

**Preliminary Proposal for the International Standardization of
Material Flow-Based Environmental Management Accounting
for ISO TC 207**

1. Background

Environmental management accounting (EMA) has continued to develop throughout the world since 1992, when the US Environmental Protection Agency launched the 'Environmental Accounting Project'. EMA is not only a powerful tool by which organisations in developed countries can link the environment with the economy within the framework of organizational management at the system level; it is also regarded as an important means by which organisations in developing countries can promote environmental conservation while enjoying economic benefits. Because there are considerable numbers of cases in that an organisation realised eco-innovation at both the process and product level through EMA, the linkage between the economy and the environment by EMA is considered to contribute very significantly to sustainability.

Nevertheless, environmental managers, who are familiar with environmental management system wishing to implement new EMA programmes, find themselves in a difficult position due to the absence of international standards for EMA in ISO 14000 family. For example, EMA is sometimes misunderstood as a method to calculate environmental protection cost, which is not so effective for organisational management. EMA essentially targets a much broader cost category including material, lifecycle, and social costs.

Concerning EMA methodologies and approaches, International Federation of Accountants (IFAC) released *International Guidance Document: Environmental Management Accounting* in 2005. However, as the main targets of the IFAC document are professional accountants, environmental managers in general are not very familiar with it. Therefore, it would be indispensable to have the International Standard of EMA in ISO 14000 family in order to promote EMA as a major means for sustainability. EMA is related to two specialized fields, environmental management and accounting, and the

basic principles of both must be incorporated so as to promote EMA as an organisation-wide activity.

We therefore propose the international standardization of EMA in order to address these issues and promote eco-innovation by EMA. In other words, we aim to realise sustainable society by achieving compatibility between the environment and the economy through EMA.

2. Purposes

The purpose of international standardization of EMA is twofold: to provide guidance to organisations seeking to implement EMA and to offer a common platform for its use, by providing a general framework and a way of implementation. Given that EMA covers a wide range of areas, comprehensive standardization would be difficult, making it necessary to leave selection of areas to be covered to the judgment of each organisation. Consequently, this proposal aims to standardize the framework and implementation focusing on the basic components of EMA to be mainly adapted to manufacturing processes. Because this proposal put importance on the aspect of the flow of materials, the title of this proposal is tentatively named ‘material flow-based EMA’ to avoid any confusion. **In addition, this proposal is not associated with any third-party certification.**

3. What is Environmental Management Accounting?

EMA¹ is “a system for linking the environment with the economy.” It is separate from corporate financial accounting regulated by law, and is a tool of using economic data in relation to the environment. EMA aims to provide accounting information useful for organisational decision-making in order to conserve the environment as well as to produce any economic benefits. EMA information would induce eco-innovations for organisations at both the products and process levels.

4. Relationship between the ISO14000 family and EMA

The ISO14000 family has been developing steadily since the publication of ISO14001 in 1996. However, the ISO 14000 family currently has no general guidance on EMA for

¹ For a definition of and details concerning EMA see the appendix.

connecting the environment and the economy at the system level (Figure 1). The balancing of the environment and the economy is a vital issue confronting economic organisations such as companies. On this point, there remains scope for improvement in the ISO14000 family. However, this need of improvement is not limited to the ISO14000 family; but it must be recognized that the time has come to expand the environmental management philosophy to include significantly greater consideration of the relationship between the environment and the economy, as shown in Figure 2.

Figure 1. Relationship between current ISO 14000 family and organisational economic activities

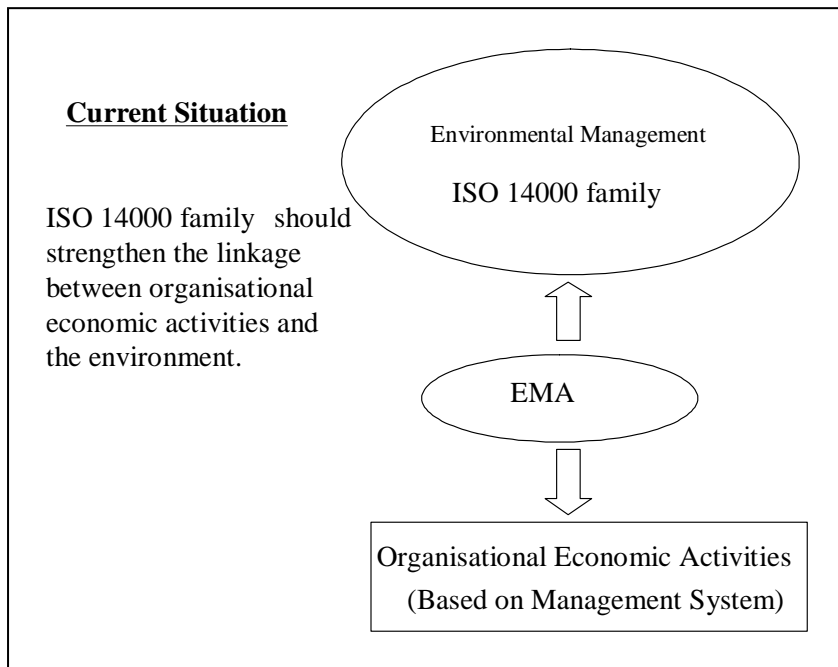
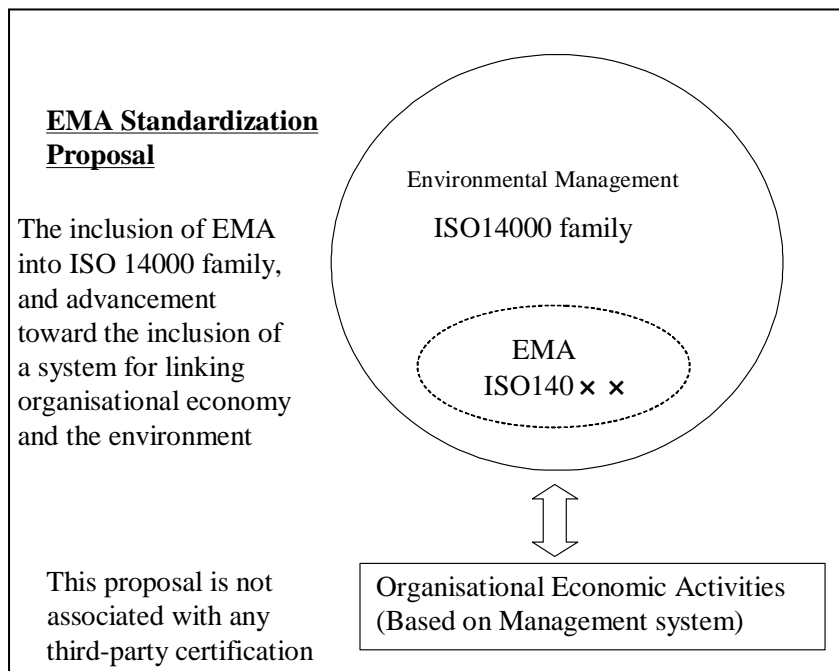


Figure 2. Expanded ISO 14000 family



Therefore, the ISO14000 family should work to establish a systematic linkage with organisational economic activities based on management system through the international standardization of EMA. Doing so will enable the realization of an environmental management framework that achieves a much more enriched balance between the environment and the economy. This must be a critical condition for sustainability

5. Details of the EMA international standardization proposal

The proposed international standard generally succeeds in realising the basic idea of the IFAC document (IFAC, 2005), adjusting their principles to the ISO 14000 family. In addition, this proposal provides general guidance on materials flow cost accounting² (MFCA). MFCA is a method to measure the flow and stock of materials within an organisation at the physical level and allocate cost data to them, which is generally overlooked by conventional cost accounting. By this calculation, the management will be

² For a definition of and details concerning MFCA, see the appendix.

able to estimate the precious waste cost amount and waste-generating steps in the process. Therefore, it is useful for organisations to base their management decisions concerning waste reduction, resource conservation, energy-use consumption, reduction of greenhouse gases and other items, on information calculated through MFCA.

Currently, the content of the study for standardization: “Environmental Management – Guidance on Material Flow Based Environmental Management Accounting – Framework and Implementation”, is as follows:

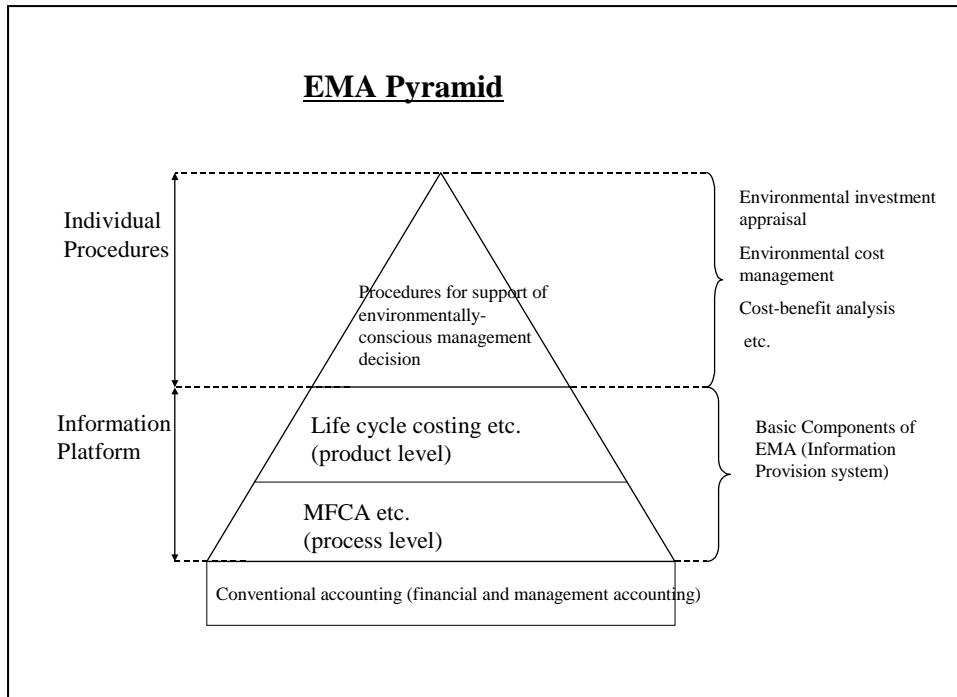
- (0) Introduction
 - (0.1) Relationship with ISO 14000 family
 - (0.2) Relationship with other guidelines on environmental management accounting
 - (1) Scope
 - (2) Normative references
 - (3) Definitions
 - (4) General explanation
 - (4.1) Environmental management accounting system
 - (4.2) Environmental management accounting for decision-making
 - (4.3) Items of special concern in environmental management accounting
 - (5) Framework
 - (5.1) Physical flow of material: materials flow accounting
 - (5.2) Monetary flow of material: materials flow cost accounting
 - (6) Implementation of material flow cost accounting
 - (6.1) Setting cost centre
 - (6.2) Measurement of information
 - (6.3) Reporting
 - (7) Index for Resource productivity from material flow cost accounting
 - (8) Relation between material flow cost accounting and conventional cost accounting
- Annex: Example of Application

6. Positioning of the proposal in the EMA system

While there are a number of other procedures involved in EMA, this proposal is mainly intended to standardize MFCA component of EMA. MFCA is classified as an

information provision system like life cycle costing³ in the EMA pyramid. This method comprises the information platform in EMA. Figure 3 demonstrates this relationship.

Figure 3. Positioning of MFCA in the EMA system



In contrast to life cycle costing’s focus on products, MFCA focuses on manufacturing processes. Therefore, when an organisation is considered as a unit, MFCA forms the ultimate platform for EMA, and has thus been made the focus of standardization. Here, standardization of framework and implementation of material flow-based EMA is also anticipated to further the use of other individual EMA tools.

While conventional accounting systems composed of financial and management accounting form the background of EMA, this proposal treats only the aforementioned component of EMA.

7. Merits of the international standardization of EMA: Toward sustainability by

³ Life cycle costing focuses on the oil and gas extraction industry, and has been standardized as ISO15663.

eco-innovation

EMA is considered to contribute very significantly to sustainability by leading eco-innovation. The following are the major merits of the international standardization of EMA:

- 1) Clarification of the impact of business processes on the environment and the economy
- 2) Promotion of waste reduction and resource conservation using EMA information
- 3) Contribution of EMA information to preventing global warming by reducing energy consumption
- 4) Enabling of recommendation of environmental conservation procedures that confer great economic benefits to small- and mid-size enterprises
- 5) Elimination of confusion in terms of interpretation of EMA information, and greater convenience for the user.

Synthesising the above merits, material flow-based EMA promotes eco-innovation in organisational manufacturing process. For example, Canon implemented MFCA for a camera lens production line, which had been regarded as producing almost no visible waste by conventional cost accounting. However, based on MFCA analysis the company found wastage of glass, which had been regarded as inevitable result of production and hence not considered as losses in the sense of conventional management, as a loss of value and a new target for reduction. Then, Canon developed a new, thinner glass material in collaboration with its supplier, which resulted in a fair amount of reduction in glass wastage as well as costs. This is a typical example how EMA leads eco-innovation, which is expected to contribute to sustainability.

In fact, organisations have actually already begun interpreting the principles of EMA independently. As a result, a number of organisations are effectively exhibiting the results of implementing EMA. Nevertheless, there still exist some cases in which the environmental impact has increased rather than decreased as the result of implementing procedures based on an improper understanding of the principles. International standardization is necessary so as to avoid such situations.

8. International Trends of EMA

This proposal is based on the research, investigation and application of theoretical and applied EMA in the real world. The following is a list of the major influences:

- 1992: The initiation of the Environmental Accounting Project by the US Environmental Protection Agency (this continued until 2002)
- 1996~1998: The provision of support by the EC provides for research and development of EMA. The EMA Network (EMAN) was formed subsequently. At present, the network has spread from Europe to the Asia-Pacific region, North and South America, and Africa.
- 1999: The Initiation of the EMA project by the Japanese Ministry of International Trade and Industry (METI) (ongoing)
- The United Nations Division for Sustainable Development (UNSD) formed the EMA Expert Working Group. The Group met nine times until 2005 and has published workbooks and pamphlets on EMA.
- 2002: The publication of *EMA Procedural Workbook* by METI
- 2003: The establishment of Environmental Management Accounting Research & Information Center (EMARIC) by the US Environmental Protection Agency
- 2003: The Issuing of *Environmental Costing Management Guide* by German Federal Environmental Ministry / Federal Environmental Agency
- 2005: The Issuing of *International Guidance Document on Environmental Management Accounting* by the International Federation of Accountants (IFAC)
- 2007: The publication of *Guide for MFCA* by METI

9. Concluding remarks

Material flow-based EMA is a tool for linking the environment and the economy at the system level throughout the organisation and beyond. Organisation can conserve the environment while enjoying economic benefits. Although the general guidance document is released by the accounting professional body (IFAC), people who are engaged in environmental management are generally not familiar with it. Therefore, it will be very useful to incorporate EMA guidance into ISO 14000 family for promoting the linkage between the environment and the economy.

The purpose of our proposal for the international standardization is to offer a common platform by providing a general framework and a way of implementation of EMA. The main body of the standard is regarding to MFCA, which is a method to measure the flow and stock of materials within an organisation at the physical level and allocate cost data to them.

Material flow-based EMA can lead eco-innovation for the management. There exist quite a number of cases in Japan. Therefore, it is expected that the standardisation of EMA promote eco-innovation all over the world and contribute very significantly to sustainability.

< Appendix >

Explanation of environmental management accounting and materials flow cost accounting

1. Environmental management accounting (EMA)

Environmental management accounting (EMA) is a set of procedures used within corporations and other organisations for linking environmental considerations with economic pursuits. The International Federation of Accountants (IFAC) defines EMA as “the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices.”⁴ In general, internationally all environmental accounting that is implemented independently from financial accounting is categorized as EMA.

In addition, EMA covers not only the monetary calculation regularly handled by accounting, but also extends to the calculation of materials on a physical basis. This is because EMA is closely tied to the flow of materials. Figure 4 shows this relationship as defined by the United Nations Division for Sustainable Development⁵. Nevertheless, the focus of EMA is generally considered to be the calculation of monetary units, with the calculation of physical units in a supporting role.

Given that EMA involves in the linkage of the environment and the economy by organisations, it covers a broad range of content and a variety of procedures. Japanese Ministry of Economy, Trade, and Industry (METI)’s *EMA Procedural Workbook* explains the following six procedures:

- Environmental investment appraisal
- Environmental target costing
- Environmental budgetary matrix
- Materials flow cost accounting (MFCA)
- Life-cycle costing
- Environmentally- conscious performance evaluation

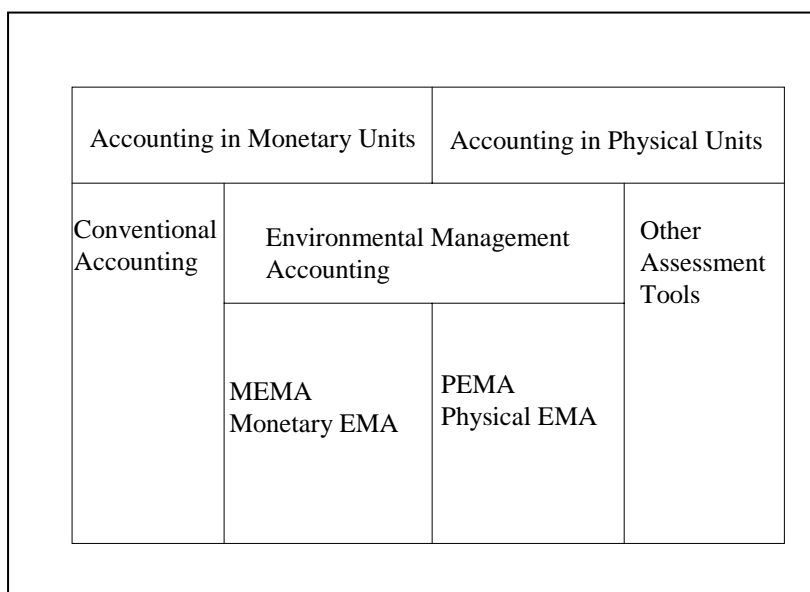
These procedures are divided into the information provision system that forms the

⁴ IFAC (2005) *International Guidance Document: Environmental Management Accounting*, International Federation of Accountants, p.19.

⁵ UNDSO (2001) *Environmental Management Accounting: Procedures and Principles*, United Nations, p.10.

basis of EMA, and individual procedures that support internal management decisions using the information received (see Figure 2). The information provision system is the more fundamental of the two categories, and is comprised of the above-mentioned MFCA, life cycle costing, etc.

Figure 4 Two areas of EMA (Source: UNDSO, 2001)



The difference between EMA and management accounting is found in their respective aims; management accounting focuses on economic gains, EMA seeks to balance the environment with the economy. While the difference between these two goals is obvious, it also results in differences in procedures and applications. In other words, EMA provides an economic measurement of environmental aspects not covered in management accounting and is designed to be reflected in organisational management decisions.

2. Materials flow cost accounting (MFCA)

MFCA is a system for measuring the flows and stocks of materials (raw materials) in a production process in both physical and monetary units. The German Federal Environmental Ministry and Federal Environmental Agency define “MFCA regards the relevant material flows as cost collectors, and therefore allocates the costs of the

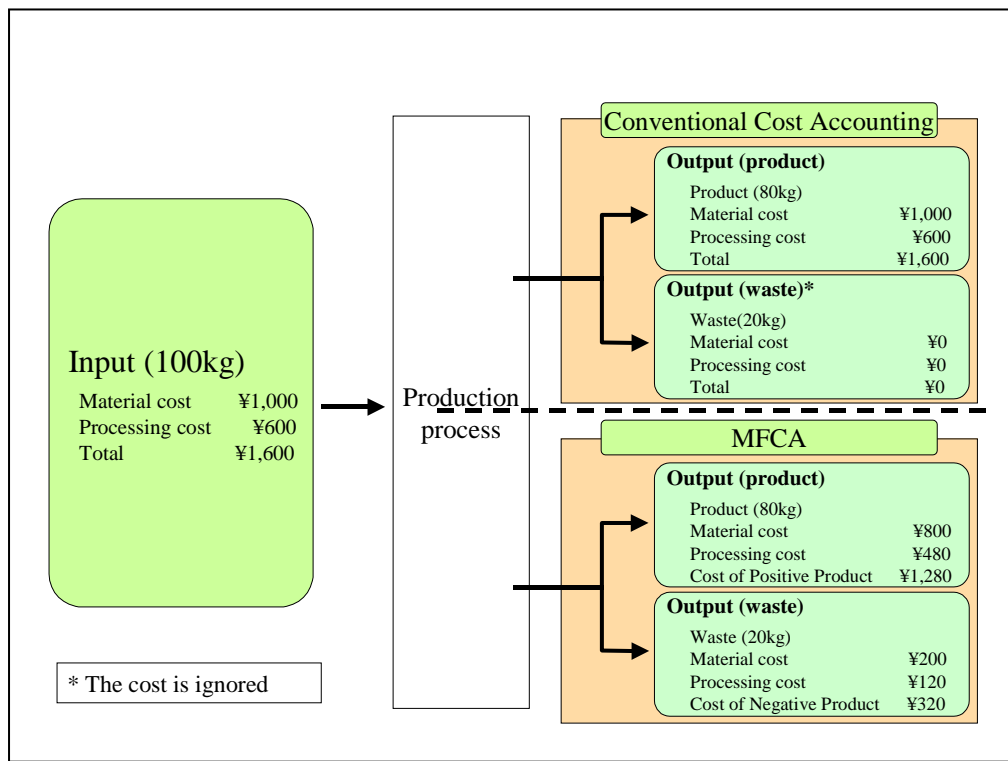
company's production operations to these material flows"⁶. In METI's EMA Procedural Workbook, MFCA is introduced as the primary method in EMA, and its implementation and promulgation are advanced.

MFCA represents a transformation of organisational production concepts, and brings forth management information useful to the new form of environmental management (in particular, cost information based on resource productivity). Organisations' outputs of products and emissions (waste) have an environmental impact, as does the resource consumption, i.e. input, in production. Nevertheless, given the need for products and services, the creation of more products from finite resources by minimizing the amount of input resources (as well as minimizing non-product emissions) constitutes environmental conservation and sustainability.

The realisation of this requires that organisational production processes be revised from the standpoint of the environment. Flow information for materials, which are input resources, must be adopted, rather than the cost information on an economic basis that has been used thus far. In real terms, this implies that all input materials flowing through production processes must be traced and categorized as 'product' or 'non-product'. Both products and non-products are treated as 'products' in the calculation, and the costs are measured separately. The saleable products are called as 'final products' and wastes (emissions) are called as 'negative products' or 'non-product output'. The method of cost calculation is shown in Figure 5.

⁶ FEM/FEA (2003) *Guide to Corporate Environmental Cost Management*, Germany Federal Environmental Ministry and Federal Environmental Agency, p.22.

Figure 5. The difference between MFCA and conventional cost accounting



As Figure 5 shows, even if waste is recognized in terms of quantity in conventional cost accounting, the ¥320 that goes towards waste production is excluded. This amount is automatically included in the cost of output (product); it is not separated in the conventional cost accounting. MFCA offers the measurement of that ¥320 and provides an incentive to management to reduce that cost.

As a result, the emissions (waste) that were thus far simply deemed “refuse” are evaluated in terms of economic loss, and attention is called to the wastefulness and inefficiencies of many production processes. This stimulates improvement measures for reducing such waste, bringing about reductions in wasteful use of materials, which in turn reduces emissions as well as material and waste disposal costs. Therefore, both a reduction in the environmental impact and a real economic benefit are achieved.

MFCA may also be extended beyond the bounds of a single organisation and applied for realization of resource productivity improvements across the entire supply chain. Given that MFCA may be applied across a broad range such as life cycle, there is a proportional relationship between the range of MFCA applications and the degree of the benefit. Therefore, we can expect application of MFCA to extend beyond the private

sector to the socio-economic sphere. It is also conceivable that it will be applied to not only big companies, but also small- to mid-size enterprises. Furthermore, the applications and benefits among organisations on a global scale can also be anticipated.

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