the following formula (UN ESCAP, 2009, p. 4):

$$\text{Eco-efficiency} = \frac{\text{Enhancing the quality (Value of a product)}}{\text{Reducing impacts (Environmental impact of a product)}}$$

The concept of eco-efficiency at the level of the business entity is focused on several major elements, namely: reducing energy intensity, the reduction of toxic dispersion, enhancing the material recycling, maximizing use of renewable energy sources, ensuring the durability of the product and service intensive products. At the macro level, the concept of eco-efficiency can be seen in the emission of carbon dioxide, the final energy consumption, solid waste generation and so on. From this perspective, eco-efficiency is expressed in terms of degree of threat to the environment per unit of economic activity (e.g. CO₂ per GDP), which is used as a performance measure of specific country.

Analysis of eco-efficiency is not limited to direct, positive effect or tangible results like products or services, although the guidelines for the measurement of enterprise eco-efficiency largely orientated on products and services produced by the enterprise. In this event, the income from sales is used to denote the economic outcome. This type of eco-efficiency is so called eco-efficiency of products. Recognizing the BSC and Strategy Maps, the elucidation of eco-efficiency in this way seems to be not enough.

There are two approaches to integrate these issues in the Balanced Scorecard. First, the creation of economic value is not limited to the net profit or income from the sale, such financial ratios. Generally, creating of economic value includes all the necessary resources and skills in business. Another consideration to both financial and non-financial variant in the Balanced Scorecard, like specialized knowledge or quality of the process. Secondly, it is not needs to include indirect economic effects in the analysis of eco-efficiency. This is the basic function of the Balanced Scorecard and Strategy Maps. Accordingly, the prime orientation of eco-efficiency analysis is the impact on the environment, as denominator of eco-efficiency ratios.

Assessing of the influence of decisions and activities on the environment, necessitates the application of adequate modeling techniques. One such approach is to estimate the life cycle. Development of Balanced Scorecard and process of modeling allows "translation" of business strategy in operational activities. Balanced Scorecard in this way involves operational and environmental objectives in the strategy of the company, which form the base for determine the functional unit and system constraints in assessing the life cycle. Indication of environmental influence calculates in two moves: estimating the life cycle inventory and assessment of environmental impact life cycle.

Assessing the life cycle inventories is determining the chain of cause-effect relationships in the flow of materials and energy corresponding to the life cycle of resources, processes, capabilities, products or activities. In doing so, these cause-effect relationships involving flow of materials and energy and transformations outside the company, given that much of the environmental influences considered external effects. "Consequently, internal company information has to be supplemented by data on the environmental impacts of the pre-life-cycle steps and the post-life-cycle steps outside the corporate accounting entity" (Moller and Schaltegger, 2004, p. 78).

Input-output relation in the transformation of materials and energy must be linearly described, whereas the quantitative expression of the transformation corresponding to the flows of reference and functional units. In particular, the quantitative productive of

transformation is the result of systems of linear equations describing the flow in the mathematical sense. Most importantly, the chain of cause-effect relationships in the life cycle inventory is always associated with certain functional units. Hence, based on the model of material and energy flow, for each individual inventory life cycle should be done the same indicator of eco-efficiency incorporated in the Sustainability Balanced Scorecard. It is hard to do in practice, therefore, accounting systems need to provide models of materials and energy flow which can be analyzed in different ways.

The necessity is to distinguish between the three sediment in an environment information system (Moller and Schaltegger, 2004, p. 80):

- Sustainability Balanced Scorecard as a component at the highest level,
- Corporate Environmental Accounting as a component that includes models of the common flow of materials and energy and
- analysis of eco-efficiency, as a link between the previous two (so called, adapter).

Component of eco-efficiency can include a number of indicators of eco-efficiency, coupled with a model of the joint flow of materials and energy, where the life cycle inventories is determined using the flow of materials and energy as a database. The logical next step in determining the indicators is as follows:

- "Interpretation of input and output flows of the processes in... model as production coefficient;
- Identification of the reference flows of all processes: process output of goods and/or process input of waste;
- decomposition of joint processes by applying allocation rules so... get single processes;
- compilation of the process matrix relative to the eco-indicator... ;
- application of the matrix methods to calculate the contributions from all processes" (Moller and Schaltegger, 2004, p. 81).

While models in corporate environmental accounting notice flow of materials and energy for concrete periods of time (for example, fiscal year), the adapters define material and energy flows in terms of functional units. This connects methods of life-cycle assessment and concept of the periodic material flow analysis. Though the components of corporate environmental accounting can be repute a database, Balanced Scorecard, Strategy Maps and eco-efficiency measures are his models. In addition to these, can be used data sources, like systems of planning material requirements (Enterprise Resource Planning Systems-ERP), etc... Strategic management is not required to conduct a comprehensive assessment of life cycle in order to assess the environmental influence and calculation of indicators of eco-efficiency. The term environmental impact resulting from the strategic objectives, largely within the non-market perspective. For example, one goal of non-market perspective may be reducing the business impact of climate change.

Thus, the Balanced Scorecard facilitates implementation of relevant strategic and economically reasonable terms of the life cycle in enterprises (Figure 1). As a frame, the Sustainability Balanced Scorecard enables afterwards information management, data collection and application of modeling techniques. From this aspect, analysis of eco-efficiency is an tool for the assessment and control of adequate key performance measures for the two main perspectives of sustainability, economic and environmental. Furthermore, the analysis of eco-efficiency can be regarded a link between the Balanced Scorecard and

information system of environmental management, relying on analysis of the material and energy flow and life cycle assessment.

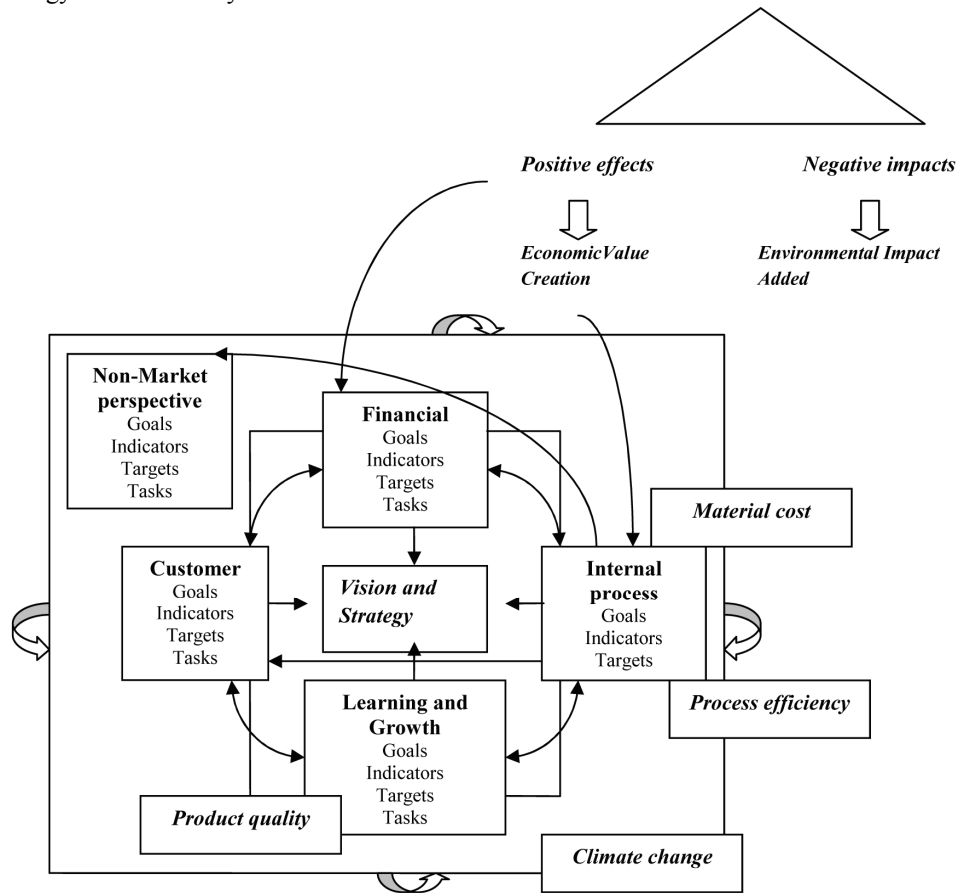


Fig. 1. Eco-efficiency indicators built in Strategy map
Source: Moller and Schaltegger, 2004, p. 79.

CONCLUSION

A balanced performance measurement system indicates the relationship between long-term resources and capabilities, including sustainability issues, and short-term financial results. Balanced Scorecard, which is enriched environmental dimension and the following relationships between resources geared towards sustainability, capacity and appropriate action is called the Sustainability Balanced Scorecards - SBSC. Sustainability Balanced Scorecard allows simultaneous management of environmental, social and financial aspects of the business. One way to incorporate sustainability issues in the Balanced Scorecard is a restructuring of existing perspectives, the second refers to the addition of key new perspectives, while the third indicates the possibility of formulating specific environmental, or social Scorecard.

Eco-efficiency is interpreted as a relation or a causal link between the creation of economic value and environmental impact. There are two approaches to integrating eco-efficiency in the Balanced Scorecard. First, should take into account all financial and nonfinancial variables in the Balanced Scorecard, such as specialized knowledge or quality of the process. Second, since it is not necessary to include indirect economic outcomes in the analysis of eco-efficiency, the main focus is to impact on the environment, as well as denominator of eco-efficiency ratios.

Analysis of the eco-efficiency at the micro level is of essential importance for the sustainable business of the company and realization the activities aimed at increasing eco-efficiency. Development and application of indicators of eco-efficiency is not only a useful tool for measuring eco-performance of the companies, but also a suitable instrument for measuring and monitoring the eco-performance of the economy as a whole. In combination with measures of state environmental regulation, eco-efficiency analysis can play an important role in the selection of investment projects that are of essential importance for achieving the defined objectives in the national strategy for sustainable development.

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BALANCED SCORECARD ODRŽIVOSTI I ANALIZA EKO-EFIKASNOSTI

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Upotreba Balance Scorecard-a je obogatila sistem mera performansi na način da se, pored tradicionalnih finansijskih mera, pojavljuju mere performansi svrstane u perspektivu potrošača, internih poslovnih procesa i perspektivu inovacija i učenja. Sve zastupljenja istraživanja, vezuju se za aspekte životne sredine i održivog razvoja koji se posmatraju kao kritični faktori uspeha u kreiranju pozitivnog imidža kompanije u savremenim uslovima poslovanja. Stoga, pitanje korporativne održivosti objektivno nalaže uspostavljanje relacija između održivog razvoja i njegovog merenja i praćenja. Cilj ovog rada je da ukaže na značaj primene Balanced Scorecard-a kao otvorenog sistema u koji mogu biti uključeni interesi svih stakeholdera, kada su od vitalnog značaja za uspeh poslovne strategije. Posebna pažnja će biti usmerena ka analizi odnosa između Balanced Scorecard-a održivosti, koji omogućava upravljanje simultanim unapređenjem ekoloških, socijalnih i finansijskih aspekata poslovanja, i analize eko-efikasnosti, kao instrumenta za procenu i kontrolu odgovarajućih ključnih mera performansi za ekološki i ekonomski aspekt, kao glavnih aspekata održivosti.

Ključne reči: Balanced Scorecard održivosti, održivi razvoj, analiza eko-efikasnosti