

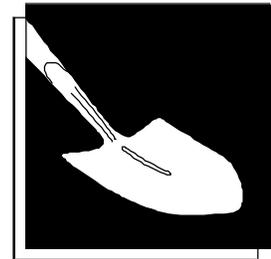
MODULE 1: LAYING THE GROUNDWORK

This module contains an overview of Environmental Management Systems, suggestions for how to build internal support for your IEMS, ideas for developing your IEMS management team, and a process for understanding how your company impacts the environment.

Overview of Environmental Management Systems

An **Environmental Management System** (EMS) provides a systematic way to review and improve operations for better **environmental performance**. An EMS can help a company better meet its compliance requirements. It can also help a company use materials more efficiently and streamline operations, thereby reducing costs and becoming more competitive.

A commonly used framework for an EMS is the one developed by the International Organization for Standardization (ISO) for the ISO 14001 standard. *Although the EMS described in this Guide is based on the ISO 14001 approach, the process outlined in this Guide may not provide for meeting all the requirements of ISO 14001 certification.* The purpose of this Guide is not to give advice towards certification. It is to demonstrate a technical means of integrating environmental concerns into company management so that businesses can become more effective in reducing their impact on the environment.



Tip

An **EMS** is a framework for managing those significant **environmental aspects** you can control or influence.

Tip

Words in **bold type** can be found in the Glossary (Appendix A).

In addition, other guides on the market provide useful approaches. Developing an IEMS based on this Guide does not imply endorsement by the U.S. EPA.

The five main stages of an EMS, as defined by the ISO 14001 standard, are as follows.

- ▶ *Commitment and policy* — top management commits to environmental improvement and establishes a company **environmental policy**.
- ▶ *Planning* — the company conducts a review of its operations, identifies legal requirements and environmental concerns, establishes objectives, evaluates alternatives, sets targets, and devises a plan for meeting those targets.
- ▶ *Implementation* — the company follows through with the plan by establishing responsibilities, training, communication, documentation, operating control procedures, and an emergency plan to ensure that **environmental targets** are met.
- ▶ *Evaluation* — the company monitors its operations to evaluate whether the targets are being met, and, if not, takes **corrective action**.
- ▶ *Review* — the EMS is modified to optimize its effectiveness. The review stage creates a loop of continuous improvement for the company (Figure 1-a).

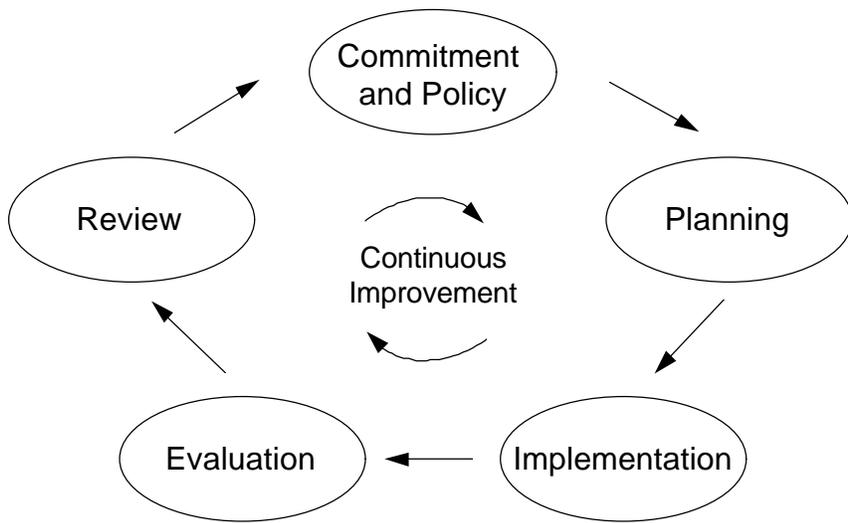
 **Tip**

For more information on ISO 14001 EMS, check Appendix G (References and Resources).

 **Tip**

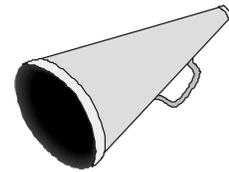
Continuously identifying and reducing risk leads to improved competitiveness and environmental performance.

Figure 1-a. The Continuous Improvement Cycle



The advantage of adopting the DfE Program approach is that it enables your company to consider and plan for managing the environmental risk of your company’s products, processes and services. The method outlined in this Guide will help your company compare alternatives to identify the least cost, best performing and lowest environmental impact option. This approach will help your company do the following:

- ▶ practice pollution prevention,
- ▶ use resources efficiently,
- ▶ avoid shifting problems from one waste stream to another,
- ▶ understand the risks associated with using both regulated and unregulated chemicals,
- ▶ integrate management of worker safety and health requirements with management of environmental concerns,
- ▶ practice extended product and process responsibility, and
- ▶ manage system change in addressing environmental concerns.



Screenprinters from the SGIA/EPA IEMS Pilot Project have this to say about what they learned:

“That you can have a *system* to achieve environmental improvement. Never gave it much thought before.”

“Changed from being reactive to environmental regulations to being more proactive.”

“The benefits of having documented operational controls.”

“General environmental awareness building across the board; and that you can be bottom-line oriented and environmentally conscious at the same time.”

“That the ultimate benefit is improving the environment and improving the bottom line at the same time.”

Thus, by using the approach provided in this Guide, you can develop a IEMS that helps you continuously identify and reduce risks to people and the environment. This Guide provides methods to help you consider risk reduction when answering the following questions.

- ▶ How does your company impact the environment?
- ▶ Which of these environmental impacts are significant?
- ▶ How can your company improve its environmental performance?

Building Support for Your IEMS

Both management and employees need to understand not only what a IEMS is, but also why they would want one. This step is designed to get people to think about and discuss the ways in which a IEMS would benefit your company. Even though you may already have management support, it is still important to get employee buy-in to this process.

Set up times to discuss your company's need for a IEMS with key managers and employees. Recording the discussions provides important documentation, which can be used to communicate the benefits of your IEMS to others. One way to record the discussion is to assign someone the task of writing the group's comments on a flip chart, so that everyone can see them for discussion. The following set of general questions will lead you through the discussion.

Discussion Questions

1. Which environmental and worker safety laws and regulations is your company required to follow?
2. How does your company define environmental performance?



Through years of working with companies, the DfE Program has learned the importance of building support from participants through open and frequent discussion about mutual concerns.

3. Does lack of time or resources prevent your organization from taking charge of its environmental obligations? Are there individuals appointed to be responsible for this function?
4. What is your company's environmental policy?
5. Does your organization know how its environmental objectives relate to its business objectives?¹

To build support, consider the benefits a IEMS might provide for your company. A more systematic approach to meeting your environmental and business goals might contribute to the following in your company:

- ▶ improved environmental performance
- ▶ improved worker health and safety
- ▶ improved competitiveness
- ▶ improved compliance and reduced liability
- ▶ fewer accidents
- ▶ lower insurance premiums
- ▶ improved public image
- ▶ enhanced customer trust
- ▶ better access to capital
- ▶ improved internal communication
- ▶ improved company morale
- ▶ reduced operating costs

It will be helpful at this point to create a worksheet comparing the expected costs and benefits of developing a IEMS.

Worksheet 1-1 provides some general categories of costs and

 **Tip**

To help get facility-wide buy-in to the IEMS process, find the workers who are most enthusiastic with the process and recruit them to spread the word among their peers. Commitment from top management is essential, but you also need promoters at all levels of your company.

¹ Adapted from: *Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations*. Ann Arbor, MI: NSF International, November 1996, p.3.

benefits. When making your comparison, provide specific examples from the discussion.

Assigning Responsible Persons

Designate, as soon as possible, the Management Representative, the IEMS Coordinator, and a Committee who will be responsible for promoting and developing your IEMS. If you have a very small company, these may all be the same person! However, it is still important to designate who will be responsible for various activities. Worksheet 1-2 provides a means to document the responsible persons. This worksheet can be placed in your Company IEMS Manual (see the *Company Manual Template*).

Worksheet 1-1: Costs and Benefits of Developing and Implementing an IEMS²

Costs	Benefits
<ul style="list-style-type: none"> ▶ Staff/employee time for: <ul style="list-style-type: none"> collecting information reading and understanding this Guide preparing worksheets facilitating IEMS sessions participating in IEMS development ▶ Possible consulting assistance ▶ Training of personnel in new procedures ▶ Technical resources to analyze environmental impacts and improvement options ▶ Resources required to make changes 	<ul style="list-style-type: none"> ▶ Improved environmental performance ▶ Expected increased efficiency/reduced cost of materials ▶ New customers/markets ▶ Enhanced employee morale ▶ Expected savings in compliance and overall compliance monitoring and assessment, and record-keeping requirements due to changes in materials used ▶ Reduced waste disposal/treatment costs ▶ Fewer regulatory requirements
Contact Person:	Date completed:

Worksheet 1-2: IEMS Responsibilities

IEMS Function	Person	Regular Position
Management Representative		
IEMS Coordinator		
IEMS Committee		
Contact Person:		Date Completed:

Corresponds to RESP-01 in the *Company Manual Template*.

²Ibid, p. 5.

In addition, Figure 1-b shows the job functions and skills that would make a strong contribution to your IEMS team. Small companies might not have a person for each function identified on the table. The list is provided to identify skills that would be useful, not to suggest that a company would need all of these on a team.

Figure 1-b. Functions to Include in Your IEMS Team

Company Function	Expertise Brought to Project Team
Production	Management of environmental aspects of production
Maintenance	Management of environmental aspects of equipment maintenance
Facilities Engineering	Management of environmental aspects of new construction and installation/ modification of equipment
Storage/Inventory	Management of environmental aspects of raw material and product storage and in-facility transportation
Shipping, Receiving, Transportation, Logistics	Management of environmental aspects of shipping, receiving, and transportation
Product Design	System for examining environmental aspects of new designs
Quality	Quality management system, including document control procedures
Human Resources	Training on environmental issues Inclusion of environmental incentives in performance measurement system
EH&S	System for complying with environmental regulations Management of environmental records
Purchasing	System for procurement (including screening of suppliers, material composition of components)
Sales/Marketing	Environment-related commitments to customers
Public Relations	System for communicating with public on environmental issues
Accounting/ Finance	System for tracking environmental costs of operations

Planning the Process

To effectively implement your IEMS, you will need to set up a plan for getting the work done. This plan will be unique to your company. You will identify the steps to take, in the appropriate order; the decisions that will need to be made; and the resources and schedules for accomplishing the tasks. Start out by considering the following points as you plan for your IEMS development:

- ▶ Determine what level of management involvement is required and what decisions will be needed from both middle and senior management.
- ▶ Set a deadline for developing your IEMS and establish a schedule. (See worksheet at the end of this module.)
- ▶ Estimate a budget.
- ▶ Determine how you will document your IEMS.

If you have never developed an IEMS before, estimating resources and time can be difficult. You will need to create a schedule and estimate resources for completing your IEMS. As you begin to work on each module, you may want to identify intermediate steps for which you will set target completion dates. At some points, you may need to alter the overall schedule. Worksheet 1-3 will assist you in developing and tracking this plan. As you go through each module, revisit this worksheet and list who is participating in each task and your estimated budget and schedule. Also, Worksheet 1-4 will help you identify and document the persons responsible for different parts of the IEMS and the resources needed to support their effort. You may not be able to completely fill out these budget and resource worksheets at the beginning of this process. In addition, the items in the worksheet blocks may change as you work your way through the IEMS process. These worksheets only present ideas to get you started.

Worksheet 1-3: IEMS Development Schedule and Resources Worksheet

Module	Participants	Budget	Target Completion
Laying the Groundwork: Identifying Environmental Aspects			
Intermediate steps: (As appropriate)			
Making the Commitment: Creating a Policy Statement and Determining the Scope			
Intermediate steps: (As appropriate)			
Determining Significant Environmental Aspects and Setting Objectives			
Intermediate steps: (As appropriate)			
Setting Targets and Measuring Success			
Intermediate steps: (As appropriate)			
Developing Operational Controls			
Intermediate steps: (As appropriate)			
Evaluating Alternatives			
Intermediate steps: (As appropriate)			
Implementing Your IEMS			
Intermediate steps: (As appropriate)			
Setting Up Environmental Management Projects			
Intermediate steps: (As appropriate)			
Establishing Continuing Improvement			
Intermediate steps: (As appropriate)			
Contact Person:	Date Completed:		

Worksheet 1-4: Persons Responsible for IEMS Development

Roles	Individual(s) Responsible	% of Time Designated	Budget
“Management representative” having responsibility for implementing the IEMS (in small businesses, this could be the owner).			
IEMS Coordinator			
IEMS Team Participants			
Identifying and determining significance of environmental aspects.			
Identifying and determining applicability of legal and other requirements.			
Competency-based training.			
Operational controls.			
Emergency preparedness and response.			
Monitoring and measurement of “key characteristics” of operations and activities that can have significant environmental impacts (i.e., the “significant environmental aspects.”).			
Periodic evaluations of environmental compliance.			
Handling and investigating non-conformance with the EMS.			
Records management.			
Internal EMS audits.			
Contact Person:	Date Completed:		

Note: Most of these blocks will be filled in as development of the IEMS progresses. This worksheet will help track progress and serve to remind the team and management of necessary assignments.

Gathering Information and Identifying Environmental Aspects: Understanding Your Company's Possible Impacts

The work in this step mostly involves gathering and organizing information about your company's activities. Information gathering involves four activities:

- ▶ map your company's activities and processes,
- ▶ identify inputs and outputs for each activity and process step,
- ▶ identify the environmental aspects associated with each input and output, and
- ▶ identify regulatory and other requirements.

The process of identifying environmental aspects is best undertaken through group discussion with all levels of production employees, office staff, and managers. This helps to gain insight through different perspectives, and it engages everyone in the process of understanding the environmental component of your daily activities.

An **environmental aspect** is an element of your company's activities, products, or services that can affect the environment. Environmental **impacts** are the changes to the environment whether adverse or beneficial that result from your company's activities, products or services. Most elements of your business operations will have environmental aspects, intended or unintended.

For example, an unintended aspect of using a cleaning solvent may be that there are **volatile** (airborne) emissions produced during use. The "impact" of these emissions may be hazardous exposure to workers or the community or a contribution to smog formation. Another example is the business activity of making paper copies. The toner cartridges contain chemicals that could interact with the environment if they are not disposed of



Each DfE project begins with a simple mapping exercise to identify possible environmental concerns. Informed participants then select a priority concern that becomes the focus of the DfE project.

Tip

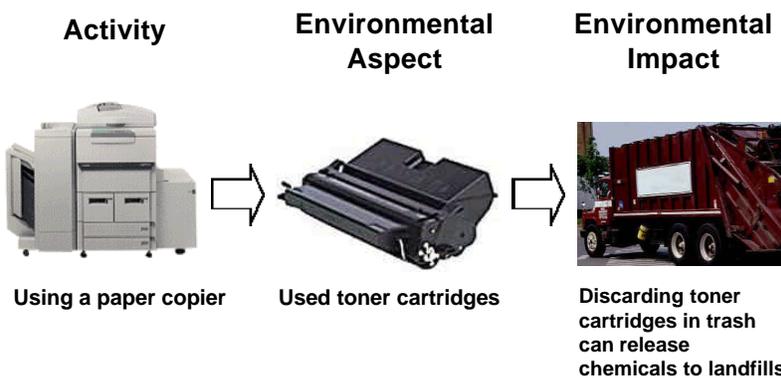
An environmental **aspect** is any element of your company's activities, products, and services that has the potential to affect the environment.

properly. The used toner cartridges with chemical waste would be an environmental aspect. The release of these chemicals into a land fill would be an environmental impact. Figure 1-c lists examples of environmental aspects and their potential impacts, and Figure 1-d graphically shows the relationship between activities, aspects, and impacts.

Figure 1-c. Examples of Environmental Aspects and Associated Impacts

Environmental Aspects	Potential IMPACTS of Each Aspect
Metals discharged to POTW	Contamination of aquatic habitat and drinking water supply
VOC emissions	Contribution to smog; worker or community exposure to volatile organic compounds (VOCs)
Scrap generation	Degradation of land, habitat, water supply
Solid waste generation	Habitat destruction, drinking water contamination from landfills, wasted land resources
Fresh water use	Depletion of natural resources
Electricity use	Contribution to global warming; degradation of air quality by electric generating plants
Exposure to chemicals during business activities	Harm to health of workers, neighbors, wildlife or plant life

Figure 1-d. How an Activity Becomes an Impact



Step 1: Develop a Process Map of Your Company's Activities and Processes

The first step in identifying environmental aspects of your business is to develop a map of your company's processes, products and services. First, categorize your business activities into areas or steps in the process, so that you can review them one by one. Some typical areas to consider might include:

- ▶ Receiving Raw Materials
- ▶ Storing Raw Materials
- ▶ Manufacturing Process, Step 1
- ▶ Manufacturing Process, Step 2
- ▶ Manufacturing Process, Step 3
- ▶ Packaging
- ▶ Process Clean-up
- ▶ Waste Disposal
- ▶ Office
- ▶ Building Maintenance
- ▶ Shipping Product
- ▶ Transportation (including employee, sales, and management staff, parking)
- ▶ Optional: map customer and supplier activities and processes that directly relate to your company's activities, products and processes

Use this list of areas to develop a process map describing the order in which activities take place in your company. Some areas may need their own map; others could be parts of a larger map. Figure 1-e shows a generic process map of a manufacturing company that might help you to set up your own map.

Worksheets EA-01a and EA-01b in the *Company Manual Template* also provide a way to document your company's operations.

Internet Help

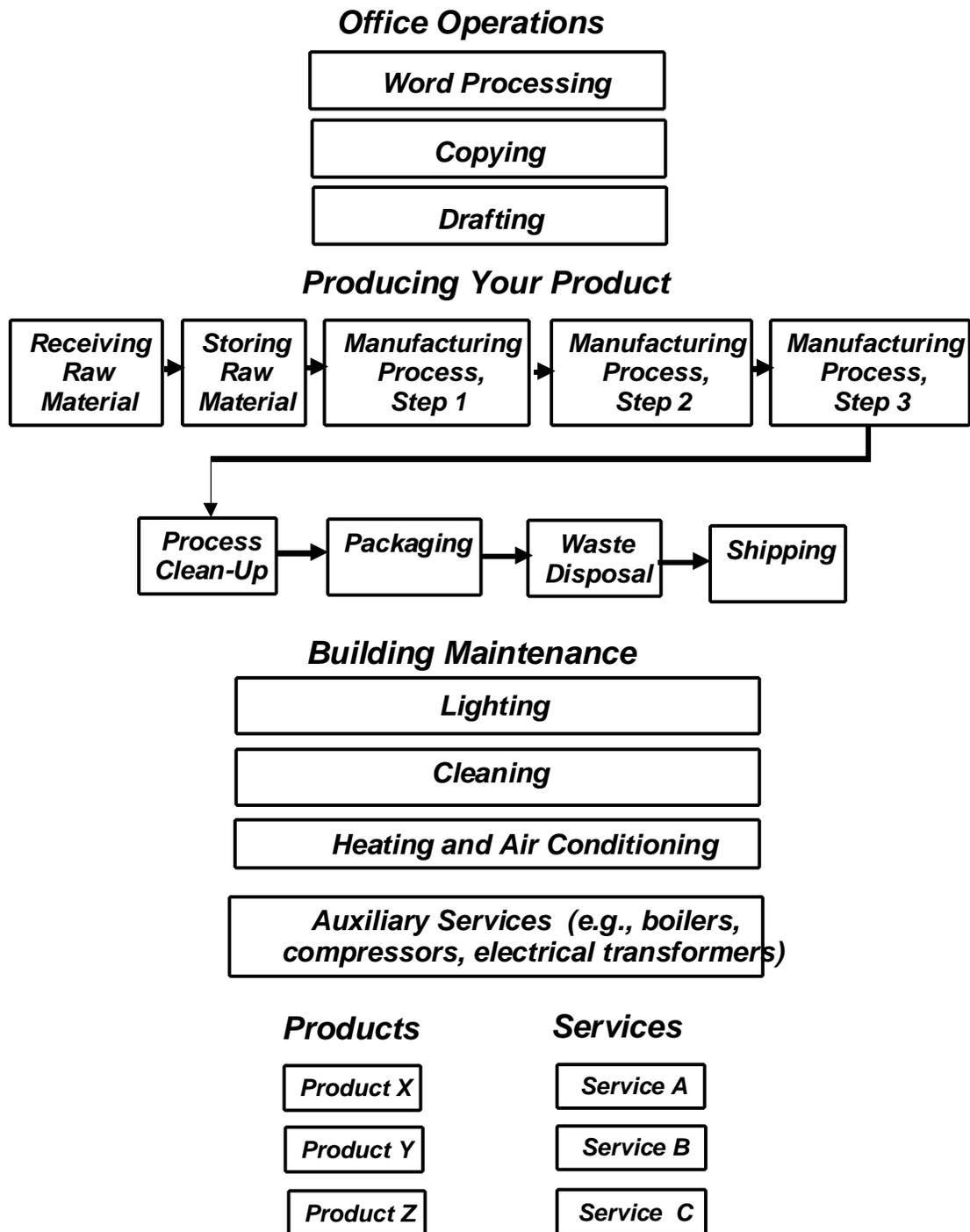
Visit the DfE website for more tools related to process mapping.

www.epa.gov/dfe

Tip

These technical sections are best developed through group discussions. There is no "right" way to build these lists. The process, however, must make sense to you and be documented so that you can review it or change it later.

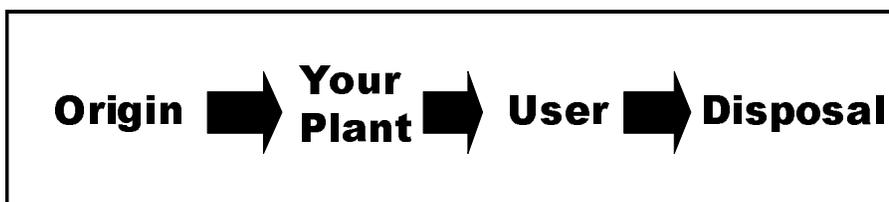
Figure 1-e. Generic Process Map for Business Activities



You will notice that two areas of activities, office operations and building maintenance, have boxes that are separate rather than being part of a sequence. This is because the activities identified under these areas are not related sequentially. Under the area “Producing Your Product,” the activities are connected in steps required to produce a product or service. This order will be important to understand later if you decide to work on an aspect that is part of a sequence of steps.

In addition to the process steps laid out in your map, you should consider the environmental aspects of your products and services. For example, does your product or its packaging have potential impacts on the environment? If so, there may be opportunities to form partnerships with customers to work on making changes that reduce the impact. As shown in Figure 1-f, many companies are extending their responsibility to consider the upstream impacts of their materials choices and the downstream impacts of consumer use and disposal of products.

Figure 1-f. Product X — Extended Responsibility



Step 2: Identify the Inputs and Outputs of Each Activity

The next step in identifying environmental aspects is to identify the inputs and outputs of each box in the process map you developed in Step 1. Among those inputs and outputs will be some that have environmental effects. Figure 1-g shows a generic step in a manufacturing process. Figure 1-h illustrates this concept with an example of a business activity (paper copying) that is an office activity rather than part of an

Tip
Appendix H contains full-page versions of the blank worksheets.

operational sequence. The second example, shown in Figure 1-i, shows the process step of press cleaning in printing operations at ABC company. Figure 1-j shows graphically the general inputs and outputs of a company's products and services.

Figure 1-g. Input-Output Diagram for a Step in a Manufacturing Operation

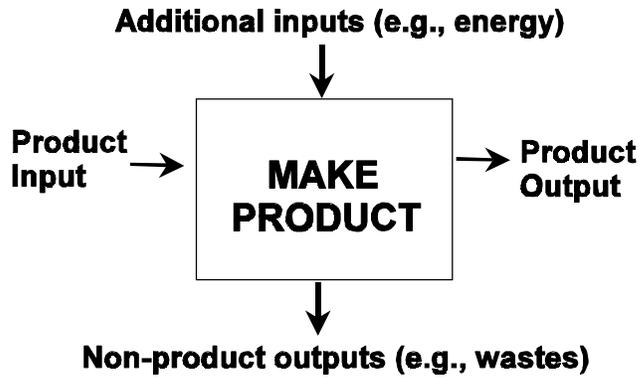


Figure 1-h. Input-Output Diagram for a Copier

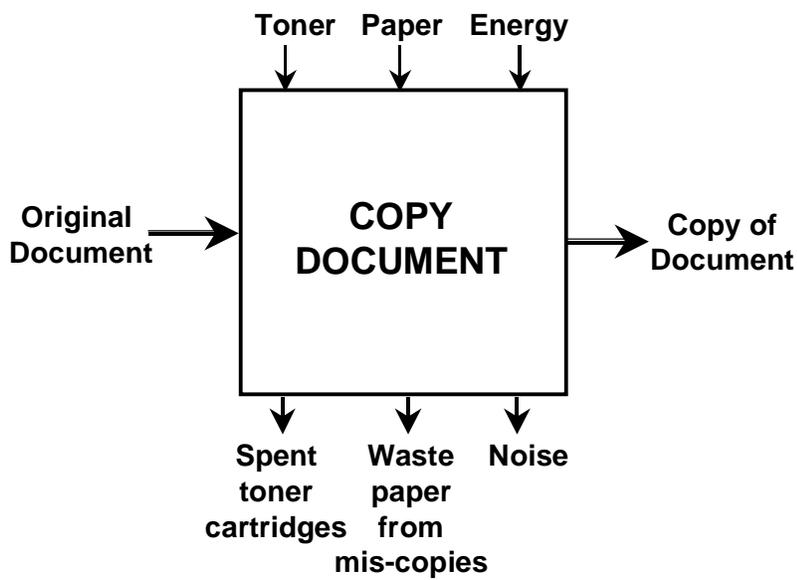


Figure 1-i. Input-Output Diagram for Cleaning a Printing Press

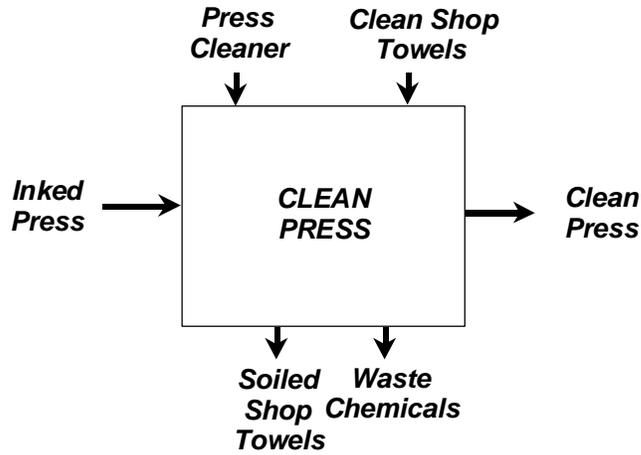
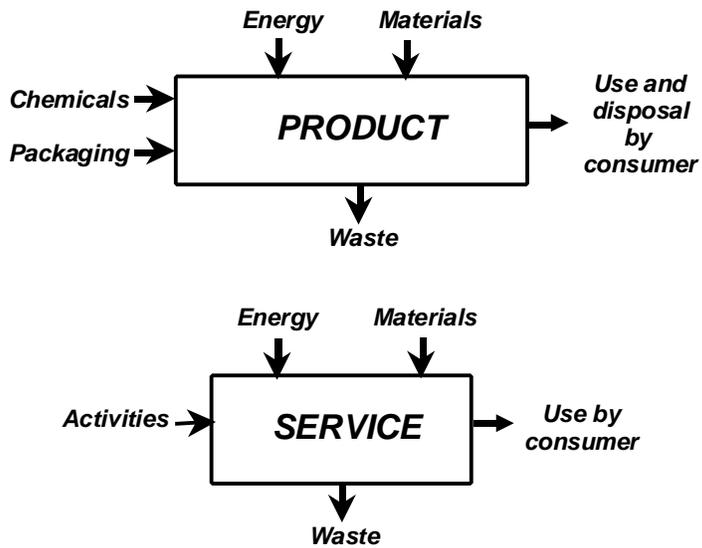


Figure 1-j. Inputs and Outputs of a Company's Products and Services



Step 3: Identify environmental aspects of each activity

Next you will identify environmental aspects associated with each input and output. Using your process map developed in Step 2, identify the environmental aspect of each input and output. Keep the following key points in mind when identifying the environmental aspect of a particular activity.

- ▶ Can it interact (beneficially or harmfully) with anything in the environment?
- ▶ Can it be toxic or hazardous to humans or anything in the environment?
- ▶ Does it use natural resources?
- ▶ How is it disposed of?
- ▶ If a product, how will it be used and disposed of by the consumer?

Use Worksheet 1-5 to help you list each process step and its associated environmental aspect. Appendix H contains a blank copy for your use.

Worksheet 1-5:* Identifying Environmental Aspects		
Input/Output	Environmental Aspect (Quantify if available)	Environmental Impact
Office Activities		
Paper (In)	Use of paper	Use of natural resources
Energy & fuel (In)	Use of energy	Use of natural resources; air quality degradation
Toner (In)	Harmful chemicals	Health and environmental effects**
Documents (In)	Solid waste	Degradation of land, habitat, drinking water
Waste paper (Out)	Solid waste	Degradation of land, habitat, drinking water
Used Toner (Out)	Solid and chemical waste	Degradation of land, habitat, drinking water
Odors (Out)	Production of odors	Indoor air quality
Manufacturing Process		
Press cleaner (acetone, toluene, MEK, isopropyl alcohol blend) (In)	Chemicals that are toxic to humans or the environment	Health and environmental effects*
Wipers (In)	Materials that are toxic to humans or the environment	Health and environmental effects*
Energy & fuel (In)	Use of energy	Use of natural resources; air quality degradation
Soiled wipers (Out)	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water*
Waste chemicals (Out)	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water*
Air releases of press cleaner (Out)	Production of air pollutants	Degradation of air quality*
Products and Services		
Product X: Chemicals	Chemicals that are toxic to humans or the environment	Health and environmental effects*
Materials	Materials that are toxic to humans or the environment	Health and environmental effects*
Packaging	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water
Waste	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water
Energy use	Use of energy	Use of natural resources; air quality degradation
Service X: Chemicals used	Chemicals that are toxic to humans or the environment	Health and environmental effects*
Waste products	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water
Energy use	Use of energy	Use of natural resources; air quality degradation
Contact Person:		Date Completed:

*Use the blank form in Appendix H for your data, then use the information to fill in EA-02 in the *Company Manual Template*. ** See Module 3 for information on chemical effects.

Step 4: Identify your legal and other requirements

The last step in identifying environmental aspects is to identify environmental legislative and regulatory requirements that pertain to your business activities, products, and services.

Regulated concerns that apply to your business should be included in your system of environmental programs because your IEMS will integrate all of your company's efforts to manage environmental concerns.

State and local legal requirements, in addition to federal, need to be considered. Often states administer federal environmental and occupational safety and health regulatory programs and may have stricter and/or different requirements than federal regulations.

You can obtain information on regulatory requirements from a variety of sources. State or city departments of environmental protection might be able to assist you in finding this kind of information. For example, state technical assistance programs are often excellent resources and often can provide one-on-one consultation. In addition, public information offices of both the Environmental Protection Agency (EPA) and the Occupational Health and Safety Administration (OSHA) of the Department of Labor (DOL) can help provide publications that explain regulations pertinent to your company's activities. Publications by the DfE Program at EPA and EPA's Office of Enforcement and Compliance Assurance (OECA) also identify federal regulations affecting certain industries. Appendix G gives full citations of the DfE publications, addresses for some resources, and describes how to obtain them. You can also visit the DfE Web site at www.epa.gov/dfe. Regulatory information is also available at the websites of many agencies.

 Tip

It is helpful to begin identifying regulatory requirements by making a list of those regulations that you know affect your company. Searching for additional information can take time. Any newfound regulatory requirements can be added into your IEMS at a later date.



 Tip

Even regulations that may not directly apply to your business may contain important information about the environmental impacts associated with your type of business.

Worksheet 1-6 will help you organize your search of regulations that affect your business. In many cases, very small businesses are exempt from some regulations. Still, the problems addressed by the regulations may affect your business and may be concerns you would want to address in your IEMS. Thus, it is worthwhile to familiarize yourself with regulations, just to identify concerns and determine whether any of them apply to your operations. Use Worksheet 1-6 to keep track of regulations that apply to your business.

Worksheet 1-6*: Regulations			
Regulatory Agencies	Regulations That Apply to My Business Sector	Business Operations Potentially Affected	Does it Apply to My Business?
Contact Person:		Date Completed:	

*Corresponds to Table LR-01 in *Company Manual Template*.

In addition to regulations, industry codes of practice and other non regulatory guidelines can help point to environmental aspects of your business activities. Your trade association also may be able to help identify useful publications.

The following case study shows how “Company A” set up a process for creating an environmental management system and some of the benefits of doing so.

Case Study: Company A

EMS Development

Company A is a 20-person manufacturer of large custom metal machine parts for industrial customers. To initiate its EMS, the company formed a small EMS implementation team that includes the managers of quality, purchasing, and human resources and is led by the owner’s son. This team developed the environmental policy for review and approval by the owner, and, equally important, set up a structure for involving all employees in the EMS process. Employees receive general environmental awareness training during some of the company-wide Friday meetings, and have been involved in identifying environmental problems and solutions in their areas of responsibility.

Company A’s comprehensive approach to environmental management yielded immediate results. After identifying oil usage as a significant environmental aspect, a team of workers and managers identified faulty gaskets as the primary cause of oil leaking from the machines. By replacing these gaskets, the company cut its oil use by 50%. This change, as well as more general improvements in work environment and worker safety, caused the local environmental enforcement agency to reclassify Company A as a non-hazardous waste generator (it had been classified as a hazardous waste generator). The company also reports significant improvements in the environmental awareness of management and workers; though less tangible, this change in attitude may prove equally significant over the long run.