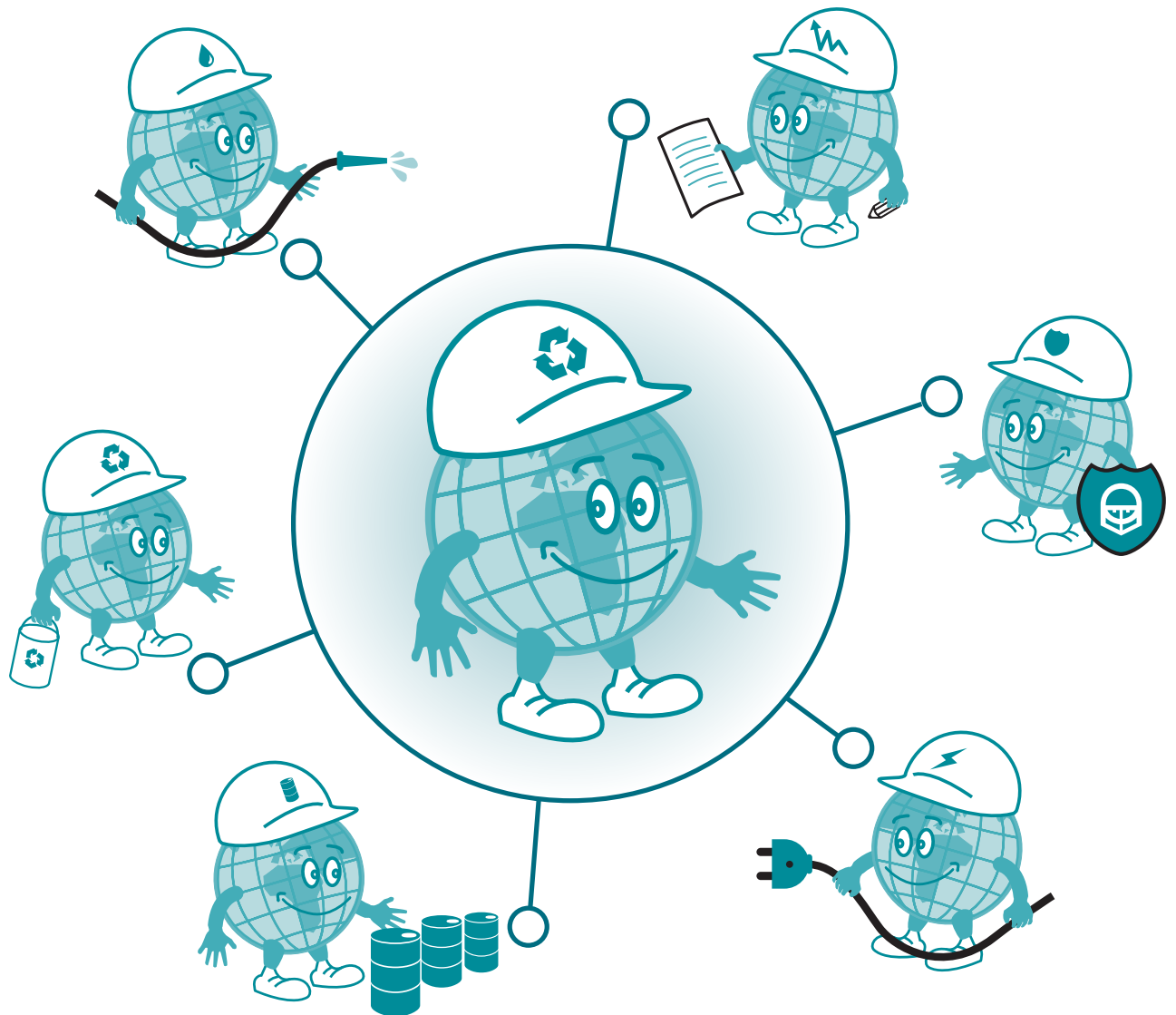


# DELTA

## Good Housekeeping

Eco-efficient environmental actions



Edited by:  
Sustainable Business Associates

With the support of:



## PREFACE

In the framework of the Swiss cooperation in Mediterranean, Sustainable Business Associates (SBA) encourages enterprises from Mashrek and Maghreb to become proactively responsible. Its goal is to enhance the knowledge and the skills of companies and influence the preservation of environment in a positive way. In order to assure sustainability, environmental action has to fall within the scope of a proactive and eco-efficient approach (linking ecological efficiency and economic return).

So, in the framework of the DELTA Programme (*cf. page 5*), SBA elaborated several eco-management tools to enable companies to apply principles of eco-efficiency. The Good Housekeeping (GHK) guide was designed to be the starting point of environmental integration in the overall strategy of the company. It sets the first steps towards an efficient Environmental Management System (EMS).

The GHK guide is intended primarily for Small and Medium-sized Enterprises (SME). It is a practical tool that helps companies identify simple environmental measures, reduce costs, improve productivity and minimise their environmental impact. The straightforwardness of the methodology enables SMEs' managers and technicians to quickly implement eco-efficient measures in their daily environmental management.

Elaborated in 1997, the first edition of the GHK guide deserved a revision and an update that takes into account the enriching feedback received during these last 7 years of its wide diffusion in Mashrek and Maghreb countries. We hope that this new edition of the GHK guide will keep encouraging enterprises to take an important step towards ecological and economic improvement in their processes.

We would like to thank the Swiss Agency for Development and Cooperation (SDC) for its support to the DELTA Programme and especially for the publication of this guide.

Lausanne, 21<sup>st</sup> of June 2004



Karim Zein, President  
Sustainable Business Associates

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## GLOSSARY

<b>Action plan</b>	A detailed plan identifying corrective actions, means, responsibilities, resources and time frame for remedial.
<b>Checklist</b>	A non-exhaustive aide-mémoire listing examples of actions to be taken to answer the environmental problems of an enterprise according to specific domains (water, energy, wastes, etc.).
<b>Eco-design</b>	The entire environmental impacts generated during all the steps of the life-cycle of a product are taken into account: extraction of raw materials, production, distribution, use and end-of-life treatment. The main objective is to decrease quantitatively and/or qualitatively the impacts of a product or service while keeping its intrinsic qualities and performances.
<b>Eco-efficiency</b>	Concept that encourages an enterprise to produce competitively priced goods and/or services which consume fewer resources and generate less waste and pollution. Eco-efficiency embraces economic and ecological efficiency.
<b>Eco-management tools</b>	Systematic measures and practices applied to manage activities, services, and products of an enterprise, which are likely to affect the environment. They help prevent losses of raw materials, minimise waste, conserve water, save energy and improve the overall operational and organisational structure and procedures. These tools include basic principles of environmental management and managerial techniques.
<b>Environment</b>	It is the natural surrounding of the enterprise, including air, water, soil, natural resources, flora, fauna, human beings and their interactions.
<b>Environmental Management System (EMS)</b>	Organisational and managerial structure and methods implemented to satisfy the requirements of the enterprise's environmental policy. The final objective is continuous improvement.
<b>Hazardous wastes</b>	Any waste containing important quantities of substances which are especially dangerous to life or health of living organisms and man when discarded in the environment. Hazardous wastes are toxic, carcinogenic, or mutagenic; they are highly reactive and have other biologically harmful characteristics (including radioactivity).
<b>INput</b>	Good or service used (entering) in a manufacturing or production process: raw materials, energy, etc.
<b>OUTput</b>	Good or service resulting (exiting) from a production process. There are products and production leftovers.
<b>Secondary raw material</b>	Material coming from the recycling of waste and that is meant to be introduced in the manufacturing cycle of a new product.

# INTRODUCTION

## The DELTA Programme

The DELTA Programme (Developing Environmental Leadership Towards Action) was conceived and initiated in 1995 by Sustainable Business Associates<sup>1</sup> (SBA). Chapter 30 of Agenda 21<sup>2</sup> underlines that business and industry have a critical role to play in achieving sustainable development goals. Thus, the DELTA Programme aims at sensitising industrialists in Mashrek and Maghreb to eco-efficiency and therefore to make them aware of new business risks and opportunities related to environmental issues. The DELTA Programme encourages proactive industrialists to federate themselves into local structures (the DELTA Networks) and create a neutral forum to improve the exchange of information and experience, gain tools based on eco-efficiency and promote the transfer of knowledge and the development of local capacities.

DELTA Networks are operating in Algeria, Egypt, Jordan, Lebanon, Libya, Mauritania, Morocco, Palestine, Syria and Tunisia. The DELTA Programme has been supported by the Swiss Agency for Development and Cooperation (SDC) since 1995.

## The conception of the guide

Sustainable Business Associates (SBA) edited this new version<sup>3</sup> of the Good Housekeeping Guide (GHK) with the objective to:

- Offer enterprises a simple management tool to improve their productivity and mitigate their environmental impacts
- Make companies aware of their daily problems related to environmental management
- Target significant and priority actions for the company, to encourage their implementation and to improve them continuously
- Integrate the environment as an element of the daily management of the company
- Show the eco-efficiency of the suggested corrective measures
- Enable enterprises to take a first step towards the implementation of a viable Environmental Management System.



*In most cases, GHK corrective measures have an investment below 2000 USD and a payback almost immediate (less than a year) [source: Programme DELTA].*

1. Sustainable Business Associates (SBA) is an international non-governmental organisation (NGO) based in Switzerland. It co-operates with enterprises within the context of sustainable development, to encourage their participation in environmental action, in order to simultaneously improve their economic efficiency and reduce their ecological impacts. Accordingly, SBA has created the DELTA Networks in 10 countries of the Mediterranean basin. The networks promote awareness among industrialists on risks and opportunities associated with environmental management. SBA activities are information (conferences, seminars, newsletter, and Web site) and training-oriented (courses, training-action, etc.)
2. Agenda 21 was elaborated during the Rio Summit in 1992. More than 150 heads of state signed a programme of actions for the 21<sup>st</sup> century. A set of concrete recommendations for the 21<sup>st</sup> century was elaborated, derived from the concept of sustainable development, which lies on 3 founding mainstays: economic action, social development and economical management of natural resources.
3. The GHK guide was first developed in 1997 in collaboration with P3U/GTZ (German Agency for Technical Cooperation; see [www.gtz.de](http://www.gtz.de)). The first edition was published in 2000 thanks to the contribution of the LIFE-Third Countries programme of the European Commission and the Swiss Agency for Development and Cooperation.

# THE GOOD HOUSEKEEPING GUIDE

## Presentation of the guide

The use of the GHK guide is intended to be simple and pragmatic. The guide gives the means to identify, at different levels of the enterprise, the opportunities to optimise its activities while reducing its environmental impacts. Indeed, GHK refers to a number of practical measures that satisfy companies' expectations to enhance their overall productivity, reduce their costs and mitigate their environmental impacts. These concrete GHK measures relate to voluntary and economically profitable actions aimed at:

- Rationalising the use of raw materials, water, and energy
- Reducing the volume and/or toxicity of waste, wastewater and emissions linked to production
- Recycling packaging materials and basic supplies as much as possible
- Improving the working conditions and organisational safety of the company.



*Examples show that waste can be reduced by 50% through the adoption of concrete GHK measures and by simply changing some working operations. [source: United Nations Environment Programme].*

By adopting GHK principles, the enterprise can also act on a vital stake: the improvement of its image towards its principals, its neighbours, its local authorities and other stakeholders.

## The GHK instruments

To enable the company to integrate GHK principles, this guide proposes 4 instruments. Their combination helps implement environmental actions satisfying the expectations and concerns of the enterprise. They allow also to see the interrelations between the enterprise, its resources and its environment.

### • FLOW CHART

Objective: to state the situation of activities and processes of the enterprise by linking the resources used (INputs) with the products generated (OUTputs).

### • CHECKLISTS

Objective: to identify the environmental problems, become aware of the necessity of targeted actions, establish its priorities and determine the responsibilities to assure the implementation and the sustainability of corrective measures.

### • ECONOMIC CALCULATIONS

Objective: to estimate the potential savings of corrective measures, assess their return on investments and serve as a decision-making tool.

### • ACTION PLAN

Objective: to summarise the chosen corrective measures within an implementation plan (responsibilities, means, expected savings and deadline) that will be communicated to the persons concerned.

To help the understanding and use of the guide, examples are detailed for each of the four instruments. Each checklist is illustrated with concrete examples of companies that obtained costs savings and reduced their environmental impact. These examples show a direct link between theory and practice.

## Target audience

GHK is intended for small and medium-sized enterprises of all sectors, wishing to better monitor their environmental impacts with the aim to implement, on a long run, more systematic environmental management tools (such as environmental cost management, environmental management system, ISO 14'001, etc.).

This tool can be used by managers, production managers and/or technical teams.

## Necessary means

**One day** is usually enough for the managers to apply the GHK guide. Should internal human means be lacking to undertake this task, an external assistance (consultant) for a day would still be worthwhile.

Moreover, in order to be profitable, **a change in behaviour and in attitude** of all the staff of the enterprise is required. Supported by a **better productivity**, this principle has to be an integral part of the corporate culture. In consequence, a general awareness raising is also necessary. This can be made effective through the circulation of the information at all levels.

Finally, to strengthen GHK principles, simple and pragmatic procedures can be developed, applied and integrated in the daily operations of the company.

# I. ANALYSIS OF INPUTS AND OUTPUTS

The detailed analysis of INputs and OUTputs of the production process enables to assess the energy and material use related to the activities of the enterprise. This instrument emphasises the potential areas of improvement according to their opportunities, their importance and the means available. Manufacturing processes transform resources into finished products, thus, the analysis of INputs and OUTputs helps identify the 'grey areas' (excessive scraps, material loss, high water consumption, etc.) and may become a motivation to establish an inventory of wastes. The aim is to:

- Use the available resources more efficiently
- Optimise the production process
- Address the economic and ecological deficiencies
- Adopt an optimal system of reuse and recycling
- Define the strategic measures to undertake.

## Quantification of INputs and OUTputs

Most of the INput data are already available in your administration departments (accounting, purchase, sale, etc) and technical departments (production, maintenance, storage, etc.). When precise data is lacking, estimations have to be made.

OUTput data are usually difficult to get. They should be estimated (give the most realistic and adequate data according to your activities; check if you are above or below the usual ratios of your sector).



*Thanks to the analysis of INputs and OUTputs, a detergent company realised that 6% of its raw material was lost through the chimney. It decided to invest in a cyclone to recuperate this raw material, therefore improving its productivity*

*[source : Programme DELTA].*

## Use of flow charts

Charts 1 and 2 list the INputs and OUTputs of the enterprise. These charts have to be adapted according to the specific activity of the company.

Chart 1 helps analyse the INputs and OUTputs of the entire production process. Chart 2 focuses on a specific step of the production process. It should be duplicated to all the steps of the production. Chart 1 represents globally the sum of INputs and OUTputs of all the production steps (sum of charts 2).



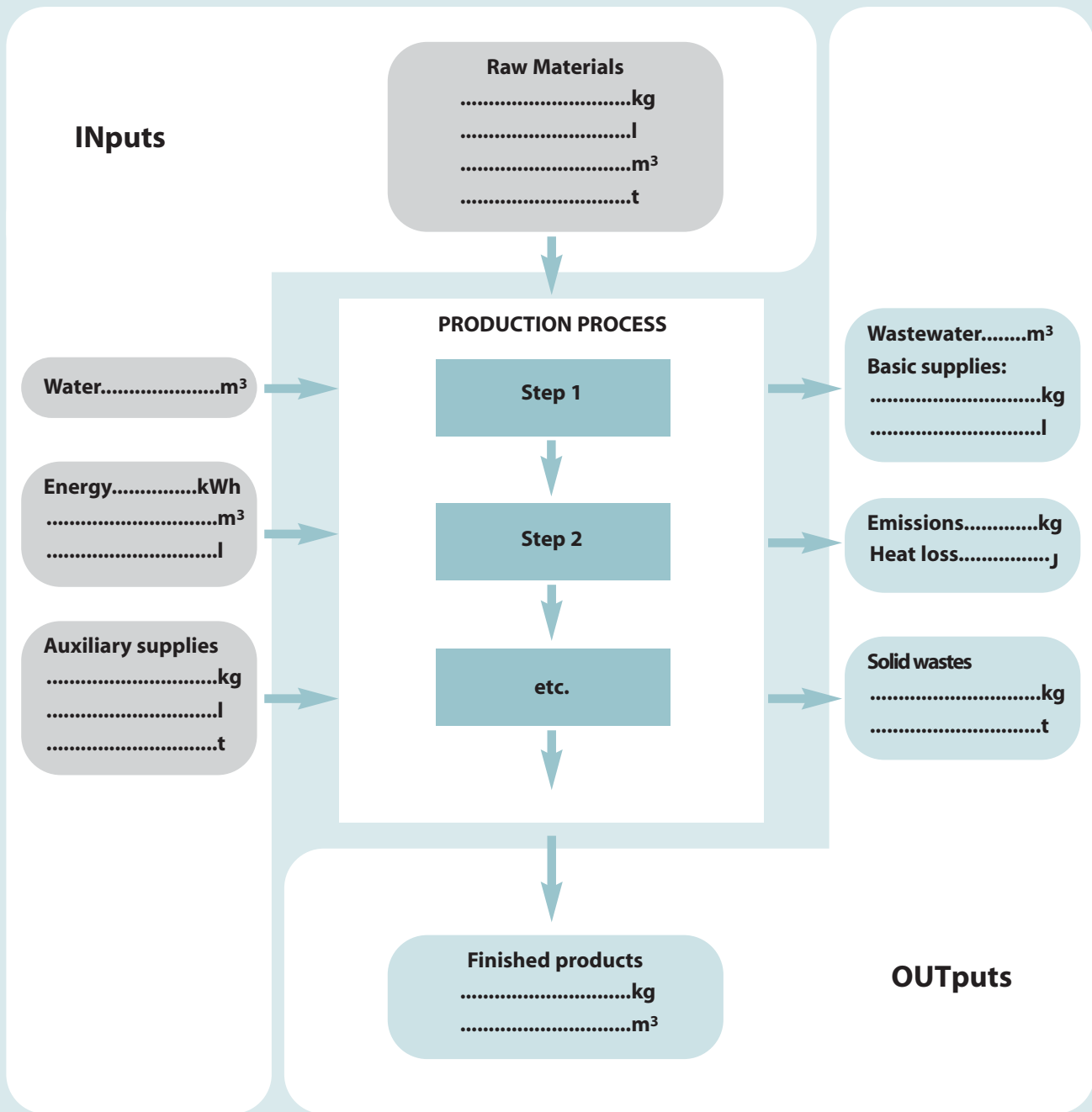
*By assessing the state of the material use, a cardboard manufacturer was able to quantify the cutting offcuts (40t/day). It implemented a recovery system to reuse them as secondary raw materials*

*[source : Programme DELTA].*

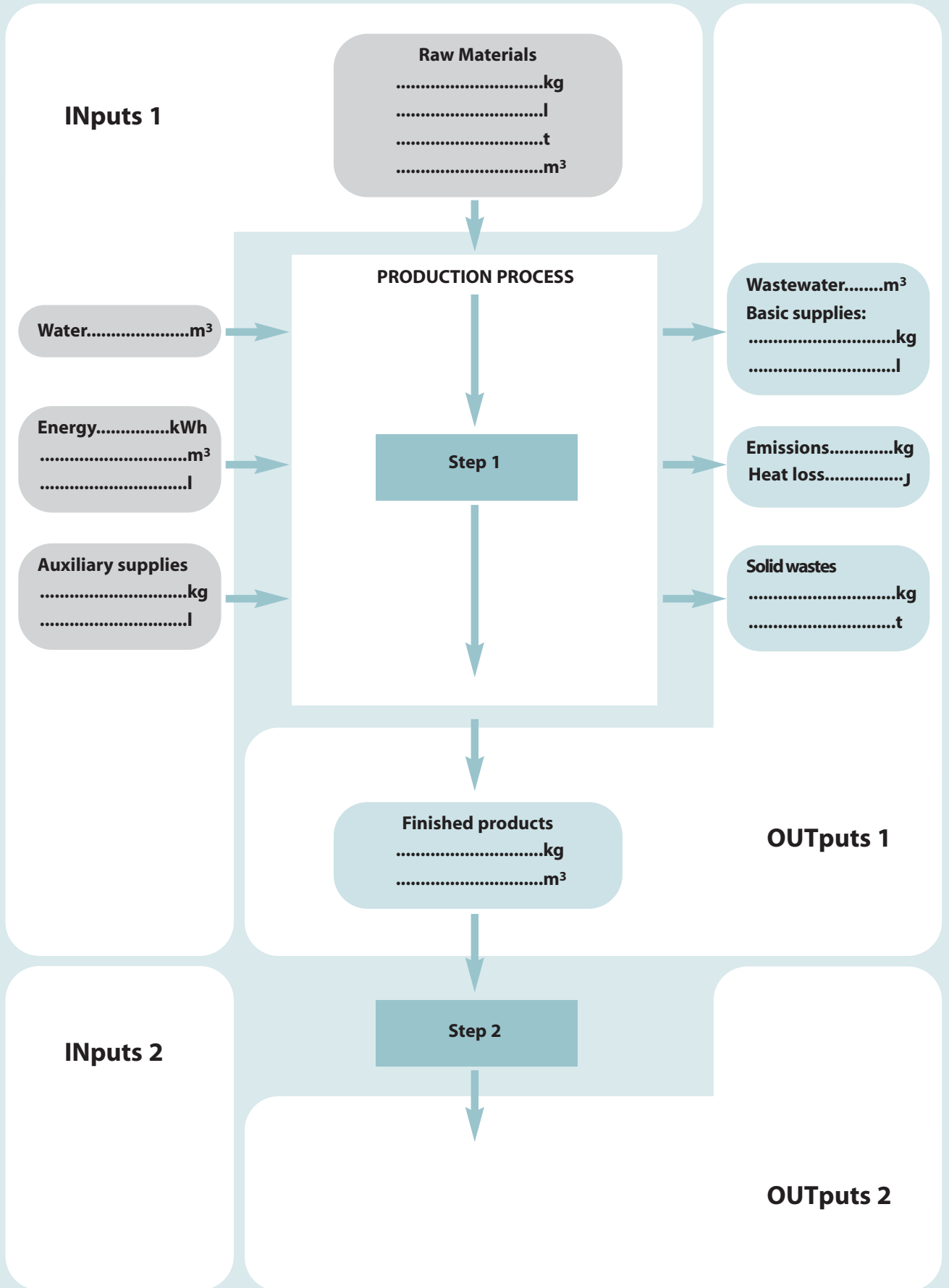
The analysis can be done either on the entire production (yearly, monthly, etc.) or on a certain production quantity (1 tonne of finished product for example).



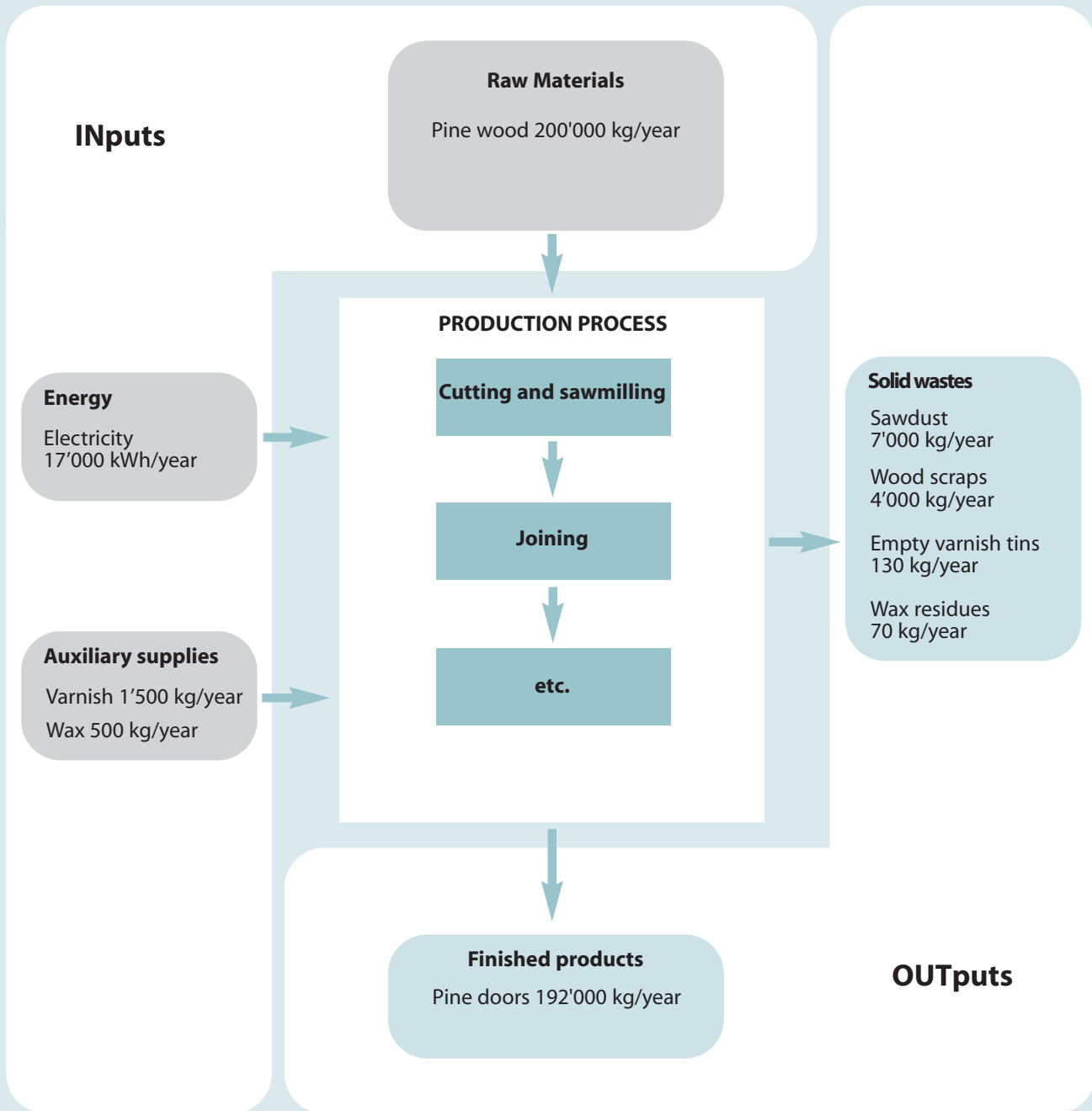
**Chart 1: Overall analysis of the INputs and OUTputs of an enterprise**



**Chart 2: Specific analysis of the INputs and OUTputs of a production process**



## Example of a global analysis of INputs and OUTputs of a joiner's workshop



## II. CHECKLISTS TO IMPLEMENT GOOD HOUSEKEEPING



A checklist is a simple but efficient instrument. It lists actions to take (potential corrective measures) in order to improve the environmental management of the company. The checklist helps check the current management of the enterprise's resources and the impact of its activities accurately. One or more actions of the checklist will be selected and will have to be implemented. The checklist can be used at different levels and for each of the production process steps. Once completed, the checklist can be posted as it is at strategic places. This will optimise the productivity and efficiency of the persons concerned as they are informed of the measures to be respected. The checklist also requires a brainstorming to carry out more important actions and to encourage the monitoring of the application of the actions.

### The domains of the checklists

The GHK guide has six checklists and each is dedicated to a specific domain:

#### RAW MATERIALS AND SUPPLIES

- To optimise the use of raw materials and supplies
- To reduce losses and avoid unnecessary waste
- To undertake preventive maintenance
- To elaborate plans and procedures in case of emergency.

#### WASTES

- To sort wastes according to their type
- To re-inject waste in the production cycle as secondary raw material
- To dispose of waste in an economically viable and environmentally sound manner.

#### LOGISTICS

- To assure proper handling and storage of raw materials and products
- To monitor stocks efficiently
- To plan and optimise production
- To establish procedures and keep good records of the company.

#### WATER

- To prevent leakage and wastage
- To reuse water in a closed circuit
- To monitor water consumption
- To save water.

#### ENERGY

- To save energy
- To install proper insulation
- To monitor energy consumption.

#### SAFETY AND PROTECTION OF STAFF

- To minimise risks and accidents
- To assure a safe working environment for the employees
- To inform and train the staff.

## Identification of priority actions

According to the suggested measures in the checklists, you must keep the actions that you think are **significant** for your activities and **applicable** in your company. Here is how you can proceed:

- 1<sup>st</sup> column: tick the box corresponding to the action to be taken
- 2<sup>nd</sup> column: set the priorities of the actions chosen according to the urgency and the relevance of the suggested measure (using for example a scale from 1 to 3: 1 = not very urgent; 2 = pretty urgent; 3 = very urgent)
- 3<sup>rd</sup> column: nominate a person responsible for the implementation and the monitoring of the corrective measure chosen
- 4<sup>th</sup> column: set a reasonable deadline to apply the measure.

### Example of the use of a checklist

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<b>Optimiser l'organisation de la production</b>			
o Dedicate certain equipment to manufacturing only one product			
o Maximise the number of same products manufactured (to operate during 1 day or 1 week the same manufacturing process on the same production line)			
<b>Repair leakage in pipes and equipment</b>			
☑ Make a visual assessment within each department in order to identify problematic areas	3	Mustafa	1 week
☑ Undertake repairs using appropriate materials	3	Mustafa	1 month
☑ Ensure that leaks have been eliminated	2	Mustafa	2 month
<b>Establish a preventive maintenance programme of equipment</b>			
☑ Determine intervals for regular checks	1	Randa	3 month
o Determine the persons responsible for regular checks			

## Domain 1: Raw materials and supplies

Objective: Optimisation of the use of materials and reduction of losses

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Monitor the consumption of raw materials in the company</b></p> <ul style="list-style-type: none"> <li>o Determine the quantities of materials consumed (material flow analysis)</li> <li>o Determine the costs and identify high consumption processes</li> <li>o Study the possibility of reducing the consumption of raw materials to reduce production costs</li> </ul> <p><b>Take measures to avoid unnecessary losses</b></p> <ul style="list-style-type: none"> <li>o Operate the machines according to the technical needs of production</li> <li>o Keep only the quantities of inputs at the workplace that are required for batch use</li> <li>o Avoid excessive purchasing</li> <li>o Keep the stocks of raw materials up-to-date</li> <li>o Protect raw materials from any damage with adequate packaging (humidity, heat, water, etc.)</li> </ul> <p><b>Optimise the production planning</b></p> <ul style="list-style-type: none"> <li>o Dedicate certain equipment to manufacturing only one product</li> <li>o Maximise the number of same products manufactured (to operate during 1 day or 1 week the same manufacturing process on the same production line)</li> </ul> <p><b>Establish a preventive maintenance programme of equipment</b></p> <ul style="list-style-type: none"> <li>o Determine intervals for regular checks</li> <li>o Determine the persons responsible for regular checks</li> <li>o Keep the maintenance manuals provided with the equipment in a convenient place</li> <li>o Provide employees with regular training to ensure that manufacturers' recommendations are followed</li> <li>o Write down for each equipment its location, characteristics and maintenance schedules</li> </ul> <p><b>Repair leakage in pipes and equipment</b></p> <ul style="list-style-type: none"> <li>o Make a visual assessment within each department in order to identify problematic areas</li> <li>o Undertake repairs using appropriate materials</li> <li>o Ensure that leaks have been eliminated</li> </ul>			

## Domain 1: Raw materials and supplies *(continued)*

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Reduce the use of cleaning products</b></p> <ul style="list-style-type: none"> <li>o Buy concentrated solutions instead of ready-made ones</li> <li>o Use disinfectants and detergents moderately</li> <li>o Follow the use instructions and to respect the measures</li> </ul> <p><b>Use environmentally sound products</b></p> <ul style="list-style-type: none"> <li>o Replace as much as possible hazardous materials with more ecological and less environmentally harmful products</li> <li>o Choose biodegradable detergents</li> <li>o Avoid disposable products and excessive packaging</li> </ul> <p><b>Assess bad uses of products</b></p> <ul style="list-style-type: none"> <li>o Make an inventory of surplus materials to reduce the over-supplying</li> <li>o Identify the reasons of the surplus and to find the most efficient solution</li> </ul>			

## Examples of application in enterprise



### RAYYAN DAIRY CO.

Dairy industry / Milk, 35 employees, Palestine

#### APPLICATION

<b>Objective</b>	Increasing profitability by preventing the loss of raw materials
<b>Set of problems</b>	Spill of milk by the operator during the filling of the bottles
<b>Action(s) realised</b>	Installation of a control valve in the filling process and of a conveyor belt to facilitate the operation

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	600 USD
<b>Annual savings</b>	8'000 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	1 month

#### ENVIRONMENTAL RESULTS

Reduction of the organic load in the wastewater following the reduction of milk spill

### KARDELEN OFFSET PRINT HOUSE

Printing industry / Magazines, books, posters and brochures, 10 employees, Turkey

#### APPLICATION

<b>Objective</b>	Purchase environmentally friendlier raw materials
<b>Set of problems</b>	Big quantities of packaging wastes due to the monthly discharge of 60 cans (1 kg each) of black ink
<b>Action(s) realised</b>	<ul style="list-style-type: none"> <li>• Purchase of 25-kilo cans of black ink</li> <li>• Reuse of the new empty packaging as trash cans</li> </ul>

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	0 USD
<b>Annual savings</b>	2'150 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

Use of environmentally friendlier materials and reduction of unnecessary packaging waste



## Domain 2: Wastes

Objective: To reduce, reuse, recycle and dispose of waste in an environmentally sound manner

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Examine the major sources of wastes</b></p> <ul style="list-style-type: none"> <li>o Identify the major sources of waste generation throughout the production steps</li> <li>o Determine periodically the quantities and the composition of wastes (monthly for example)</li> <li>o Determine the costs of treatment and disposal of wastes periodically for each department</li> <li>o Check that the practices of the company are in compliance with the current regulations</li> </ul> <p><b>Sort wastes at source</b></p> <ul style="list-style-type: none"> <li>o Avoid mixing wastes to facilitate their management and to avoid additional treatment costs</li> <li>o Sort wastes at source</li> <li>o Separate liquid waste from solid waste</li> <li>o Separate hazardous waste from other waste in order to avoid contamination and unnecessary increase of hazardous waste</li> <li>o Study the possibility of treating hazardous waste before its disposal</li> </ul> <p><b>Reduce the total amount of waste</b></p> <ul style="list-style-type: none"> <li>o Select and optimise the processes to prevent scraps</li> <li>o Order materials according to your needs to minimise waste</li> <li>o Measure, weigh and/or cut the materials used with precision</li> <li>o Store production scraps to reuse them in the future</li> <li>o Choose sustainable products and to use them correctly to increase their lives</li> <li>o Maintain and to repair equipment before replacing them</li> <li>o Use refillable products instead of disposable ones</li> </ul> <p><b>Take the necessary arrangements for non-recyclable wastes</b></p> <ul style="list-style-type: none"> <li>o Pre-treat liquid discharges</li> <li>o Store non-recyclable wastes adequately in a specific area before disposal</li> <li>o Dispose of non-reusable and non-recyclable wastes using appropriate methods that comply with existing regulations</li> <li>o Take the necessary precautions for the transport and disposal of hazardous wastes</li> </ul>			

## Domain 2: Wastes (continued)

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Reduce packaging wastes</b></p> <ul style="list-style-type: none"> <li>o Buy raw materials with the least packaging</li> <li>o Choose items in bulk to reduce excessive packaging</li> <li>o Choose materials available in large capacity containers</li> <li>o Study the possibility of reducing the packaging of your own products</li> <li>o Reuse the retrieved packaging to package your products or to put away tools or materials, etc.</li> <li>o Repair and reuse pallets to store and protect materials as well as the products of your enterprise</li> <li>o Favour suppliers that take back their packaging</li> </ul> <p><b>Reuse and recycle the different wastes</b></p> <ul style="list-style-type: none"> <li>o Identify possibilities for reusing and recycling the different wastes within the manufacturing processes</li> <li>o Sell non-contaminated organic wastes to be used as fodder or compost</li> <li>o Identify possibilities of selling materials to other companies to be reused (secondary raw materials)</li> <li>o Study the possibility of selling non-hazardous wastes to salvage dealers (paper, cardboard, plastic, iron, glass, etc.)</li> <li>o Separate and sort used solvents in the production to be regenerated</li> </ul> <p><b>Store the different types of wastes in different containers</b></p> <ul style="list-style-type: none"> <li>o Provide specific containers (different sizes and as much as necessary) for each type of wastes</li> <li>o Distinguish containers through colours, labels or symbols (pictograms) for each waste</li> <li>o Instruct employees of the use of the different containers</li> <li>o Check regularly if the separation of wastes is respected</li> </ul>			

In the annexes of this guide, you will find additional pieces of advice to manage your wastes in a rational and environmentally sound manner.

## Examples of application in enterprise



### MODERN ALUMINIUM INDUSTRIES CO. LTD

Metal industry / Aluminium products, 220 employees, Jordan

#### APPLICATION

<b>Objective</b>	Recover and reuse recyclable waste
<b>Set of problems</b>	Important quantity of solid waste because of the frequent replacement of parts of the production equipment (clamps)
<b>Action(s) realised</b>	<ul style="list-style-type: none"> <li>• Implementation of recycling procedures : systematic collection of damaged clamps by the workers and sorting of the different components according to categories and to their condition</li> <li>• Repairing and rebuilding of "new" clamps every two months as well as selling the recovered separated pieces</li> </ul>

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	179 USD
<b>Annual savings</b>	11'019 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

Reduction of solid waste by recovering 65% of damaged clamps

### SINOKROT FOOD CO.

Food industry / Wafers, 200 employees, Palestine

#### APPLICATION

<b>Objective</b>	Recycle and minimise solid wastes
<b>Set of problems</b>	Accumulation of production scraps leading to an increase of workload and an increase of solid waste quantities
<b>Action(s) realised</b>	Selling of the production scraps as animal food

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	0 USD
<b>Annual savings</b>	7'800 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

Elimination of polluting air emissions coming from the combustion of the production scraps

## Domain 3: Logistics

Objective: To improve storage, handling and transport of materials and products

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Inspect the quality of raw materials and other supplies delivered</b></p> <ul style="list-style-type: none"> <li>o Examine the packaging of the products delivered</li> <li>o Check that the contents are not damaged</li> <li>o Return the damaged materials to the supplier</li> </ul> <p><b>Guarantee specific storage conditions</b></p> <ul style="list-style-type: none"> <li>o Establish storage policies according to instructions provided by suppliers or as listed on the labels</li> <li>o Keep security records close to where material is stored and near the work posts</li> <li>o Avoid storing substances that could mix and interact together in the same area</li> <li>o Store raw materials in compatible groups</li> <li>o Check that the packaging is not damaged during storage</li> <li>o Store finished products in a specific separated area</li> <li>o Keep the storage area clean</li> <li>o Elaborate a maintenance schedule of the warehouse</li> </ul> <p><b>Assure a safe storage of hazardous products</b></p> <ul style="list-style-type: none"> <li>o Collect all hazardous products (toxic) in a designated and secure area</li> <li>o Respect the storage instructions of the manufacturers</li> <li>o Restrict access to hazardous products and control their use</li> <li>o Assure the necessary storage conditions to avoid accidents (appropriate temperature, ventilation, etc.)</li> <li>o Avoid exposing flammable products to sun or to any other source of heat</li> <li>o Make sure that the floor of the storage zone is made of non-permeable material to avoid toxic percolations and soil and/or ground water pollution</li> </ul> <p><b>Keep stocks at levels based on actual needs</b></p> <ul style="list-style-type: none"> <li>o Inspect the stocks regularly and keep records</li> <li>o Avoid excessive purchasing of raw materials</li> <li>o Minimise losses of basic supplies (to avoid open containers, open tins, etc.)</li> </ul>			

### Domain 3: Logistics *(continued)*

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Avoid losses during the storage</b></p> <ul style="list-style-type: none"> <li>o Use methods and safety devices to avoid damages during storage</li> <li>o Check expiration dates of materials to avoid unusable materials</li> <li>o Avoid unnecessary storage of large quantities of raw materials</li> <li>o Train the staff to the 'first-in first-out' principle (FIFO)</li> <li>o Check that the packaging of your finished products cannot be damaged during transport and storage</li> </ul> <p><b>Take measures to avoid losses and leakage</b></p> <ul style="list-style-type: none"> <li>o Encourage the staff to avoid contaminations by changing tools to handle the different materials</li> <li>o Close taps and lids to reduce leaks and spills</li> <li>o Establish procedures for the use of raw materials and other supplies</li> </ul> <p><b>Improve transfer practices</b></p> <ul style="list-style-type: none"> <li>o Label containers of hazardous substances clearly</li> <li>o Avoid carrying open containers of hazardous substances manually</li> <li>o Arrange that floor of the transport area are in good condition (no bump, no hole, non-slippery ground, etc.)</li> <li>o Check the means of transport so that they are adapted and do not damage the products</li> </ul>			

## Examples of application in enterprise



### MODERN PAINTS AND CHEMICALS INDUSTRIES

Chemicals / Oil paint and water paint, 30 employees, Jordan

#### APPLICATION

<b>Objective</b>	Dispose of hazardous wastes in an environmentally sound manner and without any investment
<b>Set of problems</b>	<ul style="list-style-type: none"> <li>• Disposal and storage of manufacturing residues of oil paint (solvents)</li> <li>• Lack of funds to build a treatment plant on site</li> </ul>
<b>Action(s) realised</b>	Agreement with another company to collect the solvents and reuse them as a substitute for diesel

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	0 USD
<b>Annual savings</b>	4'286 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

- Reduction of the environmentally harmful impact of hazardous waste
- Saving of raw materials for the other company

### HACIOGULLARI PAINT INDUSTRY

Chemicals / Paint, 30 employees, Turkey

#### APPLICATION

<b>Objective</b>	Improvement of the handling and transfer of raw materials
<b>Set of problems</b>	<ul style="list-style-type: none"> <li>• Frequent losses of raw materials due to the deterioration of the packaging (paper bags) following mishandling during transfers</li> <li>• Accidental spills during the discharge of the material into the tanks</li> </ul>
<b>Action(s) realised</b>	<ul style="list-style-type: none"> <li>• Improvement of the transfer by providing wheeled carts</li> <li>• Collection and reuse of the spilled raw materials</li> </ul>

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	50 USD
<b>Annual savings</b>	3'000 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

Reduction of 2.5 tonnes of hazardous wastes

## Domain 4: Water

Objective: To conserve, reuse and reduce water consumption

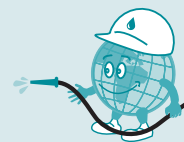
Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Monitor the water consumption of the company</b></p> <ul style="list-style-type: none"> <li>o Determine the quantities of water consumed per month and its cost</li> <li>o Install water meters</li> <li>o Identify processes and areas of high consumption</li> <li>o Determine the costs of water consumption for each step of the process</li> </ul> <p><b>Reduce water consumption in the production steps</b></p> <ul style="list-style-type: none"> <li>o Avoid unnecessary rinses between the production steps</li> <li>o Substitute running water rinses for still baths</li> <li>o Use closed circuit as much as possible</li> <li>o Install control valves on some equipment to reduce water flows</li> <li>o Train the staff to good practices of water usage</li> <li>o Check the efficient use of water, especially in high water-using processes</li> </ul> <p><b>Minimise wastage of water and to optimise its use</b></p> <ul style="list-style-type: none"> <li>o Monitor the filling of the water tanks to prevent spillage</li> <li>o Equip the tanks with automatic stopping control valves of the filling</li> <li>o Turn off unnecessary running taps</li> <li>o Avoid cleaning with high pressure hoses</li> <li>o Regulate water flows (pumps, pipes, etc.) to match the specific production needs</li> <li>o Install water-saving devices on taps</li> <li>o Encourage the staff to use small quantities of water to clean containers (2-4 litres for a 200-litre container)</li> <li>o Develop information devices (stickers, boards, etc.) to make the staff aware of the principles of minimisation and water saving</li> <li>o Cut unnecessary water flows once the production is over</li> </ul> <p><b>Eliminate leaks</b></p> <ul style="list-style-type: none"> <li>o Replace poor seals on pipes, etc.</li> <li>o Examine water pipes for holes and undertake needed repairs</li> <li>o Write down regular maintenance procedures of the piping system and of the different water circuits</li> </ul>			

## Domain 4: Water (continued)

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Reuse and recycle water in the manufacturing processes</b></p> <ul style="list-style-type: none"><li>o Identify possibilities for recycling water</li><li>o Check that reusing water does not lessen the quality of the finished product</li><li>o Recycle rinsing water and introduce it in the manufacturing processes, the bathroom or for the cleaning</li></ul> <p><b>Use the water only when necessary</b></p> <ul style="list-style-type: none"><li>o Remove water taps that are not used</li><li>o Seal unused taps</li><li>o Install inexpensive water-saving devices where appropriate</li><li>o Equip bathrooms with automatic stopping devices of water flows</li><li>o Encourage the staff to use brooms and brushes to clean up solid waste first</li></ul>			



## Examples of application in enterprise



### NATIONAL BEVERAGE CO.

Food industry / Sodas, 400 employees, Palestine

#### APPLICATION

<b>Objective</b>	Reusing wastewater
<b>Set of problems</b>	<ul style="list-style-type: none"> <li>To find a way to exploit the wastewater from the rinser</li> <li>To reduce the overall consumption of water (80'000 m<sup>3</sup>/year)</li> </ul>
<b>Action(s) realised</b>	Implementation of a closed circuit to collect wastewater and use it for general services (bathrooms and cleaning)

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	1'986 USD
<b>Annual savings</b>	3'454 USD
<b>Annual running costs</b>	270 USD
<b>Payback</b>	7 months

#### ENVIRONMENTAL RESULTS

Decrease of the volume of wastewater discharged (reuse of 59% of wastewater, i.e. 3'050 m<sup>3</sup>)

### IBRAHIM ABU SHEHAB GOLDSMITH

Jewellery / Golden jewelleryes, 7 employees, Jordan

#### APPLICATION

<b>Objective</b>	Upgrading of the factory to legal standards
<b>Set of problems</b>	<ul style="list-style-type: none"> <li>High concentration of nitric acid in wastewater (165 ml/l)</li> <li>Penalties and risks of closure</li> </ul>
<b>Action(s) realised</b>	<ul style="list-style-type: none"> <li>Installation of a wastewater treatment unit</li> <li>Reusing wastewater for general services (bathroom and cleaning)</li> </ul>

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	7'143 USD
<b>Annual savings</b>	2'973 USD
<b>Annual running costs</b>	3'142 USD
<b>Payback</b>	36 months

#### ENVIRONMENTAL RESULTS

Stopping of toxic discharges in the sewer

## Domain 5: Energy

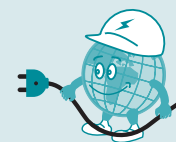
Objective: To conserve, reuse, reduce and optimise energy consumption

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Monitor the energy consumption of the company</b></p> <ul style="list-style-type: none"> <li>o Install energy meters</li> <li>o Determine the quantities of energy consumed for each process</li> <li>o Determine the costs of energy consumption</li> <li>o Identify high energy-consuming processes</li> </ul> <p><b>Reduce energy consumption</b></p> <ul style="list-style-type: none"> <li>o Cut off or unplug unused equipment and machinery</li> <li>o Clean heat-exchanging surfaces regularly to assure the best possible transfer</li> <li>o Check if there is any dysfunction in the electric network, the equipment, the engines, etc.</li> <li>o Undertake the necessary repairs to increase the efficiency of the different equipment</li> <li>o Substitute the defective equipment with more energy-efficient ones</li> <li>o Regulate the energy input according to the needs (e.g. do not produce an energy input of 70°C if the process only requires 50°C)</li> <li>o Avoid spillage and leakage if you store your own fuel</li> <li>o Reduce direct exposition to the sun of units that need low temperature</li> <li>o Operate machines according to the manufacturers' recommendations for a better energy efficiency</li> </ul> <p><b>Minimise energy losses</b></p> <ul style="list-style-type: none"> <li>o Check the state of insulation of hot water pipes to avoid heat losses</li> <li>o Maintain good insulation of cold water pipes to assure the efficiency of the cooling and air conditioning systems</li> <li>o Maintain the pressure in the compressed air pressure pipes to avoid losses</li> <li>o Check for leakage regularly and repair when needed</li> <li>o Optimise combustion efficiency through regular maintenance of the equipment</li> <li>o Use a temperature thermostat to reduce unnecessary heat variations</li> <li>o Optimiser les temps de production</li> </ul> <p><b>Recover and reuse energy in the production process</b></p> <ul style="list-style-type: none"> <li>o Install a heat exchanger in case the difference of temperature is more than 50°C</li> <li>o Reuse the heat generated, for heating or in other production steps</li> <li>o Install closed circuits to recuperate and reuse steam</li> <li>o Reuse the surplus of gas (biogas) to produce electricity</li> </ul>			

## Domain 5: Energy (continued)

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Use air conditioning systems and cooling equipment efficiently</b></p> <ul style="list-style-type: none"> <li>o Check whether air conditioning can be avoided</li> <li>o Insulate rooms equipped with air conditioning</li> <li>o Switch off air conditioning systems and cooling units when not needed</li> <li>o Adjust the air conditioning to an adequate temperature level</li> <li>o Train the staff to let materials cool down before storing them in the cold rooms or refrigerators</li> <li>o Open the doors of the cold rooms, the refrigerators and the freezers with precaution</li> <li>o Defrost refrigerators</li> </ul> <p><b>Check the performance of the installations</b></p> <ul style="list-style-type: none"> <li>o Use the most efficient energy in terms of efficiency and cost</li> <li>o Install a condensation battery at the level of the transformer</li> <li>o Maximise the combustion of the boilers</li> <li>o Avoid preheating the equipment as much as possible</li> <li>o Check the energy efficiency of the equipment regularly</li> <li>o Clean the capacitors and the air filters</li> <li>o Install solar panels to heat water, supply machines with electricity or for lighting</li> <li>o Encourage the staff to turn off unused machines</li> </ul> <p><b>Improve the lighting system</b></p> <ul style="list-style-type: none"> <li>o Replace traditional bulbs with energy-saving bulbs or fluorescent lamps</li> <li>o Clean windows to benefit from the natural light</li> <li>o Rearrange the workplace to benefit from natural light at best</li> <li>o Paint the walls in light colours to reduce artificial lighting</li> <li>o Switch off lights or reduce the lighting in rarely used rooms and at night</li> <li>o Divide the lighting systems so that they are activated independently</li> <li>o Install a movement detector and timers to monitor the lighting (rarely used rooms, halls, etc.)</li> </ul>			

## Examples of application in enterprise



### QUALITY FOOD CO.

Food industry / Meat and sausages tins, 81 employees, Jordan

#### APPLICATION

<b>Objective</b>	Rationalise the energy consumption
<b>Set of problems</b>	High consumption of energy (180'000 l/year of diesel) due to the important use of steam in the production process
<b>Action(s) realised</b>	Recycling of steam by condensation in a closed circuit (2 m <sup>3</sup> /day) and reuse it for heating the boiler

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	2'825 USD
<b>Annual savings</b>	5'853 USD
<b>Annual running costs</b>	5'425 USD
<b>Payback</b>	6 months

#### ENVIRONMENTAL RESULTS

Decrease of the energy consumption by 15%

### AL FOURATE CO.

Textile / Different types of threads, 2'400 employees, Syria

#### APPLICATION

<b>Objective</b>	Improvement of lighting
<b>Set of problems</b>	Defective and outdated automatic lighting system with a manual activation switch
<b>Action(s) realised</b>	Replacement of the defective photoelectric cells

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	11 USD
<b>Annual savings</b>	11'785 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

Reduction of energy consumption

## Domain 6: Safety and protection of staff

Objective: Improvement of the working conditions and of the staff safety

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Assure a safe environment for the staff</b></p> <ul style="list-style-type: none"> <li>o Check that the installations are without risk for the movement and daily work of the employees (uneven or slippery floor, bare electric circuits, etc.)</li> <li>o Forbid the employees to pile up containers and pallets too high</li> <li>o Repair and maintain the electric wires and equipment</li> <li>o Indicate the emergency exits clearly and keep them accessible</li> </ul> <p><b>Provide the staff with personal protection equipment</b></p> <ul style="list-style-type: none"> <li>o Provide the employees with working clothes according to their tasks (shoes, gloves, masks, helmets, etc.) and in sufficient number</li> <li>o Inform the employees of the possible health effects from not wearing personal protective equipment</li> <li>o Clean and store personal protection equipment in a secure place to optimise its use</li> <li>o Replace damaged or worn-out pieces of protective equipment</li> </ul> <p><b>Minimise risks of accident</b></p> <ul style="list-style-type: none"> <li>o Install anti-slippery floors to avoid falls</li> <li>o Establish safety instructions for handling of materials and use of equipment</li> <li>o Instruct employees to completely turn off machines before maintenance or repair</li> </ul> <p><b>Inform the staff of the use of hazardous substances</b></p> <ul style="list-style-type: none"> <li>o Provide employees with safety procedures for the handling of hazardous substances</li> <li>o Train the staff to apply and respect the established procedures</li> <li>o Request from the employees the respect of these procedures</li> <li>o Inform the staff of the possible health effects from handling these substances</li> </ul> <p><b>Reduce emanations of bad odours</b></p> <ul style="list-style-type: none"> <li>o Identify the sources of odours that disturb the employees</li> <li>o Find a solution and apply it</li> </ul> <p><b>Reduce noise pollution</b></p> <ul style="list-style-type: none"> <li>o Study the possibility of reducing noise level in the enterprise</li> <li>o Lubricate machines regularly and oil engines</li> <li>o Remove noisy machines to an isolated area or to an adequate and ventilated room</li> </ul>			

## Domain 6: Safety and protection of staff *(continued)*

Action to be taken	Priority (1 to 3)	Name of the person responsible	Deadline
<p><b>Make sufficient provisions in case of accident</b></p> <ul style="list-style-type: none"> <li>o Distribute first-aid kits in the different production departments</li> <li>o Train 1-2 employees capable of providing first aid</li> <li>o Reserve washbasins or showers near the areas where hazardous chemicals are stored and used, for personal hygiene and emergency situation</li> <li>o Mark down the phone numbers of emergency ambulance and fire services visibly on the telephone</li> <li>o Prepare an emergency plan in case of accident</li> <li>o Train the workers how to behave in case of accident</li> <li>o Check the functioning of the alarm system</li> </ul> <p><b>Reduce health risks</b></p> <ul style="list-style-type: none"> <li>o Instruct employees to wash the parts of the body that were exposed to chemical and/or toxic products</li> <li>o Instruct employees to remove chemical spills on their skin and eyes by using running water</li> <li>o Respect health instructions</li> <li>o Prevent employees from eating, drinking or smoking in risky areas</li> <li>o Keep lavatories, rest areas and work areas clean</li> <li>o Provide staff with adequate showers and changing rooms</li> </ul> <p><b>Control air quality</b></p> <ul style="list-style-type: none"> <li>o Request the use of masks to avoid inhalation of sprays and/or dust</li> <li>o Make sure an adequate ventilation for vapours, emanations, dust, sprays, etc. is working</li> <li>o Prefer the natural circulation of air to avoid polluted air</li> <li>o Study the possibility of purifying air through filtration</li> </ul>			

## Examples of application in enterprise



### DIRECTORATE OF EQUIPMENT SERVICES OF DEIR EZZOR

Services, 270 employees, Syria

#### APPLICATION

<b>Objective</b>	Improve the working conditions of the employees
<b>Set of problems</b>	Health risks (falls, inhalation, insalubrity) linked to the inadequate storage and change of oil
<b>Action(s) realised</b>	Oil change of the machines directly in appropriate barrels and selling of the latter

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	0 USD
<b>Annual savings</b>	2'400 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	Immediate

#### ENVIRONMENTAL RESULTS

Implementation of a waste management system

### ARAB INDUSTRY COMPANY

Chemicals / Cleaning products, 60 employees, Palestine

#### APPLICATION

<b>Objective</b>	Avoid risks of accident and secure the working environment
<b>Set of problems</b>	Risk of fall of piled up pallets
<b>Action(s) realised</b>	Building guards

#### DATA AND ECONOMIC RESULTS

<b>Investments</b>	3'000 USD
<b>Annual savings</b>	1'150 USD
<b>Annual running costs</b>	0 USD
<b>Payback</b>	31.3 months

#### ENVIRONMENTAL RESULTS

Reduction of raw materials wastage

## III. ECONOMIC RETURN OF CORRECTIVE MEASURES

After having identified the actions to be implemented in your enterprise, you can now calculate their return on investment. The table of economic calculations enables you to evaluate the costs of implementing corrective measures step by step, the potential savings and the expected return on investment. It is a decision-making tool that helps you assess the situation before and after the implementation of corrective measures. In other words, it simulates the return on investment of the targeted actions before applying them concretely.

The calculation of costs will encourage managers and technicians of the enterprise to:

- Identify the possibilities of efficient use of resources (raw materials, water, energy, supplies, etc.)
- Reduce the costs related to the treatment and disposal of wastes
- Implement a recycling policy.

This approach also enables to identify the environmental costs and to attribute them to the corresponding production step (cost accounting) without necessarily including them in the overheads of the enterprise.

### Elements of economic calculations

#### OVERALL DESCRIPTION

Presentation of the set of problems and of the chosen remediating corrective measure. This part encompasses the following elements:

- Domain: name of the checklist used.
- Structure concerned: department or production unit concerned with the corrective measure.
- Set of problems faced: short description of the problem faced in the particular process.
- Action to be taken: action (corrective measure) to fix the problem.

#### COMPARISON OF COSTS

Comparison of costs before and after the implementation of the corrective measure.

- Annual costs before action (Ca): incurred costs **before** the implementation of the corrective measure (consumptions and/or losses of water, energy, raw materials, maintenance costs, costs of equipment upgrade, etc.)
- Annual costs after action (Cb): recorded or estimated costs **after** the implementation of the corrective measure

#### INVESTMENT

Invested capital to acquire the means needed to implement the corrective measure. In some cases, the investment can generate annual running costs to keep up the measure.

- Investments (Iv): needed capital to implement the corrective measure. If you made several investments for one same action, you have to add them up.
- Annual running costs (Rc): additional running costs related to the implementation of the corrective measure. In some cases, there are no running costs.

#### PROFIT

Savings obtained thanks to the implementation of the corrective measure.

- Gross annual savings (Gs): annual savings obtained thanks to the implementation of the corrective measure.  $G_s = C_a - C_b$
- Net annual savings (Ns): annual actual savings obtained thanks to the implementation of the corrective measure.  
 $N_s = G_s - R_c$

#### RETURN ON INVESTMENT

Highlight of the economic efficiency of the chosen measure.

Payback period (Pp): time needed for the enterprise to recover the investment allocated to implement the corrective measure. It is expressed in years. To turn it into months, it has to be multiplied by 12. Following the payback period, the gross annual savings (Gs) become profit.  $P_p = I_v / N_s$



**Table 1: Example of economic calculations of a metal plates manufacturer**

OVERALL DESCRIPTION	
<b>Domain</b>	<ul style="list-style-type: none"> <li>Raw materials and supplies</li> </ul>
<b>Structure concerned</b>	<ul style="list-style-type: none"> <li>Painting workshop</li> </ul>
<b>Set of problems faced</b>	<ul style="list-style-type: none"> <li>50% loss of powder (electrostatic) used to paint the metal plates</li> <li>Health of the workers in jeopardy due to the presence of paint particles in the air</li> </ul>
<b>Action to be taken</b>	Installation of six air filters in the workshop to collect and reuse the powder (before it gets to the floor). This action also improves air quality (purification).
COMPARISON OF COSTS	
<b>Annual costs before action (Ca)</b>	<ul style="list-style-type: none"> <li>Cost of losses of paint powder: <math>Ca = 8'200</math> USD</li> </ul>
<b>Annual costs after action (Cb)</b>	<ul style="list-style-type: none"> <li>Cost of losses of paint powder: <math>Cb = 200</math> USD</li> </ul>
INVESTMENT	
<b>Investment (Iv)</b>	<ul style="list-style-type: none"> <li>Purchase price of filters: <math>Iv = 4'000</math> USD</li> </ul>
<b>Annual running cost (Rc)</b>	<ul style="list-style-type: none"> <li>Maintenance products for the filters: 300 USD</li> <li>Labour costs to empty the filters and collect the powder: 1'240 USD <math>Rc = 1'540</math> USD</li> </ul>
PROFIT	
<b>Gross annual savings (Gs)</b> $Gs = Ca - Cb$	47.5% savings of paint powder $Gs = 8'200 - 200 = 8'000$ USD
<b>Net annual savings (Ns)</b> $Ns = Gs - Rc$	$Ns = 8'000 - 1'540 = 6'460$ USD
RETURN ON INVESTMENT	
<b>Payback period (Pp)</b> $Pp = Iv / Ns$	$Pp = 4'000 / 6'460 = 0.6$ year $Pp = 7.2$ months  Following the payback period of 7.2 months, the company will make an annual profit of 8'000 USD.

Comment: a particular attention should be given to the choice of units (t, kg, l, etc.) and of the currency (USD or local currency). What matters is to be coherent and keep the same logic for all the units used.

**Table 2: Economic calculations**

OVERALL DESCRIPTION	
Domain	
Structure concerned	
Set of problems faced	
Action to be taken	
COMPARISON OF COSTS	
Annual costs <b>before</b> action (Ca)	
Annual costs <b>after</b> action (Cb)	
INVESTMENT	
Investment (Iv)	
Annual running cost (Rc)	
PROFIT	
Gross annual savings (Gs) $Gs = Ca - Cb$	
Net annual savings (Ns) $Ns = Gs - Rc$	
RETURN ON INVESTMENT	
Payback period (Pp) $Pp = Iv / Ns$	

## IV. ACTION PLAN

The action chosen to meet the environmental objectives of the enterprise can be written down formally in an action plan. The latter helps implement corrective measures by specifying the person responsible, the means allocated (financial, technical, human, etc.) and the deadline for the actual implementation.

The action plan will be easily developed from the GHK instruments, namely the analysis of INputs and OUTputs, the checklists and the economic calculations. The table below describes two examples of suggested actions in two different companies.

**Table 3: Example of an action plan**

OBJECTIVE	TARGETED ACTION	STRUCTURE CONCERNED	PERSON RESPONSIBLE	MEANS	INVESTMENT (Iv)	RUNNING COSTS (Rc)	NET SAVINGS (Ns)	DEADLINE
To reduce the amount of treated wastewater	To reuse the treated waste-water in the production process	Batteries production unit	Mr. Hachem	<ul style="list-style-type: none"> <li>• Lab test to determine the impact of the waste water on the quality of the product</li> <li>• Building of a recycling pipe starting from treatment plant to the production factory</li> </ul>	8'000 USD	450 USD	14'500 USD	February 05
To eliminate raw materials losses (milk)	Automatic stopping of the filling	Filling of the milk tanks	Mrs. Salwa	Installation of control valves (floaters) in the milk tank	20 USD	0 USD	7'000 USD	September 04

**Table 4: An action plan**

OBJECTIVE	TARGETED ACTION	STRUCTURE CONCERNED	PERSON RESPONSIBLE	MEANS	INVESTMENT (Iv)	RUNNING COSTS (Rc)	NET SAVINGS (Ns)	DEADLINE

## V. FOLLOW-UP AND PERSPECTIVES

Monitoring and evaluation are two integral parts of management. They provide managers with the necessary information to judge the impact and the progress of the implemented actions. Moreover, they facilitate annual benchmarking and allow to take adequate corrective measures.

### Organisational aspects

In order to get economic return of the corrective actions applied, the enterprise has to elaborate a framework of action for the daily management of its activities.

The consolidation of the company's assets, the consideration of its weaknesses and the definition of its perspectives demand some kind of internal organisation and a clear repartition of responsibilities. Nominating qualified persons to implement the corrective measures adopted is thus essential. At the same time, coordination between the units and the departments concerned with the same problem (water losses, over-consumption of energy, accumulation of wastes, etc.) will allow to reach the initial objectives of improvement.

The corrective measures as well as the results have to be assessed and documented regularly in order to quickly perceive the progress and decide of possible additional improvements or corrective measures. Once the corrective measures have been implemented, the enterprise has to maintain them. It is thus necessary to monitor the GHK realisations to assure their efficiency. This will enable the company to make sure that the corrective measures have been implemented and that they indeed meet the objectives set.

In case some initial objectives were not met, the enterprise should have to reconsider its priorities and readjust its strategy. If necessary, the enterprise can initiate new actions. If this is the case, it can apply the GHK guide again, thus satisfying the principles of continuous improvement.

### Training of staff

Acquiring competences is a continuous process. Employees have to improve to be able to meet the requirements of a modern corporate management. The training of employees has to be modelled on their daily activities. Also, to get the best upgrade, the training has to be constantly adapted to the targeted groups.

Just as investments are needed to maintain or replace machinery, an investment in employee training is essential to enhance the status of the company's human capital.

Training of staff should be considered for:

- The correct handling of materials to minimise losses and avoid accidents
- The efficient use of equipment to save water, energy, and raw materials (e.g. to keep equipment settings at a regular and continuous level rather than changing the power frequently)
- The detection of raw materials losses to water or soil and its dispersion in the air
- The respect of manufacturers' procedures and recommendations regarding the use of materials
- The use of emergency procedures in case of accident
- The involvement of employees to take voluntary actions to reduce losses, over-consumptions and generation of waste.

Behaviour and attitude changing implies that employees are highly encouraged to use regularly and correctly the different procedures established for production, maintenance, storage and other activities of the enterprise.

## Keeping and improving assets

The enterprise can benefit from the GHK systematic approach to strengthen the environmental and economic efficiency of its processes. Through the regular application of the GHK guide (each year), the company can evaluate the impacts of its corrective measures and update them.

Following the first step of GHK, the enterprise can look to adopt the principles of eco-efficiency<sup>4</sup> and become even more competitive. Eco-efficiency takes into account the following objectives:

- **To reduce the consumption of resources**

To minimise the consumption of energy, materials, water and improve the « recyclability » and sustainability of the product.

- **To reduce the environmental impact**

To minimise air emissions, accidental spills, waste production and the dispersion of hazardous substances and favour the use of renewable resources.

- **To increase the value of a product or service**

To design improved products and provide clients with additional services while controlling costs and assuring a certain quality.

Complementary to the GHK guide, the enterprise can also apply the other DELTA eco-management tools.

**Ecomapping** : a simple, visual and practical tool, Ecomapping enables to assess the environmental performance of a micro-enterprise or a workshop. Ecomapping was elaborated in collaboration with Association Belge des Eco-Conseillers (ABECE).

**The Environmental Self-Diagnosis Guide** : elaborated in collaboration with Entreprises pour l'Environnement (EPE, France), this guide enables a close follow-up of the company's initiatives for implementing the first two phases of the continuous improvement process.

**Environmental Performance Indicators (EPI)** : developed in collaboration with ABCD-Durable (France), this guide provides the enterprise with a methodology to synthesise its environmental performance in the form of indicators and to communicate it to different publics (clients, suppliers, public administrations, residents, etc.).

DELTA eco-management tools can be applied free of charge and do not usually necessitate external assistance. They guide companies on the path towards international environmental certifications such as EMAS (Environmental Management Audit System) or ISO 14'001 (1996). All DELTA eco-management tools can be downloaded from SBA's web site : [www.sba.hello.to](http://www.sba.hello.to)



4. According to the World Business Council for Sustainable Development (WBCSD), the developer of this concept, eco-efficiency is composed of the following key elements:

- Reduce the material intensity of goods and services
- Reduce the energy intensity of goods and services
- Reduce toxic dispersion
- Enhance material recyclability
- Maximise sustainable use of renewable resources
- Extend product durability
- Increase service intensity of products.

## CONCLUSION

This guide was conceived to bring a key contribution to the commitment of Small and Medium-sized Enterprises (SME) to sustainable development. It aims at giving concrete answers to environmental problems of the enterprise and to its economic aspects.

Integrating environmental aspects in the management of industries has become a priority. It requires the control of the production process and of the environmental impacts. This can be undertaken thanks to the simple and systematic instruments described in the GHK guide:

- Flow charts
- Checklists
- Economic calculations
- And action plan.

Knowing that the application of GHK corrective measures requires little or no investment, their adoption can considerably enhance the competitiveness of SMEs by reducing the production costs. Many companies having adopted eco-efficient practices realised that they could make economic profits while preserving their resources and reducing their environmental impacts significantly.

# ANNEX

## Advice for a sound management of your wastes

Complimentary to checklist 2, the pieces of advice below will enable you to make your waste management more efficient and better targeted.

### IDENTIFICATION OF THE NATURE OF THE WASTES

In the framework of its activities, a company could generate wastes that are hazardous for human health and environment. This risk is closely linked to the sector and to the products used in the manufacturing processes.

Hazardous wastes have the following characteristics: corrosiveness, flammability, reactivity or toxicity. Therefore, the enterprise has to determine if it produces hazardous wastes. The two lists below (non exhaustive) of risky products or sectors will help you do this.

*Identify among these potentially dangerous products which are the ones that you use in your production processes:*

- o Petroleum products
- o Dyes, paints, printing inks, solvents, whitening product or turpentine
- o Phytosanitary products (pesticides, herbicides, etc.)
- o Corrosive products (acid or caustic products for treating metal, wood, paper or clothing)
- o Flammable materials
- o Chemical products
- o Cosmetic products
- o Irritant products (that provoke burns or itching upon contact with skin)
- o Reactive products (that bubble or fume upon contact with water)
- o Hazardous products with a specific label.

*Find out if one of these activities correspond to your enterprise:*

- o Repair and maintenance of vehicles
- o Metallurgy (iron, steel, galvanisation, bodyworks)
- o Printing
- o Dry cleaning and laundering
- o Civil engineering (property building and road techniques)
- o Rat extermination and pest control
- o Chemical industry
- o Pesticides manufacturing
- o Textile industry, dyeing and dry filling
- o Furniture manufacturing or finishing
- o Cosmetics industry
- o Agriculture and horticulture (chemical treatment of plantations, lawns and gardens)
- o Wood treatment (against woodboring insects, varnishing and painting, etc.)
- o Paper industry.



If you are concerned with one of the lists, you should make some arrangements to dispose of your hazardous waste adequately. They should be reduced and eliminated in the best possible way. As a first step, the hazardous waste should be separated at source from the other wastes to make sure they are taken care of safely and treated adequately.

### **SEPARATION OF WASTES AND SORTING AT SOURCE**

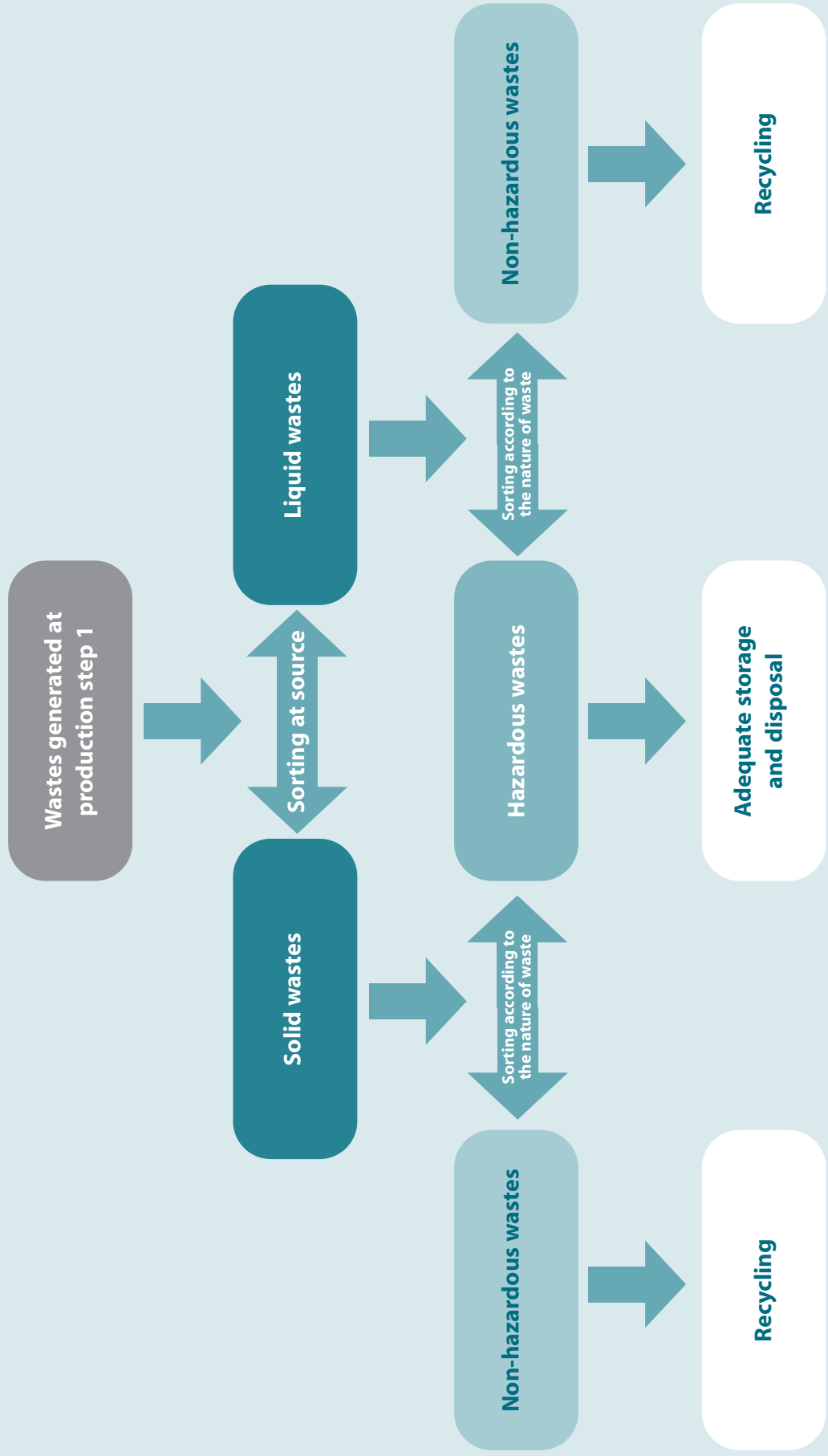
The daily management of waste is necessary to anticipate any problem of disposal. Therefore, the selective sorting of the different wastes in an enterprise is definitely an important step towards its recycling.

As sources of wastes are usually distinct, installing a waste management system with different bins avoids their mixing afterwards. This previous sorting facilitates an adequate disposal and a reduction of treatment costs.

Chart 3 (*see the following page*) helps you stimulate the sorting at source and the selective collection among your employees. It is an overview of a systematic approach. It can be used to introduce the basic principles of waste management, thus to support sorting at source. All production steps generating non-hazardous and hazardous wastes should be considered.

Sorting at source will also be facilitated if the needed material (specific bins) is available and if a close communication with the staff and awareness-raising sessions (in particular for employees of technical units) are organised.

**Chart 3: Basic principles of waste management**



## Sound management of waste

The 5 R rules will help you structure and systematise your actions to manage the waste of your enterprise more efficiently. You can use the basic rules in the following order:

- **To reduce at source**

Reduction starts directly at the design level. You can limit the consumptions to the real needs. You can also adopt practices that reduce wastes at source (optimisation of production processes, efficient use of raw materials and supplies, reduction of packaging, eco-design, etc.). This action will reduce the space needed for storage and reduce treatment costs.

- **To reuse as much as possible**

After having used a product once, you can certainly reuse it as such for other purposes (incoming pallets with raw materials can be used for the transfer of other products in the company). A product can also be reused as secondary raw material (second generation) in another step of the production process to reduce waste flow. You can also sell it or give it away to other companies.

- **To recover recyclable materials**

In the amount of wastes produced, you can recover valuable materials without transforming them, in order to recycle them in your own company (e.g. to use recovered wood planks to repair pallets or make boxes).

- **To replace with sustainable materials**

To preserve environment, replace materials and traditional production processes with other environmentally friendlier possibilities.

- **To recycle your wastes**

This option is to be looked to (as a last resort) when materials cannot be reduced or reused internally. Recycling will help you reduce the quantity of your wastes. It gives a second life to waste through salvage dealers and professional recyclers. Those wastes are transformed into new products (e.g. wood packaging into particle board).

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Sustainable Business Associates (SBA)

60, Ch. du Petit-Flon

CH-1018 Lausanne, Suisse

Tel. :+41-21-648 4884

Fax: +41-21-648 4885

Email: sba@planet.ch

Web site: www.sba.hello.to

## **Authors**

This new edition of the GHK was carried out under the supervision of Karim Zein, President of SBA, in collaboration with Majdoulaine Semlali.

The authors of the 1<sup>st</sup> edition of the guide are: Rachid Nafti (CP3, Tunisia), Joyce Miller (SBA, Switzerland) and Christof Vosseler (P3U/GTZ).

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