

Environmental Management Accounting (EMA): Reflection of Environmental Factors in the Accounting Processes through the Identification of the Environmental Costs Attached to Products, Processes and Services

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Cleopatra Șendroiu

Lector universitar doctor

Aureliana Geta Roman

Lector universitar doctorand

Costantin Roman

Conferențiar universitar doctor

Academia de Studii Economice București

Alexandru Manole

Lector universitar doctorand

Universitatea Artifex București

Abstract. *EMA can be defined as the identification, collection, estimation, analysis, internal reporting, and use of materials and energy flow information, environmental cost information, and other cost information for both conventional and environmental decision-making within an organization. Thus EMA incorporates and integrates two of the three building blocks of sustainable development – environment and economics – as they relate to an organization’s internal decision-making. EMA is a relatively new tool in environmental management. Decades ago environmental costs were very low, so it seemed wise to include them in the overhead account for simplicity and convenience. Recently there has been a steep rise in all environmental costs, including energy and water prices as well as liabilities.*

Key words: environmental costs; financial and environmental decisions; Activity-based costing (ABC); environmental management system (EMS).

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According to Bennett and James (1998a) EMA is concerned with gathering data related to the environment (lowest levels), which are converted through techniques and processes (middle level) into information which is useful for managers. Key data is both non-financial and financial in nature. Management accounting techniques such as performance measurement, operational budgeting, costing or pricing are used for the transformation.

In Europe the Pollution Prevention Pays programme of 3M played a crucial role in the spread of the EMA concept, while in the United States the high level of potential liabilities pushed companies to better evaluate their environmental costs. Now, especially transition economies are going through a fast change that will impose a requirement for more accurate control of production inputs and outputs.

Still, many companies need external help in creating or improving their EMA, as those skills are not widespread and rarely available internally. EMA has to be tailored to the special needs of the company rather than be applied as a generic system. The costs and benefits of building such a system has to be considered and the scope of the EMA properly selected.

It must be recognised that most management accounting techniques significantly underestimate the cost of poor environmental behaviour. Many people overestimate the cost and underestimate the benefits of improving environmental practices.

The primary aim of environment management accounting is to better inform and otherwise support decision-making processes that are influenced by environmental factors- which are primarily those of accounting and financial management, environmental management and operational management (Bartolomeo, Bennet, James, 1998). Some of the specific objectives that this creates can be summarised as:

- Demonstrating the impact on the income statement (profit and loss account) and/or balance sheet of environment-related activities
- Identifying cost reduction and other improvement opportunities
- Prioritising environmental actions
- Guiding product pricing, mix and development decisions
- Enhancing customer value
- Future proofing investment and other decisions with long term consequences
- Supporting the sustainable business.

Management accounting techniques can distort and misrepresent environmental issues, leading to managers making decisions that are bad for businesses and bad for the environment. Environmental managerial accounting can solve these issues.

A literature review reveals various approaches to the definition of environmental costs. In 1998, the US Environmental Protection Agency argued that the definition of environmental costs depended on how a company intends to use the information, for example in capital budgeting or product design. They introduced terminology that distinguishes between conventional costs, potentially hidden costs, contingent costs, and image and relationship costs.

Conventional costs are those raw material and energy costs having environmental relevance. Potentially hidden costs are those which are captured by accounting systems, but then lose their identity in „overheads”. Contingent costs may be incurred at a future date – for example costs for cleaning up. They are also referred to as contingent liabilities. Image and relationship costs are intangible in

nature and include, for example, the costs of producing environmental reports.

However, such costs pale into insignificance when compared with the costs associated with being seen to behave in an irresponsible manner.

UNSDSD described total corporate environmental costs as environmental protection costs (emission treatment and pollution prevention) plus costs of wasted materials, plus costs of wasted capital and labour. Waste in this context means production inefficiency (purchase value of non-material output). UNSDSD stated that wasted materials account for 40% to 90% of environmental costs according to a survey. One should recognise that environmental costs are not a separate type of cost; rather they are part of money flowing throughout a corporation.

The main difficulty associated with environmental costs is their identification and allocation. According to UNSDSD, conventional accounting systems tend to attribute many of the environmental costs to general overhead accounts with the result that they are „hidden” from management. Thus, management is often unaware of the extent of environmental costs and cannot identify opportunities for cost savings. EMA attempts to make all relevant, significant costs visible so that they can be considered when making business decisions. UNSDSD (2003) identified management accounting techniques which are useful for the identification and allocation of environmental costs as: input/output analysis, flow cost accounting, activity-based costing (ABC), and lifecycle cost.

The input/output analysis is a technique that can provide useful environmental information, sometimes referred to as mass balance (Envirowise, 2003). This technique records material flows with the idea that „what comes in must go out – or be stored”. The purchased input is regarded as 100% and is balanced against the outputs – which are the produced, sold and stored goods and the residual (regarded as waste). Materials are measured in physical units and include energy and water. At the end of the process, the material flows can be expressed in monetary units. Process flow charts can help to trace inputs and outputs, in particular waste. They demonstrate the details of the processes so that the relevant information can be allocated to main activities.

Process flow charts (Figure 1) bring together technical information and cost accounting information (UNSDSD, 2003). Flow cost accounting is a tool of a new management accounting approach – flow management. It aims to „...organise production end-to-end in terms of flows of materials and information – all structured in an efficient, objective-oriented manner” (UNSDSD, 2003). It is more than a simple assessment of environmental costs, because it is focused on assessment of total costs of production.

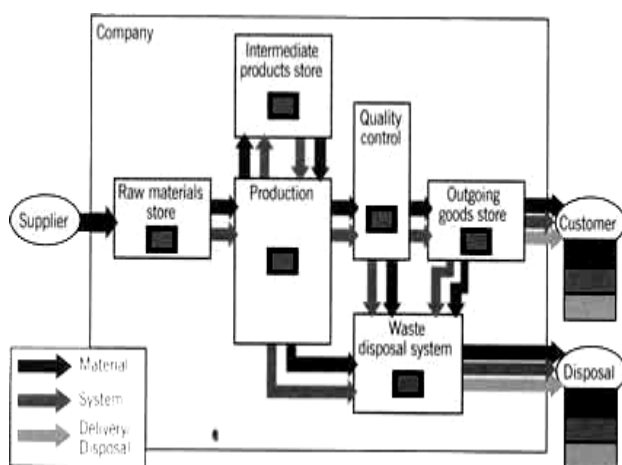


Figure 1: Flow cost accounting according to UNDS (2003)

Flow management involves not only material flows, but also the organisational structure. Classic material flows are recorded as well as material losses incurred at various stages of production. Flow cost accounting makes material flows transparent by using various data, which are quantities (physical data), costs (monetary data) and values (quantities \times costs). The material flows are divided into three categories, material, system, and delivery and disposal. The material values and costs apply to the materials which are involved in the various processes. The system values and costs are the in-house handling costs, which are incurred inside the company for the purpose of maintaining and supporting material throughput, e.g. personnel costs or depreciation.

The delivery and disposal values and costs refer to the costs of flows leaving the company, for example transport costs or cost of disposing waste. EMA can benefit from flow cost accounting because it aims to reduce the quantities of materials, which leads to increased ecological efficiency (UNDS, 2003).

The above-mentioned accounting techniques are useful for EMA to identify and allocate environmental costs. In addition, there are alternative techniques to estimate environmental costs such as the „environmental cost decision tree” as described by Rimer (2000).

The most significant problem of EMA lies in the absence of a clear definition of environmental costs. This means it is likely that organisations are not monitoring and reporting such costs. The increase in environmental costs is likely to continue, which will result in the increased information needs of managers and provide the stimulus for the agreement of a clear definition. If a generally applicable meaning of environmental costs is established, the use of EMA will probably increase with positive effects for both organisations and the environment in which they operate. In the future it will not only be large companies which can afford to implement EMA but also small and

medium-sized enterprises which have fewer available financial resources.

The main purpose of the proposed research is to define the general framework and the conditions to implement Environmental Managerial Accounting in Romanian organizations. Corroborating with the actual knowledge in the researching area, we propose to achieve the following objectives:

1. Identifying the useful information to help achieve certain objectives such as minimizing the costs (especially the environmental ones) and the negative impact on the environment. The decision makers can use the information regarding the physical use and cost of resources to take the most appropriate financial and environmental decisions.

It is important to note that, while EMA supports internal decision-making, the implementation of EMA does not guarantee any particular level of environmental or financial performance. However, for organizations and programs that have the goals of minimizing costs, especially environmental costs, and minimizing environmental impacts, EMA provides an essential set of information for meeting those goals.

EMA data are particularly valuable for management initiatives with a specific environmental focus. EMA provides not only the cost data necessary for assessing the financial impact of these management activities, but also the physical flow information (e.g., raw materials use and waste generation rates) that help characterize environmental impacts. Examples of actions which could benefit from the support offered by environmental managerial accounting may include: pollution prevention, design for environment, environmental life cycle assessment/costing/design, environmental supply chain management, environmentally preferable purchasing, extended producer/product responsibility, environmental management systems, environmental performance evaluation & benchmarking, environmental performance reporting.

2. Building a set of principles and methods to provide the means to obtain the quantification of the correlation between the environmental protection activity benefits and the costs of used resources (materials and energy), indispensable for the success of any initiative of this kind, so that the environmental managerial accounting become in the future more than just an instrument for environmental management.

Increasingly, the range of decisions affected by environmental costs of one type or another is generally on the rise. Thus, EMA is becoming increasingly important not only for environmental management decisions, but for all types of routine management activities, such as: product & process design, cost control & allocation, capital bud-

getting, purchasing, supply chain management, product pricing, performance evaluation.

3. Implementing ABC for environmental costs in Romania.

Activity-based costing (ABC) represents a method of managerial cost accounting that allocates all internal costs to the cost centers and cost drivers on the basis of the activities that caused the costs. ABC applied to environmental costs distinguishes between environment-related costs and environment-driven costs. The former are attributed to joint environmental cost centers, for example incinerators or sewage plants. The latter are hidden in the general overheads and do not relate directly to a joint environmental cost centre, e.g. increased depreciation or higher cost of staff. Nevertheless they vary with the amount of throughput. The choice of an adequate allocation key is crucial for obtaining „correct information”. The four main allocation keys are: volume of emissions or waste, toxicity of emission and waste treated, environmental impact added (volume x input per unit of volume), volume of the emissions treated and the relative costs of treating different kinds of emissions.

4. Developing an environmental management system (EMS). It can only be achieved if „environmental audit” is a concomitant feature of such a system. In this respect the organization becomes self-regulating and the undertaking of environmental audits on a regular basis provides the platform for organizations to adopt a self-critical and analytical posture as part of their routine organizational management processes. Organizations should be striving to achieve an integrated environmental strategy underpinned by the same type of culture that is required for the successful operation of a programme of total quality management (TQM). This approach to environmental quality management requires the development of environmental performance measures and indicators that will enable a comprehensive review of environmental performance to be undertaken. Many – if not all – total quality management accounting techniques can be modified and effectively adopted to help manage environmental issues.

5. Design and development of integrated software to manage and analyze the environmental costs. The system would aggregate two subsystems, one for managing the costs (built on a client server database – specific architecture, and one for data analysis (also using client server architecture and data warehouses-multidimensional analysis specific technology).

Companies and managers usually believe that environmental costs are not significant to the operation of their businesses. However, often it does not occur to them that some production costs have an environmental component. For instance, the purchase price of raw materials: the un-

used portion that is emitted in a waste is not usually considered an environmentally related cost. These costs tend to be much higher than initial estimates (when estimates are even performed) and should be controlled and minimized by the introduction of effective cleaner production initiatives whenever possible. By identifying and controlling environmental costs, EMA systems can help environmental managers justify these cleaner production projects, and identify new ways of saving money and improving environmental performance at the same time.

The systematic use of EMA principles will assist managers in identifying environmental costs often hidden in a general accounting system. When hidden, it is impossible to know what share of the costs is related to any particular product or process or is actually environmental. Without the ability to isolate and separate this portion of the overall cost from that of production, product pricing will not reflect the true costs of its production. Polluting products will appear more profitable than they actually are because some of their production costs are hidden, and they may be sold under priced. Cleaner products that bear some of the environmental costs of more polluting products (through the overhead) may have their profitability underestimated and be overpriced. Since product prices influence demand, the perceived lower price of polluting products maintains their demand and encourages companies to continue their production, perhaps even over that of a less polluting product. Finally, implementing environmental accounting will multiply the benefits gained from other environmental management tools. Besides the cleaner production assessment, EMA is very useful for example in evaluating the significance of environmental aspects and impacts and prioritizing potential action plans during the implementation and operation an environmental management system (EMS).

EMA also relies significantly on physical environmental information. It therefore requires a close cooperation between the environmental manager and the management accountant and results in an increased awareness of each other’s concerns and needs.

As a tool, we hope that the proposed method (ABC) to calculate environmental costs at EMA level will be used to support decision-making at product and process/investment level. An environmental accounting information system would allow organizations to better evaluate the economical impact of environmental performances.

Product/process related decision-making. Correct cost evaluation of products is a pre-condition for making sound business decisions. Accurate product pricing is needed for strategic decisions regarding the volume and choices of products to be produced. EMA converts many environmental overhead costs into direct costs and allocates them

to the products that are responsible for their incurrence. The results of improved costing by EMA may include: Different pricing of products as a result of re-calculated costs; Re-evaluation of the profit margins of products; Phasing-out certain products when the change is dramatic; Re-designing processes or products in order to reduce environmental costs; Improved housekeeping and monitoring of environmental performance.

The purchase value of materials and processing costs of non-product outputs play an important role in EMA. They include the cost for buying and processing that portion of production inputs that goes into the waste or is discarded as scrap such as raw materials, auxiliary materials or water, energy and the labour cost of processing. These costs are often on an average ten to twelve times greater than the waste and emissions treatment costs. Savings associated with this category of environmental costs into project evaluations will make a larger number of cleaner production projects more profitable.

2. Investment projects and decision-making. Investment project decision-making requires the calculation of different profitability indicators like net present value (NPV), payback periods (PBP) and internal rates of return (IRR) or benefit-cost ratios. Recognizing and quantifying environmental costs and benefits is both invaluable and necessary for calculating the profitability of environment-related projects. Without these calculations, management may arrive at a false and costly conclusion.

Companies should take into account hidden, contingent and image costs for project appraisals. The costs recorded in bookkeeping by conventional accounting systems are insufficient to provide an accurate projection of the profitability and risks of an investment. Many cost items that may arise from long-term operations or projects must be included in the project appraisal. These environmental costs have been grouped into five categories as follows:

- Raw materials, utilities, labour and capital costs are conventional costs always considered in project appraisals and cost accounting, however the environmental portion of these costs, e.g. non-product raw material costs, are not isolated and recognized as environmental.
- Administrative costs buried in the overhead costs and hidden. Examples include monitoring, reporting or training costs.
- Contingency costs that may or may not be incurred in the future, such as potential clean-up costs from

an accident, compensations or fines: the inherent difficulty in predicting their likelihood, magnitude or timing often results in their omission from the cost evaluation process. However, these costs very often represent a major business risk for the company.

- Image benefits and costs, often called intangible or “good-will” benefits and costs, arise from the improved or impaired perception of stakeholders (environmentalists, regulators, customers, etc.). Changes in these intangible benefits are often not felt until they are impaired. For example, a bad relationship with regulators may result in prolonged licensing process or stricter monitoring.
- External costs represent a cost to external stakeholders (communities, customers, etc.) rather than to the company itself. Most accountants agree that these costs should not be taken directly into account when making project decisions. The company should be aware, however, that high levels of external costs may eventually become internalized through stricter environmental regulation, taxes or fees. A good example of this type of cost would be costs of environmental degradation (through “acid rain”), due to sulphur dioxide (SO₂) pollution, which later standards strictly regulating SO₂ emissions would internalize, as the costs of purchasing and operating a scrubbing and neutralizing system. A profitability analysis should be done using appropriate time-lines and indicators that do not discriminate against long-term savings and benefits. Net present value and benefit cost ratios are suggested as better investment criteria than simple paybacks or internal rates of return to reflect real costs and benefits. An accurate analysis of the investment’s sensitivity to environmental costs should also be carried out, which takes into consideration the impact of input price changes and future changes in the regulatory regime (fees, fines and penalties). Different scenarios can be examined, also evaluating contingency and external environmental costs reflecting the joint impact of changing several variables at the same time. Thus, EMA is an important tool for integration of environmental considerations into financial appraisals and decision-making for new investments: environmentally friendly investments will show increased profitability in the long term if all these factors are included in the model.

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