



MANUAL ON INDUSTRIAL HAZARDOUS WASTE MANAGEMENT FOR AUTHORITIES IN LOW AND MIDDLE INCOME ECONOMIES

- Table of contents, preface, how to use the manual, acronyms, glossary, interesting links, list of figures and tables

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• Preface

With this manual GIZ addresses primarily competent authorities in low and middle income economies envisaging to establish a hazardous waste (HW) management system or to improve an existing system. It provides basic principles and key information on how to establish and apply a hazardous waste management system in a country or a region.

The manual shall serve as a basic reference document for all departments involved and all levels of authorities to achieve a multiplier effect and overall awareness of the importance of taking proper actions as an administrative body. The countries concerned might have different needs and start at different levels to set up or improve their waste management system.

The manual gives an overview on key issues related to legal requirements and practical procedures pertaining to environmentally sound HW management, taking into account and referring to requirements, recommendation and guidelines provided by Basel Convention and OECD where relevant and providing provisions and procedures from the European Union as model examples in particular.

This manual is a kind of compendium of relevant existing hazardous waste data divided in 9 thematic modules namely:

Module 1: Hazardous waste generation- summary and basic policy principles of adequate waste management

Module 2: Legal Frame, International agreements and EU waste legislation

Module 3: Guidance, training, education, capacity building for waste generators and transporters. On-site HWM, preparation for transport of dangerous goods and control of hazardous waste transport

Module 4: Allocation of hazardous waste to treatment and disposal facilities (with two supplements)

Module 5: Practical aspects of implementation and enforcement / Permitting and Inspection (HW incinerators and landfills)

Module 6a: Incinerators and Air Pollution Control

Module 6b: Co-processing: a hazardous waste incineration option

Module 7: HW Landfills and underground disposal of HW

Module 8: Waste management planning (with one supplement)

Module 9: Factors contributing to the success of a hazardous waste management system in a country, a summary.

But the manual should also serve as ready information tool for the private sector, local consultants, students, journalists and NGOs in low and middle income economies on the salient features of an efficient hazardous waste management system.

Hazardous waste is an unavoidable by-product of industrial processes. Therefore, management of hazardous waste is indispensable. Sound hazardous waste management will prevent harm to the environment and human health by detoxification, safe incineration or safe disposal of dangerous substances. For this purpose, all stakeholders, including small and medium scale enterprises (SMEs) have to get involved with hazardous waste management. However, the integration of SMEs into a sound hazardous waste management system in a specific country remains a big challenge.

Competent authorities should play a key role in supporting actively SMEs to adhere integrally to a waste management system.

With this manual we also want to change the perspective of HWM. The management of hazardous waste should be seen more as a resource efficiency activity (with emphasis in avoidance/substitution, reuse, recycle) in the frame of a circular economy rather than only the management of hazardous and non hazardous wastes. The field of recycling and pretreatment of wastes (secondary raw materials) is developing very fast and is creating new green jobs in countries where this approach is been implemented. In Germany already in 2009 by using secondary raw materials 13% of the needed raw materials by the local industry could be covered with secondary raw materials¹.

Examples and technical information illustrate the implementation of hazardous waste management at the example of EU Member States, in particular Germany. Throughout the text some examples of a project carried out by the German International Cooperation in China are given. These case studies show the practical implementation of the information and knowledge laid down in the manual.

Also examples and best practices from different low, middle and high income economies dealing with the management of six major hazardous wastes types (industrial waste, e-waste, hospital waste, PCB waste, asbestos waste and lead batteries waste) are presented in a separate document.

¹ 2010 Study of The Cologne Institute for Economic Research http://www.bde-berlin.org/wp-content/pdf/2010/20100909_iw_studie.pdf

- **How to use this manual**

Hazardous waste management is a large and complex subject. The manual is meant to provide the fundamental information, but does not claim to be complete. However, the manual provides reference to additional sources if more detailed information is desired.

The glossary contains the definitions of the main terms used, which can be used as a quick guide of these most useful definitions. However, in the majority of the cases the terms used are described and explained in the text or a reference is given.

Where appropriate, the main statements made in the chapters and important definitions are highlighted in boxes. Thus, quick readers may refer to the boxes for a short outline of the main points of the respective chapter.

The structure of the manual permits its use according to the need of the reader. If only a quick overview is needed, the reader can refer to the summary box at the end of each chapter.

In order to facilitate the acquisition of further information references include hyperlinks (the respective text appears in blue and underlined), which can be used to retrieve further information from the World Wide Web.

Both in drafting legislation and in establishing the corresponding enforcement system keep in mind the practicability and efficiency of envisaged measures and the provisions. It is recommendable to take a stepwise approach, starting from more basic requirements to a sophisticated system and from more simple treatment to the higher end of what is technically possible. Nevertheless legislation and enforcement should be organized in a way to ensure and promote constant improvement, expansion and further development of the system.

In addition, please be aware that hazardous waste is only a part of the waste generated by societies and that a comprehensive waste management system also needs to address any other waste streams, namely municipal solid waste, agricultural waste, sewage sludges and construction and demolition waste.

The majority of the recommendations provided in this manual can be applied in principle also for these other waste streams. In addition, the mentioned waste streams are more and more contaminated with hazardous compounds as new products with other materials than just natural ones are increasingly used also in households and commerce or construction.

• List of Acronyms and Abbreviations

ADR:	<u>a</u> ccord europ <u>e</u> en relat <u>i</u> f au transport international des marchandises <u>d</u> angereuses par <u>r</u> oute = European agreement concerning the international carriage of dangerous goods by road
ANC:	Acid Neutralization Capacity
AOX:	Adsorbable Organic <i>Halogen</i> Compounds
AFR:	Alternative fuels and raw materials
APC:	Air Pollution Control
BAT:	Best Available Technology
BMZ:	German Federal Ministry for Economic Cooperation and Development
BOO:	Build Own and Operate
BOOT:	Build Own Operate and Transfer
BOT:	Build Own and Transfer
BREFs:	Best Available Techniques Reference Documents
BS EN ISO:	British Standards (BS) European Standards (EN) International Organisation for Standards (ISO)
BTEX:	Benzene, Toluene, Ethylbenzene, Xylenes
C:	Confirmation (Behördliche Bestätigung, BB)
°C:	Degree Celsius
C&D wastes:	construction and demolition wastes
CEC:	North American Commission for Environment Cooperation
CEN:	Comité Européen de Normalisation = European Committee for Standardization
CN:	Consignment Note (Entsorgungsnachweis)
CPT:	Chemical/ physical and biological treatment
CS:	Cover Sheet
DAC:	Declaration of Acceptance
DAN:	Declaration Analysis (Deklarationsanalyse)
DOC:	Dissolved Organic Carbon

DMSO:	Dimethylsulfoxide
DN:	Diameter Nominal, international standard for internal pipe diameters, e.g. DN 300 = (Pipe with an) internal diameter of 300 mm.
DR:	Declaration of Responsibility
ECJRC:	European Commission Joint Research Center
EECZ:	Environmental-oriented Enterprise Consultancy Zhejiang
EIT:	Economies in transition
ELV:	End of life vehicle (= scrapped cars)
EN :	European Norm
EPA:	Environmental Protection Agency
EPB :	Environmental Protection Bureau, China
ESM:	Environmentally Sound Management
EU:	European Union
EWL:	European Waste List
Fig.:	Figure
GDP:	Gross Domestic Product
GSB:	Sonderabfallentsorgung Bayern GmbH (Bavaria Hazardous Waste Disposal Corporation)
GHS:	Globally Harmonized System of Classification and Labelling of Chemicals
H-criteria:	Hazardous Criteria, Hazardous properties of waste
HCW:	Healthcare waste
HCWM:	Healthcare waste management
HIM GmbH:	Hessische Industriemüll GmbH (HW Disposal Corporation in the state of Hesse)
H _s :	Gross Calorific Value
HWI:	Hazardous Waste Incineration
HWL:	Hazardous Waste Landfill
HWM:	Hazardous Waste Management
HWMIP:	Hazardous Waste Management Infrastructure Plan

IBC:	intermediate bulk container
IPPC:	Integrated Pollution Prevention and Control
IT:	Information technology
kN/m ² :	kilo Newton per square meter (1 kN/m ² = 1000 Pascal)
KJ/kg:	Kilojoule per kilogram
LDC:	Less developed countries
LRMC:	Long run marginal costs
L/S:	Liquid to Solid Ratio
LOI:	Loss of Ignition
MEAs:	Multilateral environmental agreements
Mg:	Megagram = (1000 kg = 1 metric ton)
MJ:	mega Joule
μS/cm:	micro Siemens per centimeter
MSDS:	Material Safety Data Sheet
MSW:	Municipal Solid Waste
NACE:	Nomenclature of economic activities in the CE
NO _x :	Nitrogen Oxides
OECD:	Organisation for Economical Co-operation and Development
OsWI's:	On site waste investigations
PAH:	Polycyclic Aromatic Hydrocarbons
PCB:	Polychlorinated Biphenyls
PCDD:	Polychlorinated Dibenzo-p-Dioxin
PCDF:	Polychlorinated Dibenzofurans
PCP:	Pentachlorophenol
PIC:	Prior Informed Consent
PPE:	Personal Protective Equipment
POP:	Persistent Organic Pollutant
NGO:	Non-Governmental Organization

REACH:	Registration, Evaluation, Authorisation and Restriction of Chemicals
RPWM:	Record of Proper Waste Management
SEPA:	State Environmental Protection Agency, China (today Ministry of environment (MEP))
SMEs:	Small and Medium scale Enterprises
SDS:	Safety Data Sheet
SSE:	small size enterprise
SSL:	Software Site License
SWMIS:	Solid Waste Management Information System
TCDD:	Tetra chlor benzodioxin
TCLP:	Toxicity Characteristic Leaching Procedure
TDG:	transport of dangerous Goods
TDS:	Total amount of Dissolved Substances
TFS:	transfrontalier shipment notification document
TOC:	Total Organic Carbon
TSCA:	Toxic substances control act
UGL:	Underground Landfill
UN/ADR:	United Nations/European agreement concerning the international carriage of dangerous goods by road
UNCED:	United Nations Conference on Environment and development
UNECE:	United Nations economic Commission for Europe
US:	United States
VHHC:	Volatile Halogenated Hydrocarbons
VOC:	Volatile Organic Compounds
WBCSD:	World Business Council for Sustainable Development
WEEE:	waste electric electronic equipment
WHO:	World Health Organization
WMO:	Waste management officer
ZSWMSC:	Zhejiang Solid waste Management and Supervision Center

• Glossary

Absolute entries

Absolute entries are entries of waste categories in the European Waste List which are considered as “absolute” hazardous regardless of any threshold concentrations

BAT

'BAT` stands for Best Available Techniques. In the sense of EU IPPC legislation (namely Directive 2008/1/EC), “Best Available Techniques “means the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole:

- 'techniques` shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned

- 'available` techniques shall mean those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator

- 'best` shall mean most effective in achieving a high general level of protection of the environment as a whole

Biological treatment

Destruction or degradation of a hazardous compound by microbes, e.g. PAH degradation by bacteria, chromium (VI) reduction by bacteria with the help of organic substances (molasses or oils)

BREFs

'BREFs` stand for Best Available Technique Reference Documents. Best Available Techniques Reference Documents (BREFs) are provided by Technical Working Groups for various industrial branches, e.g. for waste treatment industries, waste incineration, surface

treatment of metals and plastics or tanning of hides and skins². The Technical Working Groups include national experts and representatives from industry and environmental organizations. The information provided in the BREFs is focused on applied and emerging processes and techniques of a specific industrial branch and their performance as well as on the techniques to consider in the determination of Best Available Techniques. This information supports the evaluation of what is technically and economically achievable in terms of best environmental performance within waste management facilities. The [European IPPC Bureau](#) (see below) is in charge of the drawing up of BREFs

Chemical treatment

Destruction or change of a hazardous compound by a chemical reaction, e.g. reduction of chromium (VI) or oxidation of cyanide

Chemical Physical and Biological treatment (CPT)

Chemical/physical and biological treatment (CPT) can lead to a change in waste quality as well as be considered as a treatment and disposal process. As a rule, waste from CPT is assigned to a different waste code, if it is shipped to a subsequent treatment process (e.g. disposal to landfill, incinerator or to a waste oil redistillation plant). Therefore the allocation to a CPT plant is only the first step in a sequence of several treatment-, recovery- or disposal operations

Circular economy

In the sense of avoidance and usage of wastes, also now as closed substance cycle

Cleaner Production

Cleaner Production is the Manufacturing in which waste minimization and prevention practices are continuously applied. These practices include (1) conservation of raw materials and energy, (2) elimination of toxic inputs, and (3) reduction in toxic outputs³

Co-incineration

Often means the same as co-processing, exactly: only the energy potential of a waste is of interest and not the mineral components, e.g. organic chemicals for Portland cement production or light-weight fraction from the shredder in a blast furnace for pig iron production

² All BREF's can be retrieved at <http://eippcb.jrc.ec.europa.eu/reference/>.

³ [Business Dictionary](#)

Co-processing

Uses industrial by-products or other waste materials that are unable to be recycled, by incorporating the energy potential and mineral components of wastes into the manufacture of an essential product, the wastes are totally destroyed, e.g. during Portland cement production

Design for Environment (DfE)

Design for Environment (DfE) or Ecodesign are methods supporting product developers in reducing the total environmental impact of a product early in the product development process. This includes reducing resource consumption as well as emissions and waste. New EU directives such as WEEE and RoHS introduce the concept of ecodesign. A sound life cycle based Ecodesign can potentially enable to provide reliable decision support at a largely reduced effort for performing the study (Source: ECJRC)

Design for recycling (DfR)

Design for recycling is a method that implies the following requirements of a product: easy to dismantle, easy to obtain 'clean' material-fractions, that can be recycled (e.g. iron and copper should be easy to separate), easy to remove parts/components, that must be treated separately, use as few different materials as possible, mark the materials/polymers in order to sort them correct, avoid surface treatment in order to keep the materials 'clean' (Source: Danish EPA Eco Design Guide)

Eco-efficiency

Joint analysis of the environmental and economic implications of a product or technology, aiming to support choosing the method for production, service, disposal or recovery that makes most ecological and economic sense, ensuring optimum conservation of resources, minimum emissions and waste generation at a low overall cost (Source: ECJRC)

Ecotoxicity potential

Potential environmental toxicity of residues, leachate, or volatile gases to the biocoenosis of plants and animals. Ecotoxic substances alter the composition of the species of ecosystems, destabilizing it thereby and additionally threatening sensitive species in their existence (Source: EC Joint Research Center)

Environmental Risk Assessment (ERA)

Process of identifying and evaluating the adverse effects on the environment caused by a chemical substance. Often implied in the way, that an environmental exposure to the chemical is predicted and compared to a predicted no-effect concentration, supplying risk ratios for different environmental media (Source: ECJRC)

External costs

Cost not included in the market price of the goods and services being produced, but caused by e.g. emissions and damages these cause to goods and to the environment, which costs of repair or compensation are borne by the society in general (Source: ECJRC)

Environmentally sound management (ESM)

Taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes ESM of Waste” has always been referred to in most OECD Council Acts related to trans-boundary movements of wastes, as well as in other international, regional and/or national regulations, where it is one of the underlying principles of waste management policies. In these earlier OECD Acts, “environmentally sound management of waste” was considered to be a basic condition for allowing or prohibiting an export/import of waste within, as well as outside, the OECD area. However, it was also recognized that the scope and level of ESM varies greatly from one Member country to another. Lack of a clear definition and common understanding of ESM has led to challenges for the practical implementation of ESM instruments. Less stringent environmental controls, safety levels or human health standards (usually implying the lower cost options) in some countries have also created the potential for exporters, importers or waste managers to direct shipments of wastes destined for recovery to OECD countries and/or waste management facilities having lower waste management standards

Flash point

Flash point is the lowest temperature at which a liquid can form an ignitable mixture in air near the surface of the liquid. The lower the flash point, the easier it is to ignite the material

Flue gas

is the [gas](#) exiting to the atmosphere via a [flue](#), which is a pipe or channel for conveying exhaust gases from a fireplace, oven, [furnace](#), [boiler](#) or [steam generator](#). Quite often, the flue gas refers to the [combustion](#) exhaust gas produced at [power plants](#). Its composition depends on what is being burned, but it will usually consist of mostly [nitrogen](#) (typically more than two-thirds) derived from the combustion air, [carbon dioxide](#) (CO₂), and [water vapor](#) as

well as excess [oxygen](#) (also derived from the combustion air). It further contains a small percentage of a number of pollutants, such as [particulate matter](#), [carbon monoxide](#), [nitrogen oxides](#), and [sulfur oxides](#) (source: Wikipedia)

Green Procurement

A procurement process which takes into account environmental elements when buying products and services. To prevent a mere shifting of burdens of environmental damages among life cycle phases or among environmental problems, an effective Green Procurement should be based on a life cycle thinking or life cycle assessment (Source: ECJRC)

Green Public Procurement (GPP)

A procurement process carried out by public purchasers to take into account environmental elements when buying products and services. See also Green Procurement (Source: ECJRC)

Greenhouse effect

Warming of the atmosphere due to the reduction in outgoing long wave heat radiation resulting from their absorption by gases such as Carbon dioxide, Methane, etc (Source: ECJRC)

GHS

Globally Harmonized System of Classification and Labeling of Chemicals (GHS) “address classification of chemicals by types of hazard and propose harmonized hazard communication elements, including labels and safety data sheets. It aims at ensuring that information on physical hazards and toxicity from chemicals is available in order to enhance the protection of human health and the environment during the management, transport and use of these chemicals. The GHS also provides a basis for harmonization of rules and regulations on chemicals at national, regional and worldwide level, an important factor also for trade facilitation”⁴

The Globally Harmonized System for chemicals will be implemented in the EU in stages between 2009 and 2015. Between these periods the labeling and packaging of dangerous substances and preparations will change significantly. New GHS symbols must be used from specific dates, but may also be used voluntarily from January 2009. Also the material safety data sheet format and content according to GHS will be implemented in stages and will take

⁴ [UNECE](#), 2009b

years to be available worldwide. In 2015 the EU chemical Risk Phrases will be replaced by GHS Hazard Statements

GHS Hazard statements

The development of the Globally Harmonized System of classification and labeling of chemicals (GHS) has been initiated by the [UNCED Agenda 21](#)⁵, Chapter 19, Rio de Janeiro 1992. GHS hazard statements are statements developed as part of the Globally Harmonized System of Classification and Labelling of Chemicals with regard to the hazards, risks and the ability of chemical substances and mixtures to cause harm to the human health and the environment. Each statement is designated a code consisting of the starting letter H and followed by a number of three digits. In addition, the European Legislation provides supplemental hazard statements which are marked with EUH and a three digit number. The GHS hazard statements are supposed to replace the R-Phrases (see below) by 2015. The translation between the classifications is laid down in the [Regulation \(EC\) No 1272/2008](#)

GHS Symbol

The GHS (see above) symbol is part of the pictograms for hazard classes inside a red diamond. Each pictogram is defined by its color, symbol and the general format. Symbols may be exploding bomb, flame, gas cylinder, etc

Ground-level landfill

Disposal/land filling of hazardous waste near the surface, e.g. in a former clay-pit with technical protection layers

Hazardous waste

Wastes that because of their chemical reactivity, toxicity, explosiveness, corrosiveness, radioactivity or other characteristics, constitutes a risk to human health or the environment (Source: ECJRC)

Human toxicity potential (HTP)

The degree to which a chemical substance elicits a deleterious or adverse effect upon the biological system of human exposed to the substance over a designated time period (Source: ECJRC)

H-criteria/ Hazardous characteristics

⁵ UNCED, 1992

The Waste Framework Directive provides a framework for the classification of waste. A waste is considered hazardous when one of the fourteen specifically defined parameters in Annex III signifying the hazardous characteristics (e.g. explosive, flammable, toxic, etc.) of a substance or mixture is fulfilled. Each parameter, which is also referred to as H-criteria, is designated a code consisting of the letter H and an index number (e.g. H₁ explosive, H₂ oxidizing etc.)

Incineration

Burning of waste, e.g. hazardous waste in a rotary kiln with appropriate and approved emission control

IPPC

IPPC is the abbreviation for 'Integrated Pollution Prevention and Control' and refers to the [Directive 2008/01/EC](#) of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control, also called the 'IPPC Directive'. The IPPC Directive, which applies within the EU, sets down the ground rules of the permit procedure for industrial installations of particular environmental relevance. It aims at prevention and reduction of the emissions into the air, water and soil, as well as of the waste during the operation and following closure. To this end the industrial installations are urged to use Best Available Techniques (BAT, see above)

Integrated product policy (IPP)

Approach founded on the consideration of the impacts of products throughout their life-cycle to improve the environmental performance of products in a cost-effective way. (Source: ECJRC)

Internalization of externalities

Incorporation of an externality into the market decision making process through pricing or regulatory interventions. For example, internalization is achieved by charging polluters with the damage costs of the pollution generated by them, in accordance with the "polluter pays principle" (Source: ECJRC)

ISO 14000

A series of standards emitted or being prepared by the International Standards Organization (ISO), covering a number of environmental topics (Source: ECJRC)

ISO 14001

ISO standard on Environmental Management System, EMS that can be adopted by any organization (Source: ECJRC)

ISO 14040

ISO standard on Environmental Management System, EMS, concerning Life Cycle Assessment of products and processes. ISO 14040 is a framework for the standards ISO 14041, ISO 14042, and ISO 14043 that concerns the specific phases of an LCA. (The ISO standards 14041, 14042, and 14043 are integrated, harmonized, and replaced in 2006 by ISO 14044) (Source: ECJRC)

Kyoto Protocol

International treaty that was adopted at the Third Session of the Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC) in 1997 in Kyoto, Japan. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in Annex B of the Protocol (most OECD countries and EITs) agreed to reduce their anthropogenic emissions of greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆) by at least 5 % below 1990 levels in the commitment period 2008 to 2012 (Source: ECJRC)

Life cycle

Consecutive and interlinked stages of a product system, from raw material extraction, through production of materials and intermediates, parts to products, through product use or service operation to recycling and/or final disposal (Source: ECJRC)

Life cycle thinking (LCT)

The concept of Life Cycle Thinking integrates existing consumption and production strategies towards a more coherent policy making and in industry, employing a bundle of life cycle based approaches and tools. By considering the whole life cycle, the shifting of problems from one life cycle stage to another, from one geographic area to another and from one environmental medium or protection target to another is avoided (Source: ECJRC)

Material flow analysis (MFA)

An evaluation method which assesses the efficiency of use of materials using information from material flow accounting. Material flow analysis helps to identify waste of natural

resources and other materials in the economy which would otherwise go unnoticed in conventional economic monitoring systems (Source: Eurostat)

Material recovery

Restoration of materials found in the waste stream to a beneficial use which may be for purposes other than the original use (Source: ECJRC)

Leachate

Is a complex mixture of organic and inorganic pollutants generated by Infiltration of precipitation water into the waste body; or by settling of waste with high water content (e.g. effluent treatment sludge), thus forming “press water”, or the reaction of water with waste followed by mobilization and uptake of water soluble pollutants. Leachate is internationally considered as “Hazardous Waste”, NOT as wastewater!

MSDS

The Material Safety Data Sheet (MSDS) shall enable the employer to determine whether any hazardous chemical agents are present at the workplace. It provides information which helps to assess any risk to the health and safety of workers arising from the use of hazardous chemical substances and to take respective control measures. The MSDS contains physical-chemical and toxicological characteristics detailed in 16 sections, specific effects endangering human health and the environmental condition. In Europe when you buy a chemical substance it is mandatory to deliver its complete MSDS according to the GHS scheme for MSDSs

Manifest

Shipping document that travels with hazardous wastes from the point of generation, through transportation, to the final disposal facility, creating a ‘cradle-to-grave’ tracking of the hazardous waste

Mirror entries

Mirror entries are entries of waste categories in the European Waste List which are only considered hazardous if dangerous substances are present above the threshold concentrations

Physical treatment

Improving the physical property of the waste, e.g. the strength of sludge by adding cement to make it suitable for land filling

Recovery

Any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfill a particular function, or waste being prepared to fulfill that function, in the plant or in the wider economy

Recycling

(1) A resource recovery method involving the collection and treatment of a waste product for use as raw material in the manufacture of the same or a similar product. (2) The EU waste strategy distinguishes between: reuse meant as a material reuse without any structural changes in materials; recycling meant as a material recycling, only, and with a reference to structural changes in products; and recovery meant as an energy recovery only (Source: ECJRC)

R-Phrases (short for Risk Phrases)/Signal Word/ Hazard Statement

Risk Phrases are phrases formulated on the nature of special risks attributed to dangerous substances and preparations. They concern the chemicals' ability to cause harm to human health and the environment. Each phrase is designated a code starting with the letter R and followed by a number. The list of R-Phrases has been consolidated in different European languages in the [Commission Directive 2001/59/EC](#). In the course of the GHS development the R-Phrases have been replaced by the hazard statements (see above)

Solidification

Physical treatment/stabilization (chemical treatment)

Stakeholder

An institution, organization, or group that has some interest in a particular sector, product, or system Source (ECJRC)

Standard (normal)-m³air

One m³ dry air under defined temperature and pressure conditions

Sustainable material management

Sustainable Materials Management is an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials, taking into account economic efficiency and social equity

Thermal treatment

Often means the same as incineration; can also include the melting down of hazardous substances (e.g. asbestos) to destroy the hazardous substances, gasification and pyrolysis as well as plasma processes

Underground landfill

Disposal/land filling of hazardous waste in a salt dome or other geological formation without the penetration of ground water

Waste (management) hierarchy

List of waste management strategies arranged in order of preference, with waste prevention being the most desirable option and disposal the least preferred approach. Departing from such hierarchy may be necessary for specific waste streams when justified for reasons of, inter alia, technical feasibility, economic viability and environmental protection

Waste management

Approach based on three principles (EU):

- 1) Waste prevention: As a key factor the amount of generated waste should be reduced
- 2) Recycling and reuse: If waste cannot be prevented, as many of the materials as possible should be recovered, preferably by recycling.
- 3) Improving final disposal and monitoring: Where possible, waste that cannot be recycled or reused should be safely incinerated, with landfill only used as a last resort

- **Definitions as per European Framework Directive on Waste 2008/98/EC**

1. **'waste'** means any substance or object which the holder discards or intends or is required to discard;
2. **'hazardous waste'** means waste which displays one or more of the hazardous properties listed in Annex III of [Directive 2008/98/EC](#)
3. **'waste oils'** means any mineral or synthetic lubrication or industrial oils which have become unfit for the use for which they were originally intended, such as used combustion engine oils and gearbox oils, lubricating oils, oils for turbines and hydraulic oils;
4. **'bio-waste'** means biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants;
5. **'waste producer'** means anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of this waste;
6. **'waste holder'** means the waste producer or the natural or legal person who is in possession of the waste;
7. **'dealer'** means any undertaking which acts in the role of principal to purchase and subsequently sell waste, including such dealers who do not take physical possession of the waste;
8. **'broker'** means any undertaking arranging the recovery or disposal of waste on behalf of others, including such brokers who do not take physical possession of the waste;
9. **'waste management'** means the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker;
10. **'collection'** means the gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility;
11. **'separate collection'** means the collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment;
12. **'prevention'** means measures taken before a substance, material or product has become waste, that reduces:
 - (a) the quantity of waste, including through the re-use of products or the extension of the life span of products;
 - (b) the adverse impacts of the generated waste on the environment and human health; or

(c) the content of harmful substances in materials and products;

13. '**re-use**' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived;

14. '**treatment**' means recovery or disposal operations, including preparation prior to recovery or disposal;

15. '**recovery**' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfill a particular function, or waste being prepared to fulfill that function, in the plant or in the wider economy.;

16. '**preparing for re-use**' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing;

17. '**recycling**' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations;

18. '**regeneration of waste oils**' means any recycling operation whereby base oils can be produced by refining waste oils, in particular by removing the contaminants, the oxidation products and the additives contained in such oils;

19. '**disposal**' means any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy.

20. '**best available techniques**' means best available techniques as defined in Article 2(11) of Directive 96/61/EC. See also glossary.

- **Some interesting Internet links**

Artisanal mining:

http://wwf.panda.org/what_we_do/where_we_work/congo_basin_forests/wwf_solutions/extratives/artisanal_mining/

Bifa Environmental Institute, eBegleitschein Portal: www.ebegleitschein.de

Brownfield's Revitalization Act: <http://www.epa.gov/brownfields/>

Business Dictionary: <http://www.businessdictionary.com>"

Co-processing: <http://www.coprocem.com/trainingkit/pages/coprocessing.html>

Consist Business Information Technology: www.consist-itu.de

Electronic waste processing: <http://www.no-waste-technology.com/en/recycling/electronic-waste-processing/>

European Agency for Safety and Health at Work: <http://osha.europa.eu>

European Commission. 2009. Environment. Waste:

<http://ec.europa.eu/environment/waste/index.htm>

European Committee for Standardization: <http://www.cen.eu/cenorm/homepage.htm>

European Integrated Pollution Prevention and Control (IPPC) Bureau:

<http://eippcb.jrc.es/index.html>

EU guidance and practical manual on permitting and inspection of waste management operations:

<http://ec.europa.eu/environment/waste/framework/inspections.htm>

Extended Producer Responsibility: A Guidance Manual for Governments:

http://www.oecd.org/LongAbstract/0,3425,en_2649_34395_2405199_1_1_1_1,00.html

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

(Germany). 1996. Ordinance on Transport Licences of 10 September 1996.

http://www.bmu.de/english/waste_management/downloads/doc/3235.php

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

(Germany). 2002. Ordinance on Landfills and Long-Term Storage Facilities of 24 July 2002.

http://www.bmu.de/english/waste_management/doc/4343.php

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany). 2006. Ordinance on Waste Recovery and Disposal Records of 20 October 2006. http://www.bmu.de/english/waste_management/downloads/doc/3237.php

Global Partnership on Waste Management (GPWM):

<http://www.unep.org/ietc/ourwork/wastemanagement/globalpartnershiponwastemanagement/tabid/56257/default.aspx>

Japan (chemical management center): <http://www.safe.nite.go.jp/english/index.html>

Life-cycle Assessment: <http://www.coprocem.com/trainingkit/pages/module8.html>

Ministry for the Environment and Transport Baden-Wuerttemberg. 2003. How to apply the European Waste List 2001/118/EC. Stuttgart/Fellbach. <http://www.um.baden-wuerttemberg.de/servlet/is/3105/english?command=downloadContent&filename=english>

OECD. 2003. Technical Guidance for the Environmentally Sound Management of Specific Waste Streams: Used and Scrap Personal Computers. [http://www.oelis.oecd.org/olis/2001doc.nsf/LinkTo/NT000009E2/\\$FILE/JT00139462.PDF](http://www.oelis.oecd.org/olis/2001doc.nsf/LinkTo/NT000009E2/$FILE/JT00139462.PDF)

OECD. 2007. Guidance Manual for the Implementation of the OECD Recommendation C(2004)100 on Environmentally Sound Management (ESM) of Waste. <http://www.oecd.org/dataoecd/23/31/39559085.pdf>

Promoting Resource Efficiency in SMEs: www.unep.fr/scp/presme/pdf/PRE-SME_handbook.pdf

REACH: http://ec.europa.eu/enterprise/sectors/chemicals/reach/index_en.htm

Sewage sludge: <http://www.sludgenews.org/about/>

The Environment Agency (UK): <http://www.environment-agency.gov.uk>

TSCA: <http://www.ehso.com/tsca.htm>

The story of Stuff: www.storyofstuff.com

Training resource pack for hazardous waste management in developing economies, 2002:

The training resource pack is a set of training materials available as electronic files. The subjects cover the full range of topics in hazardous waste management from prevention to treatment and disposal as well as regulatory aspects, support services and development of national strategies

www.unep.fr/shared/publications/cdrom/3128/index.htm

UNCED. 1992. Agenda 21. Rio de Janeiro.

http://www.un.org/esa/dsd/agenda21/res_agenda21_00.shtml

UNECE. 2009a. European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR).

<http://www.unece.org/trans/danger/publi/adr/adr2009/09ContentsE.html>

UNECE. 2009b. Globally Harmonized System of Classification and Labelling of Chemicals (GHS). About the GHS. http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html

UNECE. 2009c. UN Recommendations on the Transport of Dangerous Goods. 16th ed.

http://www.unece.org/trans/danger/publi/unrec/rev16/16files_e.html

UNSD. 2009. Environmental Indicators, Waste, Hazardous Waste Generation. 2009.

<http://unstats.un.org/unsd/environment/hazardous.htm>

U.S. Government Printing Office: <http://www.gpoaccess.gov/ecfr/>

Vital Waste Graphics:

Aims to give policymakers, experts, media professionals, teachers and students a comprehensive overview of relevant waste-related issues, causes, effects, as well as possible solutions. Vital Waste Graphics is based on the most recent data received by the Basel Convention Secretariat.

<http://www.grida.no/publications/vg/waste/page/2851.aspx>

World Business Council for Sustainable Development: <http://www.wbcsd.org/>

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