



---

**Pilot Programme for the Promotion of Environmental  
Management in the Private Sector of Developing Countries  
(P3U)**

**Environmental Cost Management  
Summary of a Workshop**



**Published by:**

GTZ-Pilot Programme for the Promotion of Environmental Management  
in the Private Sector of Developing Countries (P3U)  
Wachsbleiche 1, 53111 Bonn  
Tel.: (+49) 0228 604710 Fax: (+49) 0228 98570-18  
E-mail: gtzp3u@aol.com

Responsible: Dr. Edith Kürzinger  
Editing/Layout/Translation: Inka van Bergen



---

## Table of Contents

Summary .....	2
1 Introduction .....	3
2 Presentation of the instrument .....	4
2.1 General aspects .....	4
2.2 Definition of relevant costs .....	5
2.3 Determination of the relevant costs .....	6
2.4 Measures aimed at reducing costs and environmental impacts .....	7
2.5 Specific aspects with regard to small and medium enterprises .....	9
3 Application in the context of development cooperation .....	10
4 Round-up and evaluation of results / follow-up .....	11
List of Participants .....	12



---

## Summary

On 5 June 1997, a workshop on environmental cost management (ECM) was realized at GTZ headquarters in Eschborn at the invitation of the supraregional *Pilot programme for the promotion of environmental management in the private sector of developing countries* (P3U). The objective was to give an introduction to this instrument, to show options to reduce production costs and negative environmental impact through ECM, and to discuss the possibilities of applying it in the framework of development cooperation.

Mr. Fischer, an external consultant (Kienbaum Unternehmensberatung), presented ECM as a management system which comprises both aspects of environmental management and of cost management. Environmental management on company level primarily includes the management of material and energy flows which each (producing) enterprise takes from and returns to the environment. Parts of these materials enter into the product, the remainder turns to waste, waste water, - air and - heat, or enters into rejects. These non-product outputs (NPOs) amount to 30 - 50 % of the overall output of a typical enterprise. In contrast to end-of-pipe environmental protection, which deals with the treatment of NPOs, integrated environmental management aims at avoiding them.

Since NPOs are materials which have been purchased, processed and finally treated or disposed of, they do not only have a negative impact on the environment, but also on the cost efficiency of the production process. The costs related to NPOs do not represent any value added, and their reduction usually implies win-win-effects both in economic and ecological terms.

Starting point for the management of NPO costs is a comprehensive determination of an enterprise's material and energy flows and their conversion into costs. The results are summarized in a table which also serves to calculate and analyze different measures designed to reduce NPO costs.

Any such measure should aim at optimizing the quantities of NPOs. They can be reduced not only in all phases of the production process, but in all areas of activity, and, as a rule, there are more possibilities and potentials at the beginning of a process than at the end.

With regard to development cooperation, the introduction of ECM was identified as a suitable instrument which could produce a number of positive effects in developing countries. It was suggested to develop a range of services in the field of cost management and to integrate them e.g. into projects for the promotion of small-scale businesses, Protrade projects, and in the classical consultancy programme for the private sector. Various proposals were also made with regard to the dissemination of the workshop contents.



## 1 Introduction

On 5 June 1997, the international day of the environment, a one-day internal workshop on 'environmental cost management' (ECM ) was realized in GTZ headquarters in Eschborn at the invitation of the supraregional *Pilot programme for the promotion of environmental management in the private sector of developing countries* (P3U).

The workshop aimed at

- giving an introduction to the instrument by way of practical examples,
- showing options to reduce production costs and negative environmental impacts through ECM, and
- discussing possibilities of applying ECM in the context of development cooperation.

Participants were primarily GTZ staff attached to environmental and resource management on the one hand, and to private sector promotion on the other hand (see annex 1 - list of participants).

The workshop was moderated by Mrs. Edith Kürzinger, head of the P3U pilot programme. As an external consultant, Mr. Hartmut Fischer from Kienbaum Management Consulting gave a comprehensive introduction to the subject. The agenda corresponded to the headlines used in this documentation.

In her introduction, Mrs. Kürzinger briefly presented objective, results and approaches of the P3U pilot programme and stressed the necessity of combining economic efficiency and ecological sustainability in order to promote environmental management among small and medium enterprises in developing countries. Regarding the composition of participants, she noted that environmental issues were not yet systematically integrated in programmes for private sector promotion, whereas programmes in the field of environmental management rather cooperated with public than private partners. Hence, synergies could result from bringing together the two working areas. She also expressed the hope that follow-up measures could be identified in the course of the workshop, including activities to be taken up by the P3U pilot programme.

During the following round of presentations, participants were invited to explain their main expectations for the workshop. These were to:

- emphasize the economic aspects of environmental management
- develop ideas regarding the way of conveying the instrument of ECM to the target group / enterprises
- identify specific fields of application.

## 2 Presentation of the instrument

### 2.1 General aspects

Mr. Fischer presented environmental cost management (ECM) as a management system which comprises both aspects of environmental management and of cost management. Environmental management instruments can be classified into three groups as follows: *Comprehensive management systems* like the EMAS Environmental Management and Auditing Scheme or ISO 14.000, *management instruments* like auditing, check lists, eco-balance sheets or environmental performance indicators, and *individual technical and organizational solutions* like waste logistics or the application of best available technologies. Within this toolbox, ECM is a comprehensive management system which is supported by the instrument of environmental cost accounting.

Based on the principles of environmental law and of reducing environmental impacts, environmental management on company level primarily includes the management of material and energy flows which each (producing) enterprise takes from and returns to the environment. The utilization of materials and energy serves to produce a commercial good, and a large percentage of these materials and of the energy enters into the good. The remainder turns to waste, waste water, - air and - heat, or enters into rejects. These outputs are collectively called 'non-product outputs' (NPOs). Thus, NPOs are material and energetic residuals which are not included in the product (paid for by the client), and which have to be treated by way of utilization, recycling and/or disposal. While end-of-pipe environmental management aims at optimizing the disposal of NPOs, i.e. takes effect after they have been produced, integrated environmental management aims at avoiding these NPOs, i.e. begins before they have been produced. With regard to production processes, environmental management thus primarily is the management of NPOs.

Most enterprises underestimate or even overlook the costs of NPOs (e.g. related to waste and sewage caused in the administration section, disposal of unused production materials or unsold stocks). However, NPOs amount to 30 - 50% (in kg) of the overall output of a typical enterprise; out of these gas and oil account for approx. 10%. In conventional cost accounting systems, waste treatment costs are considered as part of the production costs and added to the product price. This approach, however, veils the actual dimension of costs caused by NPOs and hampers the identification of potentials for their reduction.

While it is still widely held that "environmental protection costs", it is necessary to realize that economic and ecological principles do not necessarily exclude each other. Enterprises do not aim at causing environmental pollution; hence, conflicts between economy and ecology do not exist on the level of their respective objectives, but on the level of means applied. If, however, the right means are adopted, positive results can be achieved in both, economic and ecological, aspects. Whereas end-of-pipe environmental management is likely to cause costs, integrated



environmental management can bring about positive economic and ecological effects (win-win situations).

Environmental cost management can be implemented in three steps:

- Definition of relevant costs
- Determination of the relevant costs
- Reduction of costs and environmental impacts through practical measures.

## 2.2 Definition of relevant costs

Environmental costs always represent a section of an enterprise's overall costs. The definition of this section has far-reaching effects in so far as cost effects which are not included will subsequently not be considered as relevant to environmental management.

An enterprise could e.g. decide to attribute the costs related to rejects either to quality costs, to logistical costs or to personnel costs. The measures adopted to reduce the costs will depend on and vary with this decision.

A suitable definition of costs should enable an enterprise to unequivocally attribute any kind of costs to either environmental costs or other costs and ensure that all relevant costs are taken into consideration. Furthermore, it should lead to figures which give a first indication of appropriate measures to adopt.

By the way of brainstorming, participants gathered possible types of environmentally relevant costs which were subsequently grouped as follows:

Additional costs of avoiding negative environmental impacts, like

- investment in clean production procedures
- product design / eco-design
- research and development (R+D) related to clean production processes
- product-related R+D

Costs related to the production of NPOs, like

- Proportional purchasing costs for raw, auxiliary and operating materials
- Proportional costs of logistics, storage and transport

Costs related to the treatment of NPOs, like

- logistics, storage and transport
- monitoring costs
- waste treatment / disposal costs
- investment in measuring and monitoring equipment
- personnel costs related to waste treatment
- insurance
- levies, taxes, fines.

So far, environmental cost management has mostly been based on so-called “environmental protection costs“, which basically correspond to the costs of treating/disposing of residuals and waste. In this approach, however, the advantages of avoiding NPOs are underestimated, since the costs related to their production are insufficiently taken into consideration. Furthermore, the term “environmental protection costs“ may imply that costs could be reduced by “protecting less“.

“NPO costs“, on the other hand, is an appropriate cost segment: They comprise the costs related to both the production and treatment of NPOs. The term “NPO costs“ furthermore indicates that costs can be reduced by avoiding NPOs and at the same time reducing environmental impacts. This approach shows that the reduction of NPO costs is both environmental management and cost management since:

- NPO costs do not represent any value added, but they are related to environmental pollution. The reduction of these costs usually goes along with win-win effects in both economic and in ecological terms.
- Once NPO flows have been identified as a cost factor, even those enterprises which are not interested in improving their environmental performance will be motivated to avoid environmentally harmful NPO flows.
- The management of NPO costs can be understood either as environmental management or as conventional cost management with a new approach, i.e. NPOs. *Experience shows that it is more likely to raise interest in ECM by presenting it as cost management than by stressing the ecological aspects.*

The extent of NPO costs depends on a multitude of decisions in various areas. Thus, measures and regulations regarding product design, investments in technology, purchase, and production design influence the costs related to the production of NPOs; measures regarding the treatment of residuals (waste, waste air and - water) and/or external recycling or disposal influence the costs related to the disposal of NPOs.

With regard to developing countries it was commented in this context that enterprises in industrialized countries increasingly tend to buy components produced in developing countries and merely assemble them. Thus, the costs related to the production and treatment of NPOs are increasingly being shifted to developing countries.

### **2.3 Determination of the relevant costs**

There is a multitude of NPO flows in each and any enterprise. As a principle, they are generated in each process, but not always in relevant quantities. The transparency of material and energy flows is the decisive issue in NPO cost management.

Usually, data on quantities and costs are not collected comprehensively and systematically. Therefore the determination of costs is preceded by a determination





of the NPO flows as well as the material and energy flows caused by NPO flows. For this purpose, the enterprise's activities are subdivided into various processes (e.g. various production phases as well as the administration section).

A physical tour of the enterprise helps to discover NPO flows, even hidden or irregular ones. In order to get a complete and reliable overall picture, representatives of various working areas should be involved in this process, since the knowledge about the respective flows differs from sector to sector. In order to illustrate the costs caused by NPO flows, it is helpful to describe a single flow throughout the plant; this makes obvious which costs are related to the NPO flow in which phase of the process, and thus can be reduced.

Some of the NPO costs can be derived from the existing cost accounting system; e.g. waste treatment costs usually figure as a separate position. Other cost items contain a certain percentage of NPO costs which have to be reattributed proportionally. In some cases, it may be necessary to use estimates and/or approximations. These should be made conservatively in order to ensure that the final data present a reliable and trustworthy basis.

As a practical exercise, the workshop participants determined NPO costs on the basis of a simplified example.

Once the costs have been established, they are documented in a summarized table which also serves to calculate and evaluate different measures which could potentially be taken. In order to ensure correctness and acceptance of the data, the data sources, assumptions and calculation methods which provide the basis for the summarized table are carefully documented and kept aside.

Recent experience shows that NPO costs amount to 5 - 15% of the overall costs of a typical industrial enterprise (in Germany); they are composed mainly of material costs, as well as personnel costs and the costs of external waste treatment. Thus, NPOs cause substantial costs which directly reduce an enterprise's yields. Projected to the processing industry in Germany as a whole, NPO costs are estimated at approx. DM 100 to 300 billion per year.

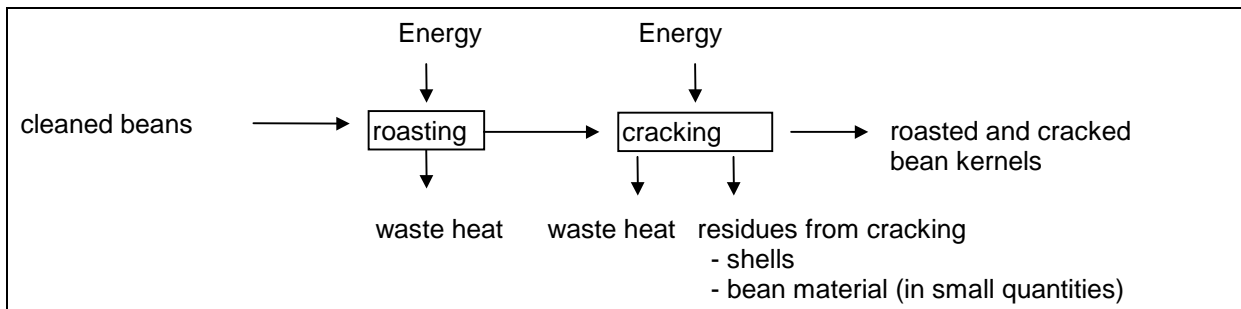
#### **2.4 Measures aimed at reducing costs and environmental impacts**

It goes without saying that it is impossible, both in technical and in economic terms, to avoid NPOs completely. However, the costs that result from not avoiding enough NPOs are unnecessarily high. Potential measures to be adopted therefore should contribute to optimizing the quantities of NPOs and their treatment.

As mentioned earlier, NPO costs depend on a multitude of decisions in various areas. Though integrated environmental management, these costs can be reduced in all areas, and the potential for developing measures (and thus the statistical probability of finding a cost-efficient solution) usually is higher in the beginning of a process than at the end.

Since it may be necessary to abandon prevailing views and opinions in order to change an enterprise's procedures, potential measures should be developed in multi-functional teams (technicians, administrative staff, management) with the assistance of creativity techniques. The following ad-hoc case study, presented by one of the participants, was used for a practical exercise to develop potential measures to reduce NPOs.

### Case study Cocoa Factory



And these were the ideas generated jointly ad-hoc with regard to reducing the quantities of waste heat and residues from cracking.

process phase	waste heat (roasting)	residues from cracking
product design	* product innovation unroasted cocoa	* acceptance of a certain amount of shells
process technology	* cracking before roasting * more energy-efficient equipment / machine	* separate cocoa from shells with the help of milk
make-or-buy	* purchase of sun-roasted beans	* external separation * genetically manipulated beans without shells
purchase	* utilization of a different type of energy * renegotiate purchasing conditions for energy	* purchase of differently treated beans
production	* alternative heat treatment procedure * reduce processing period	* alternative technology for separating
end-of-pipe	* utilization of waste heat from roasting for cracking * ferment shells into biogas * sale of waste heat	* energetic utilization of shells in the factory * utilization of energy produced from shells for roasting * definition of shells as a marketable product

The development of potential measures is followed by a quick selection on the basis of criteria such as:

- minimum costs vs. maximum savings



- gains vs. risks
- required know-how (lacking/available)
- time required for implementing the measure etc.

By implementing a single relevant measure, an enterprise can usually save one to two percent of its overall costs within 12 - 24 months, implementation costs deducted. In general, these cost reductions are achieved through technical and/or organizational measures which require rather low investments.

The continuous determination and analysis of NPO costs, the definition and monitoring of further objectives related to cost reduction, and the adjustment of existing structures and processes open potentials for further savings.

Apart from cost reduction, the following results are typically achieved as a “by-product“:

- improvement of quality through product and process innovation
- leaner procedures in the fields of material management and production
- improved cooperation and communication between departments
- reduction of negative environmental impacts by 20 - 40%.

If an enterprise intends to establish an environmental management system according to EMAS or ISO 14.000, costs can be reduced by combining it with a systematic management of NPO costs on the basis of this approach of environmental cost management.

According to estimates, the management of NPO costs can lead to a reduction of NPO quantities by 50% (factor 2) and of input quantities by 30% (factor 1.4), thus making a significant contribution to sustainable development.

## **2.5 Specific aspects with regard to small and medium enterprises**

Up to now, experience has only been gained from enterprises with more than 90 employees; the following special aspects, however, might apply when introducing ECM to small and medium enterprises:

- The cost situation may be more transparent in small and medium enterprises. Though it cannot be expected that NPO quantities are systematically determined and converted into costs, the relevant data may be available from a single person (e.g. the owner). Since many small and medium enterprises do not apply an advanced cost accounting system, the required figures may have to be deducted from the accountancy, individual vouchers or estimates, which may be less exact and reliable. If a small enterprise has not used a cost accounting system so far, there is, however, the advantage of introducing ECM right from the start.
- Small and medium enterprises often have limited know-how in the field of process technology and may depend on low-cost external support. The implementation of ECM, however, will require less experience in project management, as structures are less complex, and less people are involved.



- Due to shorter processes and simpler structures, results can be achieved in a shorter period of time as compared to large enterprises.

### 3 Application in the context of development cooperation

The following assumptions regarding possible effects of avoiding residuals and residual costs were presented in the beginning:

- Increased competitiveness of industries in developing countries (cost, quality, innovation)
- reduction of harmful environmental effects
- reduced consumption of scarce resources (water, energy)
- reduction of environmental impacts and development towards national and international environmental performance criteria.

Although, for lack of time, not all aspects mentioned could be discussed thoroughly, participants reached at the following conclusions:

In developing countries as well as in industrialized countries, the **motivation of enterprises** to introduce ECM is the reduction of costs. Even if managers of small enterprises are not aware of costs and saving potentials related to their internal processes, consciousness can be raised by producing realistic and reliable figures on cost reduction potentials. Export-oriented enterprises in particular have to produce cost-effectively, and experience shows that substantial measures are implemented as soon as there is sufficient conviction that these will be profitable.

It was also noted in this context that a lack of law enforcement does not necessarily hamper the introduction of ECM, as long as its economic advantages are highlighted. It was also pointed out that usually regulations on the treatment of NPOs only related to end-of-pipe environmental management which plays a secondary role in ECM.

With regard to effective **methods of transferring the methodology of ECM**, it was noted that a considerable number of seminars and meetings on environmental management issues were already being offered in developing countries. It was found, however, that a different kind of information transfer, combined with practical application in interested enterprises, was required to promote the implementation of concrete measures.

It was also reported that the main issue in consultancy work often was to overcome resistance to change rather than to develop technical solutions.

Furthermore, it was suggested to **combine various aspects**, like environmental management, quality management and/or risk management and safety of the work place. On the assumption that the certifiable environmental management system ISO 14.000 will gain increased importance for enterprises in developing countries as well, a range of possible combinations with ECM might soon arise. The manual

*Higher productivity and a better place to work* was cited as a positive example for combining different (here: social and economic) interests.

In the discussion, it was noted that consultancy offered free of charge (in the context of development cooperation) would lead to unfair competition. The opposite, i.e. the enterprise being charged for the consultancy service, would have the additional advantage of attributing higher value to the service and of being more demand-driven.

Considering the question of **countries which offer favorable conditions** to the introduction of ECM, especially emerging economies were considered to offer a high potential. It was noted that material flow management was also a relatively recent issue in industrialized countries, after having been neglected because material input had not represented a significant cost factor. It was only during the last decade that this factor again had gained importance through environment-related legal provisions.

Last, but not least it was deemed necessary to review existing **management information systems** in order to facilitate a continuous monitoring of costs.

#### **4 Round-up and evaluation of results / follow-up**

The following positive factors were identified with regard to the suitability of ECM as an approach for the introduction of environmental management in the private sector of developing countries:

- Environmental management standards which apply in the markets of industrialized countries play an increasing role for export-oriented enterprises in developing countries (e.g. for subcontractors).
- There is competition among enterprises in developing countries concerning access to environmentally oriented markets.
- The costs of raw materials have become more important; hence cost management and material flow management are becoming even more relevant.
- More information is available due to new technologies; thus, cost management is easier to realize.
- ECM is not a single measure, but a continuous process.

Based on these considerations, the following activities were proposed to the P3U pilot programme:

- developing and testing a range of services related to cost management and
  - integrating it into projects for the promotion of small-scale businesses in the services sector
  - integrating it into the business consultancy programme and Protrade projects
  - introducing it into small and medium enterprises in Peru



- introducing it into the ceramics industry in Vietnam
- training of local consultants
- elaboration of a module on ECM for the classical consultancy programme for the private sector and
  - application in Mexico in projects on the treatment of hazardous waste (CANACINTRA)

Regarding the methodology it was recommended not to focus on ecological, but on economic aspects. The specific requirements would have to be established in a case-to-case approach, and the service offered would have to be adjusted accordingly. In order to diffuse the concept and ensure its sustainability, it was recommended to identify key facilitators in the respective country who could ensure that importance was attached to the issue at high level.

Finally, it was suggested to disseminate the workshop results by:

- offering a half-day workshop
- developing and distributing a hand-out combined with a description of services offered by P3U
- designing a folder with a few striking core messages for project partners
- preparing an easily understandable introduction to the subject for distribution to partners
- elaborating examples of application specific to individual business sectors
- offering training on ECM for GTZ staff abroad
- developing services which include both a theoretical introduction and direct application.

Annex 1

### List of Participants

Ms. Huck	GTZ - Dept. 4150 / REV
Ms. Konstanczak	GTZ - Dept. 4140
Ms. Wucke	GTZ - Dept. 4140
Mr. Friebel	external consultant
Mr. Krist	GTZ project manager Algeria
Mr. Leffler	GTZ project member Algeria
Ms. Landmann	GTZ - Dept. 4020



---

Ms. Dr. Lumm	GTZ - Dept. 4091 / Protrade
Mr. Schreiber	GTZ - Dept. 4020
Mr. Schütt	GTZ - Dept. 4150 / REV
Ms. Trah	GTZ - Dept. 4050
Mr. Winkler	GTZ - Dept. 4020 / PVI
Ms. Dr. Kürzinger	GTZ - Dept. 4020 / P3U
Mr. Schmitz	GTZ - Dept. 4020 / P3U
Ms. van Bergen	GTZ - Dept. 4020 / RMSH
Mr. Fischer	Kienbaum Management Consulting