EMA-MFCA Excel Tool
User Guidelines

Introduction

The EMA-MFCA excel tool is part of the TEST training kit and has been developed to assist practitioners in the detailed analysis of material and energy flows in a company. The MFCA tool can be used for:

i) Input/output analysis at the company system boundary
ii) Identification of non-product output costs at system boundary and at specific cost centre level
iii) Selection of priority flows and priority areas associated with highest production losses and environmental costs
iv) Formulation of recommendations for addressing gaps in the existing company information system for monitoring important flows
v) Calculation of total environmental costs

The excel tool consists of 3 worksheets that are interconnected. The first worksheet is designed for assessing input/output balance at the company system boundary: it records both physical and cost - information on a company's inputs/outputs, as well as sources of information and the generated non-product output percentages in volume and cost for each production input. The second worksheet provides a breakdown of non-product output costs and other environmental costs by cost centre or major production process. The third worksheet calculates the total environmental cost (including NPOs cost), both in absolute and relative values.

This document provides guidance and illustrative examples for how to compile and fill out the EMA-MFCA excel tool and interpret the results for the purpose of improving internal information systems on materials and energy flows. The reader is guided step-by-step through the process of preparing the input-output mass balance and estimating loss percentages for non-product output based on the process flow chart. Examples from the pulp and paper sector are included in this document, and data from a range of companies in Austria, Cambodia, Egypt and Latin America with very different technological standards are presented.

The approach is based on ISO 14051 for Material Flow Cost Accounting (MFCA). The environmental cost categories used in the MFCA tool are consistent with the definition of UN DSD and IFAC. The main cost category is non-product output costs (NPO).

These guidelines focus on how to address a specific environmental cost category (the NPOs). If a company has significant environmental costs, however, (e.g. related to EoP or an environmental management system), assessing all environmental cost categories (e.g. end-of-pipe and integrated environmental pollution prevention) in line with a full-scale EMA assessment is recommended. More information on the definitions and procedure is available in the EMA-MFCA manual.

Material & energy balance at the company system boundary

This section describes how to complete worksheet 1 of the EMA-MFCA excel tool in step 1.4 of the TEST guide for identifying priority materials and energy flows associated with the greatest financial losses.

Preparation of the material and energy balance at the system boundary of the company are the first steps in identifying gaps and gradually improving information systems as a result of experiences gathered during the MFCA assessment for the previous business year. This ensures that better data can be generated for the next year. Lack of internal data on materials and energy flows as well as data inconsistencies due to poor information systems represent a major barrier, which can be overcome by teamwork involving the production and accounting departments. The only information system available in all companies is the accounting system where all invoices are recorded. These normally contain information not only on costs, but also on volumes purchased. It is generally best to capture this information from invoices at the moment they are recorded in the accounting system and to gradually improve the regular data monitoring systems.

These steps can be followed to start with the EMA-MFCA excel tool.

Step 1

Identify inputs and outputs at company system boundary, treating the company as a black box. Use the input/output assessment sheet in fig. 1 to record inputs and outputs. Pay attention to the different input and output categories.

All material inputs should be recorded with the amount of material used for production in relation to products produced. Stock losses should also be recorded. Only the amounts purchased may often be available for several material categories, and perhaps only sales volume for the output side and not production statistics for a given period. So one immedeate improvement option would be to improve stock management and recording of materials actually used for production.

Auxiliary materials become part of the product, but operating materials are not part of the final product by definition. For packaging distinguish between packaging of the input materials, which should be recorded under output if becomes waste, or not recorded at all if it is returned to the supplier. The packaging materials for the product are recorded on the input side. By-products are all outputs sold in addition to the main product, e.g. waste for recycling. If a company produces electricity on-site using diesel generators, the percentage of electricity that might be sold to the grid is considered a by-product. Out of specification products might be recorded as waste or as by-products, depending on whether they are sold or not. If they are internally re-processed, their record is only kept for the identification of efficiency improvements and won’t show up in the mass balance, as they don't leave the system boundary of the company black box.

INPUT	OUTPUT
Raw materials	**Products**
	By-products
Auxiliary materials	
	Waste
	Waste for recycling
Packaging	
	Municipal waste
Operating materials	*Hazardous waste*
	Wastewater
	Air emissions
Energy	CO/CO_2:
	NO_x/SO_2:
	Noise
	Maximum during night
Water	Maximum on site

Fig. 1 - Assessment Sheet Input/Output

Step 2

Estimate the product output and non-product output percentages for all inputs. The non-product output assessment sheet in fig. 2 can be used to record the data, which are normally estimated with the support of the production department. In companies with good information systems, NPO are monitored, not estimated.

INPUT	Product output in percentage (volume)
Raw materials	For the initial assessment, it may be reasonable to estimate total NPO percentage for all raw materials if no data is available, e.g. given 5 %. in the pulp and paper sector, an NPO of up to 25% seems reasonable! Over time it is best to gradually improve the information systems and quality management for the main inputs and processes.
Auxiliary materials	The responsible people in production can often provide good estimates. For auxiliary materials the loss percentage is normally lower than for raw materials.

Packaging	Experience shows 1 – 5 %, in case no better data are available.
Operating materials	*Defined as 100 % non-product output*
Energy	*Defined as 100 % non-product output*
Water	*Depending on product and processes, 100% for the pulp and paper sectoras the sold product is dry!*

Fig. 2 – Assessment Sheet Non-product Outputs

Step 3

Retrieve data on volumes and costs of all inputs and outputs from existing information system (mainly financial accounting and stock management for this system boundary and for the previous business year, since some data is only measured annually) and fill out EMA -MFCA excel tool worksheet 1. Typically, the initial input-output assessment shows a very incomplete picture. Figure n. 3 shows a typical result of an initial assessment for the pulp and paper sector in a developing country. As the sources of information are also listed, it is easy to repeat the assessment for the next financial year and, if recommendations are followed, much better information will be available very quickly.

Fig. 3 – Example of an MFCA excel sheet for a pulp and paper company.

Material & Energy Flows Balance: INPUT / OUTPUT (year 2014)	USD (unless otherwise indicated)	tonnes (unless otherwise indicated)	Source of information for USD	Source of information for tonnes	NPO percentage	Recommendations for Information system
1. Materials Inputs			Account			
1.1. Raw and Auxiliary Materials						
Raw Materials	1,700,000.00	8,000	50500	Weighted at the incoming warehouse	25% estimate	It is recommended to monitor the actual loss of raw materials
Subtotal	**1,700,000.00**	**8,000**				
1.2. Packaging Materials						
Strings and steel traps	5,000.00	not available	Included in account #89000	Not monitored	2%	It is recommended to assign packaging materials costs on a separate account
Subtotal	**5,000.00**	**-**				
1.3. Merchandise						
not to be recorded, only if they run through the production process						
Subtotal	**-**	**-**				
1.4. Operating Materials					100%	
Repair & Maintenance Materials	12,000.00	not available	70000&70100	Not monitored		Separate materials and services on this account. Gradually include these materials in stock management and record also volumes.
Operating materials	50,000.00	not available	50600	Not monitored		Record the total volume of chemicals bought by material groups, as well as the total input into production.
Aluminium sulfate		0.5		Estimated by production manager		
Caustic Soda		0.15				
Bleaching chemicals		70				
Subtotal	**62,000.00**	**71**				
1.5. Water						
Water from the river		not available		Not monitored		establish a meterig system
Water consumption from public supply (hl)	100.00	not available	78010	Not monitored		should be available from the invoice
Subtotal	**100.00**	**-**				
1.6. Energy						
Electricity in Kwh	300,000.00	1,500,000	78030	Calculated as 0.2usd per Kwh		record information from the invoice
Diesel	20,000.00	not available	65620			
Wood in m3	150,000.00	6,500	65630	invoices		measure delivery into incoming store and the amounts actually used to production
Petrol	5,000.00	not available	65600			
Gasoline	300.00	not available	65610			
Subtotal	**475,300.00**					
TOTAL MATERIAL COSTS / INPUT	**2,242,400.00**					
2. Product Output			Account number			
2.1. Products						
Sales Finish Goods		6,600	40000	The production volume of each day is physically measured.		It is recommended to keep a record of the monthly production volume.
Subtotal	**-**	**6,600**				
2.2. Byproducts						
Subtotal	**-**	**-**				
TOTAL TURNOVER / PRODUCT OUTPUT	**-**	**6,600**				

Comment [S1]: Capitalisation is uneven: Material inputs; Recommendations for information system: Raw and auxiliary materials: Actual raw material loss should be monitored; Packaging materials; Packaging material costs should be assigned to a separate account; Not to be recorded unless it runs through the production process; Operating materials; Repair and maintenance materials; …stock management and also record volumes; ---chemicals bought by material group as well as total input into production; Caustic soda; Establish a metering system; Should be available from the invoice; Electricity in kWh; …per kWh; Recorded information…; Invoices; Measure delivery into incoming store and amounts actually used in production; Product output; Sales finished goods; A record of monthly production volume should be kept; By-products [Please also remove the random full stops after some of the entries]

Material & Energy Flows Balance: INPUT / OUTPUT (year 2014)	USD (unless otherwise indicated)	tonnes (unless otherwise indicated)	Source of information for USD	Source of information for tonnes	NPO percentage	Recommendations for Information system
3. Non-Product Output						
3.1. Solid Waste						
Total non hazardous waste		not available				It is recommended to record the amount of waste regularly (weekly, daily, per shift).
Plastic waste		40		Estimated as 115kg per day as waste in the trash paper; sorted out during the pulping process		Record the amount of plastic waste if not available form the disposal invoice
Waste for Recycling						
Subtotal		**40**				
3.2. Hazardous Waste						
Hazardous Waste		5		estimated		Record the amounts of hazardous waste
Waste oil		1		estimated		Record the amounts of waste oil and ensure correct disposal
Subtotal		**6**				
3.3. Waste Water						
Qantity of waste water in m³		not available				Establish metering system
COD		not available				
cellulose material in waste water		1,500		Calculated as total solid input minus output at the bottom		
Subtotal		**-**				
3.4. Air Emissions						
CO^2 emissions heating plant				to be calculated based on boiler fuel CO2 emission factor		
CO^2 emissions vehicle fleet				to be calculated based on car fuel CO2 emission factor		
Subtotal		**-**				
TOTAL NON-PRODUCT OUTPUT						
			in %			
Total solid input paper and chemicals in volumes		**8,071**				
Total output in volumes		**6,606**				
Difference		**1,465**	18			
Total input trash paper in volumes		**8,000**				
Total output paper in volumes		**6,606**				
Difference		**1,395**	17			

Comment [S2]: See above for headings; Non-product output; Total non-hazardous waste; The amount of waste should be recorded regularly (weekly, daily, per shift); …in paper trash…; if not available from the disposal…; Waste for recycling; Hazardous waste (2x); Wastewater; Cellulose material in wastewater; Air emissions; Total input paper trash by volume; Total output paper by volume

Ideally, the mass balance balances out to zero. Water and energy should be listed but not aggregated. The mass balance can be tricky if there are several processes involving water. But the goal is not to be perfect in the initial assessment, and instead to gain an understanding of the dimensions of material flows and of the quality of the information systems that record them. It is therefore most important to make sure that input data is consistently recorded in kilograms, not in pieces, m2, bottles or other units that do not allow for aggregation. Common recommendations for improving the information systems are generated in this step, such as the opening of new accounts for the different material inputs, and the clear definition of which material numbers are to be posted to which account to make aggregation possible.

The materials purchased include all input to the site by delivery notice. However, the material actually used for production may be significantly different due to changes in inventory. Depending on the company, these materials are assessed by separate recordings of the materials withdrawn from stock for production, by measurements at the processes, or by simply recording inventory losses. For the mass balance, the materials used for production are ideally related to actual production. The materials lost on stock should be recorded separately, as the measures needed to

address these losses are different from the material used during the technical processes (material deterioration, spoilage and sometimes theft instead of leakages and scrap).

The table in fig. 4 shows where it is normally possible to find data for completing the input/output mass balance on the system boundary of the company using different information systems. If consistent and well kept, these allow a monthly data controlling system.

Sources of information for inputs	Input	Output	Sources of information for outputs
	Materials	**Products**	
List of accounts, stock management, recipe	Raw materials	Main products	Production statistics, production planning system, recipe
List of accounts, stock management, recipe	Auxiliary materials	By-products	Production statistics, production planning system, recipe
List of accounts, stock management, recipe	Packaging	**Waste and emissions = non-product output**	
Stock management, cost centre reports	Operating materials	Hazardous waste	Invoices, separate monitoring
	Water	Solid waste	Invoices, separate monitoring
Invoices, separate monitoring, cost centre reports	Different sources	Air emissions	Measurement, calculations
	Energy	Wastewater	Invoices, separate monitoring
Invoices, separate monitoring, cost centre reports	Different energy carriers		

Fig. 4 – Source of data for input/output balance (volumes and costs)

1. *Allocation of non-product output costs to cost centres*

This section describes how to compile worksheet 2 of the EMA - MFCA excel tool during step 1.5 of the TEST guide for the identification of priority areas and processes in a company that are associated with highest economic losses.

Once the data at the company system boundary have been completed for the previous business year (to the degree possible using reasonable effort), the next step is to assign the total inputs to cost centres or production steps. The structure of existing cost centres is often not related to the organisation's production steps. So a process flow chart can be drawn and amended by supportive business areas like stock management or quality control.

Cost centres are defined departments, units or even machines in an organisation to which costs are allocated. Different managers are often responsible for different cost centres. Sometimes there is also a differentiation between profit and cost centres or production and supportive cost centres. Production cost centres (also called profit centres) are directly linked to the value-added process of the company (the production process) while (supportive) cost centres are not directly linked to production process (e.g. advertising, human resources, maintenance, steam production, waste water treatment).

Figure 5 below provides a schematic process flowchart that can be viewed from different perspectives: Engineers go from the system boundary of the company down to specific processes via process flow diagrams, Sankey charts etc. while accountants apply cost accounting, stock management and production planning systems in addition to profit and loss accounts. The secret to efficiency lies in defining interfaces at which all these information systems are linked to each other and provide consistent information on a regular basis, opening the door to management and resource efficiency improvement.

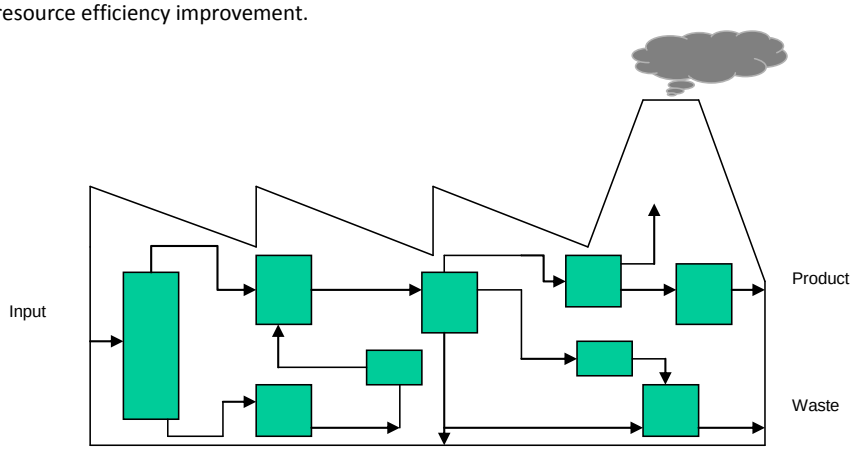

Fig. 5 – Scheme for a flow chart for cost centres

Step 4

Using the company flow chart, assign material and energy flows to each process and main production step. Consider the related material inputs and outputs for each production step. You may need to reconsider the input/output flow chart on the system boundary of the company as more significant inputs and outputs become visible.

Fig. 6 provides an example of how to complete this step in a pulp and paper company where cost centres are already defined.

Input	**Production steps**	**Production cost centres**	**Supportive cost Centres**	**Output**
Waste cartons, paper trash				Losses on stock
Auxiliary and operating materials			Incoming storage	Losses on stock
Waste cartons, paper trash	1st separation of solid waste			Waste
Water, electricity	Pumping water from the river			
Water, electricity	Soaking the paper			
Electricity	2nd separation of waste	Pulp preparation		Waste (rubbish), plastic waste
Auxiliary and operating materials, chemicals, electricity	Mixing	Mixing		Waste, wastewater
Auxiliary and operating materials, electricity	Paper forming and compressing	Paper machine		Waste, wastewater, unqualified Product
Wood			Steam production	Steam
Electricity, steam	Drying	Drying		Unqualified product, waste heat
Electricity	Sizing			Waste
Electricity	Rolling			Waste
Electricity	Packaging	Finishing & packaging		Waste
			Product storage	Losses on stock
Operating materials			Maintenance	Waste
Diesel, petrol, gasoline			Logistics	Air emissions
Operating materials			Administration	Waste
Total cost centres		**5**	**6**	

Fig. 6 – Example of flow allocation to cost centres for a pulp and paper company

Step 5

Assign non-product output costs to each cost centre/main process where it is originated. The annual costs are distributed to cost centres based on measured or estimated data. Use measured data to the degree possible and record recommendations for improved data availability. The outcome is a distribution of total annual non-product output costs by costs centre or production step, which allows a baseline for the project to be established and the top 10 priority areas to be reconsidered and backed-up with actual data from accounting. An example of worksheet three for a pulp and paper company is provided in fig. 7.

ENVIRONMENTAL COST CATEGORIES	Total usD	Cost Centers (production processes, departments, etc.)									
		Storage	Pulp Preparation	Mixing	Paper Machine	Drying	Finishing & Packaging	Steam production	Maintenance	Logistic	Administration
1. NON-PRODUCT OUTPUTS (NPO)	965,000										
1.1. Raw and Auxiliary Materials											
Raw Material 25 % loss druing production	425,000	38,250	148,750	21,250	4,250	127,500	85,000				
Loss in Stock	2,500	2,500									
Subtotal	**427,500**										
1.2. Packaging Materials											
Strings and steel traps 2 % loss	100						100				
Subtotal	**100**										
1.4. Operating Materials											
Repair & Maintenance, +-M/C	12,000		600	1,200	600	6,600	600	1,200			1,200
Operating materials	50,000	2,500		42,500		5,000					
Subtotal	**62,000**										
1.5. Water											
Water from the river											
Water consumption from public supply (hl)	100			5				80			15
Subtotal	**100**										
1.6. Energy											
Electricity in Kwh	300,000	6,000	75,000	15,000	15,000	135,000	15,000	9,000	9,000		21,000
Diesel	20,000									20,000	
Wood in m3	150,000							150,000			
Petrol	5,000									5,000	
Gasoline	300									300	
Subtotal	**475,300**										
Total Category 1	**965,000**	**49,250**	**224,350**	**79,955**	**19,850**	**274,100**	**100,700**	**160,280**	**9,000**	**25,300**	**22,215**

Fig. 7 – Breakdown of NPO costs by cost centre in a pulp and paper company.

Comment [S3]: [Spacing of the categories is odd – USD looks like usD. Can this be adjusted? Capitalization is uneven.] Pulp preparation; Paper machine; Raw and auxiliary materials: Raw material 26% loss during production; Loss in stock; Packaging materials; Operating materials; Electricity in kWh; Total category 1

Comment [R4]: Table to be replaced later

2. *Calculating total environmental costs*

The third EMA-MFCA tool worksheet automatically calculates the total environmental costs, showing the percentage distribution by cost categories. Fig. 8 provides an example for the pulp and paper company, where energy costs account for 50 % of all NPO costs and the loss of raw and operating materials is 44 % of total NPOs. Improving efficiency for those two inputs will thus also significantly reduce costs. It is worth highlighting that the data in fig. 8 refers to an SME located in a transitional economy with no EMS and no wastewater treatment plant in place. This explains the negligible environmental costs associated with end-of-pipe and integrated prevention.

	USD	Percentage [%]
1. NON-PRODUCT OUTPUTS (NPO)	**965,000**	**99.8%**
1.1. Raw and Auxiliary Materials	427,500	44.2%
1.2. Packaging Materials	100	0.0%
1.4. Operating Materials	62,000	6.4%
1.5. Water	100	0.0%
1.6. Energy	475,300	49.2%
2. END-OF-PIPE	**2,000**	**0.2%**
2.1. Equipment Depreciation	0	0.0%
2.2. Operating Materials	0	0.0%
2.3. Water and Energy	0	0.0%
2.4. Internal Personnel	0	0.0%
2.5. External Services	2,000	0.2%
2.6. Fees, Taxes and Permits	0	0.0%
2.7. Fines, Remediation and Compensation	0	0.0%
3. INTEGRATED PREVENTION		
3.1. Equipment Depreciation	0	0.0%
3.2. Operating Materials, Water, Energy	0	0.0%
3.3. Internal Personnel	0	0.0%
3.4. External Services	0	0.0%
3.5. Other	0	0.0%
TOTAL ENVIRONMENT-RELATED COSTS (1. + 2. + 3.)	**967,000**	**100.0%**
4. ENVIRONMENT-RELATED EARNINGS		
4.1. Other Earnings	0	0.0%
4.2. Subsidies	0	0.0%
TOTAL ENVIRONMENT-RELATED EARNINGS		
TOTAL ENVIRONMENT-RELATED COSTS & EARNINGS	**967,000**	**100.0%**

Comment [S5]: Capitalisation: Raw and auxiliary materials; Packaging materials: Operating materials; Equipment depreciation: Operating materials; Water and energy; Internal personnel; External services; Fess, taxes and permits; Fines, remediation and compensation; Equipment depreciation; Operating materials, water, energy; Internal personnel; External services; Other earnings

Fig. 8 – Total environmental costs for a pulp and paper company (with no WWTP in place)

The box below with related illustrations provides published information on an EMA assessment of SCA Laakirchen in Austria that indicates the average distribution of the total environmental costs to the different environmental media affected by environmental cost categories.

EMA for estimation and distribution of total environment-related costs – Austria

SCA Graphic Laakirchen AG, one of SCA's pulp and paper production sites, has been tracking its physical and monetary information under EMA since 1999 and now has a well-established, consistent system for capturing and assessing material flows and environment-related costs. The information collected is used for decisions related to both environmental management and general production. SCA Laakirchen annually calculates total environment-related costs and discloses their percentage distribution by environmental domain in its environmental statement, as illustrated in table x.

The data in fig. 9 illustrate the fact that the "materials purchase and processing costs of NPOs" (cost category 2 in this document) in many companies are often significantly higher than more familiar environment-related costs of "waste and emissions control" (cost category 3) – approximately four times as high in the case of SCA Laakirchen. Fig. 9 also illustrates the fact that "prevention and other environmental management costs" (cost category 4) at SCA Laakirchen are quite low, despite the fact that the company has implemented a number of preventive projects in past years that have achieved significant savings in "materials cost of NPO" as well "waste and emission control."

The data in fig. 9 allow SCA Laakirchen to compare its environment-related costs from year to year. For example, although manufacturing output rose almost 23% between 2002 and 2003, the use of a new paper machine kept the total environment-related cost increase to just 14.7% over the same period. This illustrates the overall positive financial impact of the company's environmental management initiatives. A more detailed look at the cost changes between 2002 and 2003 also revealed some interesting points. For example, the overall cost of operating the wastewater treatment plant did not change even though it was enlarged to handle the increased wastewater resulting from the expanded production. This was because the operational efficiency and maintenance of the wastewater treatment plant were improved in several ways as it was expanded.

Costs in other categories did increase. For example, the purchase costs of auxiliary materials increased not only because of expanded production, but also because of international price changes. SCA Laakirchen also observed that the distribution of total costs and earnings across the different environmental domains remained more or less constant over the years: 22% air/climate; 54% wastewater; 23% waste; 1% other.

The physical results of SCA Laakirchen's environmental management efforts were also presented in the company's annual environmental statement. For example, despite a production increase of about 23%, the procurement of water increased by only 11% and wastewater volume by only 13%. In absolute terms these represent increases, but they are improvements per unit of production. Use of physical inputs, such as fillers, recovered paper and energy, also increased in absolute terms but reflected eco-efficiency improvements.

Source: SCA Laakirchen Website, IFAC EMA Guidance document, 2005

Fig. 9 – Environment-related costs at SCA Laakirchen distributed by percentage** to environmental domains (2003)*

Environmental domain / Environment-related cost categories	Air + climate	Waste-water	Waste	Soil + ground water	Others	Sum
I – Material purchase cost of products	This cost category is not considered part of the EMA system by SCA Laakirchen					
IIa. Material Purchase Cost of NPOs						
Raw materials			15.2%			15.2%
Packaging			0.1%			0.1%
Auxiliary materials			2.7%			2.7%
Operating materials	0.1%	42.2%	0.5%			42.8%
Energy	19.8%					19.8%
Water		0.0%				0.0%
IIb. Material Processing Cost of NPOs		0.2%	1.0%			1.2%
Subtotal	**19.9%**	**42.4%**	**19.5%**			**81.8%**
III. Waste & Emission Control Costs						
Equipment depreciation	0.1%	2.8%	0.4%			3.3%
Operating materials and services	0.2%	5.5%		0.1%		5.8%
Internal personnel	0.7%	1.0%	0.1%			1.8%
Fees, taxes and fines	0.9%	2.7%	6.0%			9.6%
Subtotal	**1.9%**	**12.0%**	**6.5%**	**0.1%**		**20.5%**
IV. Prevention and other Environmental Management Costs						
External services for env. management					0.4%	0.4%
Internal personnel for env. protection	0.1%				0.3%	0.4%
Subtotal	**0.1%**				**0.7%**	**0.8%**
V. Research and Development Costs	This cost category falls in the prevention category for SCA Laakirchen					
VI. Less Tangible Costs	This cost category is not considered part of the EMA system by SCA Laakirchen					
I - VI Environment-related Cost Total	**21.9%**	**54.4%**	**26.0%**	**0.1%**	**0.7%**	**103.1%**
Environment-related Earnings Total			**-3.1%**			**-3.1%**
Total Environment-related Costs & Earnings	**21.9%**	**54.4%**	**22.9%**	**0.1%**	**0.7%**	**100.0%**

**Data are presented as a percentage of the total environment-related costs and earnings for the company

3. Recommendations regarding data information systems

An initial MFCA assessment can reveal major gaps in the information system and provide key recommendations for improving financial data monitoring, such as:

- Data recording of material purchase by material groups in financial accounting
- Separate accounts for different material groups
- Separate posting of materials and services (e.g. the account for maintenance often includes both)
- Posting of inventory losses by different material, not just in one line
- Recording of material numbers in production planning systems and stock management
- Estimation and recalculation of scrap percentages
- New accounts for better data monitoring, e.g. for energy consumption
- Establishing balances for energy, water and mass flow in order to verify distribution to production steps as performed during the MFCA workshop
- Reworking the structure of cost centres and making them consistent with technical data monitoring interfaces, so that regular performance measurement is possible

A few simple means for tracking performance and significant consumption provided a good basis for the pulp and paper case study for addressing the key issues and achieving the highest impact with the available resources:

- Checking consistency between material inputs according to stock management, financial accounting and production planning (from the recipe and production statistics)
- Establishing more accounts for separate posting of the different input categories
- Buying a simple scale for stock management. This was needed anyway to monitor maximum shelf weight and was also used to monitor waste volumes.
- Assigning responsibility to stock management department for waste monitoring and for collecting the related outgoing volumes and invoices.
- Establish steam production and maintenance as separate cost centres with defined responsibilities and data monitoring.
- Monitoring of water consumption per ton product for each shift
- Monitoring of steam consumption per ton product for each shift
- Monitoring of water treatment efficiency every day
- Monitoring of steam consumption
- Monitoring of diesel fuel consumption
- Monitoring of wastewater parameters for the waste water treatment plant such as BOD, COD, and TSS per day.