Adaptation
Of the Methodological Guide for the Undertaking of National Inventories of Hazardous Wastes Within the framework of the Basel Convention

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Foreword

This document is an adaptation and tailoring of the methodological guide developed by the Basel Convention Secretariat "Methodological guide for the undertaking of National Inventories of Hazardous Wastes" within the framework of the Basel Convention. Its purpose is the clarification and streamlining of the methodology, without compromising its objectives to the specific conditions and constraints of the management of HW in the Arabic speaking States. This document is not intended to replace the "Methodological guide for the undertaking of National Inventories of Hazardous Wastes", but to complement it. In this respect, it is recommended that it is used in conjunction with it.

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Table of Contents

Appendices

List of Tables

List of Figures

References

1. Introduction

In all Arab countries, one of the major constrains in developing an integrated hazardous waste management system is the absence of accurate data on HW generation. The complexity of data compilation process stems from the fact that in most countries the HW generators and the competent authorities do not accurately know which types and quantities of hazardous wastes are generated in the country. Moreover, some countries may not have clear legally binding definition of what constitutes HW and/or lack national criteria for classification and identification of such waste. Such information, however, is important for regulating, planning, setting priorities and developing an integrated HW management system. 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 implemented, the effect of which is to allow such threats to increase further.

Accordingly, and in order to reach accurate figures on types and amounts of hazardous waste generated in a specific country, a structured step wise approach need to be implemented over long time spans relying on the involvement of key actors concerned with HW management.

This document is prepared with the purpose of introducing the concept of a national HW inventory and present a methodology, adapted to conditions and constraints in Arabic speaking countries, and that could be adopted to develop and maintain the inventory. This is based on the Basel Methodological Guide for The Undertaking of National Inventories - First Version. This document is intended to be a general operational document providing simple and practical guidance to the entities responsible for developing the national HW inventory.

2. Guiding principles

The methodology is based on the following principles:

1. 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.
2. 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
3. Setting up of a national inventory is based on a 3 staged methodology:
   - A preparatory phase to set up the scene. This comprises establishing the work team responsible for initiating and coordinating the activities necessary for developing and maintaining the inventory as well as creating a national enabling environment for cooperation between the different actors, in addition to raising the awareness and building the capacity of the different key players. Establishing the team and monitoring the inventory development process is the responsibility of the official competent administrative authorities.

- An initial phase of the inventory (typically 2 years but which can be extended if necessary), during which the work team will be responsible for generating and acquiring data on HW generated on the national level using direct and indirect methods to establish a preliminary inventory. This will enable the setting of priorities with regards to the HW generating sectors and/or waste streams that need to be addressed exhaustively in the following year(s).
- A subsequent phase, where the inventory becomes a permanent one, for which a national data collection system feeding directly into it is to be developed. This would necessitate the involvement and cooperation of the different concerned entities and would aim to ensure smooth/continuous flow of information into the database.

4. The establishment of an inventory is a time-related process: 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, it is noticed that data on the generation and management of hazardous wastes become more accurate with time. The rigorous implementation of the method, training and developed experience of the various actors help them to be more accurate and to increase the value of the information compiled and exchanged. Moreover, as the usefulness of this data becomes clear, all actors will become more committed to the initiative The first activity of the inventory is to collect the data, which will be completed and fine-tuned regularly, through periodical updates (annually, biannually, etc.,).
5. Legal Framework: the setting up an inventory of hazardous industrial wastes requires a legal, institutional and technical framework, which is necessary for the success of building the inventory. However, it is a framework that would also evolve and develop with the development of the inventory, adapting to new needs of the system evolving in complexity. In this respect, each country must continue to develop: regulations, institutional structure, infrastructure, awareness-raising policy, etc.

3. Scope

Similarly to the Methodological Guide for the Undertaking of National Inventories of Hazardous Wastes of the Basel Convention, this document is directed 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. It 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.

3.1 Field of application

Similarly to the Methodological Guide for the Undertaking of National Inventories of Hazardous Wastes of the Basel Convention, this document 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 document 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[1].

3.2 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 guidelines 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.

3.3 Limitations of this document

It should be noted that the technical criteria for characterizing the hazardous wastes are not specified. Neither is a precise methodology described for the use of sampling programs and tests and laboratory analysis that permit the determination of the harmfulness of wastes, in reference to the pre-selected technical criteria. However, a number of international systems exist for classification of HW. Box 1 below provides examples for such systems.

[1] International Standard Industrial Classification of all Economic Activities, third revision, United Nations 1990. ISBN 92-1-261120-6

Box 1: EU legislations consider waste as hazardous if the total concentration of one or more hazardous constituents equals to or exceeds set concentrations. Set analytical test methods by are determined by Commission Directives 79/831/EEC and 84/449/EEC and the Council Directive 67/584/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances, for the determination of physicochemical, toxicological and ecotoxicological properties of hazardous waste such as flammability, explosive properties, oxidizing properties, toxicity, teratogenity, mutagenity, etc.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31984L0449:EN:HTML

The US EPA legislations, consider waste as hazardous if the hazardous characteristic it exhibits exceeds the quantified limit set in the legislation, determined using identified test methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846)* ***http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm***

4. Objectives of the national inventory

Developing 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.

4.1 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 with regards 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 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[2]. This can be achieved by following up the relevant programmes: tracking down sources, re-use, recycling, treatment and appropriate

[2] Minimization of volume and hazardousness of wastes.

disposal of hazardous wastes with the objective of having everything covered in an environmentally sound management strategy for wastes. Appendix (1) presents options for HW minimization schemes.

4.2 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[3] 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) Disposal 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 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;
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] 128 Countries and one economic integration organization are being Contracting Parties to the Basel Convention, as of 21 July 1999.

4.3 Specific objectives

The use of the national inventory will also facilitate the compilation and analysis of data and specific information. 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[4] the types of risks associated with hazardous wastes[5], a special coding for the transport of wastes[6], etc.,

5. Definitions and classifications

5.1 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 according to Basel convention is given in Appendix (2) of this document. Moreover, the methodological approach presented here for developing national HW inventories is also applicable in countries adopting classification systems other than the Basel classification for HW.

A number of Arab countries have developed HW classification systems within their national regulatory framework. Box 2 below gives examples for HW classification initiatives in different countries.

Box 2: In Egypt, a national Hazardous Waste Classification System is currently under adoption and by different competent government ministries and authorities in coordination with Egyptian Environmental Affairs agency. In addition, the line ministries concerned with HW management (Ministry of Industry, Health, Electricity, Interior, Petroleum and Agriculture) have developed lists including HW generated within their scope of competence. A number of the lists have been officially issued, namely the lists of the ministries of Industry, Health, Agriculture and Interior, whereas the lists of the ministries of Electricity and Petroleum are still in draft form.

In Jordan, according to the national environment law a national committee within the ministry of environment including members of entities concerned with HW management is responsible for identification and classification of the different hazardous substances and their waste.

In Kingdom of Saudi Arabia, the legal framework governing HW management provides lists categorizing streams of HW as well as listing of hazardous characteristics.

[4] Whether the wastes are in the form of gas, liquid, solids, semi-solids (slurries) or others.

[5] The idea of safety risk to the employees handling them.

[6] 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.

5.2 Identification of HW

Proper identification of generated HW relies on four key parameters as follows:

a. Determination of the generating economic sectors such as manufacturing, healthcare, agriculture, etc… Identification of generating sectors would assist in anticipating potential types of HW form specific economic sectors.

b. The hazardous characteristics, according to which the hazardous characteristics the waste generated from the different economic sectors could be identified. The different classification systems (Box 1) encompass similar hazardous characteristic.

c. Setting up thresholds for the hazardous characteristics and setting standard laboratory analysis for the technical criteria for characterizing the hazardous waste. A number of classification systems, particularly the EU and EPA have set thresholds for the hazardous characteristics. This can assist the data collection process in terms of limiting the scope of inventory such it covers only such waste corresponding to the thresholds.

d. HW lists issued by the concerned national authorities. Such lists can be used as a simple tool for HW identification. The lists are legally binding such that all waste types and streams on the lists are subject to legal enforcement. Such lists facilitate the process of HW data collection from different economic sectors. It should be noted that listing of HW should be carried out on the basis of the hazardous characteristics of the waste as well as set threshold values (point b and c above).

Box 3: Material Safety Data Sheets (MSDS) of chemicals can be used as guiding tool to assist in the identification process. MSDS give clear descriptions of the most important hazards associated with the substance particularly with regards to human health, the environment, and/or property. Furthermore, MSDS indicate the appropriate methods for the safe disposal of the surplus and/or the waste resulting from foreseeable use of the substance, as well as any contaminated packing material and other hazardous waste.

5.3 Challenges facing proper identification of HW

A number of challenges face the proper identification of HW, particularly in developing countries. These challenges comprise:

- Lack of specific technical criteria for determining the hazardous characteristics and absence of accredited/ certified laboratories for HW analysis as well as lack of official legally binding tools for HW identification in most countries, such as HW lists.
- Inadequate technical capabilities and/or awareness of generators to carryout proper identification of their HW particularly in SMEs
- Limited awareness at some concerned governmental bodies where government officials themselves may not be aware of the process of HW identification.
- Inadequate enforcement of laws and/or absence of laws regulating HW management create disabling environment for HW generators to comply with the legal requirement pertaining to HW identification and management. Moreover,

national regulations may be not clear/vague and/or not clear with regards to details of HW management stipulations.

- Low transparency of the generators, especially in the manufacturing sectors, where there is a tradition of secrecy in business and few firms report publicly on their operations. This presents a major obstacle in obtaining accurate data on types and quantities of the generated waste.

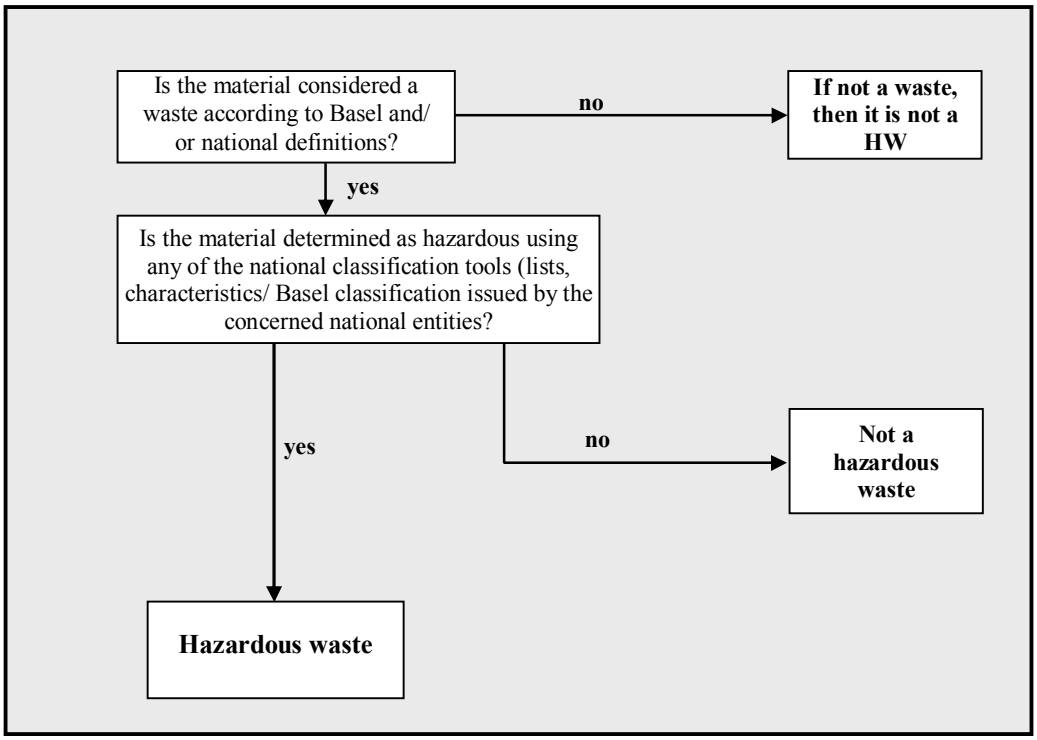

Figure 1: Simplified Steps for HW Identification

5.4 Selection of economic sectors generating hazardous wastes

The economic activity sectors that generate hazardous wastes can be consolidated into five main categories, of which the manufacturing sector is generally the largest producer of hazardous wastes:

1. **Individual consumption**: this is 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 (such as pressurized containers e.g household pesticides), batteries, etc. Quantitatively, this sector plays a negligible[7] role in the generation of hazardous wastes. During the initial phases of the inventory this sector is not be selected or analyzed.
2. **Health services**: this entails all activity and sectors linked to the

[7] 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.

provision of health services, such as health clinics, dental clinics, veterinary clinics, etc. In these 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). Given the infectious nature of these wastes, particular attention should be paid to them in the establishment of hazardous wastes and management policies.

3. **Manufacturing and industrial production:** this entails 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. In this respect, Appendix (3) presents examples for manufacturing sectors generating HW.

4. **The transport sector**: 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.).

5. **Others**: These sectors may be linked to agriculture, mining, primary industry and the service industry. On the other hand, certain specific pollutants such as PCBs[8], pesticides, asbestos, may be associated with some specific economic activity sectors. For example, PCBs with electricity distribution.

5.5 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 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[9].

Many Arab Countries have developed their national coding systems for economic sectors. For those countries that have classification systems for economic activities

[8] Polychlorinated biphenyls. See Annex 1 of the Basel Convention, item Y10

[9] The International Standard Industrial Classification of all Economic Activities, third version, United Nations 1990. ISBN 92-1-261120-6.

it is possible to obtain an equivalence of the economic sectors of ISIC to the national coding through matching the national economic activities with that of the United Nations Statistical Office.

Box 4: In many Arab countries there exists a standard classification of economic activities arranged so that entities can be classified according to the activity they carry out. For example:

- **Bahrain**: International Standard Industrial Classification (ISIC R3) - Central Informatics Organization and Ministry of Commerce
- **Egypt**: Standard Classification of all Economic Activities Central Agency for public mobilization and Statistics – Classification Division (CAPMAS)
- **Palestine**: Palestinian Standard Industrial Classification of all Economic Activities (PSIC)
- **Yemen**: National Classification of Economic Activities (NCEA) - Central Statistic Organization
- **Saudi Arabia**: Classification of All Economic Activities. (SIC) 2004 - Central Department of Statistics (C.D.S)

(http://unstats.un.org/unsd/cr/ctryreg/ctrylist2.asp)

6. Methodology

The methodology for building and maintaining a national inventory of hazardous wastes, basically comprises three stages:

1. Preparation of inventory;
2. Incorporation of first results;
3. Maintenance of inventory/permanent inventory.

Figure 2 below is a schematic presentation of the methodology stages

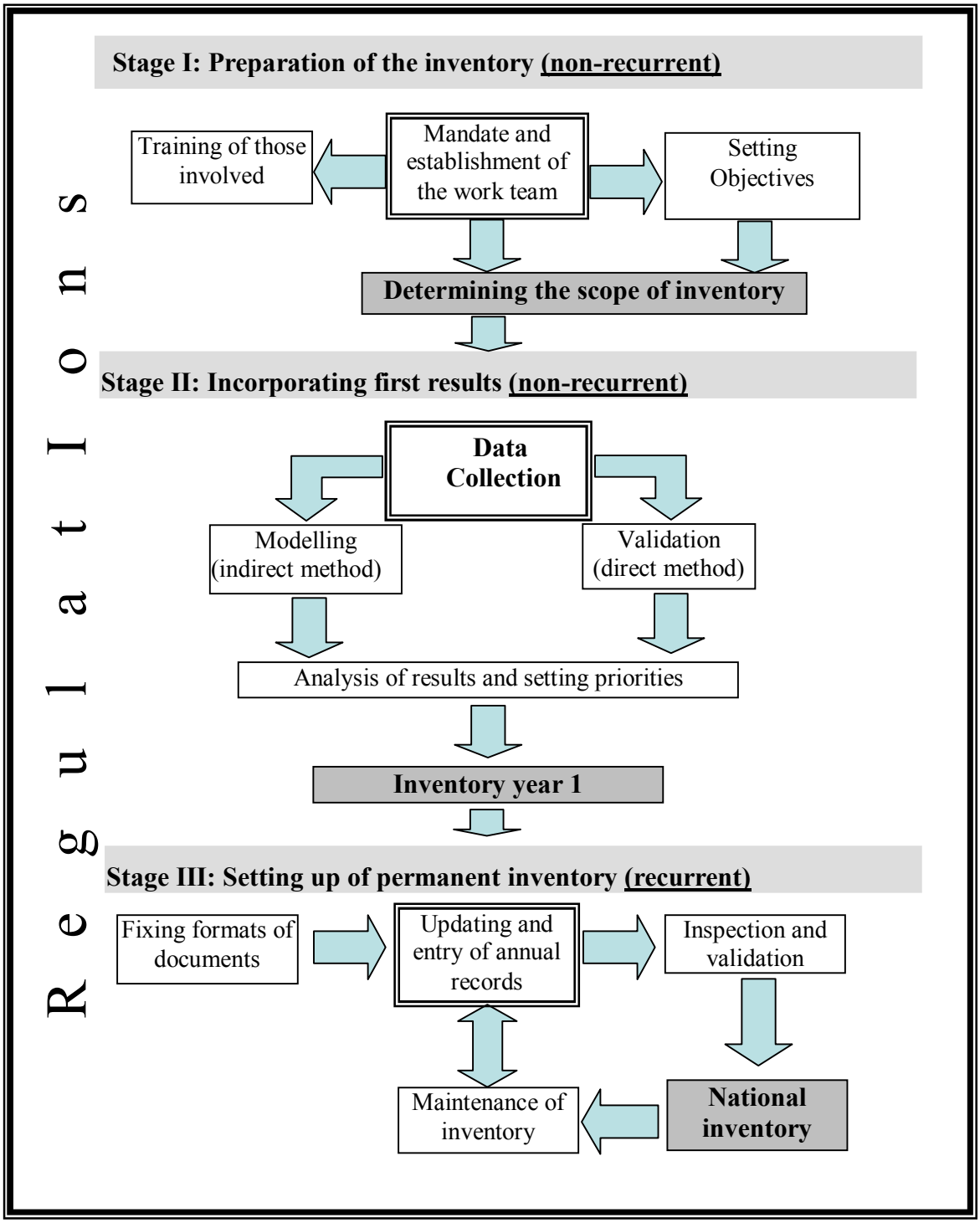

Figure 2: Overall Methodlogy For HW Inventory Development

The overall objective of this activity must be clear to all entities involved. It entails the development of a national HW inventory through a comprehensive data collection process. The inventory would present a fundamental building block to the development of a national strategy for the management of HW.

6.1 Stage I: Preparation

The production of a good national inventory of hazardous wastes rests on the preliminary preparation. Preparation of an inventory entails the following steps:

- Who does what? i.e. what persons will be working on a national inventory and how will they set about it? What will be the scope and boundaries of this national inventory?
- The type of information to be collected.
- 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.
- The possibility of interfacing with other database systems existing in the country, such as a Geographic Information System (GIS).

6.1.1 Key players of HW inventory

The success of the development of the national HW inventory is only possible when all actors are full partners in the process. Although, the national HW inventory is developed mainly by the governmental bodies, it strongly relies on the key role of the HW generators, service providers and commercial associations. In this respect, the main actors involved in of hazardous waste management are:

- generators,
- authorized HW management contractors[10],
- statutory public bodies and monitoring/inspection bodies[11].
- industrial or commercial associations

Box 5 below outlines the key players' responsibilities in developing national HW inventory.

[10] Commercial management centers for HW.
[11] Regulatory authorities.

Box 5:

- ***Core group/committee:***

- Plan and contributes in implementation of procedures for the national HW inventory
- Coordinate with different concerned ministries for data collection on HW within their scope of competence as well as for communication and dissemination of information on HW
- Identify needs for technical assistance and guidance for concerned stakeholders on HW identification and proper management
- Develop standard procedures for HW data collection
- Plan and organize training for persons involved in data collection for the national HW inventory
- Periodically Update and maintain the national HW inventory

- ***HW generators/ Transporters/Treatment and disposal facilities***
  - Proper HW identification and classification
  - Maintain updated register/records on the generated HW
  - Cooperate with the inventory work team and provide accurate and update HW information

- ***Concerned regulatory bodies***
  - Cooperate with the national work team of HW inventory
  - Provide accurate and updated data regarding HW
  - Proper enforcement of HW relevant legal requirements within their scope of competence

6.1.2 Establishment of the work team

Central to the successful development of national HW inventories is the presence of a core group (committee) who would play the key roles for the inventory development. The group/committee is to actively contribute to all phases of development through to implementation phase, monitoring the implementation progress and collecting feedback from the concerned stakeholders. Furthermore, contribution would also entail developing relevant tools, whenever needed, with the purpose of improving the efficiency and effectiveness of the HW inventory such as development of general procedures for the data collection process to ensure an acceptable level of uniformity of the data to be analyzed. Subsequently, this core group, preferably a government work team, should be clearly identified to undertake preparation of a national inventory of hazardous wastes.

Number of team members: This team, preferably small and flexible, should be incorporated within the governmental entity responsible for the environment. The team should be able to work with experienced external experts. It can work jointly in collaboration with other concerned departments or other ministries who are concerned with 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).

Institutional set-up: It is proposed that key regulatory bodies are represented in the work team by delegated members. The establishment of the core team does not have to involve the creation of a new organization. Separate, and potentially isolated, organization could be counter-productive as it may involve establishing institutional arrangements to develop communication channels with the existing concerned bodies.

Qualifications: The work team should preferably be formed of members with technical qualifications (chemists, engineers, statisticians and database specialists) having adequate background on issues relevant to HW, as well as data collection, analysis, and management.

Support: Adequate resources need to be provided to the work team including sufficient equipment such as computers and database software etc... IT support need also be available to the team.

Box 6: Taking into account the prevailing negative attitude in the Arab countries towards provision of data, the core team needs to be backed up with a legal competence such that the generators are given confidence that the provided data are not misused. Moreover, the work team, although backed up with legal competence, need to assure that the provided information is not to be transmitted to third regulatory party and used against the generators.

6.1.3 Mandate and responsibilities

Clear terms of reference and responsibilities for the work team is defined in advance by the concerned authorities. The terms of reference could include the following components:

Organizational issues

- Establishment of the work team,
- Determining the roles and responsibilities of the whole team as well as each team member
- The timetable for execution of the activities
- The identification of entities involved
- Development of reporting structure (to whom the work team is to report on the work progress)

Technical issues

- The identification of the activities to be carried
- 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.

6.1.4 Training of those involved in the Work Team

The work team responsible for developing the national inventory should have adequate background information regarding HW, and HW management (generation, hazardous characteristics, identification and classification methods

applicable nationally, etc.). In this respect, before conducting the different activities related to inventory development, training sessions need to be organized for the team in order to establish a common knowledge base for all team members. Proposed duration and topics of such training sessions are presented in Box 7 below.

Box 7:
It is recommended that the training sessions encompass two training session of two to three days each, and include, but not be limited to the following topics:

- purpose, reasons for developing the national HW inventory
- objectives of the inventory and its limits
- The need for support or collaboration with other concerned entities and the form of cooperation for example provision of data, support during site visits etc…. This can be carried out through signing cooperation protocols between the work team and the different concerned entities.
- economic sectors generating HW and potential types generated
- national HW classification systems in place and their use

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, HW registers, etc.,).

6.1.5 Scope of the Inventory: identification of the data and information

One of the major issues is to identify what information and data are required. In this respect, the work team needs to be aware of issues related to business secrets that should be out of scope of the inventory. Moreover, primary focus should address waste generating activities. Box 8 below presents example of what might be considered as business or trade secrets.

Box 8: It should be clear to the work team what information is required for the inventory taking into account the reservation the generators may have regarding their trade secrets.
A trade secret is considered:

- Any formula, pattern, device or compilation of information which is used in a business and which gives that business an opportunity to obtain an advantage over competitors who do not know or use it.
- A process or device for continuous use in the operation of the business and must be secret and not a matter of public knowledge or general knowledge in the industry. ***(40 CFR 350.27 of the US Code of Federal Regulations.)***

Information related to the above are not to be included in the data collection process.

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 1: Information fields to be compiled: Identification Of Enterprise Surveyed

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

Table 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	*Code of waste*[12]	A 3020			
2	*Physical state*[13]	L			
3	*Hazard*[14]	H3, H11, H12			
4	*Amount generated in period covered*	1 350 kg			
5	*Amount in stock on first day of period*	450 kg			
6	*Amount in stock on last day of period*	300 kg			
7	*Amount transported out of premises*	300 kg			
8	*Name and address of consignee*	Xyz, country Z			
9	*Amount received on premises*	0			
10	*Name and address of sender*	n.a.			
11	*Amount managed in situ (with appropriate management code*[15] *R1 to R13)*	1 200 kg in R1[16]			
12	*Amount managed in situ (with appropriate management code*[17] *D1 to D15)*	n.a.			
13	*Other comments*	n.a.			

[12] The code of waste is to entail that of Basel classification as well as that of the national HW classification system if different.
[13] Gas, liquid, solid.
[14] Under Annex III of the : H1 to H13.
[15] Under Annex IV of the , section B / recycling operations.
[16] Under annex IV, section B, R1: Energy reclamation, use as fuel.
[17] Under annex IV of the , section A / disposal operation.

6.2 Stage II: First results

6.2.1 Participation and consultation of private and institutional sectors

The active and progressive participation of the various actors concerned with HW management is one of the conditions for success in the setting up of the national inventory. To ensure an active participation of all of those involved, 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.

6.2.2 Awareness of involved entities

Increasing the awareness of all concerned parties will significantly contribute to the effectiveness and efficiency of inventory development. Awareness raising could be carried out through various tools including:

- awareness raising seminars: these could be organized in the trade associations, chamber of commerce, industrial zones, etc..
- set up an Internet site dealing with questions regarding hazardous wastes.
- Printing HW infosheets: these are to introduce issues related to HW classification and identification, components of proper HW management systems, etc…

Such seminars could be given selectively and in a gradual manner. This means that the target groups selected for the seminars are to include priority economic sectors generating HW. These could be identified based on their industrial sector and their potential to generate significant types and amounts of HW. The international (ISIC coding) can be used for identifying such priority economic sector. Alternatively existing national economic activity classification could also be used. Box 9 below gives examples for possible communication tools for different actors.

It should be taken into consideration that providing awareness needs to be carried out in a gradual manner. Issues related to hazardous waste, from generation point through all stages of its management should be addressed in a number of successive seminars or in a series of publications, since it is not possible to put everything across in one awareness seminar/single publication. Generators of hazardous wastes represent the largest group of actors in the area of hazardous waste management. They must be given particular attention.

Box 9: There are various communication tools that can be used to carry out consultation with the main actors. These include, but are not limited to:
- *Seminars*: one day seminars can be organized for generators. These seminars can be organized on geographic bases (for clusters of economic activities accommodating different sizes and types of sector) or sectoral bases (for selected economic sectors generating HW).
- *Individual meetings*: these would be a suitable approach for

6.2.3 Procedures of collecting information

The work team, in consultation with the various entities concerned with HW management, should identify what would be the best approach and the frequency of data collection for the national inventory. Once the approach and frequency agreed by all parties, ideally they should be included in the relevant national regulations to give them legal weight. However, other options to give "weight" might need to be investigated since developing effective "new" regulations is expected to be a long complicated process, with effective enforcement not always assured. In principle there are two possibilities for collection of HW information:

- define the wastes for which it is not necessary to have information (negative list),

or

- 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[18]). 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[19]). 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.

Once the preparations for the establishment of a national inventory on hazardous wastes have been identified and completed, a preliminary estimate of the waste needs to be addressed. This can be called year one or the first draft of the national inventory. Setting up of a national inventory needs to be done gradually and the validity of the data is expected to improve with continuous efforts put into building up the inventory.

The compilation of the first results can be carried out using indirect methods (depend on calculation and estimations of quantities) which are to be validated through direct methods (using questionnaires, filed audits, etc..).This will give guidance for the setting up of a permanent inventory.

[18] Correspond to annex VIII of the Basel Convention
[19] Correspond to annex IX of the Basel Convention

Box 10: The data collection process needs to prioritize the data collection sources. For example, first priority could be the HW generating activities (the different economic activities generating HW), whereas off-site HW management activities such as management processes in TDF or off-site temporary storage areas would come as a second priority.

6.2.3.1 Modeling or indirect method

This method relies on estimating HW quantities based on information gathered about the sizes and types of economic sectors potentially generating such waste. This will enable useful results to be obtained with relatively little effort. The results of the estimate 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.

This method necessitates the existence of comprehensive lists of the industrial establishments of the different economic sectors generating HW. Sources for such lists can include:

- *Industrial trade associations*: For example in Egypt, there exist a Federation for Egyptian Industries (FEI) composed of various industrial chambers, such as metal finishing, textile, furniture, food, etc… The different industrial establishments register at the federation and provide information about the size of the company, the number of employees and the type of activity.
- *Licensing entities:* Such as the ministry of Industry that provides construction and operation licenses for the industrial establishments. These entities are expected to have listing of all industrial establishments applying for permits. Thus presenting another source of information.
- *Environmental inspection authorities:* such entities are expected to have databases including listing of facilities subject to inspection, their sizes, sectors and probably information related to their emissions and waste including HW.

The modeling approach suggested entails obtaining the amount of hazardous wastes generated in metric tonnes per year (MT/year) for each chosen economic sector. To begin with, it should be verified if there is relevant information at a national level[20] if not, indices or hazardous wastes generation ratios could be used. For example, for each economic sector of the territory concerned, the quantity of hazardous wastes generated can be obtained from the number of employees by multiplying this number in the economic sector of concern by a generation index/ratio (MT/year/employee).

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 too many actors to be trained and integrated at the same time.

[20] Information available in local chambers of commerce, in the records of specific companies, etc

Box 11: It is important to note that although using the index of the number of employees is not always accurate due to the fact that in many cases the number of employees does not reflect the size of establishment, as result of automization of technology and minimizing the dependence of human labour, yet it could be a more straightforward way to for an estimate than other alternatives:

- Production quantity: establishments can be reluctant to disclosing information about their production and used input materials
- Fuel/energy consumption: is difficult to generalize and the sources of energy differs significantly since some establishments can use natural gas as energy source or other types of fossil fuels, other establishments might use electricity as source of energy.

Priority sectors[21] could be to be identified based of the total quantity of HW generated within these specific sectors compared to the other sectors. In addition, priority could be identified based on identifying priority waste streams based on their generation from various economic sectors.

Table 3: Example for HW estimation:

Economic sector code	*Description*	*Number of employees*	*Type of waste[22]*	*Index/Ratio MT/year/employee*	*Total of HW generated in MT/year*
2700[23]	Manufacture of primary metallurgical products	23 000	A3020	0,413	9 499
2700[23]	Manufacture of primary metallurgical products	23 000	A3140	0,010	230
2800[23]	Manufacture of finished metallurgical products	6 700	A3140	0,113	757

[21] priority sectors could be those expected to have available data from different sources

[22] Basel Convention HW classification codes provided in Annex VIII list A. If the country adopts other national systems for HW classification, then is to be used for determining the HW code.

[23] Coding according to the UN ISIC or any other national coding/economic activities classification systems in place.

6.2.3.2 Validation or direct method

The results of year one, obtained through preliminary estimation using the index/ratio tool can be validated by complementary information obtained by a direct method. This direct method primarily consists of field visits to a sample of establishments of the different economic sectors (industry, health, etc…). Chosen facilities for field visits are to be selected to reflect as much as possible the different economic sectors. In the selected sample a mix of small, medium and large establishments[24] should be considered as well as a mix of public and private establishments, where applicable.

Visits to companies transporting wastes, and, if such exist, companies that process or dispose of wastes might also be useful. 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.

In addition, other possibilities for information could include inspection reports for establishments carried out by the regulatory bodies, HW audits/studies/surveys conducted, HW transportation documents which provide information about the establishments generating such waste, their types, quantities, etc., environmental impacts assessment studies (EIAs), including information about types of HW and its estimated quantities and measures taken for its proper management.

Box 12: Establishments selected for site visits need to be representative to the size of the sector. Number of establishments in each sector can be determined using the national economic classification system in each country. The sizes of different establishments could also be determined through business and trade associations, chambers of commerce or concerned regulatory or licensing bodies. The proposed sample size could be 5-10% of each economic sectors. The number of SMEs in the sample need to be proportional to their number in each sector.

[24] Small enterprises are defined as enterprises which employ fewer than 50 persons, Medium enterprises are those employing between 50-250 employees - ***EU Commission Recommendation (2003/361/EC) concerning the definition of micro, small and medium-sized enterprises.***

6.2.3.3 Inventory – Year 1

Based on the above activities, the inventory for year 1 could be estimated. The year one inventory will be the base on which year two inventory is developed which are then used for the following years. Year 1 inventory will significantly contribute to revising and refining the national priorities as well as identification of data gap areas that need to be adequately addressed in the successive years and assist in the development of the national work plan and lines of actions to address these gaps.

6.2.3.4 Analysis of results and setting priorities

Based on the results of the preliminary estimates the work team can begin a long-term work plan for year two, which will identify the economic sectors and the hazardous wastes to be given priority. Criteria for setting priorities can entail those activities not adequately addressed in the previous year.

6.3 Stage III: The permanent national inventory

Stages I and II discussed above pave the way for setting up a permanent inventory with continuous maintenance and upkeep. This requires a number of activities and actions:

- Regulations
- Regular data updates
- Set procedures for permanent collection of data and information (format and documents)
- Verification and validation of the information compiled
- Maintenance

6.3.1 Regulations

Regulations are the overall framework that should govern all activities related to development of the permanent national HW inventory.

Legislation should regulate the following areas:

- Definition of HW subject to legal requirements
- Types of HW for which information is required
- Frequency of data collection
- Entities authorized to collect data
- Responsibility of generators and handlers of HW to provide required data

The HW regulations in place in the different countries should have answers to the following issues related to data collection:

- What information on wastes is required?
  Through out the data collection process it should be taken into account the reservation that enterprises have regarding manufacturing secrets. Necessary information include: the identification of wastes (according to national HW classification lists/system developed by the country, the lists can be sent to the facilities prior the site visits), the quantity of wastes generated which can be obtained from company environmental records and registers, the HW contractors receiving the waste from the company, etc…
- Who should provide this information?
  In the first place the generator of HW must provide the information. But the information should also be required of HW transportation and disposal contractors.
- 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.
- 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.
- What provisions should be made for penalties?
  Penalties should be imposed when particular actors do not respect their obligations.

All such provisions are expected to be included in various ways in the national legislation pertaining to 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.

6.3.2 Updating and entry of annual records

New data originating from different actors in the area of hazardous waste management should be 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 human resources must be set determined for such 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.

6.3.3 Verification and validation of data

Parallel to the establishment of an information collection system for the establishment and the annual update of the national HW inventory, it is also necessary that spot checks to be carried out by government authorities. These checks and controls will enable authorities to validate the data forwarded by the actors on their HW management and verify if the information provided by the actor for the annual records correspond to the actual situation.

Such verification and controls are carried out following a set method, using a statistical approach or otherwise according to sectors or wastes that are considered to be of high priority. There are various tools that could be used for data validation, as presented in the following section.

6.3.3.1 Audits of hazardous wastes

There are differences between audits, annual reports and self monitoring records of hazardous wastes. The following table summarizes the main distinctions.

Table 4: Comparative table on annual records, audits and self monitoring of hazardous wastes

Points of comparison	**Annual record** (updating data bases)	**Inspection** (inspection records)	**hazardous waste register/self monitoring**
Initiator	Government	Government	Private enterprise
Frequency	Once a year or at a frequency to be established by regulations	Periodic or random	Set by private enterprise within the framework of legal requirements
Motive	Establishment of material inventory	Check on conformity with regulations	Internal policy, environmental certification or other financial reasons
Who carries it out	National Committee in the Ministry of Environment	Local inspectors, or national ones in some cases	Enterprise itself or specialized consultants
Technical content	Quantity of hazardous wastes produced and managed	Report on compliance of regulations, e.g., storage methods, in situ management, annual records, transport, others	Quantities generated and managed
Financial content			Profit in minimizing wastes
Certification	Not applicable	Not applicable	ISO 14 001 or others
Owner of information	Government	Government	Private enterprise
Others	Static process pre-set frequency	Variable process, according to demand	Dynamic process, recurrent process
Usefulness to the national HW inventory	Provides periodic updated information on the types and quantities of HW generated on the national level	- Contributes to realizing proper HW management in the generating sector - Is a valuable source of information regarding status of HW management on the national level and areas of weaknesses and strengths - Provide information on newly established facilities generating HW	- Presents a tool facilitating the process of HW data collection - Is an important source for information feeding into the process of annual update and strengthening of the national HW inventory.

a) Audits of hazardous wastes

They are methodical processes which enable the identification of the amount of HW generated by activities in any establishment (industrial, institutional or other). A HW audit aims at providing information about the status of HW management within establishments, including the identification of sources, quantities, degree of hazard, current management of each of the hazardous waste stream, the storage practices, treatment and/or transportation processes. During a HW audit, attention should be given to the possibility of minimizing waste generation, that is, technical, environmental and financial feasibility for waste minimization.

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. To this extent, the data from the audit can strengthen a national inventory of hazardous wastes.
Appendix (4) presents example for a structured audit format

b) Hazardous waste register

Maintaining and updating a HW register/record is a responsibility of the waste generator. It is a continuous recurrent process, that should be carried out 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.

Depending on the national regulations in place in the different countries, HW registers could either be kept and maintained on-site (within the generating establishment) and made available for the periodic inspection of the concerned authorities, or it can be sent to the regulatory/licensing body as regular reports.

Appendix (5) presents proposed form of a HW register and the types information to be included and self monitoring checklist for proper HW management.

c) Inspection reports

The inspection reports are prepared by the concerned regulatory government bodies. The reports include data regarding HW generated by the different generating establishments and the violations detected. If required, inspection reports can include results of sampling and analysis. Appendix (6) presents example for HW inspection checklist which can be used by inspectors during field visits.

6.3.4 Fixing formats of documents

Pre-planning 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 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. 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 actors 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
  The information received by the different actors and through field validation need to be maintained in a central database located at the Ministry responsible for the environment and is accessible for data retrieval by the concerned entities. Figure (3) shows an example for an electronic database format.

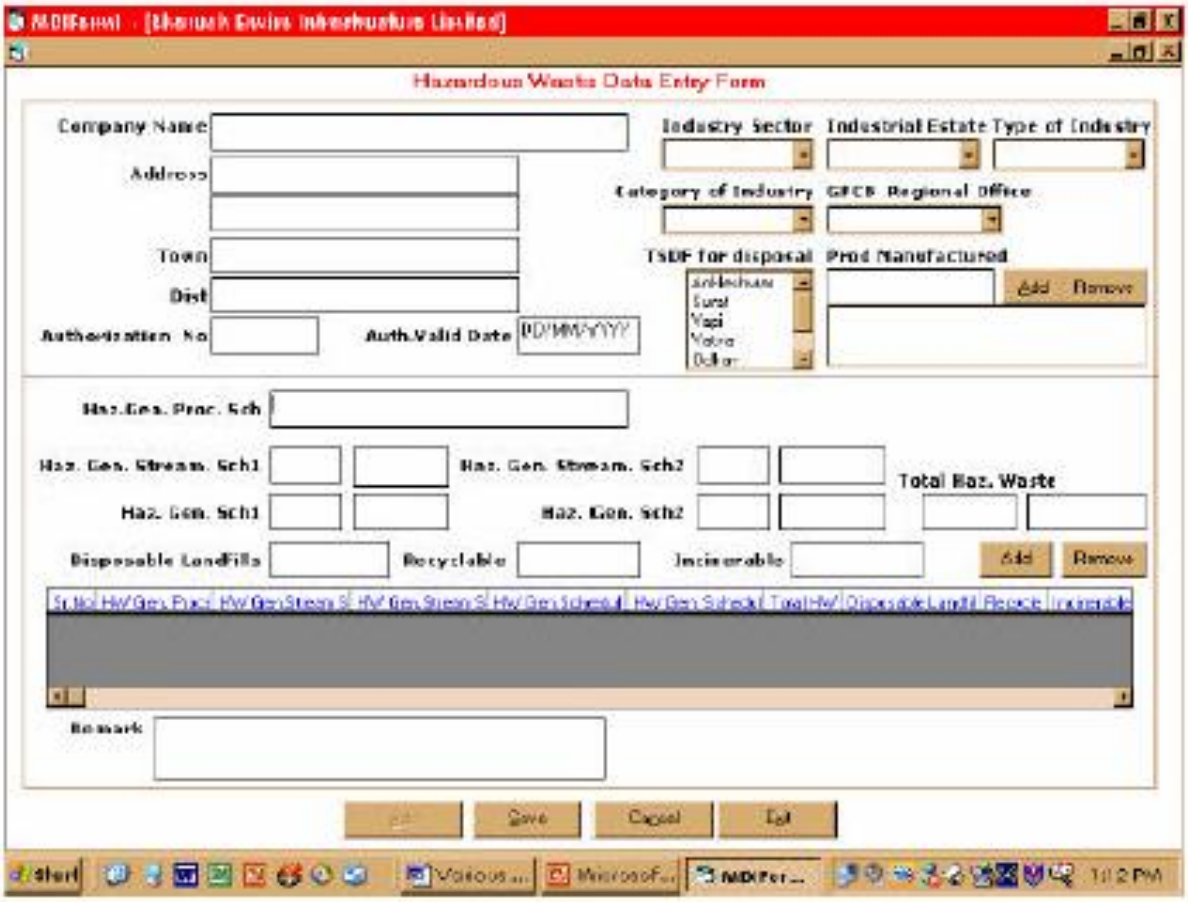

Figure 3: Example of an electronic databse format

6.3.5 Interface with other environmental databas

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).

6.3.6 Documents

There is a large variety of documents linked to the management of hazardous wastes. They include 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 included in the different documents listed above. It would be preferable to be able to guide the actors through these various documents in an easy and congenial way.

6.3.7 Maintenance of the inventory and fine-tuning of the data

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 space. Thus, for example, factors such as the modification of raw material inputs, the change or addition of a less polluting substances 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.

6.4 Government policies regarding communication of information on hazardous wastes

Government authorities will be responsible for the content and the maintenance of the database backing the national inventory of HW. These same authorities should ensure that the following aspects of information management contained in the database are addressed, 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;
- Regarding 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.

References:

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- The European Union, Commission Directives 79/831/EEC and 84/449/EEC amending the Council Directive 67/584/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances
- United States Environmental Protection Agency Office of Compliance: Sector Notebook Project (1995), Profile of Textile Industry
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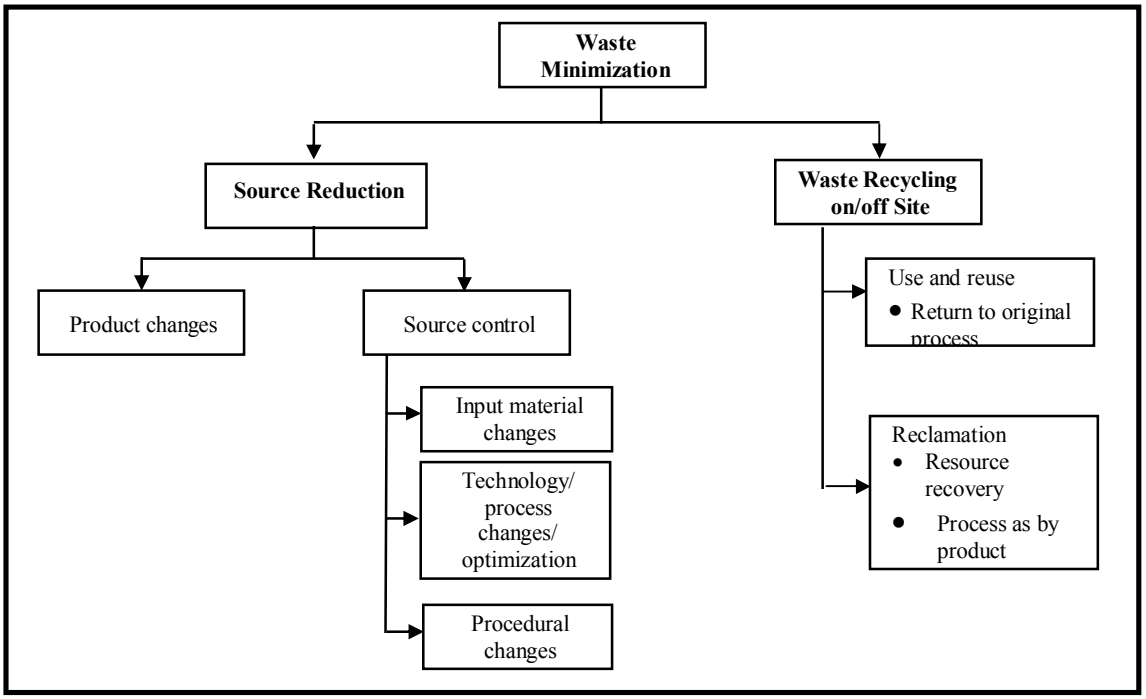
- United States Environmental Protection Agency Office of Compliance: Sector Notebook Project (1995), Profile of Metal Industry
- Egyptian Law 4 for 1994 for the Environment and its Executive Regulations
- United Nations Statistic Division website: ***http://unstats.un.org/unsd/cr/ctryreg/ctrylist2.asp***
- USEPA website: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846* ***http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm***
- USEPA Code of Federal Regulations, 40 CFR 350.27

Appendix 1

Options for Hazardous Waste Minimization

Minimization of hazardous waste could be achieved by a number of methods, as presented schematically below. It is important to point out that each any of these methods can be adopted within its individual financial and technical capabilities of the establishments and according to its own circumstances and policies.



Source Reduction

- Source reduction is the use of materials, processes, or practices that reduce or eliminate the generation of wastes at the source. This option is considered the most rational as it aims at avoiding or preventing the generation of the waste in the first place. The adoption of source reduction approach is usually encouraged because it is often the most cost-effective option as it may reduce raw material losses, energy and water consumption, the reliance on expensive "end-of-pipe" treatment technologies and disposal practices and most importantly reduces the potential liability associated with improper management of waste.
- Source reduction involves product change and source control.

  Product change

  This involves the replacement of a product with another one suitable for the same end use, with the generation of less or no hazardous waste. Hazardous waste can be minimized by eliminating the use of hazardous material from the product design. For instance, if the product contains lead or mercury it could be possible to redesign it so that the hazardous substances are eliminated from the production process. Examples for product change include:

- Batteries can be redesigned such that the toxic constituents, for example mercury and cadmium are reduced or eliminated.
- Using PET (Polyethylene Terephthalate) instead of PVC (Polyvinyl Chloride) in pipes and plastic manufacturing
- Designing products for disassembly so that they are easy to repair, upgrade or disassemble at their end-of life.

Source control

Source control encompasses input material substitution, re-engineering production processes and/or improving procedural practices.

- *Input material changes*

  Changing the used hazardous input materials can contribute to reducing the generation of hazardous waste. This reduction can be achieved by replacing the hazardous input materials with less or non-hazardous ones. Replacement of hazardous input materials involves carrying out product inventories and examining the uses of the existing materials and identify those that can be replaced. A major consideration for a successful input material change is whether the substitute provides acceptable results. Therefore product efficiency, using the substitute, is to be comprehensively investigated. Examples for input materials substitution include:
  - The use of non-toxic, non-carcinogenic dyes with no heavy metal content in the textile industries
  - The use of water-base inks and pigments instead of the solvent-base ones.

- *Technology/ process changes*

  This option can be implemented through improving or modifying the existing technologies used in production processes. Process modification ranges from eliminating leaks from the existing equipment, to installing of new advanced equipment. A product can sometimes be manufactured by alternative processes. A certain process can generate less waste than another. In this regard, industries can change the used, more polluting, process to the less polluting one. Modification of equipment and process automation are also means for waste minimization.

- *Process control/optimization*

  Process control and optimization would most likely result in the generation of less waste.

- *Good housekeeping*

  Good housekeeping or sound procedural practices play a considerable role in controlling waste at source. These practices contribute to a great extent in minimizing the losses of input materials and eliminating leaks and spills of hazardous materials from the processes. Periodic maintenance, continuous checkup, and leak detection plans are considered important components of good housekeeping practices. Good practices also include efficient hazardous waste segregation

from other non-hazardous waste streams, thus facilitating its handling and management. Finally, raising the environmental awareness of all workers and employees, as well as the continuous training is regarded as a major factor in achieving the goals of waste minimization schemes.

Reuse/Recycle/Recovery

If source reduction is not feasible, the second best waste minimization option is to recycle and/or reuse the generated hazardous waste.

- *Reuse*

  Reuse refers to the direct use once more of the waste, in the form it is generated in, in the same industrial process it is generated from, or in another processes, without the need for prior treatment or modification. Reuse may also be an exchange of waste that can be practiced in-house or among different industries. Examples for waste reuse:
  - Reuse of solvents for equipment cleaning
  - Reuse for acidic and alkali solution
  - Reuse of ferric chloride waste from manufacture of titanium oxide as wastewater conditioner
  - Reuse of chromium solutions in tanneries

- *Recycling*

  This involves prior treatment of waste so that is can be used as raw materials in the same process it is originating from, or in other processes. Recycling of waste is characterized by two major practices additional to direct waste reuse as discussed above. These are:
  - Recovery of a secondary material for a separate end use such as the recovery of a metal from sludge
  - Removal of impurities from a waste to obtain relatively purer substances which can be reused

- *Recovery or reclamation*

  This involves recovering and treating "waste" byproducts to be used as raw materials in the same or another process. Reclamation processes include chemical, physical and electrochemical separation, some of the major reclamation technologies include the following:
  - Distillation of solvent wastes
  - Dechcloronation of halogenated solvent wastes
  - Metal concentration techniques such as leaching, solvents extraction, ion exchange, precipitation, crystallization, and evaporation to treat dilute metal-bearing waste streams

Appendix 2

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 2-1: 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 of Basel Convention

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	The majority of manufacturing sector industries
Y10	Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polychlorinated biphenyls (PBBs)	The majority of manufacturing sector industries
Y17	Wastes resulting from surface treatment of metals and plastics	Surface treatment of metals

In table 2-2 are shown the categories (classes) of characteristics of hazard used by the Basel Convention,

Table 2-2: Hazard: definitions and parameters used

Class under Annex III	**Basel Convention definition**	**United Nations classification**	**Classification parameters/orange book**
H1	Explosives	**1**	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 **Example: Trinitrotoluene waste (T.N.T.) humidified with at least 30% of water (Y15)**
H3	Flammable liquids	**3**	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. **Example: Organochloride insecticide wastes, liquid, inflammable and toxic, n.o.s.[33](Y45), used solvents (Y42).**
H4.1	Flammable solids	**4.1**	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.
H4.2	Substances or wastes liable to spontaneous combustion	**4.2**	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) **Example: Wastes from metal catalysts, dry or wet, with zinc (Y23)**
H4.3	Substances which, in contact with water emit flammable gases	**4.3**	Wastes which in contact with water emit flammable gases

H5.1	Oxidizing substances	**5.1**	Wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.
H5.2	Organic peroxides	**5.2**	Wastes which contain the bivalent-0-0 structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
H6.1	Poisonous (acute)	**6.1**	Wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact. **Example: Arsenic trioxide (Y24). Residual sludge from treatment of effluents from galvanoplastic operations (Y17)**
H6.2	Infectious substances	**6.2**	Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans. **Example: Pathological and infectious hospital wastes (Y1)**
H8	Corrosives	**8**	Wastes which, by chemical action, will cause severe damage when in contact with living tissue **Example: Used pickling solutions from steel-making operations (Y34)**
H10	Liberation of toxic gases in contact with air or water	**9**	Wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
H11	Toxic (Delayed or chronic)	**9**	Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity
H12	Ecotoxic substances	**9**	Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems. **Example: PCBs: polychlorinated biphenyls (UN2315) Y10**

H13	Substances capable of yielding another material which possesses any of the characteristics listed above.	**9**	Wastes capable, by any means, after disposal, of yielding another material, which possesses any of the characteristics listed in Annex III. **Example: Leachate originating from an encapsulation site for solid wastes or from a maximum containment site for inorganic hazardous wastes (Y18)**

33 N.o.s. not otherwise specified.

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 B-3: Examples applicable to Annex VIII

Code of waste under Annex VIII	Definition of waste under Annex VIII	Potentially generating industries
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

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 listB

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[35] 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)

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 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

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

A4 <u>Wastes that may contain either organic or inorganic materials</u>

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, 38 or unfit for their originally intended use

A4040 Wastes from the manufacture, formulation and use of wood-preserving chemicals

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)

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 congenor of polychlorinated dibenzo-furan
- Any congenor 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 [40] 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)]

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 [41]

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 [42]

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 extend 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 43 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, electronic components and wires) destined for direct reuse, 44 and not for recycling or final disposal 45

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 Cerium
  - Praseodymium Neody
  - 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 TiO2 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 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 <u>Wastes containing principally organic constituents, which may contain metals and inorganic materials</u>

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 [46]:

  - 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
  - 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 47

  - perfluoroethylene/propylene (FEP)
  - perfluoroalkoxy alkane (PFA)
  - perfluoroalkoxy alkane (MFA)
  - polyvinylfluoride (PVF)
  - polyvinylidenefluoride (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

  - laminated paperboard
  - 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)
  - 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 fibers (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 garnetted 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 fibers, not elsewhere specified or included
- Waste (including noils, yarn waste and garneted stock) of man-made fibers
  - 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 <u>Wastes which may contain either inorganic or organic constituents</u>

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

Appendix 3

Common Examples of Industrial Activities And Processes Generating Hazardous Waste

Industrial Activity	Waste Type	Generating Process
Pulp and paper	- Sludges contaminated with chlorinated organic compounds, dioxins, furans and chlorophenols, peroxides	- Bleaching processes
	- Sludges containing organic solvents (eg. xylene, benzene, etc.) and heavy metals (eg. chromium VI)	- Treatment of de-inking effluents from paper recycling
	- Wastewater containing sodium hydroxide and sodium sulfide	- Delignification process
Leather and fur	- Waste containing solvents such as ethers	- Leather degreasing
	- Pickling liquor containing chromium	- Tanning process
	- Sludges containing chromium	- Wastewater treatment plant (WWTP)
	- Tanned leather contaminated with chromium	- Finishing process
Textile	- Waste containing organic halogenated solvents (eg. dichloromethane) and non-halogenated solvents (eg. xylene, toluene, etc)	- Finishing process
	- Wastes containing peroxides, sodium hypochloride, chlorine	- Bleaching processes
	- Highly alkaline effluents	- Scouring process
	- Waste dye stuff and pigments), containing azodyes, heavy metals (Cd, Cr)	- Storage - Dyeing and printing
	- Sludges containing cadmium, arsenic, lead, hexavalent chromium, arsenic, mercury, halogenated organic solvents	- Wastewater treatment plant (WWTP)

Industrial Activity	Waste Type	Generating Process
Chlor-alkali	- Chlorinated hydrocarbon liquid waste	- Electrolytic processes
	- Flue gases, containing traces of chlorinated hydrocarbons	- Incineration of the chlorinated hydrocarbon liquid waste
	- Chlorine off-gases	- Electrolytic processes Chlorine plant
	- Liquid acidic waste (spent acids)	- Drying of wet chlorine
	- Alkaline effluents	- Caustic soda processing
Iron and steel	- Sludge containing heavy metals eg. lead and cadmium	- Process of off-gases treatment, of electrical arc furnaces
	- Skimmed oil - Sludges containing oil	- Spent cooling water (machinery cooling water) treatment
	- Slags containing heavy metals	- Melting process (furnace sludge)
Pesticide	- Waste, containing organophosphorous compounds (organophosphorous pesticides, thiophosphates)	- Manufacturing processes residues
	- Halogenated organic solvents, washing solutions, and mother liquors	- Equipment cleaning and washing (storage tanks, vessels
	- Sludges (halogenated filter cakes)	- Filtration process
	- Outdated pesticides and/or ones off- specifications	
	- Sludges from effluent treatment	- Wastewater treatment plant (WWTP)
Dyes and pigment	- Aqueous washing liquids and mother liquors - Waste halogenated organic solvents	- Equipment (tanks, vessels, mixers, mills, and reactors) cleaning and washing
	- Halogenated still bottoms	- Still bottoms residues
	- Sludges contaminated with heavy metals, waste pigment and dyes	- Wastewater treatment (WWTP)

Industrial Activity	Waste Type	Generating Process
Paints, printing inks, alkyd resins, and varnishes	- Waste solvents, containing paints/ inks/ varnishes/ resins	- Equipment (tanks, vessels, mixers, mills, and reactors) cleaning and washing
	- Sludge containing pigments, oils, fatty acids, fillers, and solvents	- Paints, resins, varnishes, and inks filtration process
	- Sludges containing pigments, fillers, and other additives, containing heavy metals (cadmium, chromium, lead, mercury, oils etc..	- Wastewater treatment (WWTP)
	- Spent filter bags, containing pigments and chemicals	- Filtration
Soap, fat, grease detergents, disinfectants and cosmetics	- Sludges from effluent treatment (heavy metals, waste oils/ water, hydrocarbon/ water mixtures and emulsions)	- Wastewater treatment (WWTP)
	- Halogenated filter cakes and spent absorbents (fuller earth)	- Bleaching
Metallurgical industry	- Sludges; tars and other carbon-containing waste from aluminum metallurgy	- From anodic process - From secondary smelting
	- Black drosses containing heavy metal from aluminum industry	- From secondary smelting
	- Slags/ white drosses containing heavy metals)	- From secondary smelting
	- Spent pot lining (cyanide compounds) from aluminum metallurgy	- Maintenance of smelting furnaces
	- Salt slags containing inorganic fluoride compounds from aluminum metallurgy	- From secondary smelting
	- Sludges (heavy metals)	- From off-gases treatment
	- Slag (Calcium arsenate) from lead metallurgy	- From secondary smelting
	- Leaching residues, dust and sludges such as jarosite, hematite, etc from zinc metallurgy	- From secondary smelting

Industrial Activity	Waste Type	Generating Process
Fabricated Metal (Metal treatment , finishing, and coating)	- Cyanidic alkaline waste	- Galvanization process
	- Waste acidic pickling solutions - Spent acids and alkalis solutions	- Pickling process - Etching process
	- Sludge from WWTP, containing heavy metals	- Wastewater treatment (WWTP)
	- Oil , emulsions and grease	- Drilling and cutting machines - Degreasing before painting
	- Waste solvents	- Painting processes
	- Heavy metal solutions	- Metal finishing processes
Electronic industry	- Waste acidic pickling solution	- Pickling process - Etching, processes
	- Sludges or solid waste containing heavy metals	- Wastewater treatment (WWTP)
Petroleum refining	- Crude oil and products storage Tanks bottom sludge	- Storage tanks
	- Sludges from WWTP (API separators, DAF unit, and biological unit)	- Wastewater treatment (WWTP)
	- Spent catalyst	- Catalyst replacement
	- Solid waste, catalyst fines	- Catalyst regeneration
	- Desalter sludge, containing oil, heavy metals	- Crude oil desalting process
Coolants, foam/aerosol propellants	- Spent halogenated solvents and solvent mixes	- Manufacturing (synthesis) processes
	- Sludges and solid waste containing halogenated solvents or other solvents	- Process leaks or spills - Wastewater treatment (WWTP)

Appendix 4

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 4-1 as follows:

Table 4-1: 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

Before 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 54
  - 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.
54 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.

Comments:

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 the following table.

Table (4-2)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
Storage of raw material	*North-west corner of site*		
Washing operations	*Washing of raw materials north-west corner of factory*	*Use of sedimentation bath (5m3) equipment 15 years old*	
Heating and mixing of raw materials			
Casting of semi-finished product sourced from previous stage			
Used oil spillages	*On ground near repair workshop*		
Treatment of industrial effluents			*Refer to specific field work sheet*
Others			

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* (4.3): Details of stored raw materials: losses due to storage and maintenance

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

H3: Inflammable liquids.

B) Table (4.4): Storage of obsolete raw material or other substances

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

H3: Inflammable liquids

C) Table (4-5): Storage of wastes

Waste	Suspected hazard classification57	Quantity stored MT	Type of storage	Period of storage	Storage conditions
Processing sludge in factory drainage tank	**H8**	5 m^3	Stockpiled	For 6 months	No protection
Obsolete transformer with PCB	**H11**	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

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

A) Breakdown and identification of production processes used

Production chart

B) **Table (4-6): Examples: Data for residues/wastes generated by each separate subprocess**

Operations/subprocesses	Function of operation	Water consumption (litres/time	Treatment of liquid wastes	Data on quantity58 and frequency of residue at exit point
1. Raw material washing operation	*Washing of raw material in sedimentation bath*	*5 m^3 / lot 3 lots/day*	*None, the liquid waste goes directly into the river without treatment*	*1 m^3 /month of sedimentation sludge from rinsing of tank*
2. Heating and mixing of raw material				
3. Casting of semi-finished product sourced from previous storage				
Mobile equipment			*None*	*Used oil 200 litres/month*

Comments:

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 (4-7): Waste treatment systems

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

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 (4-8): Characterization of wastes

Sources	Residues	Sampling	Results of characterization
Subprocess 1.0	**B 3020**	Yes/no	Hazardous or not
Subprocess 2.0	**A 1130**	Not necessary	Not applicable

Subprocess 3.0 Storage area	**Y45**	yes	Hazardous or not

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 (4-9): Findings

Sources	Residue class code identification under Basel	Characteristics: degree of hazard, physical state	Quantity MT/year
Subprocess 1.0 Storage area	**B 3020**	**H6.2**	457 MT/year
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 (4-10): Current management of hazardous wastes

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

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 (4-11) 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 (4-12): Minimization options

Number	Activity minimizing or helping to minimize the generation of hazardous wastes	Comments
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.

Appendix 5

Model for Hazardous Waste Register

Instruction for filling in the register

1. This is a register where the generated HW is to be recorded.

2. A designated person should be responsible for filling the register. His name and position are to be stated in points 4 and 5 of section I.

3. The time period covered by the current data (point 5, section I), is that time period for which the hazardous waste data provided in section II and III are valid.

4. The frequency for filling in this register depends on the amounts of hazardous waste generated.

I) General Information

1. Name of the Establishment: ……....

2. Name of owner of the Establishment…….

3. Address:…….……..Tel:…… ……..……

   District:..……Governorate……..……

4. Name of the person responsible for filing the register: …….……...…….

5. Job title of the person responsible for filing the register:….……

6. The period covered by the current data:……...……

7. Signature of the officer in Charge: ……...……...…..

II) Types and Quantities of Generated Hazardous Waste:

Type and Source of Hazardous Waste	Date for Production and Packaging of Containers	Quantity	Active substances and its Concentration	Physical Status

III) Methods of Hazardous Waste Disposal

Type of Hazardous Waste	Quantity Disposed of	Disposal Method (transportation outside the facility/incineration/landfilling/…)	Name of waste transporter

IV) Licensed HW Transporter

Name of transporter	Type of license (treatment/ off-site disposal)	Types of Waste delivered	Quantity delivered

Appendix 6

Model for Hazardous Waste Inspection Checklist

I

Requirement		Compliance status		Comments
		Yes	No	
1	**Generation of HW**			
1.1	From the gathered background information, is the establishment likely to generate HW?			
2. Document Review Check that all documents relevant to HW management are available (eg. The HW register, the emergency plan, etc..) according to the legal requirements				
Note: if the inspection team suspects that HW is generated (based on preliminary data collected and the industry background). The team is to completed sections (3) and (4).				
3	**HW generating Units**			
3.1	Identification of HW generated quantities			
3.2	Are the quantities of generated HW consistent with quantities stated in the HW register?			
3.3	Is HW segregated from one another as well as from other non-HW?			
3.4	Are the HW collection containers of adequate capacity?			
3.5	Does the establishment ensure that **no** HW is accumulated/ stored at the generating units for long periods?			
3.6	Is the generated HW transferred to the main HW storage area?			
3.7	Are the employees aware of proper HW handling and trained to act in emergency cases?			
Note: If the inspector identifies possible HW minimization opportunities during the field inspection of HW generating units, he/she should briefly discuss it with the establishment's representatives during the closing meeting.				
4.	**Utilities for HW management**			
4.1	***On-site Treatment of HW***			
4.1.1	Is the treatment process consistent with the legal requirements?			
4.1.2	If HW is generated from the treatment process, is the waste properly identified and quantified?			

4.1.3	Is the HW from the treatment process separated from one another as well as from other non-HW?			
4.1.4	Are the employees aware of proper HW handling and trained to act in emergency cases?			
4.2	***On-site storage of HW***			
4.2.1	Is there a specifically designated HW storage area?			
4.2.2	Is the storage area meeting the legal requirements?			
4.2.3	Are the storage containers meeting the legal requirements?			
4.2.4	Are there clear labels inscribed with the required information on the containers?			
4.2.5	Is the storage area suitable for the types and quantities of waste stored?			
4.2.6	Are the types and quantities of stored HW consistent with the information in the register?			
4.2.7	Are the employees aware of proper HW handling and trained to act in emergency cases?			
4.3	***On-site disposal of HW*** ***If a specifically designated HW disposal area is available on-site:***			
4.3.1	Is this area meeting the legal requirements?			
4.3.2	Is disposal taking place in accordance to legal requirements?			
4.3.3	Are the quantities and types of HW disposed of consistent with the information in the register?			
4.4	***HW transport vehicles*** ***If the establishment transports HW:***			
4.4.1	Are the vehicles meeting the legal requirements?			

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The BCRC-Egypt is presenting these guidelines to contribute to the capacity building of the Arab region to adopt sound management of hazardous wastes and for more efficient implementation of the Basel convention. It is needed that those who read these guidelines and would like to contribute to their improvement in future editions to contact BCRC-Egypt at
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