



**BASEL CONVENTION**  
ON THE CONTROL OF TRANSBOUNDARY  
MOVEMENTS OF  
HAZARDOUS WASTES AND THEIR DISPOSAL



SECRETARIAT

**METHODOLOGICAL GUIDE FOR THE UNDERTAKING OF  
NATIONAL INVENTORIES OF HAZARDOUS WASTES  
WITHIN THE FRAMEWORK OF THE BASEL CONVENTION**

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## **Foreword**

This methodological guide is mainly intended for the national authorities of the contracting parties to be responsible for the development and implementation of environmentally sound national management policies on hazardous wastes. This document should be studied jointly with the "Framework document on the development of national and/or regional strategies for an environmentally sound management of hazardous wastes" (SBC publication – Highlights No.96/001(F) – November 1997), adopted at the second meeting of the Conference of the Parties (1994), together with the "Guidelines on Hazardous Wastes Audits within the Framework of the Basel Convention" (Basel Convention series/SBC No.99/010, August 1999).

Some technical elements contained in the present guide are based on the experience in various countries in regard to the management of hazardous wastes and have been adapted to the particular requirements of the Basel Convention. The classification system of hazardous and other wastes used in the guide are those set out in annexes VIII and IX to be adopted during the fourth meeting of the Conference of the Parties (1998).

Since this is the first draft, it should be used taking into account that it has a certain number of limitations and is intended to be completed or revised during the next two or three years, based on the practical experience of the Parties to the Basel Convention.

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## Introduction

In many developing countries, the competent authorities do not know accurately which types and quantities of hazardous wastes are generated or imported into their country and what kind of management should be applied to them. Such information, however, is important for regulating, planning, fixing priorities and controlling the management of wastes and particularly the management of hazardous wastes. The lack of precise and detailed information is a constraint to awareness on the part of political and administrative authorities. A vicious circle is then set up: since the extent of the threats to the environment and health involved in the inadequate management of hazardous wastes is not clearly identified, the appropriate measures cannot be taken, the effect of which is to allow such threats to increase further.

This is why the first stage of a national environmentally sound management policy for hazardous wastes consists of the preparatory process for an inventory of the types, quantities and management of those wastes. It is only then that decisions can be made as to which problems need to be addressed as a priority and by means of what measures. Following this stage, it will then become possible to develop national management systems for hazardous wastes that cover all stages of the life of those wastes, including production, transfer and disposal.

The process of a preparation for an inventory is a process in which different actors with different interests participate. Experience shows that such intersectoral processes are complicated to direct. That is why it is recommendable to work with a clear methodology so as to obtain the necessary information rapidly. The guide presented here proposes a simple and flexible approach, which can be adapted according to the demands of the relevant areas and time scales.

The guide is based on the practical experiences of some industrialized countries that. These countries have over several years learnt the requirements and the method of making an inventory of hazardous and special wastes.<sup>1</sup>

The objective of the guide is to provide simple and practical instructions to the competent authorities. Of developing countries that have ratified or acceded to the Basel Convention and indicated, how they themselves can prepare an inventory of hazardous wastes at a national level and maintain it always up-to-date. The guide deals with the preparation of an inventory of all types of hazardous industrial wastes and for this purpose uses the classification of hazardous wastes developed by the Basel Convention, according to annexes VIII and IX.

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<sup>1</sup> See for example the Swiss ordinance on the movements of special wastes of 12 November 1986. Also see the provisions of RCRA of the United States of America. Also see the provisions of the Province of Ontario, Canada.

## 1. Guiding principles

The present guide has been developed taking into account the following principles:

- A national inventory of hazardous wastes is an indispensable preliminary step for the development and implementation of a national management policy for hazardous wastes, within the framework of the implementation of the Basel Convention.
- Setting up of a national inventory is based on a specific methodology.
- Responsibility for establishing the inventory falls on the official and competent administrative authority, which appoints persons responsible for the environment.
- The establishment of an inventory should also be time-related. The first activities of the inventory are to collect the data, which will be completed and fine-tuned regularly. This process of the inventory will be periodically updated (annually, biannually, etc.).
- The setting up an inventory of hazardous industrial wastes requires a legal, institutional and technical arsenal, which each country must continue to develop: regulations, institutional structure, infrastructure, awareness-raising policy, etc.
- A national inventory of hazardous wastes fits in to a strategy of environmentally sound management of wastes and requires the cooperation of all the actors concerned.

## 2. Scope

The present manual on the methodology for the making and maintenance of national inventories of hazardous wastes is directed above all to those responsible for the environment, who are working on behalf of the official and competent administrative authorities of the member countries of the Basel Convention. The manual can also be of use to countries that are not members of the Basel Convention and it is under the guidance of the official competent administrative authorities that a national inventory of hazardous wastes can and should be constituted.

### 2.1 Field of application

The present manual is applicable to every territory, municipal, provincial or national, for which the administrators wish to constitute a territorial inventory of hazardous wastes. It basically deals with the generation and management of hazardous wastes. In this manual, the names used for the hazardous wastes are those found in Annexes VIII (list A) and IX (list B) of the Basel Convention. The management codes are those defined in Annex IV of the Basel Convention. In referring to the various sectors of economic activity of concerned country, the present document uses the International Standard Classification by industry system, including all branches of economic activity (ISIC). The coding system being used is the International Standard Industrial Classification of all Economic Activities (ISIC). The coding system being used is the third

revision<sup>2</sup>.

## **2.2 Methodology**

There are several methods of developing and maintaining national inventories of hazardous wastes. For the present manual, a method has been chosen comprising three distinct stages:

- The preparation of the inventory.
- The incorporation of the first results.
- The maintenance of the inventory (permanent inventory).

## **2.3 The role of the Focal Point of the Basel Convention**

Article 5 of the Basel Convention provides for the appointment of a focal point for each Party and one or several competent authorities to facilitate the implementation of the Basel Convention. The secretariat deals officially with the Parties through the focal points.

In this regard, before the end of each year, the focal points transmit to the Conference of the Parties via the secretariat a report containing information relating to the conduct and establishment of national management policies for hazardous wastes (see section 3.2 and article 13 of the Basel Convention). The focal points, as institutional bodies, fall for the most part under the ministries of environment.

The focal points generally have the task of guiding the implementation of the at a national level, as well as developing environmentally sound national management policies for hazardous wastes. The focal points, therefore, possess the skills required for controlling the national inventories of hazardous wastes within the framework of the Basel Convention. However, the specific task of the focal point in regard to the establishment of a national inventory can vary from case to case; the role of coordinator, the role of implementing agency, participation in extended national committees, etc. The present guide will propose to the reader the choice of a strategy in this area, however, and the reader may consider that other organizational options exist and may be applied with success according to each case.

## **2.4 Limitations of the manual**

The present manual has various limitations. In the first place, the evaluation model proposed places particular emphasis on the health sector and the industrial manufacturing sector. Some sectors such as that of individual consumption, that of transport (vehicle maintenance) and the mining sector, have been neglected, although they might represent important areas in terms of quantity or harmfulness of the hazardous wastes generated. The modeling results are developed

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<sup>2</sup> International Standard Industrial Classification of all Economic Activities, third revision, United Nations 1990. ISBN 92-1-261120-6

according to sectors of economic activity and only enable a very general level of assessment to be made. Some economic activity sectors such as the chemical industry (products of organic and inorganic chemistry) and the production of finished metal products are modeled with the same economic activity sector index, although the type of production (products) and the technologies (processes and equipment) are quite different.

This manual (first draft) is intended for the development of an evaluation mechanism of the generation of hazardous and other wastes covered by Annexes VIII and IX of the Basel Convention. It should be completed taking into account the results of inventories obtained by the Parties. Certain types of hazardous wastes involving the use of specific pollutants which are only and directly connected with the manufacturing and industrial production, such as PCBs and asbestos, should later be the subject of specific evaluation models.

It should be noted also that the technical criteria<sup>3</sup> for characterizing the hazardous wastes are not specified. Neither is a precise methodology described for the use of sampling programmes and tests and laboratory analysis that permit the determination of the harmfulness of wastes, in reference to the preselected technical criteria.

### **3. Objectives of the national inventory**

The making of a national inventory of hazardous wastes has the following objectives:

- The collection of elements useful for the development of a national policy on hazardous wastes;
- The obligation to transmit information and reports through the secretariat, in accordance with article 13 of the Basel Convention.
- Some specific objectives as well as the option of adapting the inventory in the future.

#### **3.1 The role of the national inventory in the context of a national policy on hazardous wastes**

The role of a national inventory of hazardous wastes initially consisted of diagnosing in summary form, how things stand in regard to waste generation and management, thus enabling the work priorities of the concerned governmental authorities to be identified in order to determine the outlines of a coherent and realistic national policy for the management of hazardous wastes. In that way preference could initially be given to certain sectors of economic activity and the hazardous wastes considered to be a priority. This taking into account that not everything can be done at the same time.

The annual updating of this inventory, with the help of related and updated information, will enable

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<sup>3</sup> An example is the use of small pH levels that enable it to be determined if a waste is corrosive (therefore hazardous) or not. After which pH level is the waste hazardous?

the national policy objectives prepared regionally to be corrected and modified. This may apply inter-alia to the identification of new economic sectors that are generating hazardous wastes and new in-flows of important hazardous wastes need to be controlled. This method of working will facilitate the gathering and the monitoring of the specific outcomes of all the waste minimization programmes<sup>4</sup>. This can be achieved by following up the relevant programmes: tracking down sources, re-use, recycling, treatment and appropriate disposal of hazardous wastes with the objective of having everything covered in an environmentally sound management strategy for wastes.

### **3.2 The transmission of information to the Secretariat of the Basel Convention (SBC)**

According to Article 13 of the Basel Convention on the Control of Transboundary Hazardous Wastes and their Disposal, the Parties <sup>5</sup> shall transmit, through the Secretariat, before the end of each calendar year, to the Conference of the Parties, a report containing the following information:

1. Information regarding transboundary movements of hazardous wastes or other wastes in which they have been involved, including:
  - (a) The amount of hazardous wastes and other wastes exported, their category, characteristics, destination, any transit country and disposal method as stated under response to notification;
  - (b) The amount of hazardous wastes and other wastes imported, their category, characteristics, origin and disposal methods;
  - (c) Disposals which did not proceed as intended;
  - (d) Efforts to achieve a reduction of the amounts of hazardous wastes or other wastes subject to transboundary movement;
2. Information on available qualified statistics which have been compiled by them on the effects on human health and the environment of the generation, transportation and disposal of hazardous wastes or other wastes;
3. Information concerning bilateral, multilateral and regional agreements and arrangements entered into pursuant to Article 11 of the Convention;
4. Information on accidents occurring during the transboundary movement and disposal of hazardous wastes and other wastes and on the measures undertaken to deal with them;

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<sup>4</sup> Minimization of volume and hazardousness of wastes .

<sup>5</sup> 128 Countries and one economic integration organization are being Contracting Parties to the Basel Convention, as of 21 July 1999.

5. Information on disposal options operated within the area of their natural jurisdiction;
6. Information on measures undertaken for the development of technologies for the reduction, and/or elimination of production of hazardous wastes and other wastes.

In this regard, the present guide is intended to provide Parties with useful instruments for the transmission and management of information in relation to the national inventories of hazardous wastes, with the aim of harmonizing the standards of presentation of data, to give better “comparability”, together with an improvement in the quality of the data transmitted.

### **3.3 Specific objectives**

The use of the national inventory will also facilitate the compilation and analysis of data and specific information, going beyond the objectives mentioned in points 2.1 and 2.2. Thus some countries will wish to obtain a control more specific data in regard to the type, nature and volume of information concerning the management of hazardous wastes. A national inventory could, for example, contain complementary information concerning the physical state of the wastes<sup>6</sup> the types of risks associated with hazardous wastes<sup>7</sup>, a special coding for the transport of wastes<sup>8</sup>, etc.,

## **4. Definitions and classifications**

### **4.1 Definition and classification of hazardous wastes**

The definition of wastes can be found in Article 2.1 of the Basel Convention: Seen in this sense “Wastes are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”.

The classification of hazardous wastes used in the present guide is that given in Annex VIII and Annex IX of the (see also Annex A of the guide).

Nevertheless, the methodological approach developed in the present document is also useful for any other national definition of hazardous wastes that may be used and/or chosen.

### **4.2 Selection of economic sectors generating hazardous wastes**

The economic activity sectors that generate hazardous wastes can be consolidated into five groups: individual consumption, health services, the manufacturing sector, sectors linked to transport and the other regrouped sectors remaining.

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<sup>6</sup> Whether the wastes are in the form of gas, liquid, solids, semi-solids (slurries) or others.

<sup>7</sup> The idea of safety risk to the employees handling them.

<sup>8</sup> Transport code according to the United Nations Orange Book on the transport of dangerous goods, according to the codes of the International Maritime Organization (IMO), of the International Air Transport Association (IATA), etc.

In quantitative terms, generally the manufacturing sector is the largest producer of hazardous wastes. Brief definitions of the five major groups of economic activity are as follows:

**Individual consumption**: every generation of hazardous wastes that are currently termed hazardous domestic wastes. Hazardous domestic wastes can be made up of absolute products that are potentially dangerous, such as dry cleaning chemicals, paint, waste oil, explosives, batteries, etc. Quantitatively, this sector plays a negligible role in the production of hazardous wastes. This sector will not be selected or analyzed in a national inventory.

Nevertheless, studies carried out in the industrialized countries reveal that about ten per cent of domestic wastes are hazardous. This ratio may vary widely depending on the type of consumption studied and some disparities may occur in the composition of domestic wastes.

**Health services**<sup>9</sup>: All activity sectors linked to the provision of health services, health clinics, dental clinics, veterinary clinics, etc. In these there are found pathological wastes, infectious wastes contaminated by bacteria and viruses (as in the case of syringes, bandages and other objects that have been in contact with patients). This sector is of little importance in quantitative terms. Nevertheless, given the infectious nature of these wastes, particular attention should be paid to them in the establishment of hazardous wastes and management policies. Infectious wastes are covered by the present manual.

**Manufacturing and industrial production**<sup>10</sup>: All activities linked to the production and manufacture of goods. These activities can be grouped under the designation of the manufacturing and industrial sector. Among them are found activities linked to the manufacture of wood products, textiles, metal products, chemicals, petroleum products, etc. Quantitatively, this sector plays a major role in the production of hazardous wastes.

**The transport sector**<sup>11</sup>: All activities linked to individual transport (automobiles, motor cycles, mopeds, etc.), to the trucking industry and all other modes of public transport (buses, trains, underground, ships and aircraft). The hazardous wastes associated with these modes of transport are linked to the maintenance of vehicles. Among them are included waste oils, degreasing solvents, used batteries, dirty oil filters, various liquids (windscreen washing liquids, anti-freeze, brake hydraulic fluid, etc.).

Considering the volume of waste oils, this sector plays a major quantitative role in the generation of hazardous wastes. Nevertheless considering the large number of vehicle maintenance service stations (garages or workshops), this sector will not be developed in the national inventory.

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<sup>9</sup> Under ISIC, code 8500.

<sup>10</sup> Under ISIC, codes 1500 to 3700.

<sup>11</sup> Under ISIC, codes 5000, 6000, 6100 and 6200.

**Others**<sup>12</sup>: These sectors may be linked to agriculture, mining<sup>13</sup>, primary industry and the service industry. On the other hand, certain specific pollutants such as PCBs <sup>14</sup>, pesticides, asbestos, may be associated with some specific economic activity sectors. For example, PCBs with electricity distribution<sup>15</sup>. These wastes can be subject to specific production methods that will not be covered in the present manual.

### 4.3 Coding of economic sectors

After having clarified the definition of hazardous wastes, and after having identified the manufacturing and health sectors as those on which our attention will be focused, it will be necessary to codify the economic sectors selected. In the desire to have uniformity in our approach and to take into account the fact that the majority of developing countries <sup>16</sup>are familiar with the United Nations Coding System. This document will make use of the International Standard Industrial Classification of all Economic Activities (ISIC). The third revision of this coding system will be used <sup>17</sup>.

Annex C shows a partial list of the main economic activities sectors of ISIC which will be considered in the present document. The economic sectors selected correspond for the most part to manufacturing sectors. Certain manufacturing sectors have not been chosen. Among others, these are the agro-food sector and the tobacco sector <sup>18</sup> which generate very few hazardous wastes.

It will always be possible to work to obtain an equivalence of the economic sectors of ISIC to a national coding that differs in approach to that chosen by the United Nations Statistical office.

## 5. Methodology

Throughout this text, a simplified methodology will be presented, for building and maintaining a national inventory of hazardous wastes, basically comprising three stages:

- Preparation of inventory;
- Incorporation of first results;
- Maintenance of inventory/permanent inventory.

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<sup>12</sup> Under ISIC, these sectors may be 0100 to 1500, 4000 to 5000, 5100, 5200, 5500, 6300, 6400, 6500 to 8500 and 9000 to 9900.

<sup>13</sup> This sector generates large quantities of residues. However, specific regulating provisions exist often in countries.

<sup>14</sup> Polychlorinated biphenyls. See Annex 1 of the Basel Convention, item Y10.

<sup>15</sup> Under ISIC, code 4000.

<sup>16</sup> Countries which for the most part are in need of aid and technological transfer in the work of preparation and implementation of a hazardous wastes management policy.

<sup>17</sup> The International Standard Industrial Classification of all Economic Activities, third version, United Nations 1990. ISBN 92-1-261120-6.

<sup>18</sup> Sectors 1500 and 1600.

## **5.1 Preparation of inventory**

The production of a good national inventory of hazardous wastes depends in part on the preliminary preparation. Several ingredients are essential. Preparation of an inventory can be made up of the following steps:

- The preliminary preparation. The question is to identify who does what. That is to say, what persons will be working on a national inventory and how will they set about it? What will be the scope and limits of this national inventory?
- The fields of information to be taken into consideration.
- The possibility of interfacing with other database systems existing in the country, such as a Geographic Information System (GIS).
- The training of those taking part in the inventory and the briefing of participants involved in working with wastes; generators, carriers, commercial management centers of hazardous wastes, others.

## **5.2 The work team and its terms of reference**

Clear terms of reference should be defined in advance. The terms of reference could include the following components: determination of the stages of the establishment and the timetable for the terms of reference, the identification of participants, the identification of the major through-puts of hazardous wastes, the identification of the main sectors of economic activity, prioritization of the economic activity sectors in relation to the size of enterprises (large business versus small and medium sized enterprises), the identification of the priority areas or geographic territories and the identification of the frequency and the best time for acquiring the necessary information for the national inventory of hazardous wastes.

Subsequently, a government work team should be clearly identified to undertake preparation of a national inventory of hazardous wastes. This team, preferably small and flexible, will probably be incorporated within the ministry responsible for the environment. The team should be able to work with experienced external experts. It can work jointly in collaboration or under some form of understanding with other departments or other ministries who are interested in the issue. These are likely to be the ministries concerned with health (hospital and biomedical wastes), industry (manufacturing sector) and trade (import/export of hazardous wastes).

At the start of the task, there should be a clear definition of which areas of activity are to be involved and what objectives fixed. This should be determined by the work group itself (in agreement with the commissioning service); the methodology of the inventory does not place any restriction on this. It is of importance that the objectives fixed and the system limits be clearly indicated, in order to be able to evaluate and assess these activities and also so that the results of the

inventory can be communicated and made use of properly. It is also important to justify limitation decisions that may be taken.

Once the objectives are fixed, the stages of work that should follow can be detailed; the objectives already effect the limitation of the areas of activity and therefore make it possible to achieve them. The objectives may be given in advance to the work team; but it is more useful that the work group should define them itself in consultation with the actors involved in hazardous wastes and other government participants, and present these to the commissioning service. Since the preparation of the objectives strongly influences the whole development of the inventory, sufficient time should be given for this stage.

### 5.3 Inventory limits: identification of the data and information

One of the major issues is to identify what information and data is required in a national inventory of hazardous wastes (limits of the national inventory). Consultation with those involved in the area of hazardous wastes is necessary so as to establish the feasibility of the setting up and maintenance of a national inventory. Recommendations are given in the two tables below on the minimum requirements for compiling the indicated fields of establishments generating wastes, transporting them or processing them:

**Table 5.1: Information fields to be compiled: identification of enterprise surveyed**

<b>Information fields</b>	<b>Comments and observations</b>
Company	<i>Legal company name</i>
Address	<i>Street, town, state, postcode</i>
Responsible person	<i>Name, position, telephone, fax no., email</i>
Economic sector	<i>ISIC code or national code, accurately, to four digits if possible</i>
Category of involvement	<i>Generator, carrier or commercial management centre of hazardous wastes</i>
Employees	<i>No. of employees, including administrative staff</i>
Period covered	<i>Quarter, year</i>
Geographic location	<i>If available, map reference longitude and latitude</i>
Other comments	<i>E.g. level of confidentiality of information</i>

**Table 5.2: Information fields to be compiled; management of hazardous wastes**

*Quantities in kilograms*

*Period covered: 1 January 1999 to 31 December 1999*

N°	Information to be compiled	HW N° 1 Ex.: used oil	HW N° 2	HW N° 3	HW
1	<i>Code of waste</i>	A 3020			
2	<i>Physical state<sup>19</sup></i>	L			
3	<i>Hazard<sup>20</sup></i>	H3, H11, H12			
4	<i>Amount generated in period covered</i>	1 350 kg			
5	<i>Amount in stock on first day of period</i>	450 kg			
6	<i>Amount in stock on last day of period</i>	300 kg			
7	<i>Amount exported out of premises</i>	300 kg			
8	<i>Name and address of consignee</i>	Xyz, country Z			
9	<i>Amount received on premises</i>	0			
10	<i>Name and address of sender</i>	n.a.			
11	<i>Amount managed in situ (with appropriate management code<sup>21</sup> R1 to R13)</i>	1 200 kg in R1 <sup>22</sup>			
12	<i>Amount managed in situ (with appropriate management code<sup>23</sup> D1 to D15)</i>	n.a.			
13	<i>Other comments</i>	n.a.			

<sup>19</sup> Gas, liquid, solid

<sup>20</sup> Under Annex III of the : H1 to H13

<sup>21</sup> Under Annex IV of the , section B / recycling operations

<sup>22</sup> R1: Energy reclamation, use as fuel.

<sup>23</sup> Under annex IV of the , section A / disposal operation.

#### **5.4 Procedure of collecting information**

The work team, in consultation with the various people involved in the area of hazardous waste management, should identify what would be the best approach and the frequency of data collection for the national inventory. Those involved in the area of hazardous waste management are: generators, carriers, authorized consignees<sup>24</sup>, regulating public bodies and control/inspection bodies<sup>25</sup>. Once the approach and frequency agreed by all parties, they should be included in the relevant national regulations to give them legal weight.

#### **5.5 Interface with other environmental databases**

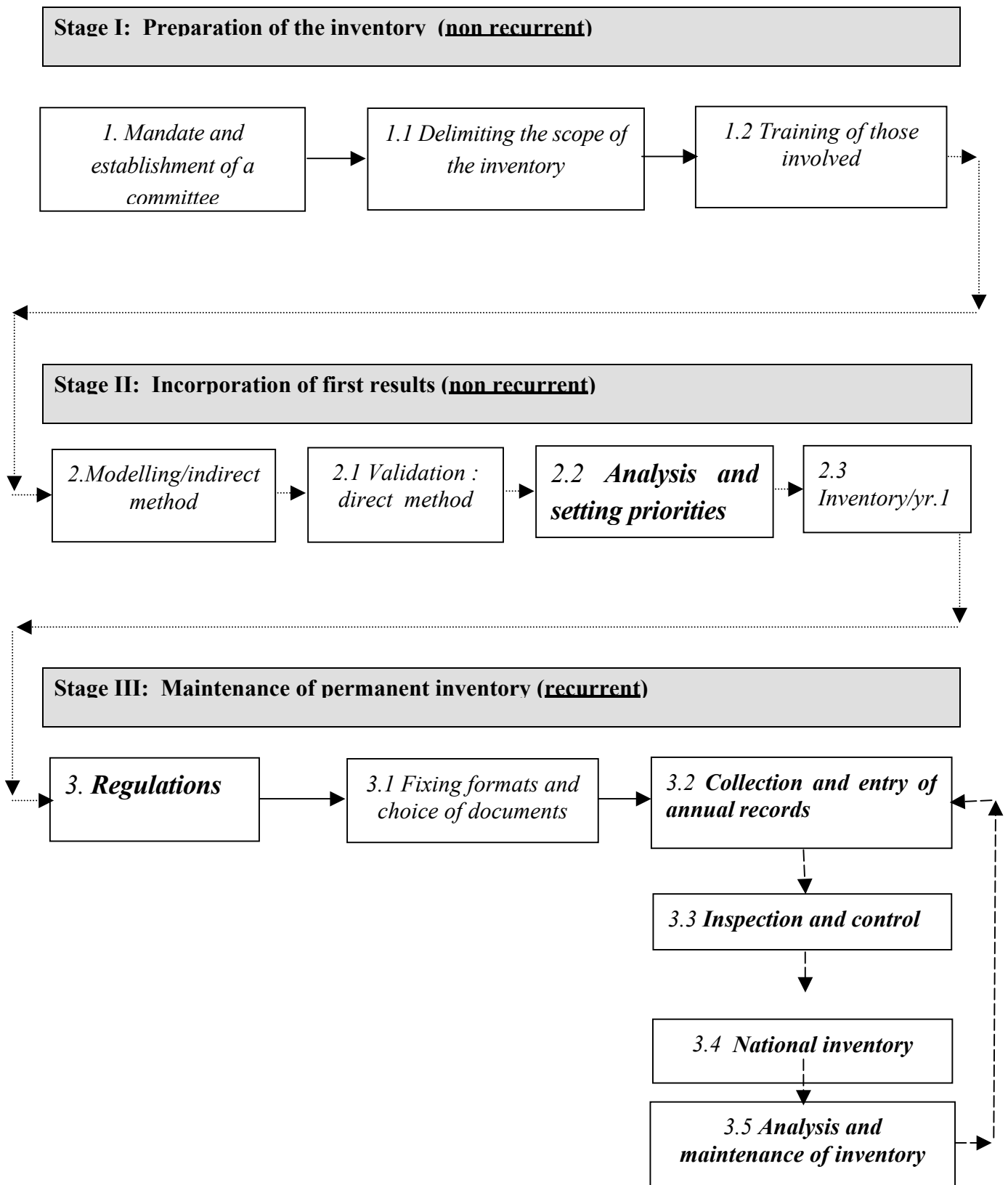
In the building of a database, consideration should be given to the possibility of linking the national inventory data on hazardous wastes with other databases that could yield data concerning generators, carriers, accredited disposers for hazardous wastes. We are thinking here of government databases dealing with systems of environmental data management, including geo referenced environmental information systems (GIS).

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<sup>24</sup>Commercial management centers for HW.

<sup>25</sup> Customs and other inspection bodies

**Figure 1: Establishment and maintenance of national inventory of hazardous wastes**



## **5.6 Participation and consultation of private and institutional sectors**

The active and progressive participation of the various actors involved in the area of hazardous waste management is one of the conditions for success in the setting up of a national inventory of hazardous wastes. The actors involved in the area of hazardous waste management are: generators, s, authorized consignees, statutory public bodies and monitoring/inspection bodies. To ensure an active participation of all of those involved in the area of hazardous wastes, it is necessary from the very first stages of establishing the inventory, to carry out selective consultations with the main actors, so as to validate the objectives and scope of the national inventory of hazardous wastes. The participation of small and medium enterprises that generate hazardous wastes is also essential. Last but not least, serious consideration should be given to the training of these actors.

## **5.7 Training**

In regard to training, it could help to hold technical training sessions, to publish electronic mail and set up an Internet site dealing with questions regarding hazardous wastes. Such technical training could be given selectively and in a gradual manner. By “selectively” we mean by identifying the priority economic sectors (ISIC coding) that are to receive the relevant training. By “gradually” we mean that the content of the training sessions should be presented in a gradual fashion. It is not possible to put everything across in one training session. Generators of hazardous wastes make up the largest group numerically of actors in the area of hazardous waste management. They must be given particular attention.

The concerned government services should also be informed and be associated with the work. In the case of the authorities, this concerns both other ministries and official services, as well as responsible people at a local level (implementing bodies, representatives of communes or districts). On the side of industry, besides the representatives of priority economic sectors, industrial or commercial associations should also be informed and encouraged to participate. The transmission of information can be done in writing, but discussions and training sessions are preferable, at least in the case of the major actors. Men and women representing small businesses should also be integrated.

The content of the training sessions could include: purpose, reasons, objectives, the need for support or collaboration, the requirement of accurate information (on wastes but also on activities that are already ongoing or projected, on the part of other work groups in similar areas). A large section of the training should be devoted to the definition and use of uniform technical information, which will permit the compilation of compatible information in a national inventory (wastes codes, management codes, physical state, transport documents, etc.,).

## **6. The entry of the first results**

Once the preparations for the establishment of a national inventory on hazardous wastes have been identified and completed, a preliminary estimate of a national inventory needs to be tackled. This can be called year one or the first draft of the national inventory. This will allow for priorities to be set in terms of economic sectors and wastes, for the follow-up and collection of information. Setting up of a national inventory needs to be done gradually and the validity of the data that it will contain is directly proportionate to the efforts put into it.

In order to save time and energy, the compilation of the first results should be done using an approach with accurate questionnaires and audits. This will give guidance for the setting up of a permanent inventory. This should cover the following points:

- A approach
- The validation of results (inspections and audits)
- The analysis of results. Identification of priority sectors and wastes
- The time-related approach (several years to fine-tune a database)

### 6.1 Modeling or indirect method

For this preliminary estimate in year one, an approach is recommended. This will enable useful results to be obtained with relatively little effort. The results of this will enable the work team to initiate for year two a work plan in the long term, which should identify the economic sectors and hazardous wastes to be given priority.

For year two, following the analysis of the findings of, one or several target economic sectors should be identified and concentrated on. For the following years other economic sectors will be progressively included in a national inventory. This will prevent the process stalling, due to a glut of too great a number of actors to be trained and integrated at the same time.

The modeling approach suggested consists in obtaining for each economic sector chosen the exact amount of hazardous wastes generated in metric tonnes per year (MT/year). To begin with, it should be verified if there is relevant information at a national level<sup>26</sup>if not, you can work with indices or hazardous wastes generation ratios. Thus for each economic sector of the territory concerned, the quantity of hazardous wastes generated can be calculated by multiplying the number of employees in that sector by a generation index/ratio (MT/year/employee). For further information consult Annex D and E.

The total of all the hazardous wastes estimated for a given economic sector will, by comparison with other economic sectors, enable the priority sectors to be identified. At the same time, the total for all the economic sectors modeled for the same hazardous wastes will enable the relevant importance of that waste to be identified in comparison with other wastes in the country.

**Sample:**

<i>Economic sector code</i>	<i>Description</i>	<i>Number of employees</i>	<i>Type of waste</i>	<i>Index/Ratio MT/year/employee (See annex F)</i>	<i>Total of HW generated in MT/year</i>
<b>2700</b>	Manufacture of primary metallurgical products	23 000	A3020	0,413	9 499
<b>2700</b>	Manufacture of primary metallurgical products	23 000	A3140	0,010	230

<sup>26</sup> Information available in local chambers of commerce, in the records of specific companies, etc.

<b>2800</b>	Manufacture of finished metallurgical products	6 700	A3140	0,113	757
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**Reference:** Annex E

Lastly, an Excel spreadsheet application is available with the present document. This application will enable the user to make a preliminary estimate of all the hazardous wastes generated in function of the A list and according the number of employees per sector of economic activity. This can be checked in Annex E. There are 16 economic activity sectors that have been initially selected. Fifteen of these sectors relate to the industrial manufacturing group and the remaining one is related to health. Special attention should be given to the comments on the use and analysis of the results obtained. One sample and a page of calculation are available in this application.

## **6.2 Validation or direct method**

The results of in year one can be validated by complementary information obtained by a direct method. This direct method consists in validating information by technical visits to some establishments or by other information originating in audits of hazardous wastes management by generators, s and commercial management centers for hazardous wastes. In regard to the content of inspections and audits, refer to point 5.3 in section 8 and to Annex F.

It would be advisable to visit at least several companies in the chemical sector (2400), basic industries for fabricating metal products (2700) and some other sectors according to the activity sectors existing in the country. It would also be advisable to make visits to some small and medium sized enterprises (SME) that generate hazardous wastes, together with technical visits to companies transporting wastes, and, if such exist, companies that process or dispose of wastes. These technical visits will help to know how enterprises manage their wastes, including hazardous wastes. The number of visits should be proportional to the number of enterprises in the country. However, at this stage, it is impossible to visit everything.

The part company management plays in addressing the problem of hazardous wastes is important to evaluate. Other technical aspects to be considered are: the characterization and identification of wastes, that is, whether they are hazardous or not, the method of storing, if any exists, the in site management of their hazardous wastes, if there is any, and lastly the transport of wastes away from the site (how, by whom and to where are the hazardous wastes transported).

## **6.3 Compilation and analysis of results**

By using the results, those of the technical visits and the audits, those results obtained can be compiled, analyzed and validated. The compilation and analysis of these results will enable the work team to begin a long-term work plan for year two, which will identify the economic sectors and the hazardous wastes to be given priority.

## **6.4 Identification of sectors/priority wastes**

In this way one or several economic sectors can be targeted and concentrated upon. That is to say, that you give particular attention to some or all the establishments <sup>27</sup>within the targeted economic

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<sup>27</sup> Priority could also be given according to the size of enterprises (small, medium and large), or as a

sector or sectors. In succeeding years you can gradually include other sectors. This will avoid the process getting bogged down by having an excessive number of actors to train and incorporate all at once.

## **6.5 Time-related approach**

The national inventory is built year after year, and the validity of the data in it is directly proportional to the efforts put in. In many cases <sup>28</sup>, you can notice that data on the generation and management of hazardous wastes become more accurate as time goes by, year after year, and the results are more and more refined and reflect well the reality of the generation and management of hazardous wastes. The rigorous implementation of the method, training and experience required by the various actors help them to be more accurate and to increase the value of the information compiled and exchanged.

## **7. Setting up of permanent national inventory**

The setting up of a permanent inventory of hazardous wastes will include the following points:

- Responsibility shared among different actors
- Updating of data
- Procedure of permanent collection of information (format and documents)
- Regulations
- Inspection and validation
- Maintenance of a permanent inventory
- Management of the information compiled

### **7.1 Institutional and technical responsibilities**

Government authorities are responsible for the collection, entry, validation and production of the national inventory of hazardous wastes. The generators, the s, the consignees (hazardous wastes management centers) will compile the relevant information with a view to producing an annual report according to the modalities fixed by the government authorities that deal with the issue and that are indicated in the local regulations.

The government authorities dealing with this issue should plan ahead and maintain a continuous training of the various actors from the area of hazardous wastes. This will guarantee that the technical information is uniformly utilized by the various actors in the area of hazardous wastes. If changes are made in the regulations regarding hazardous wastes and those changes affect the national inventory, training sessions should be planned to standardize the understanding and use of technical information being used by the national inventory. In regard to this, see point 5.6.

### **7.2 Updating of data**

New data originating from different actors in the area of hazardous waste management should be

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function of the number of employees.

<sup>28</sup> **Example:** database for the Province of Ontario from 1986 to 1997. The results of biennial reports of United States Environmental Protection Agency for the years 1989, 1991, 1993, 1995 and 1997, in the United States of America.

compiled periodically, ideally annually. Collection, validation, recording of these data on a computer database and their analysis are activities that need to be planned. The necessary budgets and manpower must be set aside for those activities. Plans should be made as to how and in what form this activity of collection and processing of data would be carried out after it originates from the area of hazardous waste management.

### **7.3 Management of information systems relating to the national inventory**

Preplanning should be done regarding the forms in which information concerning the national inventory is received. It is possible and desirable to produce a standard format (a formula which can include the fields of information detailed in point 5.2), so as to facilitate the description of hazardous wastes by the various actors, and also the collection and computer entry of data linked to the national inventory by government authorities.

### **7.4 The formats available for compiling the information necessary for the national inventory**

Several possible formats facilitate the entry and transmission of information needed for the compilation of the national inventory:

- **Hard copy:** it is possible to produce a form on paper and send it to all of the people who need to fill it out. Each one of the actors can then fill it out and address it to the competent person in the government. You should ensure that everyone fills out the information requested correctly and on time;
- **Diskette or CD-ROM:** information can be stored on CD-ROM or on computer diskettes. This procedure is already in use in several American states and some Canadian provinces. Each of the actors can then fill out the form and send it to the competent person in government. You should ensure that everyone fills out the information requested correctly and on time;
- **Internet:** It is possible to use an electronic form which is built up and available on the Internet. Each of the actors can then fill out and send it to the competent person in the government. You should make sure that all fill out the information requested correctly and on time.

### **7.5 Documents**

There is a large variety of documents linked to the management of hazardous wastes. This includes the use of quarterly registers, the production of annual records, the use of transport manifests, production of import/export notices for hazardous wastes, together with various other documents. The information requested for the national inventory makes use of all or part of the information already written down on the documents listed above. It would be preferable to be able to guide the actors through these various documents in an easy and congenial way.

### **7.6 Key elements of regulation**

Legislation should regulate at least the following areas: on what kind of wastes is information required? Within which legal framework should that information be collected and used? In principle there are two possibilities: you can define the wastes for which it is not necessary to have information (negative list), or else you can legally establish a positive list of hazardous wastes, on which information must be provided.

Most countries and international organizations nowadays prefer a positive list that is clearly defined (e.g. Annex VIII to the Basel Convention<sup>29</sup>). A complementary list of the wastes considered not hazardous under the Basel Convention can also be used for greater clarity (e.g. Annex IX to the Basel Convention<sup>30</sup>). For reasons of technical feasibility, the government authorities may wish to associate the wastes of list A as well as those of list B in the same inventory.

- What information on wastes is required? It should be clearly indicated what information is required, taking into account the reservation that enterprises have regarding manufacturing secrets. The following are part of the necessary information: the classification of wastes (according to the list sent ahead of time), the quantity of wastes, the consignees, the type of disposal.
- Who should provide this information? In the first place the generator of wastes must provide the information. But the information should also be required of carriers and disposers of hazardous wastes.
- In what form should the information be provided? The responsible authority produces a form on which the required information is to be written. The form should be apart of the regulations. A specimen of this can be seen in the Swiss Ordinance on the movements of special wastes. From the practical viewpoint, the form should contain a series of copies which can be distributed: one copy retained by the wastes generator, another by the carrier, another by the disposal contractor and another forwarded to the authorities (system of accompanying documents).
- To whom can the wastes be given for transporting and disposal? An accreditation system for carriers and disposers should be set up. Accreditation should only be given to carriers or disposers who have a proven capacity and the required equipment to carry out their tasks.
- When and to whom should the information be provided? The waste generator provides information on the wastes generated each time he hands them over to the carrier and, as well, at regular intervals, in the form of a list to the competent authority (e.g. each quarter). The carrier and the disposer provide information on the wastes transported or disposed of at regular intervals, to the competent authority. The disposer who generate wastes from their processing of hazardous wastes are also considered wastes generators and must keep in line with the practices and regulations in force.
- For what purposes can the information be used? The information should be collected for consideration under the supervision of the government authorities. And the reasons for collecting the information are known in advance (e.g. updating of the national inventory of wastes, monitoring wastes generators, carriers and disposers, planning of the infrastructure).
- Who has the right to use the information? The recipients of the collected information are known in advance and for every kind of data: national offices, institutions, Data that would enable direct conclusions to be made regarding particular enterprises should be treated confidentially. On the other hand, anonymous data, statistics, should be made public
- Who has the obligation to use the information? The information is used and updated regularly by operators clearly identified in advance in order to ensure as far as possible the duty of informing public authorities and the public.
- What provisions should be made for penalties? Penalties should be imposed when particular actors do not respect their obligations.

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<sup>29</sup> Correspond to annex VIII of the Basel Convention

<sup>30</sup> Correspond to annex IX of the Basel Convention

All such provisions are written into the national legislation in various ways. That will depend on the legal framework that exists in regard to the protection of the environment and the management of hazardous wastes. However, it would seem appropriate in order to meet these demands that a specific set of regulations on hazardous wastes should be in place, including provisions regarding the establishment and maintenance of an inventory of hazardous wastes.

## **7.7 Inspection and validation**

Parallel to the establishment of a collecting system for information for the establishment and annual updating of the national inventory of hazardous wastes, it is also necessary for spot checks to be carried out by government authorities. These checks and controls will enable authorities to validate the data forwarded by the actors in the area of hazardous waste management: generators, carriers and the authorized consignees.

The legal relations prepared at stage 7.6 should be applied and should cover the following issues:

- The obligation on the part of generators, carriers and disposers of wastes to declare the types, quantities and disposal methods for hazardous wastes in accordance with the list of wastes that is set down;
- The establishment of a system of national accompanying documentation for data entry, including if necessary reporting offices;
- Identification of monitoring bodies and procedures;
- The use of data, data management, the obligation of confidentiality;
- The allocation of mandates and prerogatives to the actors concerned.

## **7.8 Maintenance of the inventory and fine-tuning of the data**

The national inventory takes time to construct. The validity of the data in it is directly proportional to the efforts put into it. The continuous maintenance and fine-tuning of the data will provide an opportunity to carry out the comparative weighted analysis of the various economic activity sectors and to carry out an historic analysis for a sector for a given hazardous waste. The use of a computer database is strongly recommended. The identification of new coefficients of hazardous waste generation, the application of new economic activity sectors and the addition of new wastes or criteria on the degree of hazard imposed may considerably modify entries into the national inventory.

The national inventory of hazardous wastes is a dynamic tool that allows you to take into account changes in a certain number of parameters in time and in space. Thus, for example, factors such as the modification of raw material inputs, the change or addition of a less polluting process and the use of more appropriate techniques and technologies, the production of new goods, the decrease in local and international demand for certain products, the modification of the definition of hazardous wastes and the more strict implementation of the regulations concerning hazardous wastes can all affect results in the national inventory, in regard to the generation and annual management of hazardous wastes.

For example, in the United States of America a quantitative analysis <sup>31</sup> of hazardous wastes

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<sup>31</sup> Office of Solid Waste (OSW), RCRA Environmental indicators progress report: 1995 Update. USA, June 1996, pages 2-4.

generated for the years 1989 and 1991 national inventory, shows that new hazardous wastes considered for the year 1991 (by the addition of a specific definition of new hazardous wastes) represented almost 50% of the quantity of hazardous wastes products. On the other hand, still for 1991, a decrease of 25% of the quantity of hazardous wastes regulated in 1989 and also in 1991. This decrease was mainly attributed to the establishment of programmes to minimize hazardous wastes by generators.

### 7.9 Technical use of data

The technical maintenance of data in an inventory, using a computerized database should be planned for and the consequent budgets allocated to it.

### 7.10 Government policies regarding communication of information on hazardous wastes

Government authorities will be responsible for the content and the maintenance of the information contained in the database backing the national inventory of hazardous wastes. These same authorities should ensure that the following aspects of information management contained in the database are tackled, discussed and find adequate responses:

- Access of the public in the wide sense – individuals, industrial associations, NGOs and others – to consolidated government information arising from the managers of the national inventory of hazardous wastes;
- The publication and information on the national status (data and consolidated information from the national inventory on hazardous wastes). It is in fact the duty and responsibility of government authorities to inform the public regarding the environmental status of the country;
- Regard for the confidentiality of the data transmitted by the various actors in the area of hazardous wastes management, and the publication of that data with the prior agreement of the various actors.

## 8. Inspections and audits of hazardous wastes

There are differences between inspections and the audits of hazardous wastes. The following table summarizes the main distinction in regard to certain predetermined points of comparison.

**Comparative table on inspections/audits of hazardous wastes**

<b>Points of comparison</b>	<b>Annual record</b>	<b>Government inspectors</b>	<b>Audits of hazardous wastes</b>
<i>Initiator</i>	Government	Government	Private enterprise
<i>Frequency</i>	Once a year or at a frequency to be established by regulations	Periodic or random	Set by private enterprise
<i>Motive</i>	Establishment of material inventory	Check on conformity with regulations	Internal policy, environmental certification or other financial reasons
<i>Who carries it out</i>	National Committee in the Ministry of	Local inspectors, or national ones in some	Enterprise itself or specialized consultants

	Environment	cases	
<i>Technical content</i>	Quantity of hazardous wastes produced and managed	Report on compliance of regulations, e.g., storage methods, in situ management, annual records, transport, others	
<i>Financial content</i>			Profit in minimizing wastes
<i>Certification</i>	Not applicable	Not applicable	ISO 14 001 or other SME
<i>Owner of information</i>	Government	Government	Private enterprise
<i>Others</i>	Static process pre-set frequency	Variable process, acc to demand	Dynamic process, recurrent process

## 8.1 Government inspections and controls

It will be necessary that spot checks be carried out by the competent authorities. Such inspections and control be carried out following a set method, using a statistical approach (of a random type) or otherwise according to sectors or wastes that are considered to be of high priority. These inspections and control will enable the authorities to verify the compliance with regulations on the part of the actor inspected. That is to say, that official, local or national inspectors will verify if the actor is complying with the regulatory provisions concerning the whole question of hazardous wastes, if necessary.

It may be a question of verifying if the wastes of the enterprise inspected are hazardous or not. It is a matter of verifying if they are in fact hazardous, if they are properly identified, if they are correctly stored or if the method of in situ management is in conformity with the regulatory provisions. Part of this inspection could be used to check if the information supplied by the actor for the annual records correspond to the actual situation.

## 8.2 Audit of hazardous wastes

What is an audit? What is an environmental audit? What is an audit of hazardous wastes? The main answers to these questions is found in the following paragraphs:

**Audit:** A methodical and documented process of verification and audit proof to be obtained and evaluated objectively so as to determine if the activities, events, conditions or information supplied, **are in conformity with the pre-established criteria of the audit**, together with the findings of this process to be communicated to the person who is requesting it.

**Environmental audit:** A methodical and documented process of verification of audit proofs to be obtained and evaluated objectively so as to determine if the activities, events, conditions and management systems relating to the environment or to the information provided are in conformity with the criteria of the audit together with the communication of the findings of this process to be communicated to the person who requested them. Example: The audit process in regard to the standards of the ISO 14000 series <sup>32</sup>.

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<sup>32</sup> ISO 14,000: A series of standards, produced by the National Standards Organization (ISO) dealing with environmental management. Standard 14001 deals with, inter alia, environmental management

**Audit of hazardous wastes:** A methodical process which enables the identification of the volume level of hazardous wastes generated by activities in any establishment (industrial, institutional or other), together with their present management and potential for a better management. Example: waste oils, obsolete hazardous chemicals,

An audit of hazardous wastes will in the first instance provide information, **according to the predetermined audit criteria**, on the identification of sources, quantities, degree of hazard, current management of each of the hazardous wastes generated, stored, transported in the relevant establishment. Particular attention should be given to the possibility of minimizing wastes produced, that is, technical, environmental and financial feasibility. In fact, the findings of the audit are in part made up of the summary of all the activities of hazardous waste management for a given establishment and a given period.

Every activity in the management of hazardous wastes has a beginning and an end (*hazardous wastes are generated and are disposed of*) and concern only one hazardous waste at a time. The activity of managing hazardous wastes can be summarized by indicating the source, the regulatory code, the characteristics and the management of hazardous wastes. The summary of all these activities of hazardous wastes provide information that facilitate the keeping of records and the production of quarterly reports and annual records; that summary can also constitute an important part of the audit of hazardous wastes.

Some information from the audit can serve the purpose of checking, with the approval of the enterprise concerned, the preliminary data of an establishment obtained by modeling or according to a preliminary estimate. The initiator and the proprietor of the information of the audit is the private enterprise. To this extent, the data from the audit can strengthen a national inventory of hazardous wastes. The audit of hazardous wastes, which is the responsibility of the wastes generator, is a continuous recurrent process, that should be carried out done annually or incorporated into any notable change made in the production in situ: new inputs (raw material), new production procedures, new facilities for treating pollution, new products classifications, new regulations,

By a continuous process, we mean that this process is interactively linked to production of the enterprise. The more that production is modified the more chances there are for an increase in the volumes and the degree of the hazard of the wastes produced. In Annex F to the present document is shown a brief description of a methodology for carrying out audits of hazardous wastes.

### **8.3 Audits versus annual reports, registers, manifests, etc**

Audits of hazardous wastes, if they are produced regularly and on an annual basis, generally provide all the consolidated information needed to produce and forward to the government authorities all the information required necessary for the keeping of an updated national inventory.

Within the information of an annual audit of hazardous wastes is contained all the additional information concerning the information of hazardous wastes. For example all the information contained in the transport manifests of hazardous wastes should be found within the information of the audit of hazardous wastes. Some information from the audit can be used for the record of the

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systems.

management and for the annual record that is later forwarded to the authorities.

## **Annex A: Definition of hazardous wastes under the Basel Convention (Annex I, III, VIII, IX) and the national definition of hazardous wastes**

### **1. *What is a hazardous waste (HW) under the Basel Convention?***

The first thing to be clarified in order to draw up a national inventory of hazardous wastes correctly is to know what we are talking about. What is a hazardous waste? The aim of the present annex will therefore be to present, with the help of examples, the definition of hazardous wastes given by the Basel Convention, in subparagraph (a), article 1, of that Convention. However, it may happen that by virtue of an existing national or regional definition (the internal legislation of a country or territory), some other definition of hazardous wastes may be the one used for the construction of a national inventory.

### **2. *Definition of hazardous wastes under the Basel Convention***

According to article 1 of the Basel Convention, a hazardous waste is defined as follows:

*“The following wastes that are subject to transboundary movement shall be “hazardous wastes” for the purposes of this Convention:*

- (a) Wastes that belong to any category contained in Annex I, unless they do not possess any of the characteristics contained in Annex III; and*
- (b) Wastes that are not covered under paragraph (a) but are defined as, or are considered to be, hazardous wastes by the domestic legislation of the Party of export, import or transit.”*

### **3. *The Annexes and lists of wastes of the Basel Convention***

In the Basel Convention there are five Annexes that deal with the definition of hazardous wastes. These are: Annex I (*categories of wastes to be controlled*), Annex II (*categories of wastes requiring special consideration*), Annex III (*list of hazardous characteristics*), Annex VIII (*list A*) and lastly Annex IX (*list B*).

### **4. *List of Annex I, according to the criteria of Annex III***

According to subparagraph (a), article 1 of the, hazardous wastes are defined as: *wastes that belong to any category contained in Annex I, unless they do not possess any of the characteristics contained in Annex III.* To begin with, therefore, it is necessary for a waste to be included in the list of Annex I. This list is divided into two subgroups. The first subgroup, the wastes Y1 to Y18, is considered as wastes having or representing constituents. However, to be considered as wastes streams, while the second subgroup, wastes Y19 to Y45 are considered as hazardous, the wastes should not only be listed in Annex I, but should also possess one of the characters of Annex III.

**Table A-1: Example of types of wastes for some industries in the manufacturing sector. These wastes can be considered hazardous if they have one of the characteristics of Annex III**

Code of waste under Annex I	Definition of waste under Annex I	Potentially generating industries
Y6	Wastes from the production, formulation and use of organic solvents	The majority of manufacturing sector industries
Y8	Waste mineral oils unfit for their originally intended use	<b>The majority of manufacturing sector industries</b>
Y10	Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polychlorinated biphenyls (PBBs)	<b>The majority of manufacturing sector industries</b>
Y17	Wastes resulting from surface treatment of metals and plastics	<b>Surface treatment of metals</b>

***Example:** Waste: Y6 (used organic solvent) which does not possess any of the characteristics of Annex III (specifically that of flammable liquids H3, or of toxic substances H11, or ecotoxic substance H12, or any other characteristic of Annex III) is not considered as a hazardous waste.*

In table A-2 are shown the categories (classes) of characteristics of hazard used by the Basel Convention, which are largely based on the classification system of hazardous characteristics used by the coding system for classes of transport of dangerous goods contained in the *United Nations Orange Book: Recommendations on the Transport of Dangerous Goods*. The classification parameters (technical parameters) are those of the Orange Book.

**Table A-2: Hazard: definitions and parameters used**

Class under Annex III	Basel Convention definition	United Nations classification	Classification parameters/orange book
<b>H1</b>	Explosives	<b>1</b>	An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings <b>Example: Trinitrotoluene waste (T.N.T.) humidified with at least 30% of water (Y15)</b>

<b>H3</b>	Flammable liquids	<b>3</b>	Liquids, or mixtures of liquids, which give off a flammable vapor at temperatures of not more than 60.5 deg. C, closed-cup test, or not more than 65.6 deg. C. open-cup test. <b>Example: Organochloride insecticide wastes, liquid, inflammable and toxic, n.o.s. <sup>33</sup>(Y45), used solvents (Y42).</b>
<b>H4.1</b>	Flammable solids	<b>4.1</b>	Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction.
<b>H4.2</b>	Substances or wastes liable to spontaneous combustion	<b>4.2</b>	Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire. (Y23) <b>Example: Wastes from metal catalysts, dry or wet, with zinc (Y23)</b>
<b>H4.3</b>	Substances which, in contact with water emit flammable gases	<b>4.3</b>	Wastes which in contact with water emit flammable gases
<b>H5.1</b>	Oxidizing substances	<b>5.1</b>	Wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.
<b>H5.2</b>	Organic peroxides	<b>5.2</b>	Wastes which contain the bivalent-0-0 structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
<b>H6.1</b>	Poisonous (acute)	<b>6.1</b>	Wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact. <b>Example: Arsenic trioxide (Y24). Residual sludge from treatment of effluents from galvanoplastic operations (Y17)</b>
<b>H6.2</b>	Infectious substances	<b>6.2</b>	Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans. <b>Example: Pathological and infectious hospital wastes (Y1)</b>
<b>H8</b>	Corrosives	<b>8</b>	Wastes which, by chemical action, will cause severe damage when in contact with living tissue <b>Example: Used pickling solutions from steel-making operations (Y34)</b>
<b>H10</b>	Liberation of toxic gases in contact with air or water	<b>9</b>	Wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
<b>H11</b>	Toxic (Delayed or chronic)	<b>9</b>	Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity
<b>H12</b>	Ecotoxic substances	<b>9</b>	Substances or wastes which if released present or may

<sup>33</sup> N.o.s. not otherwise specified.

			present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems. <b>Example: PCBs: polychlorinated biphenyls (UN2315) Y10</b>
<b>H13</b>	Substances capable of yielding another material which possesses any of the characteristics listed above.	<b>9</b>	Wastes capable, by any means, after disposal, of yielding another material, which possesses any of the characteristics listed in Annex III. <b>Example: Leachate originating from an encapsulation site for solid wastes or from a maximum containment site for inorganic hazardous wastes (Y18)</b>

## 5. *Annexes VIII and IX of the Basel Convention*

The Basel Convention has adopted the use of pre-defined lists of wastes so as to facilitate the identification of the hazardous characteristics of a waste (Annexes VIII and IX of the Basel Convention): these two lists should be considered together with Annex V of the Basel Convention.

**Annex VIII:** *wastes characterized as hazardous under Article 1, paragraph 1 (a), of the Basel Convention.*

**Annex IX:** *wastes not covered by Article 1, paragraph 1 (a) of the Basel Convention, unless they contain Annex I material to an extent causing them to exhibit an Annex II characteristic.*

**Table A-3: Examples applicable to Annex VIII**

<b>Code of waste under Annex VIII</b>	<b>Definition of waste under Annex VIII</b>	<b>Potentially generating industries</b>
A1040	Waste having as constituents: metal carbonyls and hexavalent chromium compounds	Tanneries
A1050	Galvanic sludges	Surface treatment of metals
A1060	Waste liquor from the pickling of metals	Surface treatment of metals

Annex IX deals with wastes not covered by article I, paragraph 1 (a) of the Basel Convention unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic.

## 6. *Liquid effluents/hazardous wastes in a liquid state*

A very important aspect to be clarified is to tackle the question of liquid wastes from industries or institutional establishments. Generally speaking, liquid wastes are not considered as hazardous wastes to the extent that they are regulated and standardized according to the regulations and

standards dealing with the quality of wastewater.

**Example:** in Canada, in the province of Quebec, liquid wastes (other than waste water from closed rinsing baths from surface treatment operations) are excluded from the regulations on hazardous wastes.

**Example:** In El Salvador, there is a regulation dealing with water, which defines waste waters from the industrial sector (article 108), such as liquid waste from any industrial process that may contain, organic, mineral or toxic residues. By this definition, therefore, these liquid effluents (wastes) will not be included in the definition of hazardous wastes.

However, this last consideration on liquid wastes does not remove the possibility that a hazardous waste may be found in a liquid phase. It happens in the case of used oils (Y8), PCBs (Y10), used solvents (Y41 and Y42), etc.

## 7. *Definition under national/specific regional jurisdiction*

Certain countries or regional jurisdictions have developed and adopted a particular and specific definition of hazardous wastes. For these, the methodology of the audit of hazardous wastes can be applied in relation to this regulation, including the local definition used for identifying hazardous wastes.

**Example:** In Canada: everything in relation to the application of the Basel Convention (*transboundary movements of hazardous wastes and their disposal*) is of federal jurisdiction. Therefore, the federal definition of hazardous wastes is consistent and coherent with that of the Basel Convention. However, Canadian provinces are responsible for defining what is a hazardous waste, in regard to the internal management in their territory of hazardous wastes.

**Example:** In El Salvador, there is no current national regulation for hazardous wastes for defining what a hazardous waste is. El Salvador has ratified the Basel Convention. It has also ratified a regional agreement on hazardous wastes (*involving six countries of Central America*). This agreement, for El Salvador, could be considered in the definition of hazardous wastes.

A simple quick and efficient procedure to enable the determination if a waste is hazardous or not can be set out in four stages. The following table describes these stages:

**Table A-4: Logical path for the assessment of the degree of hazard of wastes under the Basel Convention**

<i>Step</i>	<i>Tools</i>	<i>Observations</i>
1	<b>National/regional definition</b>	Check whether there is an existing national or regional definition for the establishment concerned. <b>If there is, take this national or regional definition into account to determine if the waste is hazardous.</b>
2	<b>List A</b>	Check whether the waste is included under list A. <b>If it is, the waste is hazardous.</b>
3	<b>List B</b>	Check whether the waste identified is included under list B, <b>if it is, the waste is not hazardous</b> , unless it contains Annex I material to an extent causing it to exhibit an Annex III characteristics, <b>in which case the waste is hazardous.</b>
4	<b>Annex I together with criterion of Annex III</b>	Lastly, check if the waste identified is included in Annex I with one of the characteristics of Annex III. <b>If it is, the waste is hazardous.</b>

## **Annex B: Annexes VIII and IX of the Basel Convention**

### **Annex VIII**

#### **LIST A**

Wastes contained in this Annex are characterized as hazardous under Article 1, paragraph 1 (a), of this Convention, and their designation on this Annex does not preclude the use of Annex III to demonstrate that a waste is not hazardous.

#### **A1 Metal and metal-bearing wastes**

A1010 Metal wastes and waste consisting of alloys of any of the following:

- Antimony
- Arsenic
- Beryllium
- Cadmium
- Lead
- Mercury
- Selenium
- Tellurium
- Thallium

but excluding such wastes specifically listed on list B.

A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following:

- Antimony; antimony compounds
- Beryllium; beryllium compounds
- Cadmium; cadmium compounds
- Lead; lead compounds
- Selenium; selenium compounds
- Tellurium; tellurium compounds

A1030 Wastes having as constituents or contaminants any of the following:

- Arsenic; arsenic compounds
- Mercury; mercury compounds.
- Thallium; thallium compounds

A1040 Wastes having as constituents any of the following:

- Metal carbonyls
- Hexavalent chromium compounds

A1050 Galvanic sludges

A1060 Waste liquors from the pickling of metals

- A1070 Leaching residues from zinc processing, dust and sludges such as jarosite, hematite,
- A1080 Waste zinc residues not included on list B, containing lead and cadmium in concentrations sufficient to exhibit Annex III characteristics
- A1090 Ashes from the incineration of insulated copper wire
- A1100 Dusts and residues from gas cleaning systems of copper smelters
- A1110 Spent electrolytic solutions from copper electrorefining and electrowinning operations
- A1120 Waste sludges, excluding anode slimes, from electrolyte purification systems in copper electrorefining and electrowinning operations
- A1130 Spent etching solutions containing dissolved copper
- A1140 Waste cupric chloride and copper cyanide catalysts
- A1150 Precious metal ash from incineration of printed circuit boards not included on list B <sup>34</sup>
- A1160 Waste lead-acid batteries, whole or crushed
- A1170 Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous.
- A1180 Waste electrical and electronic assemblies or scrap<sup>35</sup> containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B B1110)<sup>36</sup>
- A2 Wastes containing principally inorganic constituents, which may contain metals and organic materials**
- A2010 Glass waste from cathode-ray tubes and other activated glasses
- A2020 Waste inorganic fluorine compounds in the form of liquids or sludges but excluding such wastes specified on list B
- A2030 Waste catalysts but excluding such wastes specified on list B
- A2040 Waste gypsum arising from chemical industry processes, when containing Annex I constituents to the extent that it exhibits an Annex III hazardous

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<sup>34</sup>Note that mirror entry on list B (B1160) does not specify exceptions

<sup>35</sup> This entry does not include scrap assemblies from electric power generation.

<sup>36</sup>PCBs are at a concentration level of 50 mg/kg or more.

characteristic (note the related entry on list B B2080)

- A2050 Waste asbestos (dusts and fibers)
- A2060 Coal-fired power plant fly-ash containing Annex I substances in concentrations sufficient to exhibit Annex III characteristics (note the related entry on list B B2050)
- A3 Wastes containing principally organic constituents, which may contain metals and inorganic materials**
- A3010 Waste from the production or processing of petroleum coke and bitumen
- A3020 Waste mineral oils unfit for their originally intended use
- A3030 Wastes that contain, consist of or are contaminated with leaded anti-knock compound sludges
- A3040 Waste thermal (heat transfer) fluids
- A3050 Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives excluding such wastes specified on list B (note the related entry on list B B4020)
- A3060 Waste nitrocellulose
- A3070 Waste phenols, phenol compounds including chlorophenol in the form of liquids or sludges
- A3080 Waste ethers not including those specified on list B
- A3090 Waste leather dust, ash, sludges and flours when containing hexavalent chromium compounds or biocides (note the related entry on list B B3100)
- A3100 Waste paring and other waste of leather or of composition leather not suitable for the manufacture of leather articles containing hexavalent chromium compounds or biocides (note the related entry on list B B3090)
- A3110 Fellmongery wastes containing hexavalent chromium compounds or biocides or infectious substances (note the related entry on list B B3110)
- A3120 Fluff - light fraction from shredding
- A3130 Waste organic phosphorous compounds
- A3140 Waste non-halogenated organic solvents but excluding such wastes specified on list B
- A3150 Waste halogenated organic solvents
- A3160 Waste halogenated or unhalogenated non-aqueous distillation residues arising

from organic solvent recovery operations

A3170 Wastes arising from the production of aliphatic halogenated hydrocarbons (such as chloromethane, dichloro-ethane, vinyl chloride, vinylidene chloride, allyl chloride and epichlorhydrin)

A3180 Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB), polychlorinated terphenyl (PCT), polychlorinated naphthalene (PCN) or polybrominated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more <sup>37</sup>

A3190 Waste tarry residues (excluding asphalt cements) arising from refining, distillation and any pyrolytic treatment of organic materials A4 Wastes which may contain either inorganic or organic constituents

**A4 Wastes that may contain either organic or inorganic materials**

A4010 Wastes from the production, preparation and use of pharmaceutical products but excluding such wastes specified on list B

A4020 Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects

A4030 Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated, <sup>38</sup> or unfit for their originally intended use

A4040 Wastes from the manufacture, formulation and use of wood-preserving chemicals <sup>39</sup>

A4050 Wastes that contain, consist of, or are contaminated with any of the following:

- Inorganic cyanides, excepting precious-metal-bearing residues in solid form containing traces of inorganic cyanides
- Organic cyanides

A4060 Waste oils/water, hydrocarbons/water mixtures, emulsions

A4070 Wastes from the production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish excluding any such waste specified on list B [(note the related entry on list B (B4010)]

A4080 Wastes of an explosive nature (but excluding such wastes specified on list B)

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<sup>37</sup> The 50 mg/kg level is considered to be an internationally practical level for all wastes. However, many individual countries have established lower regulatory levels (e.g. 20 mg/kg) for specific wastes.

<sup>38</sup> "Outdated" means unused within the period recommended by the manufacturer.

<sup>39</sup> This entry does not include wood treated with wood preserving chemicals.

- A4090 Waste acidic or basic solutions, other than those specified in the corresponding entry on list B (note the related entry on list B B2120)
- A4100 Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on list B
- A4110 Wastes that contain, consist of or are contaminated with any of the following:
- Any congener of polychlorinated dibenzo-furan
  - Any congener of polychlorinated dibenzo-dioxin
- A4120 Wastes that contain, consist of or are contaminated with peroxides
- A4130 Waste packages and containers containing Annex I substances in concentrations sufficient to exhibit Annex III hazard characteristics
- A4140 Waste consisting of or containing off specification or outdated <sup>40</sup> chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics
- A4150 Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on human health and/or the environment are not known
- A4160 Spent activated carbon not included on list B [note the related entry on list B (B2060)]

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<sup>40</sup> “Outdated” means unused within the period recommended by the manufacturer.

## Annex IX

### LIST B

Wastes contained in the Annex will not be wastes covered by Article 1, paragraph 1 (a), of this Convention unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic.

#### **B1**            **Metal and metal-bearing wastes**

B1010          Metal and metal-alloy wastes in metallic, non-dispersible form:

- Precious metals (gold, silver, the platinum group, but not mercury)
- Iron and steel scrap
- Copper scrap
- Nickel scrap
- Aluminium scrap
- Zinc scrap
- Tin scrap
- Tungsten scrap
- Molybdenum scrap
- Tantalum scrap
- Magnesium scrap
- Cobalt scrap
- Bismuth scrap
- Titanium scrap
- Zirconium scrap
- Manganese scrap
- Germanium scrap
- Vanadium scrap
- Scrap of hafnium, indium, niobium, rhenium and gallium
- Thorium scrap
- Rare earths scrap

B1020          Clean, uncontaminated metal scrap, including alloys, in bulk finished form (sheet, plate, beams, rods, etc), of:

- Antimony scrap
- Beryllium scrap
- Cadmium scrap
- Lead scrap (but excluding lead-acid batteries)
- Selenium scrap
- Tellurium scrap

B1030          Refractory metals containing residues

B1040          Scrap assemblies from electrical power generation not contaminated with lubricating oil, PCB or PCT to an extent to render them hazardous

B1050          Mixed non-ferrous metal, heavy fraction scrap, not containing Annex I materials

in concentrations sufficient to exhibit Annex III characteristics <sup>41</sup>

- B1060 Waste selenium and tellurium in metallic elemental form including powder
- B1070 Waste of copper and copper alloys in dispersible form, unless they contain Annex I constituents to an extent that they exhibit Annex III characteristics
- B1080 Zinc ash and residues including zinc alloys residues in dispersible form unless containing Annex I constituents in concentration such as to exhibit Annex III characteristics or exhibiting hazard characteristic H4.3 <sup>42</sup>
- B1090 Waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury
- B1100 Metal-bearing wastes arising from melting, smelting and refining of metals:
- Hard zinc spelter
  - Zinc-containing drosses:
    - Galvanizing slab zinc top dross (>90% Zn)
    - Galvanizing slab zinc bottom dross (>92% Zn)
    - Zinc die casting dross (>85% Zn)
    - Hot dip galvanizers slab zinc dross (batch)(>92% Zn)
    - Zinc skimmings
  - Aluminium skimmings (or skims) excluding salt slag
  - Slags from copper processing for further processing or refining not containing arsenic, lead or cadmium to an extent that they exhibit Annex III hazard characteristics
  - Wastes of refractory linings, including crucibles, originating from copper smelting
  - Slags from precious metals processing for further refining
  - Tantalum-bearing tin slags with less than 0.5% tin
- B1110 Electrical and electronic assemblies:
- Electronic assemblies consisting only of metals or alloys
  - Waste electrical and electronic assemblies or scrap <sup>43</sup> including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry A1180)
  - electrical and electronic assemblies (including printed circuit boards,

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<sup>41</sup> Note that even where low level contamination with Annex I materials initially exists, subsequent processes, including recycling processes, may result in separated fractions containing significantly enhanced concentrations of those Annex I materials.

<sup>42</sup> The status of zinc ash is currently under review and there is a recommendation with the United Nations Conference on Trade and Development (United Nations Conference on Trade and Development (UNCTAD)) that zinc ashes should not be dangerous goods.

<sup>43</sup> This entry does not include scrap from electrical power generation.

electronic components and wires) destined for direct reuse, <sup>44</sup> and not for recycling or final disposal <sup>45</sup>

- B1120 Spent catalysts excluding liquids used as catalysts, containing any of:
- |   |                                  |            |
|---|----------------------------------|------------|
| transition metals, excluding waste catalysts (spent catalysts, liquid used catalysts or other catalysts) on list A: | Scandium                         | Titanium   |
|   | Vanadium                         | Chromium   |
|   | Manganese                        | Iron       |
|   | Cobalt                           | Nickel     |
|   | Copper                           | Zinc       |
|   | Yttrium                          | Zirconium  |
|   | Niobium                          | Molybdenum |
|   | Hafnium                          | Tantalum   |
|   | Tungsten                         | Rhenium    |
|   | Lanthanides (rare earth metals): | Lanthanum  |
|   | Praseodymium                     | Neodymium  |
|   | Samarium                         | Europium   |
|   | Gadolinium                       | Terbium    |
|   | Dysprosium                       | Holmium    |
|   | Erbium                           | Thulium    |
|   | Ytterbium                        | Lutetium   |
- B1130 Cleaned spent precious-metal-bearing catalysts
- B1140 Precious-metal-bearing residues in solid form which contain traces of inorganic cyanides
- B1150 Precious metals and alloy wastes (gold, silver, the platinum group, but not mercury) in a dispersible, non-liquid form with appropriate packaging and labeling
- B1160 Precious-metal ash from the incineration of printed circuit boards (note the related entry on list A A1150)
- B1170 Precious-metal ash from the incineration of photographic film
- B1180 Waste photographic film containing silver halides and metallic silver
- B1190 Waste photographic paper containing silver halides and metallic silver
- B1200 Granulated slag arising from the manufacture of iron and steel
- B1210 Slag arising from the manufacture of iron and steel including slags as a source of TiO<sub>2</sub> and vanadium
- B1220 Slag from zinc production, chemically stabilized, having a high iron content (above 20%) and processed according to industrial specifications (e.g., DIN

<sup>44</sup> Reuse can include repair, refurbishment or upgrading, but not major reassembly.

<sup>45</sup> In some countries these materials destined for direct re-use are not considered wastes.

- 4301) mainly for construction
- B1230 Mill scaling arising from the manufacture of iron and steel
- B1240 Copper oxide mill-scale
- B2** **Wastes containing principally inorganic constituents, which may contain metals and organic materials**
- B2010 Wastes from mining operations in non-dispersible form:
- Natural graphite waste
  - Slate waste, whether or not roughly trimmed or merely cut, by sawing or otherwise
  - Mica waste
  - Leucite, nepheline and nepheline syenite waste
  - Feldspar waste
  - Fluorspar waste
  - Silica wastes in solid form excluding those used in foundry operations
- B2020 Glass waste in non-dispersible form:
- Cullet and other waste and scrap of glass except for glass from cathode-ray tubes and other activated glasses
- B2030 Ceramic wastes in non-dispersible form:
- Cermet wastes and scrap (metal ceramic composites)
  - Ceramic based fibres not elsewhere specified or included
- B2040 Other wastes containing principally inorganic constituents:
- Partially refined calcium sulphate produced from flue-gas desulphurization (FGD)
  - Waste gypsum wallboard or plasterboard arising from the demolition of buildings
  - Slag from copper production, chemically stabilized, having a high iron content (above 20%) and processed according to industrial specifications (e.g., DIN 4301 and DIN 8201) mainly for construction and abrasive applications
  - Sulphur in solid form
  - Limestone from the production of calcium cyanamide (with a pH less than 9)
  - Sodium, potassium, calcium chlorides
  - Carborundum (silicon carbide)
  - Broken concrete
  - Lithium-tantalum and lithium-niobium containing glass scraps
- B2050 Coal-fired power plant fly-ash, not included on list A (note the related entry on list A A2060)
- B2060 Spent activated carbon resulting from the treatment of potable water and

processes of the food industry and vitamin production (note the related entry on list A A4160)

B2070 Calcium fluoride sludge

B2080 Waste gypsum arising from chemical industry processes not included on list A (note the related entry on list A A2040)

B2090 Waste anode butts from steel or aluminium production made of petroleum coke or bitumen and cleaned to normal industry specifications (excluding anode butts from chloralkali electrolyses and from metallurgical industry)

B2100 Waste hydrates of aluminium and waste alumina and residues from alumina production excluding such materials used for gas cleaning, flocculation or filtration processes

B2110 Bauxite residue ("red mud") (pH moderated to less than 11.5)

B2120 Waste acidic or basic solutions with a pH greater than 2 and less than 11.5, which are not corrosive or otherwise hazardous (note the related entry on list A A4090)

**B3 Wastes containing principally organic constituents, which may contain metals and inorganic materials**

B3010 Solid plastic waste:

The following plastic or mixed plastic materials, provided they are not mixed with other wastes and are prepared to a specification:

- Scrap plastic of non-halogenated polymers and co-polymers, including but not limited to the following <sup>46</sup>:
  - ethylene
  - styrene
  - polypropylene
  - polyethylene terephthalate
  - acrylonitrile
  - butadiene
  - polyacetals
  - polyamides
  - polybutylene terephthalate
  - polycarbonates
  - polyethers
  - polyphenylene sulphides
  - acrylic polymers
  - alkanes C10-C13 (plasticiser)
  - polyurethane (not containing CFCs)
  - polysiloxanes
  - polymethyl methacrylate
  - polyvinyl alcohol

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<sup>46</sup> It is understood that such scraps are completely polymerized.

- polyvinyl butyral
- polyvinyl acetate
- Cured waste resins or condensation products including the following:
  - urea formaldehyde resins
  - phenol formaldehyde resins
  - melamine formaldehyde resins
  - epoxy resins
  - alkyd resins
  - polyamides
- The following fluorinated polymer wastes <sup>47</sup>
  - perfluoroethylene/propylene (FEP)
  - perfluoroalkoxy alkane (PFA)
  - perfluoroalkoxy alkane (MFA)
  - polyvinylfluoride (PVF)
  - polyvinylidene fluoride (PVDF)

B3020 Paper, paperboard and paper product wastes

The following materials, provided they are not mixed with hazardous wastes:

- Waste and scrap of paper or paperboard of:
- unbleached paper or paperboard or of corrugated paper or paperboard
- other paper or paperboard, made mainly of bleached chemical pulp, not coloured in the mass paper or paperboard made mainly of mechanical pulp (for example, newspapers, journals and similar printed matter)
- other, including but not limited to
  - (i) laminated paperboard
  - (ii) unsorted scrap.

B3030 Textile wastes

The following materials, provided they are not mixed with other wastes and are prepared to a specification:

- Silk waste (including cocoons unsuitable for reeling, yarn waste and garneted stock)
  - not carded or combed
  - other
- Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garneted stock
  - noils of wool or of fine animal hair
  - other waste of wool or of fine animal hair
  - waste of coarse animal hair
- Cotton waste (including yarn waste and garneted stock)

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<sup>47</sup> Post-consumer wastes are excluded from this entry

- Wastes shall not be mixed
- Problems arising from open-burning practices to be considered.

- yarn waste (including thread waste)
- garneted stock
- other

- Flax tow and waste
- Tow and waste (including yarn waste and garneted stock) of true hemp (*Cannabis sativa* L.)
- Tow and waste (including yarn waste and garneted stock) of jute and other textile bast fibres (excluding flax, true hemp and ramie)
- Tow and waste (including yarn waste and garneted stock) of sisal and other textile fibres of the genus *Agave*
- low, noils and waste (including yarn waste and garneted stock) of coconut
- Tow, noils and waste (including yarn waste and garneted stock) of abaca (*Manila hemp* or *Musa textilis* Nee)
- low, noils and waste (including yarn waste and garneted stock) of ramie and other vegetable textile fibres, not elsewhere specified or included
- Waste (including noils, yarn waste and garneted stock) of man-made fibres
  - - of synthetic fibres
  - - of artificial fibers
- Worn clothing and other worn textile articles
- Used rags, scrap twine, cordage, rope and cables and worn out articles of twine, cordage, rope or cables of textile materials
  - sorted
  - other

B3040 Rubber wastes

The following materials, provided they are not mixed with other wastes:

- Waste and scrap of hard rubber (e.g., ebonite)
- Other rubber wastes (excluding such wastes specified elsewhere)

B3050 Untreated cork and wood waste:

- Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms
- Cork waste: crushed, granulated or ground cork

B3060 Wastes arising from agro-food industries provided it is not infectious:

- Wine lees
- Dried and sterilized vegetable waste, residues and byproducts, whether or not in the form of pellets, of a kind used in animal feeding, not elsewhere specified or included
- Degras: residues resulting from the treatment of fatty substances or animal or vegetable waxes
- Waste of bones and horn-cores, unworked, defatted, simply prepared (but not cut to shape), treated with acid or degelatinised
- Fish waste
- Cocoa shells, husks, skins and other cocoa waste
- Other wastes from the agro-food industry excluding by-products which meet national and international requirements and standards for human or animal

consumption

- B3070 The following wastes:
- Waste of human hair
  - Waste straw
  - Deactivated fungus mycelium from penicillin production to be used as animal feed
- B3080 Waste parings and scrap of rubber
- B3090 Paring and other wastes of leather or of composition leather not suitable for the manufacture of leather articles, excluding leather sludges, not containing hexavalent chromium compounds and biocides (note the related entry A3100)
- B3100 Leather dust, ash, sludges or flours not containing hexavalent chromium compounds or biocides (note the related entry on list A A3090)
- B3110 Fellmongery wastes not containing hexavalent chromium compounds or biocides or infectious substances (note the related entry on list A A3110)
- B3120 Wastes consisting of food dyes
- B3130 Waste polymer ethers and waste non-hazardous monomer ethers incapable of forming peroxides
- B3140 Waste pneumatic tyres, excluding those destined for Annex IVA operations
- B4 Wastes which may contain either inorganic or organic constituents**
- B4010 Wastes consisting mainly of water-based/latex paints, inks and hardened varnishes not containing organic solvents, heavy metals or biocides to an extent to render them hazardous (note the related entry on list A, A4070)
- B4020 Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives, not listed on list A, free of solvents and other contaminants to an extent that they do not exhibit Annex III characteristics, e.g., water-based, or glues based on casein starch, dextrin, cellulose ethers, polyvinyl alcohols (note the related entry on list A, A3050)
- B4030 Used single-use cameras, with batteries not included on list A

## Annex C: The economic code selected: ISIC

The following table contains the categories and divisions of industrial activity sectors, as used by the United Nations. This coding system is called ISIC: International Standard Industrial Classification of all Economic Activities (third revision, 1990)

Table C-1 The economic sectors of ISIC.

Category of class	Division	Description
A	0100 and 0200	Agriculture, hunting and forestry
B	0500	Fishing
C	1000 to 1400	Mining and quarrying
D	1500 to 3700	Manufacturing
1	<b>1710</b>	<b>Manufacture of textiles</b>
2	<b>1720</b>	<b>Manufacture of other textile products</b>
3	<b>1900</b>	<b>Tanning and dressing of leather</b>
4	<b>2000</b>	<b>Manufacture of wood and wood products</b>
5	<b>2100</b>	<b>Manufacture of paper and paperboard and paper and paperboard products</b>
6	<b>2200</b>	<b>Publishing, printing ,</b>
7	<b>2310 and 2320</b>	<b>Manufacture of coke and petroleum products</b>
8	<b>2400</b>	<b>Manufacture of chemical products</b>
9	<b>2510</b>	<b>Manufacture of rubber products</b>
10	<b>2520</b>	<b>Manufacture of plastic products</b>
11	<b>2600</b>	<b>Manufacture of non-metallic mineral products</b>
12	<b>2700</b>	<b>Manufacture of basic metals</b>
13	<b>2800</b>	<b>Manufacture of fabricated metal products</b>
14	<b>3100 and 3200</b>	<b>Manufacture of electrical machinery and apparatus, and radio, television and communication equipment and apparatus</b>
15	<b>3400 and 3500</b>	<b>Manufacture of transport equipment (motor vehicles, trailers and other transport equipment)</b>
E	4000 and 4100	Production and distribution of electricity, gas and water
F	4500	Construction
G	5000-5200	Wholesale and retail trade
H	5500	Hotels and restaurants
I	6000-6400	Transport, storage and communications
J	6500-6700	Financial intermediation
K	7000 to 7400	Real estate, renting and business objectives
L	7500	Public administration and defense, compulsory social security
M	8000	Education
N	8500	<b>Health and social work</b>
O	9000-9300	Other community, social and personal service activities
P	9500	Private households with employed persons
Q	9900	Extra-territorial organizations and bodies

**N.B.** The economic sectors chosen (see divisions) for annex F (generation index) are in bold letters.

## Annex D: Table of technical parameters

This table reflects and identifies the various realistic options for developing indices or ratios of the generation of hazardous wastes as a function of production factors. Production factors are the key elements or major components linked to production of the goods in question. The headings of the following table show columns representing some of the production factors selected that can have an important and significant correlation with the generation of hazardous wastes.

Consider the example of an aluminium factory: aluminium is produced by means of an electrolytic process, which is directly linked to electricity consumption. Electricity consumption in kilowatt hours is directly proportional to the aluminium production, and therefore to the generation of hazardous wastes associated with it (example: cathodic wastes which contain fluoride, traces of cyanide and other hazardous substances).

The other production factors chosen for analysis are: the number of employees (*both administrative and production staff*), inputs (*the raw material input into the production process*), and the outputs, that is the finished products (*example: number of vehicles produced, number of hides manufactured, the quantity of aluminium ingots rolled,*) The vertical column shows the economic subsectors of the manufacturing sector chosen for the development of indices and ratios. In every block in the table, one of the following pieces of the information is given:

- **Yes:** this means that there is a strong correlation between the production factor and the economic sector shown
- **n.a.:** not applicable, which means that there is not a strong correlation between the production factor and the economic sector shown
- **Other comments:** one example is the health sector where the index/ratio chosen is linked to the number of beds installed
- In some cases reference is made to footnotes at the bottom of the page.

Lastly, it may be noticed that the index/ratio chosen and developed in the following Annex (Annex F) is that of the tonnage of hazardous wastes generated per person per year (MT/year/employee). The use of the MT/year/employee ratio is the simplest to develop and to use. Almost all countries have this kind of information available (*number of employees per economic sector*). Besides, some data is already available (*ratio by economic activity sector*) which can be used and are shown in Annex F.

As and when national inventories are established, including the compilation of field data produced by the various actors in the area of hazardous wastes, it will be possible to update and refine the MT/year/employee ratio for each economic activity subsector, depending on the technological processes that are used. It should also be possible to develop other ratios which are useful in other respects and which will become comparative standards to evaluate the environmental performance of industries of the same economic activity sector which produce virtually the same finished products and use the same production technologies.

**Table D-1: On the production factors that can represent some degree of correlation with the generation of hazardous wastes**

	Name of industry sector	ISIC code <sup>48</sup>	Energy consumption kw/h	Number of employees	Raw material use (inputs)	Unit of fabricated products (output)	Others
1	Primary textile industry	1710	n.a.	Yes	Yes	Yes	n.a.
2	Textiles	1720	n.a.	Yes	n.a.	n.a.	n.a.
3	Leather	1900	n.a.	Yes	n.a.	Yes	n.a.
4	Wood	2000	n.a.	Yes	n.a.	n.a.	n.a.
5	Paper and related products	2100	n.a.	Yes	n.a.	n.a.	n.a.
6	Printing	2200	n.a.	Yes	n.a.	n.a.	n.a.
7	Petroleum refinery	2300	n.a.	Yes	Yes	Yes	n.a.
8	Chemical industry	2400	n.a.	Yes	n.a.	n.a.	n.a.
9	Rubber products	2510	n.a.	Yes	n.a.	n.a.	n.a.
10	Plastic products	2520	n.a.	Yes	n.a.	n.a.	n.a.
11	Non-metal products	2600	n.a.	Yes	Yes	Yes	n.a.
12	Basic metal products	2700	Yes <sup>49</sup>	Yes	Yes	Yes	n.a.
13	Fabricated metal products	2800	Yes <sup>50</sup>	Yes	n.a.	Yes	n.a.
14	Electric and electronic products	3100 and 3200	n.a.	Yes	n.a.	n.a.	n.a.
15	Transport industry	3400 and 3500	n.a.	Yes	n.a.	Yes	n.a.
16	Health sector	8500	n.a.	n.a.	n.a.	n.a.	No of beds <sup>51</sup>

<sup>48</sup> ISIC: International Standard Industrial Classification third revision, 1990, United Nations.

<sup>49</sup> Mainly for aluminum production (cathode wastes). An aluminum smelter is a major consumer of electricity (electrolytic process).

<sup>50</sup> Mainly metal plating industries (chrome, copper and other plating). Those industries generally use an electrolytic process.

<sup>51</sup> Ratios used by WHO and PAHO (refer to texts for confirmation).

## Annex E: Modeling: generation index/ratio according to Annexes VIII and IX

### 1. Annex VIII (or list A) with the mirror sites of Annex IX (list B)

The following table has been drawn up to represent for each economic sector selected (under the ISIC coding) and indicated in the headings across on the first line, the possibilities of generation of hazardous wastes listed in list A, and, for some, in list B if applicable (mirror wastes). Mirror wastes are wastes that are found in list A and list B. The difference is that in list A the waste is considered hazardous, while it is not so considered in list B. The table shows the following information:

- **n.a.:** not applicable or insignificant: which means that there is only a slight possibility of the generation of hazardous wastes for the economic sector considered
- **Yes:** this indicates that there is a strong possibility of the generation of such a type of hazardous waste, but no quantitative index/ratio is available
- **A number:** if there is a number, this represents the index of ratio of generation expressed in MT/year/employee, or in MT/bed/year for the 8500 sector.

**Table E-1: Ration/index of generation by economic activity sector in MT/year/employee  
Except health sector 8500 (index is in MT/bed/year)**

Code Annex VIII	Mirror code Annex IX	1711	1720	1900	2000	2100	2200	2310 and 2320	2400	2510	2520	2600	2700	2800	3100 and 3200	3400 and 3500	8500
List A	List B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>A1</b>	<b>Metal and metal-bearing wastes</b>																
1010		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	Yes	Yes	Yes	n.a.	n.a.
1020		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	Yes	Yes	Yes	n.a.	n.a.
1030		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	Yes	Yes	n.a.	n.a.	n.a.
1040		n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	Yes	Yes	n.a.	n.a.	n.a.
1050		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	Yes	n.a.	Yes	n.a.
1060		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	Yes	n.a.
1070		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
1080	1080	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
1090		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.
1100		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
1110		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
1120		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	Yes	n.a.	n.a.
1130		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	Yes	n.a.	n.a.
1140		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1150	1160	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
1160		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1170	1090	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1180	1110	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.
<b>A2</b>	<b>Wastes containing principally organic constituents, which may contain metals and inorganic materials*</b>																
2010		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2020	2020	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.
2030	1120	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
2040	2080	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2050		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2060	2050	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<b>A3</b>	<b>Wastes containing principally organic constituents, which may contain metals and inorganic materials</b>																
3010		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
3020		0,026	n.a.	0,001	0,003	0,018	0,001	0,044	0,242	0,003	n.a.	0,003	0,413	0,006	0,003	0,016	Yes

3030	Petrol?	n.a.	n.a.	n.a.	n.a.	0.001	n.a.	0.007	1.109	0.330	0.027	0.104	0.381	0.002	n.a.	0.005	yes
3040		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3050	4020	0.002	0.049	0.001	n.a.	0.002	n.a.	0.042	0.041	0.003	0.002	0.365	0.001	0.006	0.002	0.008	n.a.
3060		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	Yes	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3070		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.278	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3080	3130	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	Yes	Yes	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3090/3100/3110	3100-3090-3110	n.a.	n.a.	0.208	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3120		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.
3130	Phosphorous	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3140	Yes	0.012	0.005	0.008	0.007	0.295	0.052	0.021	0.304	0.018	0.020	0.020	0.010	0.113	0.020	0.110	Yes
3150		0.006	0.003	0.004	n.a.	0.002	n.a.	0.118	0.008	0.003	0.004	0.002	0.006	0.014	0.022	0.008	Yes
3160		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3170		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	Yes	Yes	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3180		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3190		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	Yes	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
A4	Wastes which may contain either inorganic or organic constituents																
4010	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.001	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes
4020		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.4752
4030		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.005	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes
4040		n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
4050		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.
4060		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.133	0.006	n.a.	n.a.	n.a.	n.a.
4070	4010	n.a.	0.002	0.007	0.004	0.001	0.006	n.a.	0.051	0.007	0.003	n.a.	0.130	0.024	0.006	0.083	n.a.
4080	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
4090	2120	0.008	n.a.	n.a.	n.a.	0.006	0.004	0.031	0.343	0.003	0.012	0.017	0.465	0.116	0.038	0.607	n.a.
4100		yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	Yes	yes	yes	n.a.
4110		n.a.	n.a.	n.a.	n.a.	Yes	n.a.	n.a.	Yes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
4120	Peroxide																
4130	Packaging																
4140		yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4150		yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4160	2060																

**N.B.:** there are more than 19 streams of mirror wastes (based on list A). The streams A3140, Z4010 and A4080 are very general mirror sites, which means that they may correspond to several streams of list B.

**Comments on the table:**

1. The indices developed in the table should be used only for guidance and the results should be interpreted cautiously. The results from actors in the area of hazardous wastes, on an annual basis, will establish the national inventory which in the end will represent reality in the best possible way for a given territory.
2. The indices shown in the table are the result of the correlation of indices of generation of hazardous wastes developed for the case of 803 Canadian enterprises located in the Province of Ontario for the year 1989<sup>53</sup>.

<sup>52</sup> Calculation according to figures used by PAHO, ref. Estudios de generación de Desechos Sólidos en la Area Metropolitana de San Salvador, ALA 91/33, p.12 and annex 2. According to the World Health Organization (WHO), the ratio may vary from 0.24 tp 0.60 TM/bed/year. Source: WHO/PEP/GETNET/93. 1-A Environmental Technological Services, 1993.

<sup>53</sup>Work of correlation by Martin Clermont, international consultant on hazardous waste management.

3. The results in the table only represent the quantities of hazardous wastes (list A).
4. The hazardous waste code 4090, written in list B, covers all wastes having heavy metal constituents in acid or basic solutions.
5. The classes of hazard are those defined by the Basel Convention, but no technical hazard criterion has been developed (technical parameters not identified). The Canadian indices, however, use such technical criteria (e.g. pH level).
6. Certain streams of wastes cannot be quantified for each economic sector. This happens in the case of PCBs. This hazardous waste is linked more to the use of substances (*for electric apparatus*) than directly linked to the production of goods.
7. It can be seen that some hazardous waste streams are found in all the economic sectors shown in the table. This is the case for PCBs (A3180), oil/water emulsions (A4060), solvents (A3140, 3150 and 3160), used oils (A3020), sludge contaminated by anti-knock compounds (**A3030 – petrol tank**) and halogenated organic solvents (A3150).

Similar cases are those of asbestos (A2150, in building structures), glass waste from cathode-ray tubes used for lighting (A2010) and batteries (A1160 and A1170). The same applies to codes A4140 and A4150.

## Annex F: Summary of a methodology for an audit of hazardous wastes

### *Introduction: summary of stages*

A brief description of the eleven main stages of an audit of hazardous wastes is shown in table F-1 as follows:

**Table F-1: Stages in an audit of hazardous wastes**

Stage no	Stage description
1	Methodology and preliminary preparation
2	Field visit
3	Storage of materials and their maintenance
4	Processes and sub-processes
5	Waste treatment systems
6	Identification and characterization of wastes found
7	Current management of hazardous wastes inventories
8	Identification of minimization alternatives
9	Cost/benefit analysis
10	Conclusions and analysis
11	Audit report

### **1. Methodology and preparation of audit**

After carrying out a field visit, the following substages should be taken into account:

- **Plan of work:** preparation of a methodical plan of work comprising the establishment of prior information gathering activities, training of actors,
- **Information regarding the pre-established criteria of the audit.** Example: what regulations should be applied to the audit? The Basel Convention or a local specific regulation?
- **Prior information:** obtain prior information on the establishment, such as:
  - A map of the area with information on watercourses, hydrology, populated areas.
  - The industrial activity sector (industrial coding).
  - A production background, quantify the site production, since when has the site been in operation.
  - The production process or processes used, the age of the process, the substances and technology used.
  - A brief breakdown of the production process (production chart).
  - Gathering of preliminary information on the type of wastes that are probable given the industrial activity sector in question <sup>54</sup>
  - The amount of raw water consumption
  - Information from local government authorities competent in the matter.
  - Other information.

**Training of actors:** check the competence of the actors who will carry out the audit; if unsatisfactory, plan the appropriate training.

---

<sup>54</sup> WHO documentation, information from the United States Environmental Protection Agency, other sources.

**Format:** Whether to prepare a questionnaire to be completed (check list), the use of a survey sheet for information received during the field visit.

<p><u><b>Comments:</b></u></p>
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**2. Field visit, observations, questions, notes and reports**

Divide out the different areas or sections of the factory having at hand a format to take notes and comments. The areas of interest could include:

- Section for recovery, maintenance and repair of mobile and fixed equipment/machinery,
- Storage of (hazardous) materials and their maintenance,
- Potential of recognized areas of spillage on the ground of potentially hazardous substances (e.g. used oil, PCBs),
- Production area and processes,
- Collection and treatment systems for industrial effluents,
- Used electrical equipment, PCBs,
- Building structures, use of mecurial paint for asbestos,
- The use of other polluting substances,
- Other aspects.

During the field visit, it is preferable to be accompanied by a staff member from the factory, previously briefed. During the audit, it should be with the authorization and under the supervision of that person that the audit will be carried out. Questions will be asked to the relevant factory staff through his intermediation. The permission to take photographs or video films should also be obtained from that person. That person can also fill in the production background of the establishment concerned. Finally it is with that same person that follow-ups should be made, if supplementary questions need to be asked after the visit. The format for taking notes during the field visit could be made up in the manner described in Table F-2.

**Table F-2: Field survey format/sample general observations**

Areas/elementary operations considered	Description of its activities and location	General remarks and comments	Notes/References to file number
<b>Storage of raw material</b>	<i>North-west corner of site</i>		
<b>Washing operations</b>	<i>Washing of raw materials north-west corner of factory</i>	<i>Use of sedimentation bath (5m<sup>3</sup>) equipment 15 years old</i>	
<b>Heating and mixing of raw materials</b>			

<b>Casting of semi-finished product sourced from previous stage</b>			
<b>Used oil spillages</b>	<i>On ground near repair workshop</i>		
<b>Treatment of industrial effluents</b>			<i>Refer to specific field work sheet</i>
<b>Others</b>			

**Comments:**

### ***3. Storage of materials and their maintenance: obsolete products, wastes***

In this section we are concerned with raw materials, obsolete products and their wastes. In the section "comments", observations can be made on the location of storage, on protection measures (rainfall and ground seepage,), on the safety and accessibility of the storage, on safety measures, on staff training, on contingency plans and spillages observed.

#### **A) Table F-3: Details of stored raw materials: losses due to storage and maintenance**

<b>Raw material</b>	<b>Hazard classification<sup>55</sup></b>	<b>Quantity stored</b>	<b>Quantity of r.m. purchased per year</b>	<b>Type of storage</b>	<b>Average storage period</b>	<b>Estimated annual losses</b>
Solvent	<b>H3</b>	400 litres	800 litres	Drum	6 months	50 litres through spillage
Other material						

**H3:** Inflammable liquids.

<sup>55</sup> See section II, table of Annex III of the Basel Convention on hazardous characteristics.

**B) Table F-4: Storage of obsolete raw material or other substances**

Obsolete material	Hazard classification <sup>56</sup>	Quantity stored	Type of storage	Period of storage	State of contents
Paint	<b>H3</b>	400 litres	Drum	18 months	Corroded, with spillage to ground
Other material					

**H3:** Inflammable liquids

**C) Table F-5: Storage of wastes**

Waste	Suspected hazard classification <sup>57</sup>	Quantity stored MT	Type of storage	Period of storage	Storage conditions
Processing sludge in factory drainage tank	<b>H8</b>	5 m <sup>3</sup>	Stockpiled	For 6 months	No protection
Obsolete transformer with PCB	<b>H11</b>	350 litres of liquid	Liquid drained into two drums	For 2 years	Drums in good condition

**H8:** Corrosive materials

**H11:** Toxic materials

**Comments:**

- a) Location
- b) Protection against weather
- c) Safety and access measures
- d) Safety, training, contingency plan measures
- e) Spillage or pollution
- f) Others

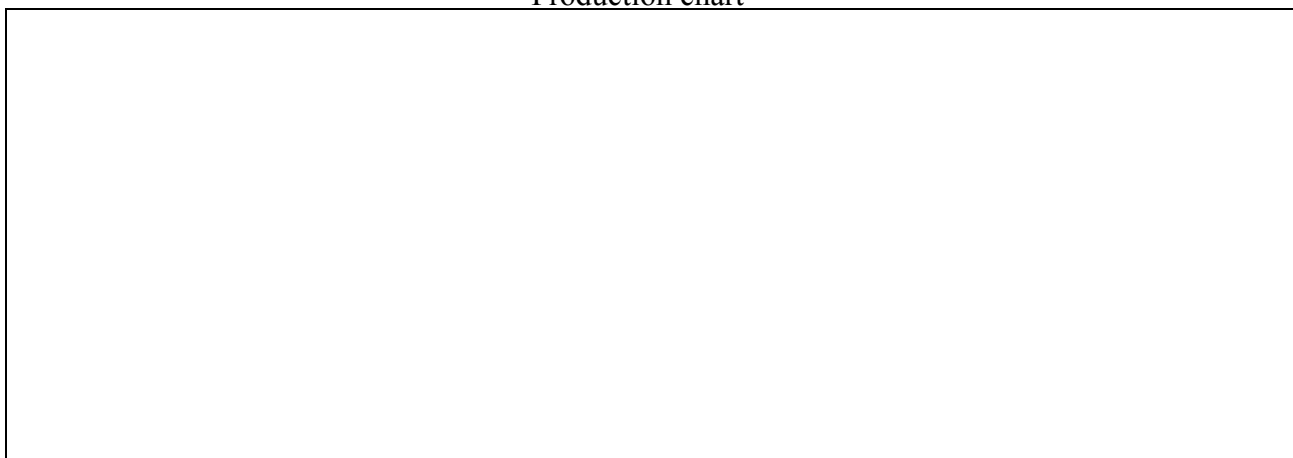
<sup>56</sup> See section II, table of Annex III of the Basel Convention on hazardous characteristics

<sup>57</sup> See section II, table of Annex III of the Basel Convention on hazardous characteristics.

4. *Review of industrial process: breakdown of activities or subprocesses*

*A) Breakdown and identification of production processes used*

Production chart



*B) Table F-6: Examples: Data for residues/wastes generated by each separate subprocess*

<b>Operations/sub processes</b>	<b>Function of operation</b>	<b>Water consumption (litres/time)</b>	<b>Treatment of liquid wastes</b>	<b>Data on quantity<sup>58</sup> and frequency of residue at exit point</b>
<b>1. Raw material washing operation</b>	<i>Washing of raw material in sedimentation bath</i>	<i>5 m<sup>3</sup> / lot 3 lots/day</i>	<i>None, the liquid waste goes directly into the river without treatment</i>	<i>1 m<sup>3</sup> /month of sedimentation sludge from rinsing of tank</i>
<b>2. Heating and mixing of raw material</b>				
<b>3. Casting of semi-finished product sourced from previous storage</b>				
<b>Mobile equipment</b>			<i>None</i>	<i>Used oil 200 litres/month</i>

**Comments:**

<sup>58</sup> On an annual basis: metric tonne/year MT/y

## 5. Identification and evaluation of existing waste treatment systems

This stage consists in identifying and locating, for each of the broken down subprocesses, the treatment systems for existing atmospheric and liquid wastes, and in identifying the wastes generated by these: sludge, dust, filters. Exact notes should be taken in regard to the quantity (on an annual basis: MT/year), hazard, as well as physical state (gas/liquid/solid).

**Table F-7: Waste treatment systems**

Subprocesses	Types of waste	Treatment unit	Waste from treatment unit Quantity, physical state, if hazardous
<b>Raw material washing operation</b>	<i>Liquid waste</i>	<i>None</i>	<i>None</i>
<b>Heating and mixing of raw materials</b>	<i>Liquid waste</i>	<i>None</i>	<i>None</i>
<b>Casting of semi-finished product sources from previous stage</b>	<i>Liquid waste</i>	<i>Yes</i>	<i>1 m<sup>3</sup> /2 months semi-liquid toxic sludge</i>

**Comments:**

## 6. Identification and characterization of wastes generated

### (a) Sampling/characterization and identification of wastes

Make a case-by-case evaluation of the need to take samples so as to determine the level of hazard. Define a method of sampling and a procedure for laboratory tests.

Particular attention should be accorded to the so-called "mirror" wastes, that is, those contained in both Annex VIII and IX.

**Table F-8: Characterization of wastes**

Sources	Residues	Sampling	Results of characterization
Subprocess 1.0	<b>B 3020</b>	Yes/no	Hazardous or not
Subprocess 2.0	<b>A 1130</b>	Not necessary	Not applicable
Subprocess 3.0	<b>Y45</b>	yes	Hazardous or not
Storage area			

**B 3020:** Paper, paperboard and paper product waste

**A 1130:** Spent etching solutions containing dissolved copper

**Y45:** Organochlorinated compounds other than substances referred to in Annex I of the Basel Convention.

**(b) Findings**

The findings, broken down by source of waste generation, should indicate to us the waste code, its degree of hazard and the annual quantities produced.

**Table F-9: Findings**

Sources	Residue class code identification under Basel	Characteristics: degree of hazard, physical state	Quantity MT/year
Subprocess 1.0	B 3020	H6.2	457 MT/year
Storage area			
Total			

**B 3020:** Paper, paperboard and paper product wastes

**H6.2:** Infectious wastes

**Comments:**

**7. Current management of hazardous wastes**

This stage enables us to summarize for each type of hazardous waste, coded according to the definition, the source or origin of that waste, its annual quantity, whether the waste is managed in situ or transported outside. Lastly we will indicate the management method used, according to Annex IV of the Basel Convention. Storage is to be identified as D-15 or R13, according to whether it is storage prior to a disposal activity or prior to a recycling activity.

**Table F-10: Current management of hazardous wastes**

<b>Wastes by code</b>	<b>Identification of sources</b>	<b>Annual quantity MT/year</b>	<b>Management in situ or off site</b>	<b>Disposal management mode D1 to D15</b>	<b>Recycling management mode R1 to R13</b>
<b>Total</b>		<b>Quantity</b>			

**Comments:**

**8. The identification of minimization options for hazardous wastes**

Once the foregoing table is completed, we can note down observations or make comments on the minimization options for each of the hazardous wastes thus identified. Working hypotheses can then be submitted and scenarios drawn up, including the estimate of hazardous wastes generated once these hypothetical changes are made. Table F-11 provides ideas for some minimization scenarios for wastes.

In making any change to the factory procedure out of environmental or economic considerations, environmental data should always be taken into account, such as the nature, the quantity and the hazard of atmospheric and liquid wastes. We could also, with the data obtained from our audit, return to carry out a more general audit (e.g. that of United Nations Environment Programme UNEP/UNIDO), in order to seek solutions that respect the environment more and more. In brief, audits are an interactive and continuous process.

**Table F. 11: Minimization options**

<b>Number</b>	<b>Activity minimizing or helping to minimize the generation of hazardous wastes</b>	<b>Comments</b>
1	Introduction of clean technologies, by subprocesses	
2	Change raw material used (product or substance generating little or less hazardous wastes)	
3	Installation of high-performance equipment for treatment of atmospheric, liquid and other wastes	
4	Change of production process or modify its product in line with environmental objectives	
5	Closing of factory	
6	Others	

### ***9. Cost-benefit analysis***

The cost-benefit analysis enables us to evaluate the feasibility of undertaking waste minimization measures. Several economic approaches can be used. In the first place, we estimate costs associated with the measure, then the benefits, following which a feasibility calculation can be made.

### ***10. Conclusions and recommendations***

Among the conclusions will be found the information on the findings of the audit, the information contained in section 7.0, recommendations on the possible improvements to the management of hazardous wastes, together with minimization options for those wastes in the short and long term.

### ***11. Report of the audit, what it contains***

In the report, there should be a summary of the conclusions and details of the audit: the survey sheets, the calculation sheets, photographs, letters and all other documents that have been used in carrying out the audit. As a general rule, for a small factory (from 0 to 20 employees), this audit should not take more than 2 to 3 days. A day of preparation and collection prior information, a half-day visit and writing the report: for other factories, the time period may vary according to the availability of information relevant to the audit.

## Annex G: Format of annual report on hazardous wastes

The following table shows a model annual report format for hazardous wastes

### Annual report format

Table provided by actors involved in the area of hazardous waste management

Period covered: from \_\_\_\_\_ of \_\_\_\_\_ to \_\_\_\_\_ of \_\_\_\_\_ year \_\_\_\_\_

Information	To be completed <i>Section identifying the party</i>
<b>Number of actor</b>	<i>Number of actor according to government register</i>
<b>Company</b>	<i>Legal name of company:</i>
<b>Address</b>	<i>Street, town, province, postal code:</i>
<b>Person in charge</b>	<i>Name, title, telephone, fax and email:</i>
<b>Economic sector</b>	_____ <i>(4 digits exactly)</i>
<b>Type of production process</b>	<i>Brief description of products and technology:</i>
<b>Total annual sales</b>	<i>In US\$</i>  <i>\$US</i>
<b>Quantity of finished products</b>	<i>Quantity</i> _____ <i>Unit</i> _____
<b>Type of actor</b>	<input type="checkbox"/> <i>Hazardous wastes management center</i> <input type="checkbox"/> <i>Generator</i> <input type="checkbox"/> <i>carrier</i> <input type="checkbox"/> <i>Other (specify)</i> _____
<b>Employees</b>	<i>Number of employees, including administrative employees:</i> _____ <i>employees.</i>
<b>Comments of actor</b>	<i>ISO 14 001 certification, SME, company policy, audits of hazardous wastes carried out, hazardous wastes minimization programme?</i>

<b>Official authority comments</b>	<i>Reference to inspection or control:</i>
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Information on hazardous waste management

**N.B.:** Quantities in kilogrammes

N°	Compiled information	DD N°1	DD N°2	DD N°3	DD N°4	DD N°6
1	<i>Waste code</i>					
2	<i>Physical state<sup>59</sup></i>					
3	<i>Hazard<sup>60</sup></i>					
4	<i>Quantity generated in period covered</i>					
5	<i>Quantity in storage on first day of period covered</i>					
6	<i>Quantity in storage on last day of period covered</i>					
7	<i>Quantity exported out of site</i>					
8	<i>Name and address of consignee</i>					
9	<i>Quantity received on site</i>					
10	<i>Name and address of sender</i>					
11	<i>Quantity managed in situ (recycling) (associated with appropriate management code<sup>61</sup> R1 to R13)</i>					
12	<i>Quantity disposed of in situ (associated with appropriate management code<sup>62</sup> D1 to D15)</i>					

<sup>59</sup> Gas, liquid, solid

<sup>60</sup> Under annex III of the Basel Convention: H1 to H13

<sup>61</sup> Under annex IV of the Basel Convention, section B, recycling operations

<sup>62</sup> Under annex IV of the Basel Convention, section A, disposal operations

## **Annex H: Sample of a spreadsheet to estimate hazardous wastes generation according to the indirect method**

The following pages illustrate the various stages to be followed when using a spreadsheet to estimate hazardous wastes generation according to Annex VIII and IX of the Basel Convention.

This spreadsheet has been developed as an instrument of support for the present manual and is available from the secretariat. This preliminary version of the spreadsheet should be completed regularly in the course of the next years in order to be totally operational.