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**ENVIRONMENTAL MANAGEMENT ACCOUNTING:  
INFORMATION SUPPORT  
OF COMPANY MANAGEMENT**

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*The decision-making tasks in a company require high quality information support. Under the conversion to the sustainable development scheme where the behavioural patterns of producers as well as consumers change, and where the approach of companies towards environment has a direct influence on the company's prosperity, environmental management accounting becomes a substantial tool for the support of decision-making processes – namely that component of the environmental accounting system which is primarily focused on meeting the information demands of the management. This paper focuses on the information demands of the management in the field of environmental performance and its influence on the company's economic performance.*

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## Environmental Management Accounting – Part of Company’s Information System

Environmental management accounting, hereafter referred to as EMA, is defined, according to the International Federation of Accountants [2] as “management of the environmental performance and economic performance by means of the development and implementation of adequate environmentally related accounting systems and procedures. EMA includes Life Cycle Costing, Full Cost Accounting, evaluation of benefits and strategic planning for environmental management. In some companies the system may also include reporting and auditing.” It is apparent from the definition that the field of interest for EMA lies both in *financial* and *non-financial* aspects. The same opinion regarding the subject of EMA is also held by M. Bennett and P. James [1] and C. Jash [3].

EMA can therefore be defined as a system which provides information on the environmentally induced financial impacts and the environmental aspects and impacts of a company’s activities, products and services on the environment for the needs of internal users (i.e. for the needs of the management). The EMA system is always divided into two subsystems in the expert literature – *environmental management accounting in monetary units* (MEMA) and *environmental management accounting in physical units* (PEMA). Such a division is not ordinary for the traditional management accounting where both subsystems are not at an equal level. Such an approach is used within EMA in order to make it clear that emphasis must be put on the *measurement of non-financial aspects of the company’s performance and on their management*, which is quite important especially for long term decision making [4,5].

MEMA is involved in the environmental aspects of the company’s activities which are expressed in monetary units and are used to support the internal decision-making processes. It is therefore based on the traditional management accounting which is extended and adjusted to trace and evaluate the environmental aspects of the company’s activities. MEMA is focused on the environmentally induced *financial* impacts. Its subject of interest are, for instance, material costs, energy costs, fees, penalties for violating the environmental laws, project investments aiming to reduce the impacts of the company activities on the environment, costs related to the provision of these activities, etc. MEMA is a very important tool for the support of the internal decision-making processes, because it tracks, traces and evaluates the costs and benefits which arise out of the company’s effect on the environment (i.e. as a consequence of the environmental aspects and impacts of the company’s activities, products and services). The information arising out of MEMA is used as part of the strategic and operative planning, as the information support for adopting such measures which would be used to achieve the required objectives and targets, and which play an important role in responsibility management.

PEMA is also used as an information tool to support internal decision-making processes. Its subject of interest comprises the environmental aspects and impacts caused by the company which are expressed in physical units. It reflects the primary link between the effectiveness of use of input materials and energies and the produced contamination. The emission and waste are in fact produced only if the resources are not completely used (imperfect use). PEMA gathers, records, traces and evaluates information regarding the environmental aspects and impacts which are used for decision-making inside a company. According to S. Schaltegger and R. Burrit [8], PEMA is used as:

- An analytical tool which enables us to define the strong aspects and weaknesses in the company's approach to the environment.
- A tool to support the decision-making processes which is focused on the assessment of the environmental quality.
- A tool to measure environmental efficiency.
- A tool for the direct as well as indirect control of environmental consequences.
- A responsibility tool which provides the basis for internal (indirectly also external) environmental communication.
- A tool which might help to support the sustainable development.

As part of the EMA system, a wide range of tools can be used. These tools are used to support the decision-making processes in the company and are always used depending on the type of the *decision issue* which is to be solved, on the *purpose for which the information is to be used*, and on the link to the *management level* where the decision is realised.

### **Information Demands of the Management Regarding the Environmental Performance and its Financial Consequences**

Managers are deemed to be the decisive factors in company management [9]. Recently management at all levels has had to respect the *issues of environmental protection*. To support the decision-making processes at all management levels, environmental information must be available which should actually be provided by the EMA system.

*The top management* focuses their attention especially on the strategic and long term accounting information which is used for planning and control at the company level as one entity. For the needs of the top management, especially those EMA tools from both subsystems (MEMA and PEMA) are utilisable which aim at the long term horizon and provide information about the previous development as well as future-related information. The top management works especially with the aggregate information and search for such measures which could be used to compare very different activities of the company. For this reason,

the top management prefers monetary information, which is obtained within the company's accounting system and which enables the comparison of a variety of the company's activities. Those MEMA tools which are used to support the strategic decision-making processes, aiming at fixed assets and fixed capital, are therefore the best tools to be used within the EMA system. Especially ad-hoc information is used in the decision-making processes, obtained upon a single request, which relates to the investment appraisal of each project including environmental aspects and impacts with high demand on financial capital. The top management, therefore, especially uses information concerning capital costs and revenues, life cycle costing and target costing, and is interested also in information relating to the actual results of the investment projects which have been carried out.

The top management is responsible for the future development of the company. To support the decision-making processes, long term budgeting is used from the EMA system which focuses mostly on research and development relating to the impact of the company's activities, products and services on the environment. Selection of suitable investment projects also plays an important role in the company's future development. To support their decisions in investments, the top management use information inferred from the investment appraisal, within which attention is paid to the assessment of the financial consequences of the environmental aspects and impacts of each project on the environment, or the assessment of the financial consequences of the environmental impacts as part of the entire life cycle.

*The middle management and executive ("first line") management* must perform many tasks: provide communication (between the top management and the operative staff), organise work (prepare work tasks for the given plant, report the tasks and provide for their fulfilment), provide for controlled operating conditions, manage their subordinates, constantly monitor the situation in the managed plant and analyse it, and adopt measures to prevent undesired conditions, assess the achieved results, monitor the opinions of the subordinates, initiate and control the implementation of changes (activity improvement) and monitor adherence to the standards and directives. Also the work of middle management is influenced by the company's approach to the environment and is affected by the environmental aspects of the company's activities, products and services. The executive management must provide communication about the environmental aspects and impacts regarding the activities for which they are responsible. As part of providing operating conditions and the management of operating activities, such as with production activities, an important role is played by input materials and energies, waste flows and methods of managing them. The management of material and energy flows is the key aspect for the improvement of production and other processes and operating procedures. The executive management therefore needs information on the material and energy flows and the waste flows and their

management, to be able to suggest and realise measures which would improve the efficiency of the processes and activities which they control. The executive management is also interested in the fulfilment of the relevant standards and other directives, where labour safety, health protection and environmental protection play an important role. The information demands of the executive management which are met through the EMA system are demonstrated on an example of production management.

*The production management* particularly needs information relating to production activities. With respect to the fact that they are responsible for the course of the production process, which is managed through production plans and their control, they are interested in information expressed in physical units rather than in monetary units [7]. Of the EMA tools, the production managers especially use the PEMA tools which provide information relating to the short term horizon. This is information on the material and energy flows which is used to achieve the desired level, or to improve the efficiency of the production process. It is mostly routinely gathered and processed information which is used for the planning of the production process and its control.

### **Information Demands at Various Management Levels**

The following text presents a general overview of the main information demands for each management level relating to environmental information, shown on an example of a company which is divided into business units according to their field of business. Various processes (activities) are in progress in each business unit, and company production is realised (products, services or other work). The business units are further divided into the relevant plants (centres).

The management at the business unit level is responsible to the top management for achieving the desired performance, not only as regards financial results, but usually also in environmental performance. The information demands of the management at the business unit level generally depend on the internal company management system which is applied throughout the company, and on the level of competence and responsibility of each internal unit, or the relevant workers (managers). The detection of the level and field of competence and responsibility is the primary condition for the construction of the responsibility management system. It is only on these grounds that criteria are defined which the management can influence, and their desired level is set. The information system must be able to measure the actually achieved level of the defined criteria and to quantify the positive or negative impacts on the overall results, depending on which plant (worker) is in charge of them. The entire process is accomplished by the relation of the achieved results to the bonuses or another form of incentive. A complex system of decisions tasks must therefore be resolved as part of the

responsibility management [6]:

- Organisational and economic structure of the company.
- Level of centralisation and decentralisation in the management of components and subsystems of these structures.
- Clarification of the primary features of management of concrete intracompany units.

When delegating a substantial part of the competence and responsibility relating, for instance, to the produced assortment, method of performing the tasks, and organisation of purchase and sales, to the management of a business unit, the decision-making processes at the level of the management of the business unit approach the decision-making processes which are going on at the level of the top management. The management of the business unit focuses their attention especially on tactically-operative management, but they also take an important share in the strategic management within the given field of business. To support the decision-making processes, tools from the EMA system are utilisable which focus on the long term horizon as well as information which is of a short term nature, such as information of the development of environmental costs. The management uses mostly the monetary information (of the past development as well as future-related information). Within the decision-making processes, both routinely processed information and ad-hoc information, which relates to the investment appraisal of the projects with environmental aspects and impacts, is used. To support the decision-making processes, the EMA system provides long term budgeting focusing mainly on the field of research and development relating to the impacts of the activity of the business unit, its products and services on the environment. If the business unit is also responsible for the environmental performance, information expressed in physical units is used – the management of the business unit is mostly interested in information on the environmental aspects and impacts of the activities of the business units, its products and services on the environment, and in the information of the environmental aspects and impacts of the investment projects which are important for the environmental performance management of the business unit both in the short term as well as the long term.

Within each business unit the management is usually realised both by product and by plants (responsibility management) and processes (activities). The information demands regarding environmental information to support the decision-making processes for the management in each of the above can be summarised as follows:

- *Product management* – this is focused on the management of environmental aspects and impacts, and their financial consequences, by each product type, product line, service or other work. The management uses both monetary

information and information expressed in physical units, because within the decision-making processes various decision tasks are resolved, such as price decisions, costing, solution of environmental issues related to each output etc.). The main tool for the product management is the costing – both cost calculations (preliminary and actual) and price calculations. Among the MEMA tools, environmental cost accounting is most used for the tactically-operative management (and within it, preliminary and actual costing for the environmental cost management), and the life cycle costing and target costing is most used for strategic management. Information on material and energy flows, waste flows and their management, and information on environmental aspects and impacts are quite important for the product management. Of the PEMA tools, especially the balances of material and energy flows are therefore used for the tactically-operative management, and the assessment of environmental aspects and impacts and the effects of produce within the entire life cycle are used for the strategic management.

- *Plant management* – the information demands of the management at the level of the company's units (centres) generally depend on the company's internal management system and the level of competence and responsibility of each unit or their managers. To support the decision-making processes, it is again the monetary information and information expressed in physical units which is used. The main monetary tool for this type of management is budgets. Of the MEMA tools, information from environmental cost accounting and short term environmental budgeting is used. Of the PEMA tools, information of material and energy flows is used most.
- *Activity-based management* – in connection with the increasing differentiation of products and services, with the necessity to react quickly to the changes in the business environment and with an emphasis on adapting to the individual customer's needs, it is necessary to carry out such activities in the company which are not directly linked to the products [6]. The costs of these activities are not directly related to each product and also their management by responsibility does not necessarily have to contribute to the rational behaviour. Relatively new tools must, therefore, be used which are based on the knowledge of costs incurred in each activity and process (such as the method of activity-based costing and activity-based budgeting). Management accounting must provide information support both for the operative process management, aiming especially at the reduction of production time, restriction of non-productive activities, increasing the effectiveness and quality of activities, and for the strategic process management which emphasises mainly the construction and technological preparation of production, development of customer and supplier relationships and further aspects which will enable cost reduction in the long term. Within the process management, both monetary information as well as information expressed in physical units is again used.

Among the EMA tools, information from the subsystems of environmental cost accounting, short term environmental budgeting, balance of material and energy flows and short term environmental planning is used for the operative process management. The information is used to support the operative management of environmental costs and impacts resulting in connection with the relevant activities (processes). Strategic process management focuses mostly on the information on the impacts of each process on the environment and on its financial consequences, which is used to propose such processes and procedures that are in accordance with the financial as well as environmental objectives of the company.

## **Conclusion**

The EMA system is a powerful tool to support the decision-making processes under conditions where the company's approach to the environment affects its prosperity. It is applicable to various management levels and to various types of organisation – production companies, those which render services and to NGO's, to small, medium-sized and large companies and to various fields of business.

The following comments can be added regarding the structure of EMA and the tools used within EMA:

- The EMA system is divided into two subsystems: MEMA and PEMA. These can be used either as mutually interrelated or as separate, depending on the information demands of the management. Both subsystems are important tools used for the management of the company's environmental performance and its economic performance in mutual relationships.
- The application of the relevant tools from EMA depends on the time frame of the impacts (past impacts, existing impacts, future impacts), and on the time in which the managers are interested as part of the relevant decision-making processes (short term, long term frame).
- Tools used within the EMA depend on the type of decision tasks which are to be resolved by the relevant managers.

The EMA system is also an important source of information which assists the management at various levels in defining and achieving goals aiming at improving the company's environmental performance and its economic performance. It may substantially support the company's efforts towards continuous improvement of both its environmental performance and its economic performance.



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