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Accounting for environmental costs as an instrument of environmental controlling in the company

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Abstract

Purpose – The purpose of this paper is study the peculiarities of environmental controlling in the context of the implementation of the sustainable development strategy and the systematization of methods, functions and tools, as well as consideration of the possibility of applying environmental controlling methods in the organization through the consideration of environmental costs.

Design/methodology/approach – The authors solved the following problems. The authors defined the essence of the concept of "environmental controlling;" conducted an analysis of methods, functions and instruments of environmental controlling; investigated the possibility of accounting for environmental costs as an instrument of environmental controlling; and systematized approaches of using the tool of accounting for environmental costs at enterprises.

Findings – The approaches to accounting for environmental costs differ in the degree of integration into the existing accounting system and in the frequency of accounts handling (one-time or regular). One-time solutions to accounting for environmental costs (e.g. environmental design calculations) are calculations conducted independently of traditional accounting. Their advantage lies in the fact that they can be formed and used without affecting the existing cost accounting system. However, they generate additional costs and generally receive less recognition than integrated solutions. Accounting for environmental costs is an integrated part of the existing and regularly conducted accounting system.

Research limitations/implications – Accounting of environmental costs has broad prospects for use in enterprises as an environmental controlling instrument for the improvement of management efficiency and quality.

Originality/value – Accounting for environmental costs is necessary as an instrument of environmental controlling in order to obtain information on the enterprise interdependencies between costs, revenues, consumption of raw materials and energy as well as environmental protection measures. In addition, the consideration of environmental costs can serve companies as a source for the identification of the potential to reduce the cost of output products.

Keywords Cost accounting, Sustainable development, Environmental costs, Controlling, Environmental controlling

Paper type Research paper

Introduction

The increasing burden on the environment, the reduction in the reserves of non-renewable natural resources, the pollution of the biosphere and the progressive climate change due to anthropogenic loading lead to a reduction in the rates of economic growth of individual states and territories.

Of particular importance is the economy, which focuses on sustainable development and, consequently, on the preservation of the foundations of the humankind existence. Such an economy is a prerequisite for the long-term economic growth. As part of the tightening of environmental legislation, companies are forced to introduce the environmental component in all areas of the organization: production, logistics and management.

Environmental management and environmental controlling in the enterprise are designed to account for both environmental and economic assessment of changes in financial and energy flows. However, until recently such systems mainly covered the

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physical, quantitative aspects of the problem, without completely affecting the cost characteristics of the process of production management. Such ecological and economic management in the enterprise corresponds to the concept of sustainable development. It is aimed at implementing the principle of ecological efficiency and involves reducing the impact on the environment while increasing the profitability of production.

The practice of management in the field of environmental protection and nature management is improved based on the principles of sustainable development by developing and implementing new management mechanisms aimed at achieving environmental goals and objectives and implementing projects and programs in order to improve the environmental and economic efficiency of economic activities. Currently, such innovative management tools as environmental management, environmental auditing and environmental controlling are actively developed and disseminated. Hence, there is a need for a scientific justification for environmental and economic management in an enterprise based on approaches of environmental costs accounting.

The purpose of this paper is to study the peculiarities of environmental controlling in the context of the implementation of the sustainable development strategy and the systematization of methods, functions and tools, as well as consideration of the possibility of applying environmental controlling methods in the organization through the consideration of environmental costs. To achieve this goal, the authors solved the following problems: they defined the essence of the concept of "environmental controlling;" conducted an analysis of methods, functions and instrument of environmental controlling; investigated the possibility of accounting for environmental costs as an instrument of environmental controlling; and systematized approaches of using the tool of accounting for environmental costs at enterprises.

Environmental controlling

It should be noted that environmental controlling is one of the relatively new informational and analytical tools of environmental management and it devotes itself to internal recording and analysis of environmental aspects of the economic activities of the organization.

This tool is designed to ensure the effective operation of the organization by justifying and applying such information tools that contribute to the coordination (harmonization) of individual management functions. The models of ISO or EMAS systems place emphasis on management processes, and therefore require the formulation of environmental policy, the development of an environmental program and the verification of the management system. On the other hand, eco-controlling puts financial and energy flows at the center of consideration as a basis for reducing the environmental burden. In addition, we identify tools, which allow more efficient analysis and management of these flows.

The central task of environmental controlling, as well as general controlling, is management support. In this case, the focus is on environmental measures and solutions of environmental problems (Baum *et al.*, 2007, p. 108). Environmental controlling, therefore, is a part or a subsystem of general controlling and is aimed at protecting the environment in the enterprise. The main difference between environmental controlling and controlling of financial or any other processes is that it is applied in areas that are directly related to environmental protection, for example, resource consumption, energy use, waste generation, noise, etc. (Tschandl, pp. 4-5).

A single definition of the concept of "environmental controlling" is missing. Therefore, it is necessary to give its definition and characteristics. Environmental controlling was first applied to improve the environmental performance of production activities, to control environmental costs and losses and to implement social responsibility policies. Currently, environmental control is introduced into the overall system of environmental management of enterprises and becomes an important reserve for the improvement of management efficiency.

Kozhukhova (2012) in her studies considers environmental controlling "as a system to support the management of environmental activities" Kirsanova (2004) – "as an informational and analytical tool for eco-management" (p. 4). However, Shliago (2013) believes that "the use of the term of 'environmental controlling' should be considered only as a figurative expression, and not a scientific term that has an independent meaning" (p. 304).

Thus, environmental controlling is an instrument of active, unified and environmentally oriented management of an enterprise. It covers, represents and assesses the physical and financial consequences of an enterprise's activities related to the environment. The main subjects of analysis, therefore, are the volumes and costs of environmentally important flows of materials and energy in the enterprise. Environmental controlling facilitates the identification and reduction of industrial environmental loads, and the achievement of the environmental objectives of the enterprise as an element of (environmental) management.

The main objectives of environmental controlling are the planning, management and control of all environmental objectives of an enterprise or environmental management measures.

Methods of environmental controlling

Methods of environmental controlling can be divided into three groups according to their orientation and practical application:

(1) methods focused on finance: carrying out an environmental differentiation of financial controlling and accounting, i.e. analysis of the financial consequences of environmentally related activities (linear: monetary approach);

(2) eco-friendly methods: the creation and application of environmentally oriented controlling as an extension of financial controlling and accounting, i.e. direction for data collection and management of environmental effects of economic activity (linear: physical environmental load); and

(3) integrated environmental and economic methods: control and management of both the financial consequences of environmentally related actions and the environmental effects of economic activity (two-dimensional measurement: monetary unit per unit of environmental load or unit of environmental load per monetary unit) (Schaltegger and Sturm, 1995, pp. 11-12).

In addition to methods that focus on the environment or the economy, methods of integrated (environmental) controlling are being increasingly considered. It includes an equal accounting of both economic and environmental aspects (Czymmek and Faßbender-Wynands, 2001, pp. 3-4). Helber and some other authors go even further. They consider integrated controlling as an instrument for coordinating the management activities at all levels of the enterprise. Integrated controlling not only forms systems of goals with multiple criteria, but also covers problems that go beyond the boundaries of an enterprise. The purpose of integrated controlling, therefore, is to support management in the formation and communication of enterprise policies that take into account the interests of all strategically important interests (stakeholders) (Helber, 2004, pp. 130-131).

From the definition of environmental controlling and the breadth of its tasks, its close connection with environmental management becomes clear. It prepares the decision-making and implementation process. However, it should not be equated with environmental management (Perl, 2006, p. 35). Environmental controlling supports environmental management especially in matters of improving or enhancing environmental efficiency in an enterprise. DIN EN ISO 14031 defines environmental performance as "(measurable) results arising from the management of environmental aspects of an organization." At the same

time, environmental aspects represent those elements of production activities, products or services of the organization that can have an impact on the environment (e.g. energy, noise, sewage) (DIN EN ISO 14031, 2000, p. 4).

Functions of environmental controlling

The primary goal of environmental controlling, as well as general controlling, is to ensure coordinated actions of the management system. Indirectly, environmental controlling should promote the achievement of environmental objectives in certain areas of an enterprise (Horvath, 2003, p. 143). Environmental controlling results from the need to integrate, process and prepare data/information. Classic controlling aimed at economic outcomes does not meet these requirements.

As well as classical controlling, i.e. the environmental controlling, performs the following main functions:

- functions of system formation: the creation of a basic system of organization and the work order for environmental management;
- intersystem and binding functions: establishing, maintaining and adapting links between systems;
- information function: providing information that is important for decision making with the help of environmental management tools;
- planning function: creation of planned indicators and their comparison with the actual ones;
- function of coordination and management: overcoming the asymmetric distribution of information affecting both functions within an enterprise and the enterprise as a whole;
- monitoring function: conducting actual and future comparisons of planned and actual indicators, preventing deviations and determining the possibility of their influence, monitoring the environmental consequences of enterprise activities, monitoring of planned environmental targets, and early identification of planning errors; and
- adaptation function: the establishment of new development trends important for the enterprise and their coordination with adaptation solutions or their implementation (Bleis, 1996, pp. 85-86).

Instruments of environmental controlling

A special area of environmental controlling is environmental risk (e.g. in case of incompliance with environmental regulations). Environmental risk occupies a large place in the overall risk of an enterprise and plays an important role in the use of materials (especially those that have dangerous properties) and the subsequent appearance of products and wastes (Scherpner and Form, 2003, pp. 548-549). Typical consequences of environmental risk are not only changes in the state of the environment and deterioration in the health of employees or the population, but also economic consequences in the form of creating economic and social hazards, for example, the risk associated with contracts or liability as well as financial risks (Bozek, 2003, p. 386). Timely identification of environmental risks, their reduction and the identification of long-term chances and potentials are central requirements for environmental monitoring.

From the ecological point of view, the use of classical tools can lead to significant mistakes in decision making and even partially block the implementation of environmental protection into management (Schäffer and Jais, 2005, p. 385). Therefore, many such tools have been

modified to meet the requirements of environmental protection and now can be applied in enterprises in an adapted form (e.g. in the form of environmental indicators). Other tools were created specifically for use in environmental management (e.g. environmental compatibility analysis). "The purpose of these tools is to support the systemic and constant environmental protection at enterprises, excluding any environmental or economic damage" (Klenner, 2002, p. 34). Consequently, we are talking about methods for solving specific problems of planning, regulating and stimulating the environmental protection or environmental management at the normative, strategic and/or operational levels.

Tools for supporting environmental management or environmental controlling include the following:

- consistent implementation of the idea of environmental protection by purposeful and systemic processing of environmental problems;
- providing environmentally relevant information that facilitates the process of preparing solutions or supporting the process;
- simplified (i.e. not covering the entire complexity of the problem), but fundamentally intact and relevant description of environmental problems;
- feasibility, practical applicability and possibility of integration into the work of an enterprise; and
- possible clarity and ease of use.

Integrating of environmental accounting into the company's traditional accounting system is a complex problem for several reasons. First, the limited accounting, i.e. funds with no cash equivalent, is not subject to accounting. For this reason, raw materials and materials coming to an enterprise are reflected in accounting documents, and other components of the environment, such as waste air and heat, are absent in the accounting registers – these values can be taken into account mainly in natural meters. The next reason for not including the above categories into accounting reports is the condition, according to which the resource becomes an asset only if it is controlled by the enterprise. The absence of such accounting at the branch enterprises leads to uncontrolled pollution of the environment (water, air, soil, and the appearance of a significant amount of non-recycled waste). The fact that any modern enterprise should be considered and taken into account as part of an integrated system connected with the environment becomes more obvious.

This circumstance predetermines the objective need for a more complete coverage of natural capital in accounting and statistical accounts in order to implement efficient management of the resources flow. At the same time, the important issue is the correct understanding of environmental costs, which includes many different factors.

Accounting for environmental costs as an instrument of environmental controlling

It is advisable to apply the accounting of environmental costs. This tool has proved itself in practice and it is an integral part of environmentally oriented production. This tool concerns the monetary side of pollution and environmental protection in an enterprise. There are many ways to apply the calculation of environmental costs, as each company can find the most suitable option for itself and use it once or permanently.

Depending on the subject and volume of analysis, there are various definitions of the concept of "environmental costs," but a unified one is missing.

BMU/UBA (2003) under environmental costs understand the costs associated with environmental management, with measures to protect the environment, and with impact on the natural environment (p. 45).

Based on this definition, further environmental costs can be differentiated in two ways:

(1) concerning belonging to an enterprise: internal and external environmental costs; and

(2) concerning the emergence of costs: the costs of protecting the environment and the costs of loading the environment (BMU/UBA, 1996, p. 44).

Internal environmental costs are the costs that the generating company must incur (BMU, 2007, p. 127). In contrast, external costs are the outgoings of economic activity, the unreached and unvalued negative impact of the market (i.e. environmental load) on households, enterprises or society in the form of increased costs or expenses (e.g. repair of damaged monuments) or intangible restrictions (e.g. negative impact on human health, loss of recreational function of forests) (Kumm, 1975, p. 40).

The costs of environmental protection (they are also called the costs of environmental discharge) are the consumed goods that are valued and purposefully used by the enterprise for protecting the environment in the enterprise. These include:

- investment and current costs for additive and integrated environmental protection (e.g. personnel costs, repair costs, depreciation charges, interest payments);
- costs for the environmental management system (e.g. maintenance costs of the person responsible for environmental management, literature, registration fees, etc.); and
- costs of external services (e.g. state control, environmental advice) (Jäger and Karger, 2006, p. 52).

The costs of the environmental load are the compensation costs for the damage already caused to the environment. For example, these are:

- environmental taxes, penalties, contributions (e.g. contributions for waste, penalties for violation of environmental legislation);
- contributions to environmental insurance; and
- the costs of regulating the caused environmental damage (e.g. compensation for damage in the context of liability) (BMU/UBA, 1996, pp. 43-44).

In our opinion, accounting for environmental costs is an internal tool of the enterprise that serves to account for all the costs that arise from the impact of the enterprise and its products on the environment. Unlike specific tools of environmental management, the accounting of environmental costs is based on the existing accounting system in the enterprise. It expresses processes related to the environment.

The choice and introduction of a specific system of accounting for environmental costs at enterprises is not accompanied by any legal obligations or standardization in the form of a norm (Bundesministerium für Verkehr, Innovation und Technologie, 2005). Nevertheless, there is a number of instructions that can help in the selection and introduction of an appropriate system. Depending on the individual goal and the initial situation, enterprises can choose an acceptable system from an array of diverse approaches and, if necessary, directly integrate it into the existing accounting system, into the organizational structure, and into the information and communication technology system (BMU, 2007, p. 127).

Any of the selected system of accounting for environmental costs depends on the available traditional cost accounting system, and requires additional collection and provision of specific environmental information. Accounting for environmental costs in this context uses specific environmental management tools that enable full and detailed review of the company's activities impact on the environment (e.g. environmental balances). From the point of view of the methodology, it is also possible to criticize the inevitable ignoring of those environmental aspects that do not have financial consequences for an

enterprise, as well as conceptual drawbacks in the (complete) collection of external environmental costs in general and specifically in the enterprise accounting system (Kottmann *et al.* 1999, p. 7). In this case, indirect environmental impact, i.e. the previous and subsequent one, is not sufficiently taken into account (Jäger and Karger, 2006, p. 55).

Discussion

Although there is no specific statistical material for determining the degree of distribution of environmental cost accounting systems, some conclusions can be drawn from their application in individual enterprises. Therefore, it turned out that small- and medium-sized enterprises rarely use environmental accounting systems. They are more common in large enterprises, primarily in the processing industry. This category of enterprises uses environmental cost accounting systems, for example, to meet UStatG's requirements for presenting their investment, as well as current environmental costs to the Federal Office of Statistics. The EU also recommends that large enterprises take into account environmental aspects when drafting annual reports, i.e. openly report and analyze these data in annual balances and reports on the state of affairs in the enterprise. Finally yet importantly, some environmentally active enterprises appreciate the advantages of the accounting system for environmental costs as an instrument to identify potentials for costs reduce. In order to generate significant and comparable information on environmental protection in the enterprise, the accounting system developed for the specific conditions of the enterprise can be of great importance. However, in the practice of enterprises, the external environmental costs are not taken into account or taken into account insufficiently.

Accounting for environmental costs is, first of all, an internal management tool with an environmental orientation, which can be used for other external purposes. The range of use of this tool is diverse and varies from company to company.

It is possible to name the following aspects of the utility of implementing and applying accounting decisions for environmental costs at enterprises:

(1) Ensuring the implementation of environmental management tasks, for example:
   - compliance with statistical reporting obligations;
   - stimulation of an effective and competitive environmental protection system;
   - purposeful planning and management of environmental costs; and
   - ensuring transparency of costs in relation to their causer as an instrument of internal and external communication.

(2) Ecological effectiveness: simultaneous reduction of environmental load and environmental costs:
   - increasing transparency due to the quantification of environmental costs;
   - supporting synergies between the economy and the environment;
   - identification of the achieved and planned potentials in order to improve the economic and environmental situation; and
   - cause-dependent distribution of environmental costs to centers and carriers of cost emergence.

(3) Protecting the strategy: checking the riskiness of long-term projects:
   - improvement of the basis for making operational and strategic decisions in an enterprise (planning tool); and
   - ability to conduct flexible analyzes (scenario models).

Over the past 30 years, a large number of methodological approaches to accounting for environmental costs have arisen. According to the authors of Loew (2001, pp. 10-11), Bleis and Helling (2002, p. 30), Jäger and Karger (2006, pp. 52-54), existing approaches to accounting for environmental costs can be divided into four groups:

(1) environmental cost accounting, which focuses on environmental protection: determining the amount of environmental costs related to management and communication, for example, accounting for environmental costs by Fleischmann and Paudtke (1977);

(2) accounting for investment and project environmental costs: taking into account environmental aspects in investment decisions, for example, environmental protection calculations by Wagner and Janzen (1991);

(3) process-oriented accounting of environmental costs related to material and energy flows: support for identifying potential savings based on material and energy flow analysis in the enterprise, for example, recording flow costs by Arnd (1995); recording residual costs by Fischer and Blasius (1995); accounting for resource costs by EFA Letmathe *et al.*, 2002; accounting for environmental costs for the life cycle by Fraunhofer-Gesellschaft, 2004); environmentally oriented target-costing (Seidel, 2003, pp. 101-103); and

(4) approaches for external costs determining: analysis of costs for external effects of enterprise production, for example, environmental accounting by Müller-Wenk (1978); accounting for environmental costs by Roth (1992); accounting for costs and flows in the enterprise according to the Wuppertal Institute for Climate, Environment and Energy (MIPS) (Liedtke *et al.*, 1997).

These four groups of approaches and their representatives simultaneously reflect the stages of environmental costs development. Initially, approaches explored environmental costs as costs for the environment "repair." Subsequently, environmental costs began to be understood as costs used to reduce current and subsequent environmental damage. New approaches investigate environmental costs in terms of preventing environmental damage.

This can be demonstrated in the following example. Since the mid-1990s, it became clear that an analysis of the costs of environmental protection would not reveal economically viable environmental protection potentials. A flow record of environmental costs has been formed after the recognition of the need to take into account all the important costs in the context of substances and energy flows. This approach allows tracing the path of individual materials in the enterprise from their receipt to output in the form of a finished product or residual material. In this case, we consider not the spheres and departments of the enterprise, but its processes and flows. Online accounting of environmental costs is constantly being improved from the time of its first use in enterprises (Spath *et al.*, 2003, p. 17). The approach of accounting for external environmental costs has most imperfect concept. Methodological problems and dilemmas arise in the full detection and quantification of external effects and their subsequent monetization.

However, there are two completely different theoretical concepts for monetization: an accident cost approach and a cost avoidance approach, but their application is associated with some shortcomings (e.g. a high degree of uncertainty). The accident cost approach evaluates and analyzes the actual damage caused by external effects (e.g. damage to the monuments material under the external effect – acid rain). The cost avoidance approach defines preventive measures, which concern specific costs on reducing or preventing negative externalities. This approach is applied, for example, in assessing external costs as a result of a greenhouse effect.

In addition, the approaches to accounting for environmental costs differ in the degree of integration into the existing accounting system and in the frequency of accounts handling

(one-time or regular). One-time solutions to accounting for environmental costs (e.g. environmental design calculations) are calculations conducted independently of traditional accounting. Their advantage lies in the fact that they can be formed and used without affecting the existing cost accounting system. However, they generate additional costs and generally receive less recognition than integrated solutions. Accounting for environmental costs is an integrated part of the existing and regularly conducted accounting system.

This topic is more detailed in the research of scientists Gaur and Kumar (2018).

Conclusions

To implement the goals and objectives of environmental management for the improvement of environmental performance of the company, it is possible to use environmental controlling. Environmental controlling (in a broad sense – environmental management) of the company is focused on general production and/or specific environmental instruments, depending on the requirements, conditions or the initial situation in the enterprise.

Accounting for environmental costs, as an instrument of environmental controlling, is necessary to obtain information on the enterprise interdependencies between costs, revenues, consumption of raw materials and energy, as well as environmental protection measures. In addition, the consideration of environmental costs can serve companies as a source to identify the potential for reducing the cost of output products.

The conducted analysis of the existing approaches to accounting for environmental costs in the enterprise shows that the choice of approach depends on the individual requirements of a particular enterprise. The task of creating a specific system of environmental management and controlling tailored to the needs of the enterprise can be interpreted either as a chance or as a challenge. The analysis also shows that accounting of environmental costs has broad prospects for use in enterprises as an environmental controlling instrument to improve management efficiency and quality.

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