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ECO-MANAGEMENT ACCOUNTING AS A TOOL OF ENVIRONMENTAL MANAGEMENT (ECOMAC)

SUMMARY FINAL REPORT

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I. OBJECTIVES

The aim of the project was to build on the existing literature and practice and to analyse the current status of environmental management accounting in the EU. A central issue was whether and how companies calculate environmental costs and how these figures support management decisions. Its specific objectives were to:

- explore the possible contribution of management accounting to environmental management within the European context;
- develop a conceptual framework to map and analyse the relationship between the two activities;
- disseminate the results to business, policy-makers and others.

II. METHODOLOGY

The project methodology consists of the following parts:

- a survey among 84 European companies (located in Italy, Germany, the Netherlands and the United Kingdom) to give a picture of how companies of different sizes and operating in different sectors deal with the management accounting side of environmental management and to test four hypotheses on environmental management accounting as an emerging field.
- 11 case studies in EU countries on how companies deal with the accounting needs of environmental management;
- 4 case studies with companies participating as associate partners on whether available accounting practices give the right incentives to consider environmental effects and how additional accounting systems can improve those incentives;
- definition of a holistic framework which can map the overall relationship between accounting and environmental management;
- preparation of educational materials for SMEs and their advisers.

III. MAIN RESULTS

Survey

To a great extent the survey was explorative in nature. It showed that now and even more in the future management accounting activities such as budgeting, capital budgeting (investment appraisal), product costing and financial performance indicators will be of considerable importance or even crucial to environmental management. This conclusion holds for a great part of the companies irrespective of size and sector, but in particular for companies with 50 to 500 employees. Capital budgeting is dominant among the aforesaid accounting activities, but it is expected that in the future all of them will be very important to environmental management for most companies. Figures in this area are broken down into the sizeclasses 5-50, 50-250, 250-500 and more than 500 employees as well into the following sectors: textile finishing companies, chemical companies, paper companies, electronic companies and utility companies.

From the 15 Ecomac Cases

IBM Germany: proposed German legislation on product take-back created a need for new kinds of data on end-of-life costs. It is easier to generate such data with Activity-Based Costing. However, it also notes the dangers of relying on historic data when undertaking life-cycle costing.

Italiana Petroli: After assessing the risks of leakages at its petrol stations and the likely severity of the consequences, the company calculated the costs and benefits of taking remedial measures, such as building double-skin storage tanks. These proved to be uneconomic when a limited inventory of costs and benefits were taken into account, but cost-effective when contingent costs such as liabilities, damage to image and higher insurance premiums were taken into account

Auping (the Netherlands): its environmental costs under the MEC model (based on quality management) were almost four times those revealed by conventional accounting. As the model excluded con-

tingent costs and the costs of processing materials which end up as waste, the real environmental costs are even higher.

Zeneca (UK, Huddersfield site): the accumulated costs of waste amounted to tens of millions of pounds annually. There was a potential to save several millions of pounds per annum - much of which has now been achieved. One lesson is that organisational factors are important as these have a great impact on accounting structures and related incentives.

There were four hypotheses which played a part in designing the questionnaire and which were tested in the light of the findings. The hypotheses and the conclusions as to whether they hold are as follows.

Hypothesis 1: Logical relations between management accounting and environmental management can be established via the existing production processes and products.

This relationship was explored by distinguishing different sectors and size-classes, because sectors relate to specific production processes and size to the complexity of accounting structures. The survey shows that both have an impact but individual differences are dominant. Company histories (causing differences in governance structures and management practices) probably have a notable influence on how accounting systems look like. However, it can be expected that in the future best practices in the field of environmental management accounting lead to more common approaches.

Hypothesis 2: The linking of management accounting to environmental management will enhance the financial superiority of preventive measures relative to end-of-pipe measures.

In general, the interviewees believed that the availability of more detailed environmental cost information would lead to greater opportunities for preventive measures. The higher the visible costs, the greater the saving opportunities for measures which promise to eliminate or avoid these costs when implemented. Even though this hypothesis is supported by the survey, the ECOMAC project does not add fresh fuel to the idea that, categorically, prevention is tantamount to enormous costs savings. Moreover, there is a sense of uncertainty as to whether a substantial rise in environmental costs can be expected to take place in the future.

Hypothesis 3: Firm-based costs resulting from emissions to the environment are often not identified within the conventional management accounting practices. As a result, cost savings related to environmental measures frequently remain hidden.

According to the survey, in many companies a great part of the environmental costs are allocated to overheads. Such a practice is detrimental to making costs and cost drivers visible.

Moreover, case study materials demonstrate that environmental accounting initiatives can open one's eyes for unconventional business opportunities. Therefore, the hypothesis is largely supported by the findings.

Hypothesis 4: Activity based Costing (ABC) is a promising approach to remedy the "black box" nature of overheads. It can be applied so as to systematically quantify the cost-saving effects of environmental measures

According to the survey, 26 percent of the companies interviewed use ABC to provide insight into environmental costs. This shows that to some extent ABC is used to improve the environmental cost figures. A number of case studies also highlight the relevance of ABC in solving cost allocation problems. Therefore, the hypothesis is supported by the findings but this does not make ABC a sine qua non. European conventional accounting practices are closer to ABC than the conventional Anglo-Saxon accounting practices.

Case studies

The case studies centred on a number of themes such as the management of end-of-life disposal of computers, the calculation of liabilities costs related to environmental impacts of petrol stations, the quality of a company's environmental management, the cost control and capital budgeting of a paper manufacturing company, a chemical company's waste minimisation priorities.

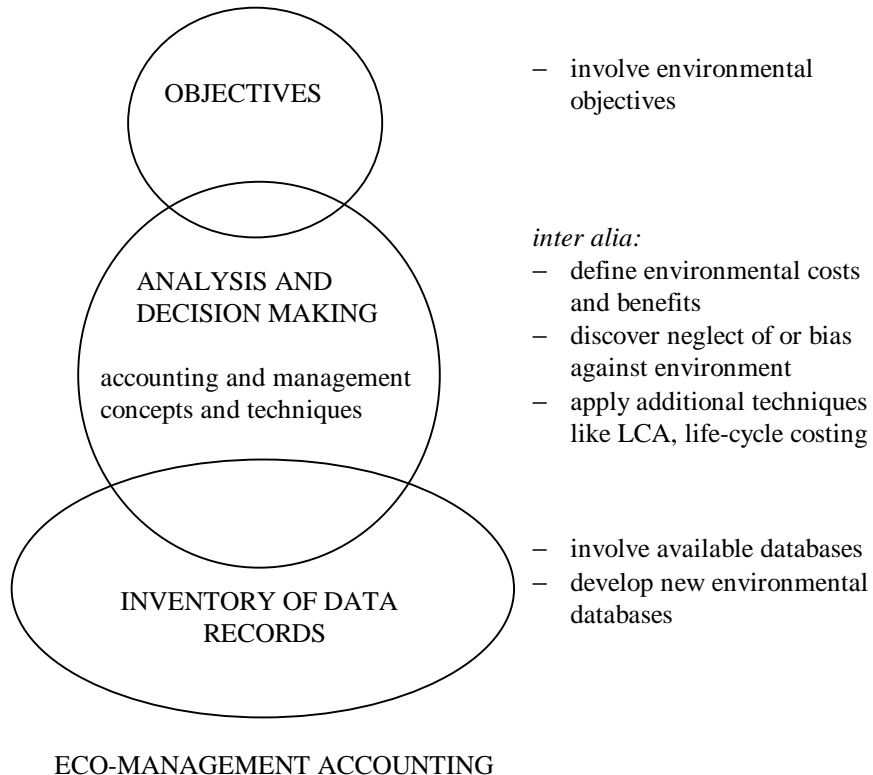
A dominant aspect of all case studies appeared to be the allocation of environmental costs. Advanced environmental policies which integrate economic and environmental aspects increasingly require better cost data which the existing cost allocation systems do not provide. The definition of environmental may be too narrow; environmental costs may remain hidden in overheads or allocation rules may be unrelated to the real cost drivers. New cost perspectives were created by means of concepts such as life-cycle costs, logistics costs and take-back costs.

Substantial attention has been given to environmental costs from a quality perspective. In particular, a distinction between the costs of preventive measures and failure costs may be important to spot proactive business-units.

- A complete definition of environmental costs contains the following elements:
- expenses which are wholly and exclusively required for purpose of environmental protection (capital costs of equipment and its operating costs);
- expenses which are largely related to purposes of environmental protection, using, where necessary, some form of apportionment of actual expenditure;
- the costs of inefficiency, i.e. suboptimal utilisation of environmental resources such as energy, raw materials and water (the amount of environmental cost is the difference between actual consumption and a conceivable lower level);
- intangible costs, such as damage to reputation which are difficult to quantify;
- external costs, i.e. welfare losses to society caused by a company's activities, which are not reflected in the company's own transactions or accounts;
- opportunity costs, i.e. welfare losses associated with forgone alternatives (in this case referring to declined environmental actions or overruled options for preventive investments).

All results were integrated in the so-called Ecomac Framework. The following diagram gives a simplified picture of this framework.

ECOMAC Framework



Eco-management accounting of course strongly relates to a company's financial and management accounting but it has implications for and requires data from many other functions and operational areas. The Ecomac Framework distinguishes three broad domains: environmental management, accounting and other management. For each of these, there is a hierarchy of three levels:

- the inventory of non-financial and financial data
- the techniques which process the data into information which is useful for managers and stakeholders,
- the specific objectives of the activity, which are related to the overall strategic objectives of the company.

The Ecomac Framework elaborates on all these levels. The three domains and the related accounting and score keeping practices are influenced by general features of the organisation relating to its structure, culture and processes.

A fundamental structural variable is the degree of decentralisation within the organisation. Strong decentralisation may encourage local initiatives of eco-management accounting. Intracompany comparability of figures may, on the other hand, be a disadvantage if decentralisation.

Culture is influenced by many variables. One important distinction is between 'bottom-line' and 'stakeholder' organisations. The former ones have a primary focus on financial issues, whereas stakeholder organisations see financial performance as just one factor in meeting the needs of a variety of stakeholders. These cultural differences are reflected in the different forms of business level eco-management accounting. The 'bottom-line' organisation tends to emphasise financial performance whereas the 'stakeholder' organisation is more interested in a holistic and long-term view. This may create an interest in eco-balancing and a longer-term perspective.

Effective and enduring cross-functional processes are vital for successful eco-management accounting because many practical actions require collaboration by different functions, such as accounting and environmental management. Where such processes are lacking, the development of eco-management accounting is unlikely to happen as it strongly depends on bringing together the three domains of accounting, environmental management and other management. Poor communications between controllers and environmental managers, for instance, may frustrate preventive measures whose advantages cannot be shown on the basis of current statements.

In a world where all costs going along with sustainability are internalised then sustainable value added will be the equivalent of economic value added, but this is far from being the case at present. Eco-management accounting is an indispensable step to bridge the gap.

IV. SCIENTIFIC INTEREST AND NOVELTY

The project has produced unique empirical materials which show how companies use management accounting to support environmental management. It produced important insights into how companies can apply the principles of environmental accounting. It shows where existing accounting structures are helpful and where new sources of information are needed to address the environmental issues companies have to face. It gives insight into the potential usefulness of different accounting concepts and techniques in the environmental field. It produced a framework which allows the integration of literature and project findings into one coherent body of knowledge. It indicates areas for further research.

V. POLICY RELEVANCE

The internalisation of environmental costs which the industrial societies have to bear, is not secured by the mere implementation of financial instruments such as eco-taxes and tradable pollution rights. Whether the desired effects are realised strongly depends on how financial signals are channelled through a company's decision-making structure.

Short-sighted concepts of environmental costs and limited cost allocations, as well as a lack of cost-driven incentives can frustrate the intended effects of financial instruments. Therefore, governments have to take a great interest in sound accounting practices. The ECOMAC project indicates what it takes to implement them. Project results and subsequent publications will be available, also after the project's completion, on pages of the

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At the moment there is an interest in developing uniform environmental performance indicators which also involve financial values. These make it possible to compare figures between companies. The ECOMAC project can contribute to developing such indicators, both in terms of conceptual underpinning and in terms of assessing the practical implications of composing financial indicators.

A continual debate on the policy-relevant issues associated with eco-management accounting will take place within the framework of the Eco-Management Accounting Network (EMAN). Major means of interaction are an annual meeting and a newsletter. Educational materials (discussed in seminars for SME advisers) will be available so as to assist companies in taking environment into accounting.

VI. LIST OF PUBLICATIONS

1. in preparation

De Walle, F.B., M.H.A. Wind and T.J.J.B. Wolters (1998) *Four case studies on eco-management accounting in the Netherlands*. EIM Small Business Research and Consultancy, Zoetermeer.

Bartolomeo, M., M. Bennett, J.J. Bouma, P. Heydkamp, P. James, F.B. de Walle and T. Wolters (1999) *Eco-management*, Kluwer Academic Publishers, Deventer

Bartolomeo, M., M. Bennett, J.J. Bouma, P. Heydkamp, P. James and T. Wolters (1999) *Eco-management accounting - current status and future possibilities in Europe* submitted to European Journal of Accounting

Bennett, M. and James P. with M. Bartolomeo, J.J. Bouma, P. Heydkamp, P. James and T. Wolters (1998) *Eco-management accounting - Guidelines for accountants, business advisers and environmental managers* UK Centre for Environment and Economic Development, Cambridge and University of Wolverhampton

- a number of articles in accounting and management journals

2. in press

Bouma, J.J. and T. Wolters (1998) *Een bijdrage vanuit management accounting aan het voorzien in milieu-informatie* (Management accounting contributing to the provision of environmental information) Tijdschrift voor Bedrijfsadministratie, jrg. 102, oktober 1998, blz. 382-387

3. published

Bartolomeo, M., M. Bennett and P. James (1998) *Eco-management accounting - a framework for analysis and action* UK Centre for Environment and Economic Development, Cambridge and University of Wolverhampton

Bouma, J.J. and T. Wolters (1998) *Management Accounting and Environmental Management: A survey among 84 European companies*, Erasmus Centre for Environmental Studies, Rotterdam.

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Four eco-management accounting cases in the UK UK Centre for Environment and Economic Development, Cambridge and University of Wolverhampton