

REVIEW OF THE EUROPEAN LIST OF WASTE

INTERIM REPORT 2

MAY 2008

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Abbreviations

CSA	Chemical Safety Assessment
CSR	Chemicals Safety Report
DPD	Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations, Dangerous Preparations Directive
DSD	COUNCIL DIRECTIVE of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (67/548/EEC) Dangerous Substances Directive
DU	Downstream User of a substance (as such or in a preparation)
ES	Exposure Scenario
eSDS	Extended Safety Data Sheet
LoW	Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste, European list of waste, 2000/532/EC
GHS	Globally Harmonised System for the classification and labelling of substances and preparations
HWD	Council Directive 91/689/EEC of 12 December 1991 on hazardous waste, Hazardous Waste Directive (91/689/EEC)
M/I	Manufacturer or importer of a substance (as such or in a preparation)
REACH	Registration, Evaluation and Authorisation of Chemicals – Acronym for the new European chemicals legislation
SDS	Safety Data Sheet
SVHC	Substances of Very High Concern

1. Background and objective

The European Waste Catalogue (EWC) (Commission Decision 94/3/EC) was to be a “reference nomenclature providing a common terminology throughout the Community with the purpose to improve the efficiency of waste management activities”.

The EWC according to Decision 94/3/EC was replaced by the European list of waste (LoW) by Commission Decision 2000/532/EC last amended by Council Decision 2001/573/EC.

It serves as a common encoding of waste characteristics in a broad variety of purposes like transport of waste, installation permits, decisions about recyclability of the waste or as a basis for waste statistics.

According to Decision 2000/532/EG the LoW should be revised regularly on the basis of new knowledge and, in particular, of research results. The Thematic Strategy on Prevention and Recycling has called for a revision of the system of waste nomenclature with the purpose of simplifying and modernising waste legislation.

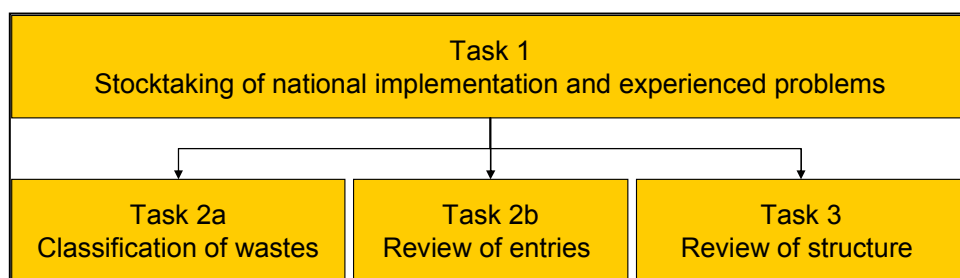
At two workshops the TAC¹ discussed experiences with the implementation and application of the LoW. The discussion covered the broad range from amending specific issues within the existing basic structure of the LoW to the need for basic modification of the structure of the LoW.

With this background the objective of this study is to collect and evaluate information about the implementation of the LoW, develop proposals for its amendment and assess its impacts.

¹ Committee established under Article 18 of Directive 2006/12/EC (Technical Adaptation Committee)

2. Approach

The project is divided in three tasks. Task 1 collects information about the implementation of the LoW in the Member States and experienced problems. Task 2 addresses the issues of the characterisation of waste as “hazardous” and the interface between waste legislation and chemicals legislation. In addition Task 2 also asks for missing and superfluous waste codes within the existing structure of the LoW. Task 3 of the project develops and evaluates proposals for a revised structure of the LoW (see figure below).



Task 2a comprises a number of sub tasks (see also graph below):

- Rules on the application of H-criteria H9, H12, H13, H14,
- Review of concentration limits,
- Waste testing strategy,

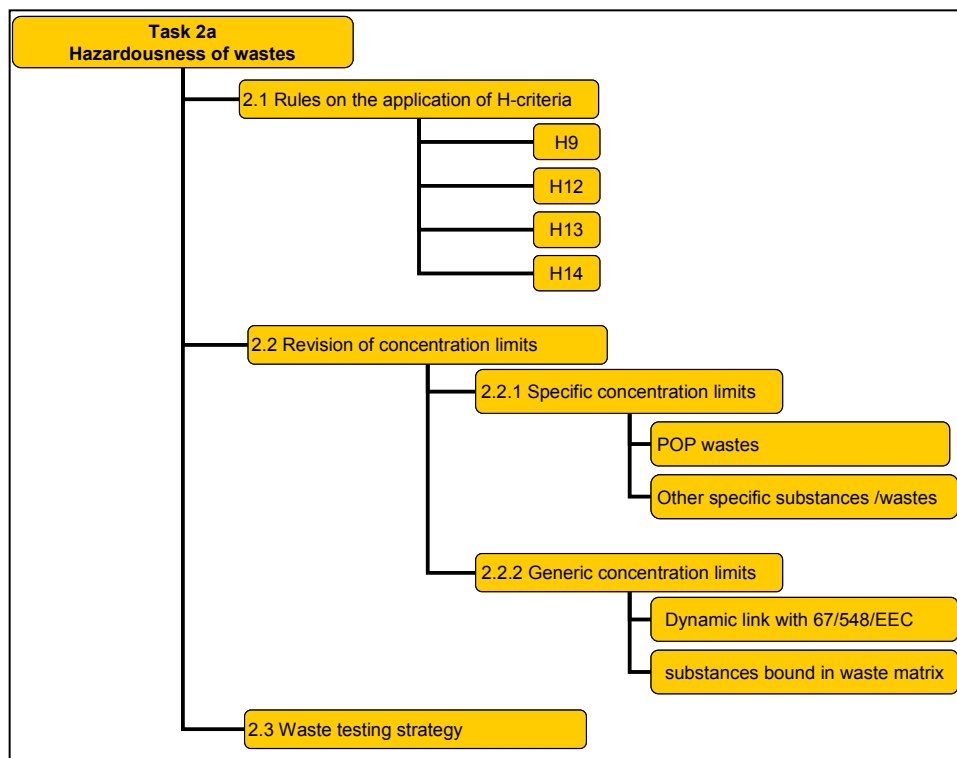


Figure 1: Overview of tasks – Task 2a

Task 2b comprises the subtasks (see also graph below):

- Assessment of the introduction of a general code for unspecified hazardous waste (“98” in parallel to the non-hazardous waste code “99”),
- Introduction of new codes,
- Deleting of existing codes.

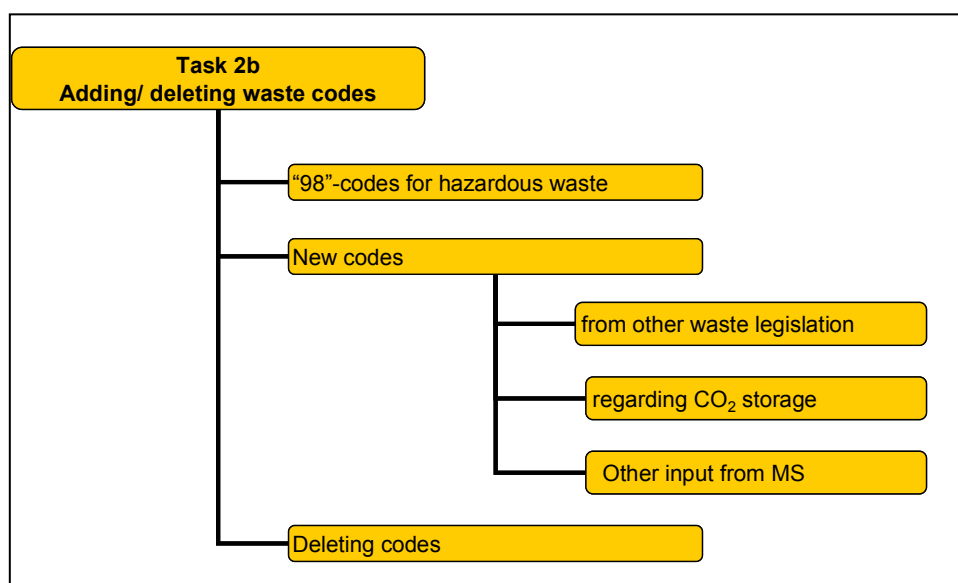


Figure 2: Overview of tasks – Task 2b

In Task 3 amendments of the structure of the LoW are analysed.

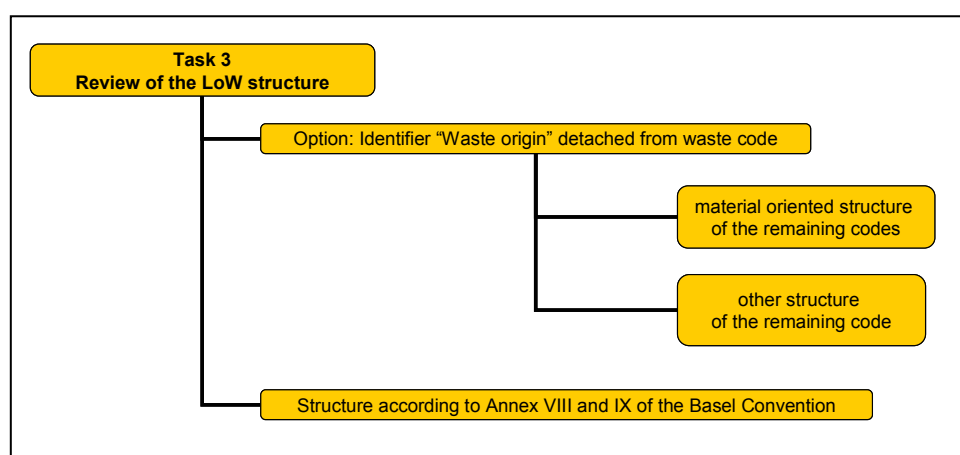


Figure 3: Overview of tasks – Task 3

The project comprises a number of **stakeholder consultation processes**. Two of them have been performed so far.

- Questionnaire aiming at stocktaking of national implementation and experienced problems (see chapter 3 of this report for a detailed description),
- Internet stakeholder consultation performed in March, where preliminary results from the evaluation of the present situation with the LoW have been published for discussion.

Stakeholder and Member States workshops will be held in June and expert meetings in summer.

Information about the project, current events and relevant documents are published on the website <http://low.oekopol.de>. In addition information is distributed via distribution lists.

This **Second Interim Report** presents the status quo of the project and the outcome of the discussion so far. It serves as a basis for the discussion at the stakeholders workshops in June.

3. Background information

3.1. Clarification of terms

To avoid misunderstandings, it is explained how some terms are used in this report:

Substance (definition according to REACH Article 3(1))

„Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition;“

This definition is part of Directive 67/548/EEC and REACH as well as the proposal for a GHS-implementing regulation. It means that substances are defined as they are obtained from any manufacturing process, which could either be a synthesis or a purification. Substances can either be 'pure', i.e. consisting of almost 100% the same types of molecules, or can be very complex, i.e. consisting of various compounds at various percentages. Examples for the latter are refinery streams, which consist of carbon chains of various lengths but, as the production process is always similar, the composition of the substance is always similar. The 'manufacture' of substances during recovery and disposal operations is one of the interfaces between waste and chemicals legislation.

Whenever the term substance is used in this report, a substance as legally defined under the REACH legislation is meant.

Preparation (definition according to REACH Article 3(2))

Preparation: means a mixture or solution composed of two or more substances;

Preparations are produced by mixing one or more substances or preparations. The term preparation will be changed to mixture, when the GHS-implementing Regulation enters into force.

Whenever the term preparation is used in this report, a mixture that has been intentionally produced and placed on the market by a company is meant.

Chemical

The term chemical is not legally defined but is widely used in Member State authorities and industry. In this report, the term chemical is used when both, substances and preparations are meant.

Dangerous / classified / classified as dangerous

The “Dangerous Substance Directive” 67/548/EEC (DSD) defines that substances or preparations are regarded as classified, when they exhibit at least one of the properties listed in Article 2(2)² of the Directive. The terms ‘dangerous’, ‘classified’ and ‘classified as dangerous’ are used synonymical in this report for substances and preparations in the legal meaning, i.e. that they meet the legal definition of a dangerous substance or preparation.

The GHS defines the term ‘dangerous’ in Article 3(2). It is a basic aim of GHS not to extend the scope of any downstream legislation making reference to this term. Hence, the term “dangerous” as used in this report is applicable under both pieces of legislation and has the same scope.

Hazardous

Hazardous is not a legally defined term, in the existing classification and labelling directives but is frequently used as synonym for dangerous. In this report, the term hazardous is used to describe substances and preparations which are dangerous (in the legal sense) and to substances which have properties which could cause damage to humans or the environment, but which are not legally defined as dangerous. For example a substance with endocrine disrupting properties would not be regarded as dangerous (as there is no dangerous property called ‘endocrine disruption’ defined in Directive 67/548/EEC) but could cause an adverse effect and is thus ‘hazardous’.

² Explosive, oxidising, extremely flammable, highly flammable, flammable, very toxic, toxic, harmful, corrosive, irritant, sensitizing, carcinogenic, mutagenic, toxic for reproduction, dangerous for the environment.

“Hazardous” will be defined in Article 3(1) of the GHS-implementing regulation and means there a substance or mixture which fulfils any of the criteria described in the Annexes (hazard classes relating to physico-chemical properties and human health or environmental effects).

Exposure

The term exposure is used to summarise any situation, where a human or the environment come into contact with a chemical. Exposure of humans could occur via oral uptake, inhalation or dermal contact. Exposure of the environment is differentiated into surface and marine water (including sewage treatment plants), air, soil and sediments.

Risk

The term risk is used as introduced and implemented in the chemicals regulation REACH. It is a concept assuming the likelihood of effect from the use of a chemical by combining the hazards of a substance / preparation with the exposures occurring for humans and the environment.

Waiving

The term waiving has been introduced in the REACH regulation. It means that an actor may omit testing of a substance and hence not determine a dangerous property, if he can provide scientific arguments that testing is not possible or not necessary or if he can show that exposures that could lead to a respective damage do not occur in the life-cycle of a substance (exposure based waiving). For example, if a substance is only used in closed processes and does not enter consumer products, the identification of reprotoxic properties of the substance could be waived.

3.2. The planned implementation of the GHS

At UN-level, a harmonised set of rules for classification and labelling of substances and preparations has been developed (GHS). The GHS is a recommendation and consists of so called building blocks, which can be adopted as they are or modified by the implementing countries.

The EU plans to implement the GHS as a regulation. The major changes introduced by the GHS in comparison to the existing classification and labelling rules regard the methods and criteria for determining physico-chemical hazards, some human health end-points and the application of rules for using non-test data.

The Dangerous Substance Directive (67/548/EEC (DSD) and the Dangerous Preparations Directive 99/45/EC (DPD) will be replaced by the GHS. The analysis of the link between chemicals legislation and LoW in this Second Interim Report is performed for the DSD and DPD. Potential adaptation needs for linking to the GHS will be outlined.

3.3. Screening of Annex I of Directive 67/548/EEC

Annex I of Directive 67/548/EEC contains more than 3300 substances, for which a harmonised classification has been agreed under current legislation. It has to be noted that not for all substances, all classification end-points have been agreed, hence it is possible that e.g. the human health hazards have been agreed at EU-level and included in Annex I, whereas the environmental classification was not even assessed. Therefore, it cannot be assumed that all substances with a harmonised classification have been fully assessed. For the classification that is specified in the Annex it can be assumed that it is validated and based on good data.

525 of the substances in the Annex I have specific concentration limits. These concentration limits don't relate to physical hazards, but only to properties rendering a substance dangerous to the environment or human health.

For 36 substances classified as dangerous to the environment, specific concentration limits have been included in Annex I. One substance is classified as dangerous for the ozone layer (tetrachloromethane), all other of the substances are classified with R50/R53 (See Annex xyz). All of substances which have a specific classification limit are active substances used in plant protection products and/or biocide products. The application of lower classification limits for preparations has now been implemented as classification rule in the preparations directive (see chapter on H14).

150 of the substances which have a specific classification limit (either for an environmental, a human health or a physico-chemical danger) in the Annex are classified with R53 alone or in combination with R50, R51 or R52. For 36 substances the specific limit relates to the environmental classification as such, for 100 substances, it is set for a human health property. Among these,

- 5 are classified as a category 1 CMR as most stringent classification
- 24 are classified as a category 2 CMR as most stringent classification
- 16 are classified as a category 3 CMR as most stringent classification

Pops³

Aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, and chlordecone are included in Annex I, but do not have a specific classification limit. Hexabromobiphenyl is not included in Annex I at all. Only lindane has a specific concentration limit.

³ Substances regulated under regulation EC 850/2004 on persistent organic pollutants, except substances which are not intentionally produced, such as dioxines

EU PBTs

Many of the substances currently regarded as PBTs in the EU are not included in Annex I with a harmonised classification at all (many of them are refinery streams) or have not specific concentration limit.

Heavy metals and hydrocarbons

A harmonised classification with R53 alone or in combination with R50 to R52 is included in Annex I also for a number of substances which are refinery fractions or heavy metals (organic compounds or salts). These are listed in the following table. For zinc chloride, antimonpentachlorid and tributyltin SCLs for the environment are part of Annex I.

Table 1: Harmonised classification of heavy metals and hydrocarbons

Substance name	EC number	classification
Benzo[def]chrysen; , Benzo[a]pyren	200-028-5	Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, R43, N; R50-53
Dibenz[a,h]anthracen	200-181-8	Carc. Cat. 2; R45, N; R50-53
Chromtrioxide	215-607-8	O; R9, Carc. Cat. 1; R45, Muta. Cat. 2; R46, Repr. Cat. 3; R62, T+; R26, T; R24/25-48/23, C; R35, R42/43, N; R50-53
Lead alcyls	-	Repr. Cat. 1; R61, Repr. Cat. 3; R62, T+; R26/27/28, R33, N; R50-53
Lead compounds, except separately listed	-	Repr. Cat. 1; R61, Repr. Cat. 3; R62, Xn; R20/22, R33, N; R50-53
Potassium dichromate	231-906-6	O; R8, Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T+; R26, T; R25-48/23, Xn; R21, C; R34, R42/43, N; 50-53
Sodium dichromate	234-190-3	O; R8, Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T+; R26, T; R25-48/23, Xn; R21, C; R34, R42/43, N; 50-53
Chromium dichloride; , Chromium oxychloride	239-056-8	O; R8, Carc. Cat. 2; R49, Muta. Cat. 2; R46, C; R35, R43, N; R50-53
Sodium dichromate, dihydrate	234-190-3	O; R8, Carc. Cat.2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T+; R26, T; R25-48/23, Xn; R21, C; R34, R42/43, N; R50-53
Cadmium sulphate	233-331-6	Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T; R48/23/25, T+; R26, T; R25, N; R50-53
Cadmium chloride	233-296-7	Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T+; R26, T; R25-48/23/25, N; R50-53
Cadmium fluoride	232-222-0	Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T+; R26, T; R25-48/23/25, N; R50-53
Sodium chromate	231-889-5	Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat.2; R60-61, T+; R26, T; R25-48/23, Xn; R21, C; R34, R42/43, N; R50-53
Cadmium sulphide	215-147-8	Carc. Cat. 2; R45, Muta. Cat. 3; R68, Repr. Cat. 3; R62-63, T; R48/23/25, Xn; R22, R53
Ammonium dichromate	232-143-1	E; R2, O; R8, Carc. Cat. 2; R45, Muta. Cat. 2; R46, Repr. Cat. 2; R60-61, T+; R26, T; R25-48/23, Xn; R21, C; R34, R42/43, N; R50-53
Potassium chromate	232-140-5	Carc. Cat. 2; R49, Muta. Cat.2; R46, Xi; R36/37/38, R43, N; R50-53
Antimony trichloride	233-047-2	C; R34, N; R51-53
Tintetrachlorided	231-588-9	C; R34, R52-53
Antimony pentachloride	231-601-8	C; R35, N; R51-53
Cadmium diformiate	224-729-0	T; R23/25, R33, Xn; R68, N; R50-53
Cadmium iodid	232-223-6	T; R23/25, R33, Xn; R68, N; R50-53
Cadmium hexafluorosilicate(2-)	241-084-0	T; R23/25, R33, Xn; R68, N; R50-53
Tributyltin compounds, except	-	T; R25-48/23/25, Xn; R21, Xi; R36/38, N; R50-53

Substance name	EC number	classification
those listed here		
Ziram (ISO); tin-bis(<i>N,N</i> -dimethyldithiocarbamate)	205-288-3	T+; R26, Xn; R22-48/22, Xi; R37-41, R43, N; R50-53
Trimethyl-tin compounds, except those listed here	-	T+; R26/27/28, N; R50-53
Triethyl-tin compounds, except those listed here	-	T+; R26/27/28, N; R50-53
Cadmium cyanide	208-829-1	T+; R26/27/28, R32, R33, Xn; R68, N; R50-53
Dimethyl mercury; [1], Diethyl mercury [2]	209-805-3 [1], 211-000-7 [2]	T+; R26/27/28, R33, N; R50-53
Organic mercury compounds, except those listed here	-	T+; R26/27/28, R33, N; R50-53
Inorganic mercury compounds except mercury silver (II)sulphide and those listed here	-	T+; R26/27/28, R33, N; R50-53
Trioctyl- tin compounds, except those listed here	-	Xi; R36/37/38, R53
Cadmium compounds, except (xCdS.yCdSe) and mixtures of cadmium sulphide and zink sulfide (xCdS.yZnS), and mixtures of cadmium sulphide and mercury sulphide as well as other listed cadmium compounds listed here	-	Xn; R20/21/22, N; R50-53
Fluorotriptylstanann; [1], Hexapentylstannoxan [2]	243-546-7 [1], 247-143-7 [2]	Xn; R20/21/22, N; R50-53
Fluorotrihexylstannan	243-547-2	Xn; R20/21/22, N; R50-53
Tetracyclohexylstannan; [1], Chlortrihexylstannan; [2], Butyltricyclohexylstannan [3]	215-910-5 [1], 221-437-5 [2], 230-358-5 [3]	Xn; R20/21/22, N; R50-53
Antimony compounds except Sb ₂ O ₄ , Sb ₂ O ₅ , Sb ₂ S ₃ , Sb ₂ S ₅ as well as antimouny compounds listed separately here	-	Xn; R20/22, N; R51-53
Zinkchloride	231-592-0	Xn; R22, C; R34, N; R50-53

3.4. The new chemicals legislation REACH

In the past, chemicals legislation consisted of several directives and regulations specifying the rules for the classification and labelling of substances, the duties to deliver safety data sheets and what to include in them, restrictions on the marketing and use of substances, requirements to notify new substances and/or to assess dangers of substances already on the market at EU level etc.

Since June 2007, chemicals legislation has been reorganised by the regulation REACH. This regulation integrates all existing provisions on manufacturing, placing on the market, communication and use of substances and preparations. REACH introduces some changes of paradigm with regard to the responsibility of industry to ensure safe use of chemicals and the related duty to assess associated risks.

In the past, placers on the market had to classify substances and preparations based on available information. This meant that they needed to assess only the

existing information on dangerous properties of substances (or to take into account the received information on substances and preparations they use to manufacture their products) and classify and label accordingly before placing on the market.

If no data was available, no classification was made. Under REACH, any manufacturer and importer of a substance as such or in a preparation has to provide a data set on hazardous properties, the extent of which is based on his market volume. If required data is not available, that information has to be generated.

3.5. Interface LoW - REACH

3.5.1. The waste life stage of substances under REACH

Duties under REACH related to the CSA (Annex 1⁴, article 37)

Waste as defined in the Waste Framework Directive 2006/12/EC of the European Parliament and of the Council⁵ is *not a substance, preparation or article under REACH* (Article 2(4)). Thus, players handling substances in waste are neither downstream users nor recipients of articles, and consequently they do not have duties under REACH⁶.

Nevertheless manufacturers and importers (M/I) of substances, downstream users (DU) and eventually recipients of articles have a number of duties under REACH related to waste.

- M/I shall document in the registration dossier available information on the amount of waste resulting from manufacture of the substance, from the identified uses and the subsequent service life in articles, including composition of the waste streams.
- For dangerous substances > 10 t/a, waste resulting from manufacture and use of the substance must to be covered in M/I's chemical safety assessment (see Annex I of REACH). This includes exposure estimation, and measures for safe handling to be communicated downstream with the exposure scenarios and in chapter 13 of the extended safety data sheet (see REACH Annex II).

Consequently, it is the duty of downstream users i) to consider the waste life-stage related information received with the exposure scenario, ii) to take action in case the internal handling of waste and the chosen route for disposal is outside the conditions set in the ES, and iii) to communicate the relevant information to further downstream users.. The tasks for MI and DU under REACH with regard to handling of waste are limited to the following:

⁴ Point 5.1.1

⁵ OJ L 114, 27.4.2006, p. 9.

⁶ This status ends and REACH applies as soon as a company re-introduces substances (as such or in preparations) or articles recovered from waste into the market (see REACH Article 2 (7)(d)). Thus, one and the same company may operate outside REACH regarding the waste-input side and within REACH on the product-output side.

- Implement waste related measures with regard to M/I's or DU's own activity, as stated in the exposure scenario.
- Forward waste related information received with the ES from the supplier to the next downstream user.
- Choose external waste treatment operations, in line with what is recommended in the supplier's exposure scenario.

Figure 4 illustrates the scope of the waste related considerations in the CSA and the information mechanisms in the supply chain. The RIP 3.2 guidance suggests the following clarifications:

- Internal handling of substances in waste to be disposed of in external operations is still part of downstream use under REACH. This regards for example occupational and environmental measures to prevent exposure from internal collection and storage of waste, and onsite pre-treatment of residues for example by extracting water⁷.
- The waste regime begins, and hence duties under REACH end, when the residues have been transferred into the responsibility of an authorised waste management company. In this understanding, a DU under REACH must comply with REACH and with EU waste legislation at the same time.
- Residues that may occur in onsite pre-treatment of waste-water and exhaust air (= result of environmental risk management measures) and which are to be disposed of in external waste treatment facilities are to be covered in the waste management section of the relevant exposure scenarios.
- Cleaning and regeneration of contaminated/spent processing aids or product aids (e.g. re-distillation of cleaners, washing of cleaning wipes) outside waste legislation is regarded a downstream use under REACH. This is based on the assumption that the objects to be cleaned remain in the ownership of the same company for the whole cycle.

⁷ The waste definition as laid down in Council Directive 75/442/EEC as amended includes substances and objects which the holder intends or is required to discard. Thus the waste character of a material containing a substance at the end of its service life may already emerge during down-stream use. Thus environmental risk management measures under REACH (e.g. removing of substances from waste air and waste water; preventing substances to enter into the sewage system) may turn into waste management measures under the waste legislation at the site of the DU.

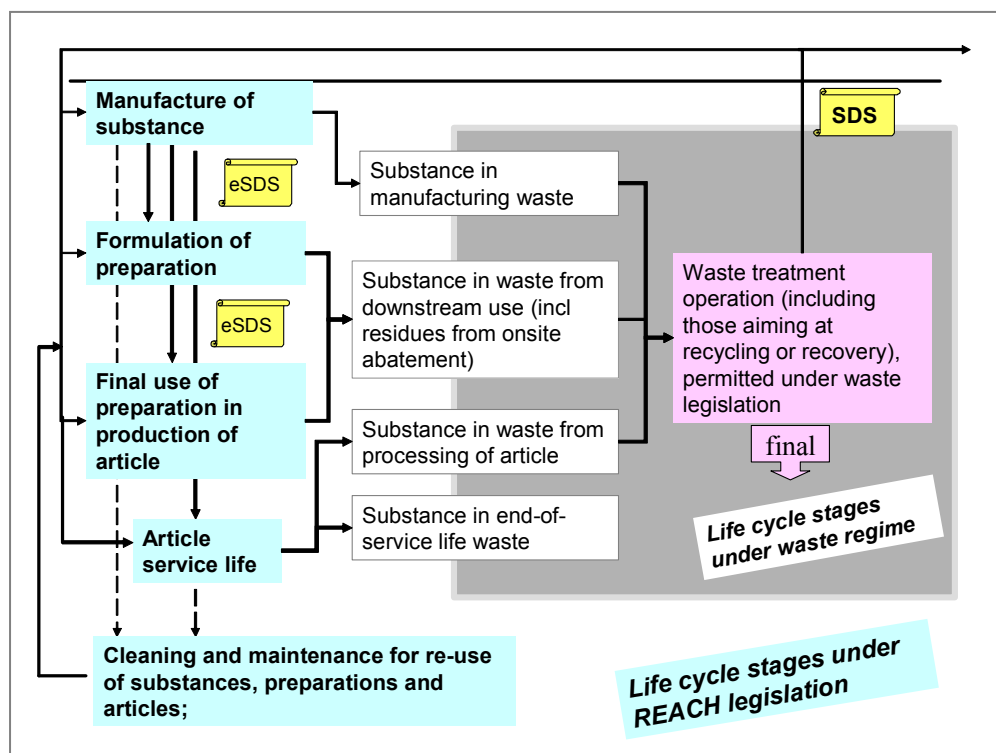


Figure 4: Interface between REACH and waste legislation

Duties under REACH related to Safety Data Sheets (Annex II)

Annex II of REACH sets out the following requirements related to section 13 of the safety data sheet:

- If the disposal of the substance or preparation (surplus or waste resulting from the foreseeable use) presents a danger⁸, a description of these residues and information on their safe handling shall be given.
- Specify the appropriate methods of disposal of both the substance or preparation and any contaminated packaging (incineration, recycling, land filling, etc.)⁹
- Where a Chemical Safety Report is required, information on waste management measures that adequately control exposure of humans and the environment to the substance shall be consistent with the exposure scenarios set out in the annex to the Safety Data Sheet.

Whether or not the disposal of a substance or preparation presents a danger needs to be assessed by i) the manufacturer or importer of a dangerous substance > 10 t/a in his CSA and/or ii) by any downstream user placing a substance or preparation on the market and being required to provide a safety data sheet.

If none of the appropriate methods of disposal specified in section 13 of the SDS (or the ES annex) is available to the DU (respectively the waste manage-

⁸ due to the intrinsic hazards of the waste

⁹ Type of disposal operation according to Annex II to the EU Waste Framework Directive

ment companies contracted by the DU), the DU will be required to carry out an own CSA. This CSA would be targeted to the disposal of waste resulting from the use of the respective dangerous chemical covered in the SDS. The CSA should demonstrate that the waste disposal method applied to that waste ensures control of risk for the respective substance in the waste. When developing or selecting an exposure scenario for the relevant waste treatment operation, M/I or DU may be confronted with the situation, that for a specific waste treatment operation neither the EU BREF document nor the EU waste legislation provide details on the operational conditions and risk management under which control of risk is ensured.

3.5.2. LoW and the REACH information mechanisms

Communication related to downstream uses

Under waste legislation any holder of a waste to be discarded is required to i) make himself aware whether the waste has to be disposed of as hazardous waste and ii) to assign an appropriate waste name (code). The European list of waste is the corresponding tool to do so. For the classification of waste the LoW suggests specific criteria for the assessment. In contrast to the REACH approach for the classification of substances the classification of waste according to the LoW is, in general, not based on exposure assessment and risk characterisation related to handling and processing of the waste.

Figure 5 illustrates the link between the top-down assessment by manufacturers/ importers of substances under REACH and the classification of waste under waste legislation:

- M/I include advice on safe disposal of waste containing his substance into the extended safety data sheets communicated down the supply chain. This advice is based on exposure assessment and risk characterisation for the waste life stage, and may include recommendations on appropriate waste codes and disposal routes for any waste containing the substance (if dangerous and > 10 t/a).
- DU will have to choose one of three options:
 - Follow the waste management advice in the exposure scenario.
 - If DU is not willing or technically not able to follow the suppliers' advice¹⁰, he can ask the supplier to bring the advice in line with DUs practice, assumed control of risk can be demonstrated.
 - Carry out an own CSA/CSR for the waste life stage of the substance and notify the case to the European Chemicals Agency.

At the same time all companies generating waste are required to assign an entry from the LoW to their waste and to assess whether the waste is to be

¹⁰ including requirements by local waste authorities

disposed of as hazardous waste or not. Thus M/Is advice (based on exposure assessment and risk characterisation) and the waste generator's assessment (based on H criteria and LoW) have to be linked to each other at downstream user level. Both assessments may complement each other in practice, assumed sufficient communication mechanisms in the chain can be set up, preferably as early as possible before December 1, 2009¹¹.

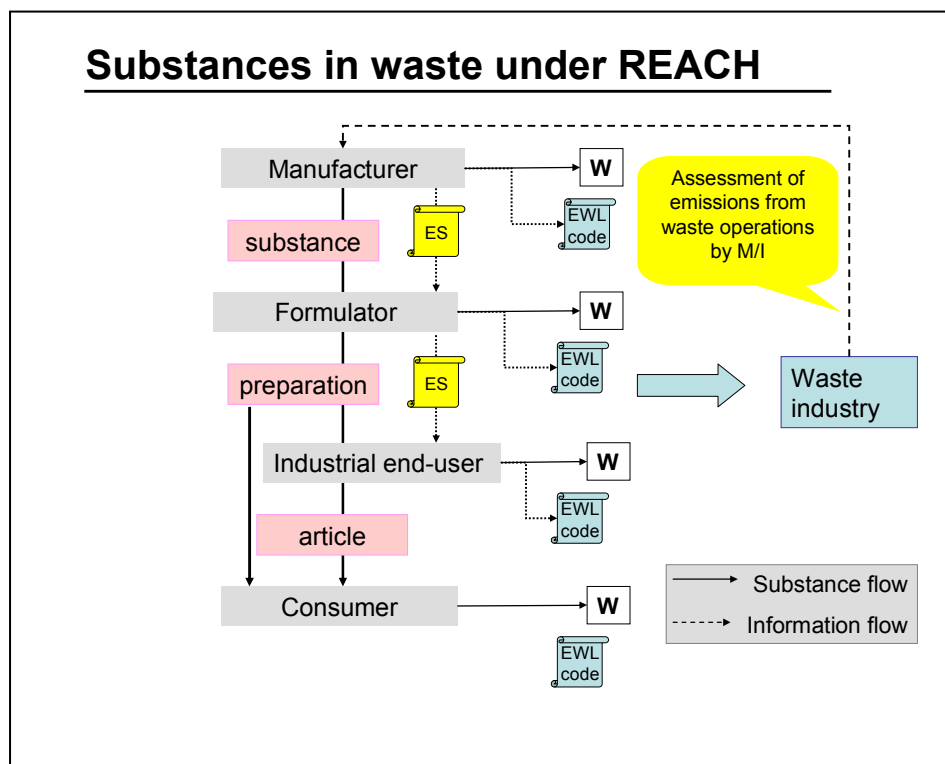


Figure 5: Interaction between REACH information and assignment of LoW codes

Communication related to SVHC in articles

If a substance has been identified according to Article 59 to fulfil the criteria of REACH Article 57 (substances of very high concern, such as: carcinogens, mutagens, substances toxic to reproduction, substances being persistent bioaccumulative and toxic, substances being very persistent and very bioaccumulative), the manufacturer/importer of an article containing such substance > 0.1% shall supply the recipient of such article with sufficient information to allow safe use of the article.

¹¹ Manufacturers and importers are required to take into account in their registration any information on uses and conditions of use communicated up the chain one year before the corresponding registration deadline.

3.5.3. REACH and classification of substances and preparations

Under REACH, harmonised classification of substances at EU level will only be carried out for CMR substances and respiratory sensitisers. For all other dangerous properties, classification will be made by manufacturers and importers (so called self-classification). The inventory of substance classifications will be made publicly available by ECHA, and REACH urges M/I to agree on the classification for the same substance among each other. The existing Annex I to Directive 67/548 will be carried over into the GHS implementing regulation. Most of the principal mechanisms to derive classification of preparations will not change under GHS and thus the basis of the corresponding H criteria for waste classification will also not fundamentally change.

3.5.4. Perspectives

Manufacturers and importers of substances >1000 t/a, of all CMR substances and of R50/53 substances > 100 t/a are obliged to register by December 2010 at the latest.

For **dangerous** substances, M/Is are required to carry out a CSA and to communicate waste related advice down the supply chain. This may include

- suitable LoW codes for waste formed during the life cycle of the substance (where available), as far as M/I has described the corresponding uses based on the use descriptor system under REACH¹²
- the nature of the danger the waste presents on disposal (refers to the danger caused by the substance)
- advice on handling and suitable disposal techniques (recycling, recovery and final disposal) to ensure control of risk

The actors in the supply chain will be confronted with the legal obligation to follow the requirements of waste legislation (in his function as waste producer) and the DU requirements of REACH (receiving and providing information about proper handling and disposal of substance containing waste) at the same time. This is not necessarily a drawback as long as consistent technical guidance is worked out at EU level, and Member States work towards harmonisation of waste management practices. This should cover for example:

- Make the knowledge existing in waste industries and local permitting and/or competent authorities accessible to M/I's for carrying out their generic assessment of releases from waste operations and the corresponding risk management advice.
- Make the safety assessment approach under REACH and the hazard based waste classification rules under the waste legislation work together.

¹² The use descriptor system as outlined in the Part D of TGD on Chemicals Safety Assessment is based on process categories, product categories and categories for the sector of use. The use descriptors under REACH and the chapter of the LoW reflecting the origin of the waste partly corresponds 1:1 to each other, e.g. waste from MFSU of coatings (LoW 08). For other types of waste (thermal processes, metal processing) the two systems do not match at all.

- Classification of waste under waste legislation does not lead to specific risk management advice, however it leads to a conclusion whether the waste is considered hazardous or not.
 - For dangerous substances, the CSA under REACH aims to demonstrate control of risk based on risk/waste management advice. M/I's assessment includes exposure estimates and risk characterisation.
- Systematically link the use descriptor system to describe the uses of a substance under REACH (in a brief general way) to the LoW describing the origin and the technical nature of waste.
- Set up a general rule under waste legislation that all waste, containing a substance identified according to article 59 of REACH (substances fulfilling the criteria to be of very high concern) in concentration > 0.1% is classified as hazardous waste, unless testing (or other evidence) demonstrates that exposure of man or the environment can be excluded under the relevant conditions of disposal.

3.6. Acceptance procedure for landfill wastes

Council Decision 2003/33/EC establishes procedures, methods, as well as limit values and other criteria for the acceptance of wastes at landfills and thus pertains to Directive 1999/31/EC on the landfill of wastes. The acceptance criteria are different for the different classes of landfills and have to be applied as of 16 July 2005.

The overall procedure for the acceptance of wastes at landfills consists of three steps: 1) the basic characterisation of wastes, 2) compliance testing and 3) on-site verification. The function of the basic characterisation is to determine in which landfill class a waste can be disposed of safely. For the basic characterisation the following parameters have to be specified which have particular relevance for assessment of whether or not the H-criteria are fulfilled.

- Source and origin of the waste, including process producing the waste, raw materials and products and any waste treatment applied before land filling ,
- Composition of the waste and the leaching behaviour, where relevant,
- Application of the H-criteria of the Hazardous Waste Directive,
- Physical form of the waste.

For the derivation of composition information, leaching behaviour and whether or not H-criteria are fulfilled, testing of waste may be necessary. Wastes which are regularly generated from the same type of processes (and same type of materials) can be regarded as 'similar wastes' and don't have to be re-tested individually, whereas wastes which are not regularly generated have to be tested "batch-wise".

Testing of wastes must consist as a minimum of those parameters, which are checked for compliance testing. Exceptions from testing exist for wastes, which are either exempted in the Annex of the decision, which are sufficiently charac-

terised based on non-testing information, or for which testing is not technically or scientifically feasible.

Compliance testing is to ensure that a waste complies with its basic characterisation and is to be carried out periodically.

Landfill operators have to reassure that a waste delivered to them corresponds to the basic characterisation and that respective documentation is provided.

3.6.1. Types of wastes in accordance with landfill classes

The list of parameters¹³ that may have to be analysed in waste, depending on the type of waste includes heavy metals, chlorides, fluorides and sulphates as well as sum parameters for organic substances. For each landfill class / type of acceptable waste, it is specified in Annex II of the Decision, which concentration limits apply.

For each parameter, the limit values are specified either as liquid to solid ratio or as concentration in the leachate.

In the Decision the following is differentiated:

- Inert wastes, which are expected to give rise to no or minimal emissions of substances in the leachate. Testing is only required, if there is a suspicion of the waste not being inert or of it releasing substances above the concentration limits specified.
- Non-hazardous wastes and hazardous wastes, which are acceptable at landfills for non-hazardous wastes
- Hazardous wastes.

Furthermore, asbestos wastes and wastes for underground storage are described (not further discussed here).

Wastes which are listed in the list of inert wastes are per definition not hazardous and do not have to be further tested. However, it may have to be tested if substances are leaching from the waste in order to verify that the waste can be regarded as inert. For other types of wastes the respective information should be derived either by testing or from other information sources, such as the composition of the waste.

¹³ See also the Table with a compilation of thresholds.

Table 2: Limit values for substances in leachate of wastes according to the acceptance criteria at landfills¹⁴

Type of waste Parameter	Inert waste	Non-hazardous and stable, non-reactive hazardous waste ¹⁵	Hazardous waste
As [mg/l]	0.06	0.3	3
Ba [mg/l]	4	20	60
Cd [mg/l]	0.02	0.3	1.7
Cr total [mg/l]	0.1	2.5	15
Cu [mg/l]	0.6	30	60
Hg [mg/l]	0.002	0.03	0.3
Mo [mg/l]	0.2	3.5	10
Ni [mg/l]	0.12	3	12
Pb [mg/l]	0.15	3	15
Sb [mg/l]	0.1	0.15	1
Se [mg/l]	0.04	0.2	3
Zn [mg/l]	1.2	15	60
Chloride [mg/l]	460	8500	15000
Fluoride [mg/l]	2.5	40	120
Sulphate [mg/l]	1500	7000	17000
Phenol index [mg/l]	0.3	--	
DOC [mg/l]	160	250	320
TOC	3000 [mg/kg]	5%	6%
BTEX	6 [mg/kg]		
PCBs	1 [mg/kg]		
Mineral oil	500 [mg/kg]		
PAHs	Member States to set limit values		
pH Minimum		6	
ANC		To be evaluated	To be evaluated
LOI			10%

3.6.2. Testing methods

For the various types of wastes and control parameters, testing methods are listed in the Decision, where existing. They include methods for testing the leaching behaviour¹⁶, digestion tests¹⁷ and methods for identification and quantification of the various metals and other chemical parameters¹⁸ of the leachate.

¹⁴ Only the values for the concentration in leachate (percolation test) are quoted

¹⁵ The decision specifies this explaining that the waste would not change adversely in the long – term under normal conditions at the landfill through processes such as biodegradation, the influence of ambient conditions such as contact with water, air, temperature or mechanical as well as the interaction with other wastes (including waste products such as leachate and gas)

¹⁶ prEN 14405 Leaching behaviour test - Up-flow percolation test and EN 12457/1-4 Leaching — Compliance test for leaching of granular waste materials and sludges for different particle sizes

¹⁷ EN 13657 Digestion for subsequent determination of aqua regia soluble portion of elements and EN 13656 Microwave-assisted digestion with hydrofluoric (HF), nitric (HNO₃) and hydrochloric (HCl) acid mixture for subsequent determination of elements (total digestion of the solid waste prior to elementary analysis)

¹⁸ ENV 12506 Analysis of eluates — Determination of pH, As, Ba, Cd, Cl, Co, Cr, CrVI, Cu, Mo, Ni, NO₂, Pb, total S, SO₄, V and Zn, ENV 13370 Analysis of eluates — Determination of ammonium, AOX, conductivity, Hg, phenol index, TOC, easily liberatable CN, F and prEN 14039 Determination of hydrocarbon content in the range of C10 to C40 by gas chromatography

4. Stocktaking of the current LoW application

4.1. Objectives

The objective of task 1 is to compile information on the implementation of the LoW and on the experiences of Member States with its application. The work focuses on information that is needed for the work under tasks 2 and 3. This includes information on:

- the classification procedures in general;
- the classification of hazardous wastes in particular;
- the rules and testing strategies applied;
- aspects which are relevant for the review of the structure of the LoW.

The respective information is drawn mainly from three sources:

- Questionnaires sent to competent authorities, stakeholders, waste experts, etc (Task 1.1);
- Statistical data (data reported under the WStatR and data from a data request to Member States) (Task 1.2);
- Guidance documents, reports and other literature concerning LoW application in MS (Task 1.3).

The following chapters describe the approach to these tasks and the main results.

4.2. Approach

4.2.1. Questionnaire Survey

Survey and questionnaire design

The aim of the questionnaire survey was:

- to collect detailed information on LoW application in Member States;
- to provide input to the development of definitions and rules for the application of the H criteria in task 2;
- to identify aspects to be considered in the revision of the LoW in task 3.

A draft questionnaire was developed and submitted to DG ENV for discussion on 12.10.2007. After discussion the questionnaire was revised accordingly. The final version was presented at the kick-off meeting on 29.10.2007.

The questionnaire consists of five parts and collects information on:

- the responding institution, association or enterprise (Part 1)
- the transposition and implementation of the LoW in Member States (Part 2);
- the practical application of the LoW (classification problems, needs for revision) (Part 3);
- the application of hazard criteria and mirror entries (Part 4);
- laboratory analyses carried out for waste classification purposes (Part 5).

The complete questionnaire is shown in the Annex 1.

A list of addressees was compiled and agreed upon with the European Commission. The questionnaire was sent to:

- all 27 EU Member States, represented by the Permanent Representations, the TAC members, and other competent representatives from Ministries and Environmental Agencies;
- stakeholders (industrial associations, NGOs) and other waste experts.

The complete distribution list is enclosed in the Annex 2.

Questionnaires were sent out between 31.10.07 and 9.11.07 asking for a response by 30.11.2007. Reminders were sent between 7.12.07 and 12.12.07 to all addressees that had not responded by that time. On request of individual Member States and stakeholders the final deadline for submission of the questionnaire was postponed to 15.01.2008.

Questionnaire return

Information from the questionnaires is available on 18 EU Member States:

- From 16 countries the questionnaires were partially or totally completed by official administrative bodies (Ministries, EPAs). From 3 of these countries returns from 2 different bodies were received (Bulgaria, Germany, Spain)
- For two countries (Denmark, France) information is available only from the questionnaires completed by national associations (Denmark: DAKOFA, Waste Denmark; France: FNADE, SYPRED). The respective information is marked accordingly.
- Where available, additional information was drawn from other sources, in particular from the return to a survey carried out by Ökopol in 2005/2006 [Ökopol 2006].

The return from stakeholders is shown in Table 3. Questionnaires or comments were received from 10 European associations, from 8 national associations and

from 8 companies. The input from stakeholders ranges from completed questionnaires to only short remarks on specific aspects.

Table 3: Return of the questionnaire survey from stakeholders

	European associations	National associations	Individual companies	Total
Waste generating industry	5 responses <i>ECPA, ESTAL, ETRMA, Eurelectric, ACEA</i>	2 responses <i>Assocarta, (IT), IVA (DE)</i>	6 responses <i>mainly steel and automobile industry</i>	13 responses
Waste management sector	5 responses <i>BIR, FEAD, CEMBUREAU, Eucopro, WEEE-Forum</i>	6 responses <i>FNADE (FR), SYPRED (FR), BDE (DE), Affald-danmark (DK), DAKOFA (DK), Vereniging Afval-bedrijven (NL)</i>	2 responses <i>SITA (FR), Sigfito (ES)</i>	13 responses
Total	10 responses	8 responses	8 responses	26 responses

The detailed lists of respondents and the dates of information delivery are documented in Annex 3.

4.2.2. Analysis of Statistical Information

An analysis of statistical information was carried out in order to provide supporting quantitative information on LoW application in Member States. One source of information was the data collected pursuant to the Waste Statistics Regulation (WStatR)¹⁹ and the review of the corresponding statistical quality reports. The analysis covered the data on waste generation according to Annex I of the regulation and focussed on:

- Waste items (EWC-Stat keys) for which no waste are reported by one or several Member States.
- Waste items which dominate the total amount.
- Waste origins which dominate the total amount.

The table showing the number of entries and the amounts on the basis of EWC-Stat items is shown in Annex 4.3. Furthermore, Annex 4.4 provides a listing of all corresponding LoW-codes for the EWC-Stat items. The results of the analysis are presented in detail in interim report 1 (Chapter 3.3). It was intended to use the analysis of data on the basis of the WStatR as initial screening for the usage and quantitative relevance of groups of LoW codes, represented by the EWC-STAT waste items. The results of this analysis can briefly be summarized as follows:

- There is no waste item which was not used by a majority of Member states; the item with the lowest number of 14 (of 27 possible) entries was

¹⁹ Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics, OJ L 332, 9.12.2002, p.1, as last amended by Commission Regulation 783/2005/EC, OJ L 31, 25.5.2005, p. 38

item 48 (EWC-Stat 13, hazardous solidified, stabilised or vitrified wastes), which refers to the two LoW codes 190304* and 190306*²⁰.

- For hazardous wastes the amounts²¹ vary between 0.1 kg/cap*a for hazardous glass wastes (Item 18, EWC-Stat 07.1, one LoW code 101111*) as well as wastes containing PCB (Item 25, EWC-Stat 07.7, 6 LoW codes) and 25.5 kg/cap*a for combustion wastes (Item 45, EWC-Stat 12.4, 51 LoW codes).
- For non-hazardous wastes the lowest value reported is again 0.1 kg/cap*a for spent chemical catalysts (Item 5, EWC-Stat 01.4, three LoW codes 160801, 160803, 160804²²) and the by far highest value was reported for mineral wastes with 3656 kg/cap*a (Item 42, EWC-Stat 12 (excl. 12.4, 12.6), 72 LoW codes).
- The major sources for waste generation are the manufacturing industry (NACE section D) for hazardous waste and the sectors of mining (NACE section B) and construction (NACE section F) for non-hazardous wastes.

The number of LoW codes mentioned in the above results indicates that, on account of the data aggregation according to the EWC-Stat classification, the analysis allowed only little conclusions with regard to individual LoW codes. Therefore a second analysis was carried out on the basis of individual LoW codes, which is described below. Two major sources of information were used:

- Data from a data request sent to the Member states, the procedure and requested data of which are described below in more detail.
- Data collected in question 17a) (99-codes used and respective quantities) and question 19 (unused codes) of the survey questionnaire in the context of sub-task 1.1 as already described above (refer to section 4.2.1)

The data request was sent to 25 EU Member States, represented by their national Statistical Offices or other representatives of Ministries and Environmental Agencies responsible for data collection.

The Member States were asked to provide data on the national amount of waste and on the number of statistical units that generated the waste on the level of the six-digit LoW codes for the year 2004 or the latest year available, and to provide a specification of the statistical unit applied (e.g. enterprise, kind-of-activity unit, local unit).

The complete distribution and response lists are enclosed in Annex 4.1 and Annex 4.2. The data request was distributed on 14.11.2007 asking for a response until 07.12.2007. Reminders were sent on 17.12.2007 to all addressees that had not responded by that time.

The return on the data request was as follows:

²⁰ 19 03 04* wastes marked as hazardous, partly stabilised; 19 03 06* wastes marked as hazardous, solidified.

²¹ The amounts are aggregates for the EU 27 in relation to the population based on the current state of the data as published by Eurostat at the time of interim report 1.

²² 160801 spent catalysts containing gold, silver, rhenium, rhodium, palladium, iridium or platinum (except 16 08 07), 160803 spent catalysts containing transition metals or transition metal compounds not otherwise specified, 160804 spent fluid catalytic cracking catalysts (except 16 08 07).

- 19 countries replied on the request, 6 did not reply.
- 16 countries provided data, 3 stated unavailability of data.
- 8 countries could provide complete sets, i.e. generated waste amounts for the whole national economy.
- The remaining 8 data sets received covered only specific sectors (e.g. manufacturing industry), certain aspects (waste to landfills) and/or certain waste categories (e.g. hazardous waste only)

Table4 provides an overview of all data which were suitable for the analysis on the basis of six-digit LoW codes. It contains data from the data request for 12 countries and data from the questionnaire for 9 countries, four of which already provided data in the context of the data request. Thus the analysis covered a maximum of 17 different countries. A more detailed overview of the data included in the analysis is provided in Annex 4.5.

Table4: Overview of data selected for statistical analysis

Country	Year	Data coverage	Source
CZ	2004	All sectors	Data request
EE	2005 & 2006	All sectors	Data request
EL	2004	All sectors	Data request
FI	2006	All sectors	Data request
FR	2006	only HW with gaps for agriculture and services	Data request
HU	2004	All sectors	Data request
IE	2004	Waste from manufacturing sector	Data request
LV	2006	All sectors	Data request
NL	2004	Non-haz. waste [NACE C-E]/ hazardous waste all sectors	Data request
PL	2004	All chapters except 20	Data request
PT	2004	All sectors	Data request
SI	2004	All sectors	Data request
BG ²	2004	99-codes, All sectors	Questionnaire
DE ²	2005	99-codes & unused codes, All sectors	Questionnaire
HU ²	2004 to 2006	99-codes & unused codes, All sectors	Questionnaire
IT ²	2004	99-codes & unused codes, All sectors	Questionnaire
LT ²	2005/06	99-codes & unused codes, All sectors	Questionnaire
LV ²	2004	99-codes, All sectors	Questionnaire
NL ²	2006	99-codes & unused codes, All sectors	Questionnaire
RO ²	2004	99-codes, All sectors	Questionnaire
SI ²	2004	99-codes & unused codes, All sectors	Questionnaire

The provided data were rather heterogeneous, particularly with regard to the following aspects:

- Data refer to different reference years; some countries provided data for more than one reference year.

- Missing and real zero values are treated differently in data from data request: sometimes 0 means "code not used", sometimes it means "data is confidential", examples:
 - one country provided a complete list of all 839 codes -> 0-value means "code not used"
 - two of the countries provided only used codes -> 0-value means "confidential"
 - the remaining countries provided an incomplete list with (far) less than 839 codes: 0-value or missing codes means "code not used"
- Data has different level of details: HU, for instance, provided data by several NACE branches for each LoW-code.
- Data has different coverage either by waste types (PL) or economic activity (IE, NL) or both (FR), or covers only 99-codes (applies to all data sets from the questionnaire)
- Data has different statistical level: Sometimes amounts refer only to the sampled statistical units, sometimes data was extrapolated for the whole country
- In eight cases waste-keys not listed in the LoW were used, mostly as additional codes, but in a few cases also codes from the "old" EWC

As a consequence of the above limitations it was necessary, depending on the scope of the individual analysis, to make a careful selection of suitable datasets, leading to varying sets of countries presented in the different result tables.

The analysis consisted of two major stages:

1. The first part consisted of several analyses covering only partial aspects of the LoW (i.e. of unused and additional codes as well as the usage of 99-codes) on a higher level of aggregation (chapter, sub-chapter, EWC-Stat)
2. The second part covered the whole LoW and provides information on the frequency of usage and the national amounts on the level of all individual six-digit LoW-codes

The following chapter outline briefly the methodological issues of all data analyses.

4.2.2.1. Part 1 – Analysis of partial aspects on aggregate level

The following analyses were carried out on a more aggregated level in order to gain an overview (the information in brackets refers to the chapters where the results are presented):

Amounts assigned to 99 entries (refer to 8.2)

This analysis focussed on the shares of amounts assigned to 99-codes from the total national amounts generated. The analysis covered the following levels:

- Share from the total national waste generation
- Shares from the totals of EWC-Stat categories

- Shares from the totals by chapters and sub-chapters of the LoW

On the national level and the level of EWC-Stat categories, data from the request and the questionnaire were used. For the latter the total amounts generated for the whole economy and by EWC-Stat-categories were estimated on the basis of the available WStatR-data. The analysis on the level of LoW (sub-) chapters was restricted to the data from the data request.

Frequency of unused codes (refer to 8.3)

The analysis of unused codes covers the frequencies of unused codes in relation to the number of available codes. The analysis resulted in the shares of the number of unused codes from the available codes for the levels of:

- the whole LoW (i.e. number of unused codes/839)
- chapters and sub-chapters

For the analysis both data sources (request/questionnaire) were used and those country data selected that were most stable and representative.

4.2.2.2. Part 2 – Analysis of complete LoW on the level of six digit codes

In this analysis the frequency of usage and the amounts relative to the national totals on the level of six-digit LoW-codes over the number of countries covered was determined. It is characterised by the attempt to maximise the number of countries available. The approach was to group the data shown in Table 4 into four categories reflecting the quality and quantity of available information:

1. Data from the request covering the whole economy ("all sectors"): For this group of countries the whole LoW is covered, as either an amount > 0 is available or the code was not used (CZ, EE-2006, EL, FI, HU, LV, PL²³, PT, SI).
2. Data from the request NOT covering the whole economy: This group contributed to the results only for the LoW codes listed, as the codes not listed could as well have been used in the missing sectors of the economy (NL, IE, FR).
3. Data from the Questionnaire for unused codes and amounts of 99-codes: For this group again the whole LoW is covered; for 99 codes quantities are available, the unused codes are directly listed and the remainder can be concluded as used codes but without quantitative information (DE, IT, LT).
4. Data from the Questionnaire ONLY for amounts of 99-codes: Identical to group 2, but further restricted to 99-codes (BG, RO).

This approach led to a varying number of countries which provided information on the usage/amounts for each individual waste code directly (data request) or indirectly (questionnaire/unused codes), with a maximum of 17 countries. In order to minimise the influence of the countries size on the waste amounts gen-

²³ Poland is listed in group 1, as the gap in coverage is defined by waste category, i.e. only codes from chapter 20 were not covered

erated by six-digit LoW codes, indicators were calculated by setting all available amounts in relation to the national total amount generated for hazardous and non-hazardous waste, respectively. Whenever the national amounts were not available/not complete in the data from the Questionnaire or data request, the amounts reported on the basis of the WStatR were used as estimators.

The results for all individual LoW codes are presented in Annex 4.6 for non-hazardous wastes and in Annex 4.7 for hazardous wastes in the sorting order of the LoW. From these complete lists the following groups of interest were filtered and listed separately:

1. Two tables showing those waste codes with the lowest degree of usage and the smallest amounts for hazardous and non-hazardous waste, respectively (see Annex 4.11 and Annex 4.12)
2. A table containing all 99-codes (see Annex 4.4)
3. A table containing the codes with the highest amounts for hazardous and non-hazardous wastes (see Annex 4.13)

These separate listings shall assist in the assessment of codes that may be redundant (1), of 99-codes which are particularly problematic (2) or of codes which may be too unspecific (3).

The approach to set all amounts on the basis of the individual waste code in relation to the total national amounts results in very small values. In order to assist in the interpretation of these values, the following graphs and tables shall provide some guidance.

Table5 shows the amounts as provided in % in the result tables and to which absolute amounts they correspond in small or large countries with typical national waste generation figures.

Table5: Exemplary presentation of the effect resulting from the calculation of indicators in relation to national total amounts generated – examples for small and large countries and hazardous (HZ) and non- hazardous (NH) waste

Amount in relation to national total		National total amounts [t] for			
		Small country		Large country	
		HZ	NH	HZ	NH
		5.000	200.000	5.000.000	200.000.000
ratio	percentage	corresponding absolute amounts [t] per waste code			
10^{-1}	10%	500	20.000	500.000	20.000.000
10^{-2}	1%	50	2.000	50.000	2.000.000
10^{-3}	0,1%	5	200	5.000	200.000
10^{-4}	0,01%	0,5	20	500	20.000
10^{-5}	0,001%	0,05	2	50	2.000
10^{-6}	0,0001%	0,005	0,2	5	200

The values in Table5 give an impression how the low percentage values calculated for each LoW code may be interpreted in terms of the quantitative relevance of the waste type within a countries waste management system. For example, if for a certain waste code the average of the relative amounts of a certain number of countries is 10^{-6} (or 10^{-4} %), then this average can be interpreted

to correspond to absolute values of 0.2 tonnes in a small country or 200 tonnes in a large country for non-hazardous waste, or 5 kg/5 tonnes for hazardous waste. These figures are certainly very low in absolute terms, but how can these values be interpreted in relation to the remaining wastes from the LoW. Are there many other codes that have still lower waste generation figures? In order to assess the quantitative relevance of a certain LoW code in relation to the other wastes from the LoW, the following paragraphs shall provide more insight.

For each code of the LoW, all available amounts were put in relation to the respective countries total generation, and subsequently, mean, median, minimum and maximum of all the relative amounts were calculated for each LoW code. In the next step the means and medians of all LoW were grouped according to their values on a logarithmic scale and the frequencies of LoW codes were plotted over these intervals.

The intervals start at values below 10^{-4} % of the national amounts, i.e. the generated amount of the waste type was less than one millionth of the national amount, and this on average over all countries which provided quantitative data for this waste type according to LoW. The highest group refers to average shares from national amounts of between 10 % and more and is labelled "< 100 %".

Note that neither for non-hazardous nor for hazardous waste amounts were available for all waste types according to LoW codes. However, the results cover 821 of the 839 waste codes. Of the missing 18 codes, two were not used by any country, 1 was used by 3 countries and the remaining were used by one or two countries, but no quantities were available for any of the used codes.

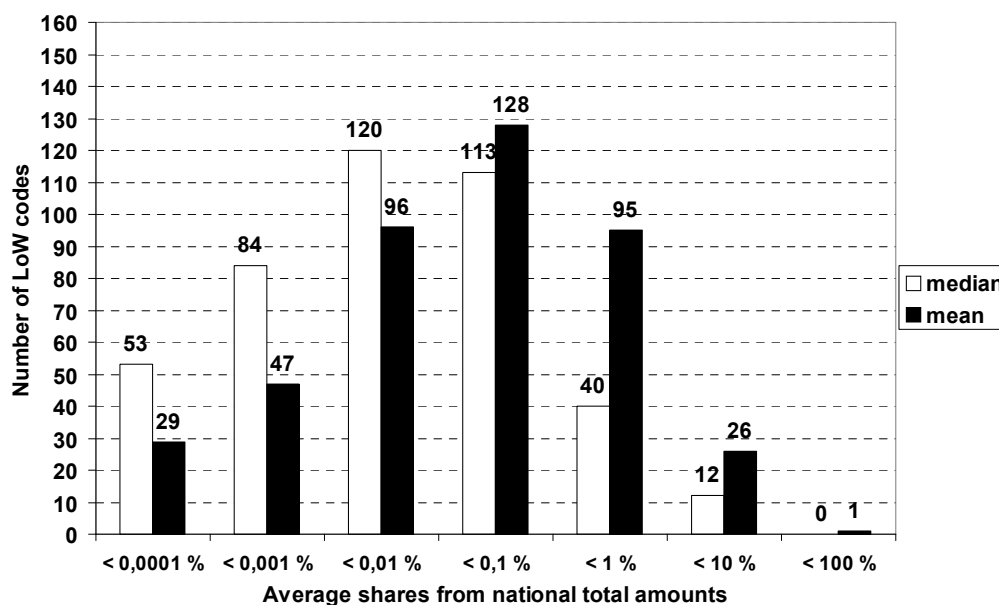


Figure 6: Frequency distribution of average shares from national amounts for 422 of 434 non-hazardous waste codes

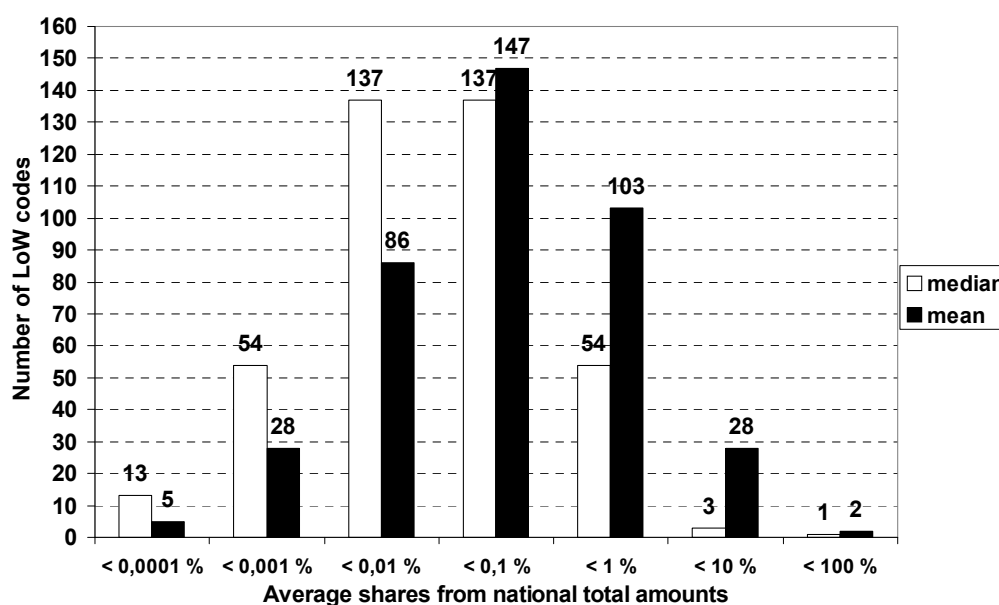


Figure 7: Frequency distribution of average shares from national amounts for 399 of 405 hazardous waste codes

The figures above show, as would have been expected, distributions similar to the normal-distribution with the largest number of keys in the medium range of amounts (< 0.1 %) and by far fewer codes with large amounts of 1 % and more (groups: <10 % and < 100 %). In either figure there is still a moderate number of codes in the group of lowest values, i.e. with average national shares below 10^{-4} %. This means, that for non-hazardous waste about 12.5 % (53 codes based on median) of 422 codes make up less than a millionth of the national amounts. The corresponding value for hazardous waste is much lower with

about 3 % of 399 codes (13 codes based on median). In general, it can be observed that for hazardous waste the distribution is more close to a normal distribution than for non-hazardous waste where the number of codes with lower average national shares is much higher.

The differences between the means and the medians can be explained by the fact that for most codes outliers were observed at the upper end of the scale with far higher amounts than the remaining values. This leads to results where the mean is in general higher than the median, so that the frequency distribution by means is characterised by a larger number of codes in the groups of high waste amounts and, consequently, lower number of codes in the groups of small waste amounts. Obviously it is often the case that even if a waste type is observed only in small amounts in a majority of countries, that in a few countries the code has a much larger relevance in terms of generated amounts.

However, the median is seen as a more suitable parameter to represent the average over all countries and will be used throughout this document when referring to the average.

4.2.3. Analysis of Guidance Documents

The aim of this task was to identify, collect and analyse guidance documents, tools and other relevant documents that are used in Member States to support and specify the application of the LoW.

Several guidance documents have already been collected in previous projects (i.e. guidelines of the Netherlands, the Flemish region, Germany, UK etc.). Additional guidelines, if existent, were identified and gathered through the questionnaire survey and by screening through internet.

The collection phase for the relevant documents via questionnaire survey (in addition to the already available documents) was scheduled to take up to 3 months and was completed by January 15, 2008.

During the first month of the project a primary assessment scheme has been prepared. When all documents were collected the analysis and assessment phase started and was finished by the end of project month 5.

The outputs with regard to the analysis of guidance documents are as follows:

- List of guidance documents, tools and other relevant documents used in Member States for LoW application
- Assessment of the guidelines with regard to the aspects (see chapter 4.4).
 - Structure and applicability of the document;
 - Depth of the guidance and possible interpretation leeway with regard to
 - Origin (sector/process) specific information
 - Waste type specific information
 - Mirror entries
 - Gaps leading to classification problems;
 - Rules leading to diverging classifications;
- Synopsis of the guideline contents with regard to the points to be discussed under task 2.
- Compilation of useful definitions and approaches for the rules to be developed under task 2 and for the revision of LoW under task 3.

The list of guidance documents, tools and other relevant documents used in Member States for LoW application is completed. The list includes all guidance documents which are indicated by

- the EU Circa-platform,
- the return from the questionnaire,
- through investigations on the internet.

The compiled list of guidance documents is enclosed in Annex 5 to this report.

The primary assessment scheme was prepared to screen the guidelines with regard to the aspects:

- Structure and applicability of the document;
- Depth of the guidance and possible interpretation leeway with regard to
 - Origin (Sector/Process) specific information
 - Waste type specific information
 - Mirror entries

This primary assessment scheme was applied to the available guidelines only. It provided the basis to select guidelines for further assessment with regard to:

- Rules leading to diverging classifications;
- Compilation of useful definitions and approaches for the rules to be developed under task 2 and for the revision of LoW under task 3.

Guidelines which did not give any detailed information on the classification of wastes for which mirror entries exist or which did not define additional limit values or characterization approaches other than in the EU legislation were not further contemplated. If guidance documents of several Member States use the same system, the most detailed guideline was chosen to represent all other guidance documents.

4.3. Transposition of Decision 2000/532/EC in Member States

In part 2 of the questionnaire the Member States were asked for information on the date the LoW entered into force, and on the way the LoW was implemented (i.e. possible modifications of codes or of classification procedure). The available information is summarised in Table 6.

Table 6: Transposition of LoW in Member States

Country	Effective ¹⁾ since	Has the LoW been adapted to national requirements?	Has the classification procedure been adapted?
Austria	-	AT uses national classification and LoW in parallel	-
Flanders (Belgium)	-	-	yes
Bulgaria	April 2004	no	no
Czech Republic	1.1.2002 ¹	no	no
Estonia	June 2002 ²	Adaptations of existing codes and introduction of new ones	
Finland	1.1.2002	Adaptations of limit values for H4, H5, H6; introduction / adaptation of codes	no
France	April 2002	no	no
Germany	1.1.2002	no	no
Hungary	1.1.2002	no	no
Ireland	2002 ³	no	no
Italy	1.1.2002	no	no
Latvia	July 2002 ²	no	no
Lithuania	2003	no	no
Netherlands	May 2002	no	no
Poland	1.1.2002 ²	Yes, introduction of new codes	
Romania	2002 ²	no	no
Slovenia	2001, amendments in 2003	no	no
Spain	20.02.2002		
Sweden	1.1.2002	no	no
UK	2002	no	no

The information in the table is taken from the returns of the questionnaire if not marked otherwise.

1) For some countries the reported date seems to refer to the date of publication rather than the date of coming into force.

2) Information from [EUROSTAT 2003]

3) Information from [OEKOPOL 2006]

The table shows that most of the countries that responded to these questions transposed Decision 2000/532/EC without changes. Major deviations or changes like the use of a national classification, the introduction of new waste codes, changes of limit values for H-criteria or a modification of the classification procedure are known from Austria, Poland, Estonia, Finland and Flanders:

- Austria uses a material-based national waste list for the permission of treatment, recovery and disposal facilities (ÖNORM S 2100). The wording of the LoW is used in cases, where it is required by Community law (e.g. Decision 96/302/EC²⁴, Decision 94/774/EC²⁵, Decision 2003/33/EC²⁶ or the Waste Shipment Regulation).
- Poland has added about 80 additional waste codes (6-digit-level) and 3 additional sections (4-digit-level) to the 839 codes defined in Decision 2000/532/EC. The additional codes are said to represent waste types that are characteristic for the Polish industry and the waste management system. The codes were introduced with the aim of an optimal characterisation of the waste types, in particular of those that are important in terms of quantity. However, Poland concedes that the lobbying by the waste generators might also have influenced the introduction of the national codes. The national codes are integrated in the LoW-coding system and end with the digits 80 to 8x. The complete list of the national Polish codes is shown in Annex 7.1.
- Estonia added new wastes codes (27 codes; 6-digit level) and modified the wording of existing LoW-entries (5 codes were adapted) in order to adapt the LoW to the national needs. Several changes relate to wastes from the use of oil shale for energy production. The wastes from oil shale processing and combustion are specific for Estonia. They are mostly hazardous and make up considerable quantities (see chapter 8.2). Several other national codes refer to medicine waste and used medicines. New codes are integrated in the coding system of the LoW and end with the digits 9x. The whole list of additional and adapted codes in Estonia and the reasons for their introduction is shown in Annex 7.2.

²⁴ Commission Decision 96/302/EC of 17 April 1996 establishing a format in which information is to be provided pursuant to Article 8 (3) of Council Directive 91/689/EEC on hazardous waste

²⁵ Commission Decision 94/774/EC of 24 November 1994 concerning the standard consignment note referred to in Council Regulation (EEC) No 259/93 on the supervision and control of shipments of waste within, into and out of the European Community

²⁶ Council Decision 2003/33/EC of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC)

- Finland introduced two new codes and did a few modifications of existing entries. In addition, limit values for the H-criteria H4, H5 and H6 were changed or specified. The national amendments include:
 - All waste medicines from consumers and health care sector are classified as hazardous (18 01 09*, 18 02 08*, 20 01 32*).
 - H4: The limit value for irritant substances classified as R41 was lowered to 5 %.
 - H5 and H6 were specified by setting a separate limit value for substances which can cause long-term health effects.
 - A general provision for H4 to H8, H10 and H11 was introduced that the limit values in the EC List of Dangerous Substances will be used when they are lower than the values set in the Finnish Waste Decree.

For more details concerning the Finnish modifications please refer to Annex 7.3.

- The Public Waste Agency of Flanders, OVAM, has published a 6-step decision tree that deviates from the 4-step classification protocol according to the introduction of the Annex of Decision 2000/532/EC. The modified procedure is intended to eliminate some ambiguities that might arise when applying the four-step process as published in Decision. The decision tree is shown in Annex 6.2.
- Some Member States (e.g. Estonia, Germany) use national sub-lists (8-digit codes) to the LoW in case the LoW-codes are not specific enough:
 - Estonia has established sub-lists for metal waste and for waste electrical and electronic equipment.
 - In Germany 8-digit codes are used for statistical purposes, e.g. for further specification of mixed municipal waste (20 03 01) and of components from dismantling and maintenance of ELV (16 01).

4.4. Guidance on LoW application

Sources

Guidance documents and tools used in the EU Member States to support and specify the application of the LoW were collected. 24 guidance documents and other tools originating from 10 Member States were assessed in total. The table "List of guidance documents and tools" in Annex 5 gives an overview.

From the following 17 Member States no guideline could be identified or was pointed out in the questionnaire:

Austria, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Greece, Hungary, Italy, Lithuania, Luxemburg, Malta, Poland, Portugal, Romania, Slovak Republic., Slovenia.

The guidance documents derived from previous projects and the EU-Circa Platform and from answers to the questionnaire. The internet inquiry resulted in two additional documents and the updates of 4 guidance documents from the EU-Circa Platform. As the guidelines and other tools have various objectives, structure and target groups a first assessment was undertaken to find the most promising documents with regard to task 2 and 3.

Description and assessment

The first assessment was a screening with regard to the dominant structure of the document. The structure could be comparable to the LoW structure or follow a different system by referring, for instance, to industrial branches or to the material-oriented statistical nomenclature EWC-Stat.

Then the depth of the guidance was contemplated with regard to practical examples, calculation methods and a description of a specific assessment of hazardous wastes.

Additionally the documents were analysed regarding:

- Are there supplementary definitions or limits given for H9 and H12 to H14?
- Are there testing methods or calculation named?

The answers to these questions were condensed in the table "Primary Assessment of Guidance Documents" (see Annex 6.1)

The main objective of most guidelines is to explain the system of the LoW and to support its application. The level of detail of the documents varies. Most documents do not tackle the specific application of H-criteria in-depth.

Guidelines with a comprehensive approach to the H-criteria of the LoW

Documents, which contemplate all hazardous criteria directly and comprehensively, are the guidance document 'Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1)' from UK [UK 2006] and the Latvian draft guideline (LV 2005A), which is almost identical with parts of the UK document]. The UK guideline focuses on the determination of the hazardousness of waste with mirror entries (appendix B) and all H-criteria are assessed in a separate volume (appendix C). In most cases detailed decision making schemes are included. The guidance document [UK 2006] is very thorough and detailed and leaves little room for interpretation with regard to waste type specific information and mirror entries classification.

The German 'Guidelines on the Application of the Waste Catalogue Ordinance [DE 2005] pays particularly attention to the assignment of hazardous properties in the case of 'mirror entries', explains the hazardous properties H1 to H14 and

a system for the assignment of these properties. *"Not all hazardous properties are specified in the Waste Catalogue Ordinance (only H3 to H8, H10 and H11). In the interests of a uniform application, explanations are given in these guidelines for the other non-specified properties, which allow easily identifiable classifications to be made."* With regard to the hazardous criteria assessment the document is comprehensive and tackles all H-criteria.

The Dutch Guideline [NL 2001A] has a clear and easy to follow determination scheme for the classification of waste. Its search- and decision making scheme offered in the first two steps for the identification of the waste is identical with the approach in point three of the introduction section of the LoW. In case the waste has a mirror entry the following decision tree is followed (see also Annex 6.3):

- Step 3: Waste with a flash point below 55°C is hazardous.
- Step 4: The composition of the waste, i.e. the contained substances and their concentrations, is determined and further assessed on the basis of the R-phrases in steps 5 to 7.
- Step 5: Comparison of the contained substances with the substances in Annex 2 of the Dutch guideline.
- Step 6: Comparison of the contained substances with the substances in Annex 1 of the Substance Directive.
- Step 7: Determination of R-Phrases on the basis of existing data (physical-chemical properties, toxicity, ecotoxicity).
- In step 8 a scheme with all R-phrases and the respective concentration levels offers a guidance to decide the hazardousness.

In a separate table substances, which render the waste hazardous, are connected to R-phrases, H-criteria and limit values, where available. A second table is structured according to the R-phrases. The limit values are in line and do not go beyond the relevant EU legislation. The document makes no references to the criteria H13 and H12 (except for Cadmiumcyanide-R32-H12). For H14 no bio tests are proposed, but concrete substances listed which fulfil these criteria. H14 is connected the R-phrases R50-R59.

The guidance document is accompanied by a second volume that includes practical examples for training [NL 2001B] and does not refer to any production processes.

Guidelines and tools, which take a practical waste producer orientated approach:

Three of these documents from Belgium [BE 2004], Finland [FI 2005D] and Baden-Württemberg [DE 2003] feature a production related approach and are structured from the point of view of a waste generator.

They support the waste producer to assign the relevant waste codes by offering a pre-selection of waste codes linked to production steps, which are illustrated in the guidance document. This pre-selection also includes 99 codes and mirror entries from the LoW.

The Finish guideline of 1999 includes also statistical codes, but its updated version, the guideline FI 2005D, refers to LoW codes only. The waste is classified according to the business sector and then to the production activity. If a waste doesn't have an own category in the business sector, the waste is classified according to its generation process or type of waste. Where for a certain type of waste from the production a hazardous code and a mirror entry are applicable, both codes are mentioned. For the application of hazardous criteria to determine the hazardous waste from the non-hazardous mirror entry no specific information is given in the document.

The guideline from Baden-Württemberg [DE 2003] also classifies the waste according to the business sector and then to the production activity. *"The aim is to assign real wastes to the suitable waste codes"*.

It comprises of three volumes:

- Part A: Legal basis; LOW to sub-chapter 10 13,
- Part B: Sub-chapter 11 01 through 19 13,
- Part C: Chapter III, options for disposal and recovery.

For the sub-chapters of the LoW are following information are available:

- Industrial process description.
- Material flows "Waste" and classification in waste categories.
- Notes on appropriate disposal and recovery processes.
- Matrix on waste code/material flow.

"In addition the so-called mirror entries were taken into consideration. In some cases it was possible to solve potentially contentious classification and allocate waste to hazardous or non-hazardous categories." The limit values or criteria for the determination of the hazardousness of wastes, for which mirror entries exist, are not stricter than required by EU regulations. But the assignment to the type of waste and to the production process supports the correct decision making by the waste generator.

The Belgium guideline by OVAM [BE 2004] explains the hazardousness of waste by the obvious characteristics of the waste, e.g. tar-containing, base/acid, halogen-containing, asbestos-containing. The definition is linked to waste codes

and refers to concrete limit values for specific substances or substance groups and the respective detection methods. The following example concerning oil-containing waste shall illustrate the approach of the OVAM-guideline:

“A waste stream is described as oil-containing if it has a mineral oil content of more than 2%. The determination of the mineral oil content take place with the analytical method from the Analysecompendium of VITO (CMA)...Most oil-containing waste streams are found in chapter 12 and 13 of the EURAL list. In case a real oil stream is concerned, it is clear that here always an oil-containing (and therefore hazardous) waste is meant. Examples from the EURAL list are.... 050105, 0501012*, 080319*, 120106*.....The less specific, potentially oil-containing waste streams of the EURAL list are numerous, but are situated mainly in the EURAL chapters 12 and 13. Some examples from other EURAL chapters are excluded here: 010505*, 050106*,.... 170410*.... ” ([BE 2004] page 11-12).*

The guideline introduces a flow scheme for the allocation to the waste codes which differs slightly from the scheme of the European LoW. It is a six step approach which starts with the identification of “*exclusively packaging*” at the beginning (see Annex 6.2) and examples for the use of this scheme are given.

For the definition of hazardous criteria the guideline states that „ *some clear criteria defined in [BE 2004] for some of these characteristics that are relatively easy pursuable (e.g. concentrations of flammability) ...for another part of these characteristics there are criteria indicated in the Preparation Directive (99/45/EG)....*“ Annex 3 of the guideline summarizes the hazardous criteria in a table. The R-Phrases indicated here refer to Directive 67/548/EEG (“Substances Directive”) and the concentration limits are drawn from Preparations Directive. So the definition of the hazardous criteria in the guideline generally do not go beyond the EU Directives, but the systematic approach guiding the waste generator to characterize the waste is detailed and clear.

The application of the hazardous criteria is explained in detail and a very comprehensive sector specific assignment of waste codes and relevant examples of wastes from this production steps. In the production specific chapter the pre-selection of waste codes related with different production steps takes place and includes 99 codes and mirror entries. The classification has still to be carried out by the waste generator, but the choice of codes from the LoW is already limited to make the LoW more applicable. So the guideline is very user friendly and apt for application by industry.

Another document, which is of interest for practical application by the waste producer, is the transnational HWIT Hazardous Waste Identification Tool. HWIT was developed under the project HAZTRAIN led by the Clean Technology Centre (CTC), Cork Institute of Technology and therefore found under the Irish No. [IE 2007]. The tool takes a step-by-step approach to the identification of the hazardous components of any given waste in accordance with EU legislation and aims to support for the waste generator.

The tool guides the user through three assessment steps where the known characteristics of the waste has to be filled in and requests data on various analyses. In connection with a data base the assessment of the hazardousness of the waste is then carried out by the programme. Within this study the data base could not be accessed.

Guidelines and documents restricted to specific issues

The French document [FNADE 2003] refers to landfill criteria/waste acceptance. Nevertheless it provides some interesting information for Hazard-criterion H14.

One German document "Vollzugshinweise zur Zuordnung von Abfällen zu den Abfallarten eines Spiegeleintrages" [DE 2007D] focuses on eco-toxicity with regard to a specific testing regulation.

One document [UK 2007B] refers mainly to related hyper links.

The German document HAZARD-Check: Die Bewertung der Gefährlichkeit der Abfälle and the transnational HWIT-document Hazardous Waste Identification Tool [IE 2007] are related to data base applications.

The Dutch document EUROPESE AFVALSTOFFENLIJST (EURAL) Praktijktraining [NL 2001B] is actually more for training issues.

The Spanish Ministerial Order of 1989 defines the hazardousness of waste without mentioning of H-criteria and in a different systematic. In the annex to the Ministerial Order methods for the analysis of flash point, eluate and leachate and bio test for leachate are described at a level of a technical norm. An overview on the hazardous waste characterization by Ministerial order 1989 is shown in Annex 6.4

Documents which were not further assessed with regard to H-criteria

These guidance documents leave a lot of interpretation leeway and therefore not further assessed.

The Swedish guideline "Farligt avfall - Handbok 2003:8" was not further assessed due to the information from the Swedish questionnaire. There, the Swedish EPA states that "the handbook is dealing with the general provisions for the implementation of Directive 2000/532/EC but is insufficient with regard to classifying waste."

The Irish guideline [IE 2002] transposes the LoW and offers a general assessment scheme, which refers to the Irish Waste Management Act, 1996 to define the properties of hazardous waste. The Waste Management Act, 1996 transposes the annexes 1 to 3 of the Directive 91/689/EEG directly. (see Annex 6.5). No additional guidance for the classification of waste is given, but it makes reference to the transnational HWIT Hazardous Waste Identification Tool by the Clean Technology Centre (CTC), Cork Institute of Technology [IE 2007]

Guidance documents for the extraction of additional information with regard to the H-criteria:

In the next step those guidelines were selected which are promising in particular with regard to additional definitions and approaches for the rules to be developed under task 2. The documents for further contemplation were chosen on the basis of the primary assessment based upon the content of further methods, limit values etc. for the application of H-criteria. Those documents giving a deeper insight into the set of problems, giving practical examples, calculation methods, testing methods or further limit values and documents based on other promising regulations or guidelines were selected. The selected documents are shown in Table 7.

The further analysis of guidance documents focused on the hazard criteria H9, H12, H13 and H14. In addition, H7 was included as some countries mentioned problems with the application of H7 in their answers to the survey questionnaire.

Table 7: Guidance documents for further assessment of H-criteria

<i>Guidance document (Nr.)</i>	<i>H-criteria considered</i>
Europese afvalstoffenlijst EURAL Handleiding [BE 2004]	H7
METHODOLOGICAL GUIDE Waste classification. Practical application to storage centers [FNADE 2003]	H14
Guidelines on the Application of the Waste Catalogue Ordinance of 10 December 2001 [DE 2005]	H7, H9, H12, H13, H14
Vollzugshinweise zur Zuordnung von Abfällen zu den Abfallarten eines Spiegeleintrages. Germany, Brandenburg [DE 2007C]	H13
Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1) [UK 2006]	H7, H9, H12, H13, H14

The complete analysis of the primary assessment for each document is condensed in table "Primary assessment scheme", Annex 6.1. The table shows a synopsis of guideline contents with regard to the subjects of task 2. For the assessment of the guidelines with regard to the mentioned H-criteria please refer to chapter 5.

4.5. Classification problems

The spectrum of answers concerning classification problems is very broad, ranging from general structural deficits to detailed aspects concerning specific codes. A lot of answers overlap with the questions concerning the additional waste codes and the question concerning the H-criteria.

The classification problems addressed in the questionnaires can be grouped as follows:

- Problems resulting from the structure of the LoW and the classification procedure;
- Problems concerning the classification of hazardous waste and the application of mirror entries;
- Problems resulting from the lack of suitable waste codes;
- Ambiguous classification on account of two or more possible codes;
- Problems resulting from unclear or imprecise definitions.

4.5.1. Structural aspects and classification procedure

Classification problems result from the mix of the origin-based approach (chapters 1 – 12, 17 – 19) and the material based approach (chapter 13 to 15).

The mixed structure complicates the classification procedure. Several countries point out that the classification procedure and the instructions are too difficult and need a lot of explanation in order to achieve a harmonised application (FI, LV, HU, NL, FNADE). It is stated as likely that this classification procedure is not strictly followed by all companies / operators. Finland, for instance, points out that companies (and authorities) generally tend to use the sector-specific chapters and rather assign waste to the 99-codes of the respective sector than to look for appropriate codes in the chapters 13 to 16.

Problems arise with regard to chapter 20 on municipal waste. Chapter 20 neither applies the origin-based approach, as it covers wastes from households and from commercial and industrial sources, nor does it follow a material-based approach. This results in questions and ambiguities. The Netherlands, where a helpdesk for LoW applications has been established, indicates that questions concerning the coverage of chapter 20 are among the most frequently asked questions the helpdesk has to handle.

A very practical problem is addressed by Estonia. The names of numerous waste codes are not self-explanatory and can be applied correctly only together with the headings of the respective chapter and/or section. Estonia proposes to clarify the wording of the LoW codes by including all necessary information from the headings of the higher-ranking classification levels in every waste code.

Such editorial changes are assumed to prevent misclassification resulting from the disregard of the section and chapter information.

4.5.2. Classification of hazardous waste

Most remarks concerning existing classification problems refer to the classification of hazardous waste. The following points are mentioned:

- The dealing with mirror entries, i.e. the application of chemical legislation to waste, is seen as very time-consuming and difficult task for companies and authorities, preferably in case of some solid, complex wastes of varying composition. Sweden sees this as the main classification problem.
- The Netherlands point out that those problems are encountered in particular where a specific compound in a waste stream is not classified in Directive 67/548/EC and where no R phrases exist.
- Serious problems result from the lack of harmonised criteria, methods and limit values for the hazard criteria H9, H12, H13 and H14. This aspect is not specified here as it is extensively described in chapter 5.
- In some cases the concentration limits for the H-criteria according to chemical substance law are considered to be too high for waste management purposes. Wastes might thus be classified as being non-hazardous even though the concentrations of hazardous substances are considered to be too high for environmental and waste related objectives. This applies in particular to the 0.1 % concentration limits for dioxins and furans with regard to the criterion H7. Reference is made to the lower limits in the POP-Ordinance.
- Problems exist with regard to the application of criterion H7 to hydrocarbons in general (IT) and to “bituminous masses containing coal tar” in particular (SE). An agreement is necessary with regard to an appropriate indicator and the concentration limit that should be applied.
- Germany sees a major problem in the missing up-date of current data from hazardous substance classification. The legal basis for dangerous substances / preparations has not been implemented in Decision 2000/532/EC according to the latest state (e.g. missing link to the Directive 1999/45/EC).

4.5.3. Lack of suitable waste codes

Classification problems on account of lacking waste codes were mentioned by numerous Member States and stakeholders. Some countries consider this even as the most serious problem.

Possible impact of nonexistent entries:

- Extensive use of 99-codes which is a problem for waste statistics as well as for monitoring / enforcement.

- In the absence of generic codes for hazardous waste (98*-codes) the non-existence of appropriate codes may result in a classification as non-hazardous 99-code which might lead to inadequate treatment of the waste.

A detailed list of proposed waste codes is given in Annex 13.

4.5.4. Several codes exist for one waste type

The problem that a specific waste may be assigned to different waste codes is seen as a frequent problem by several Member States and stakeholders. The examples given refer mainly to the question whether to assign a waste to chapter 20 or to look for appropriate entries in other chapters. The following examples are mentioned:

- Waste electrical and electronic equipment (WEEE): 16 02 or 20 01
- Metal waste of non-municipal origin: 17 04 or 20 01
- Glass packaging: 15 01 07 or 20 01 02
- Solid oil wastes: 13 08 99* or 15 02 02*

4.5.5. Unclear definitions

- Several comments from Member States and stakeholders refer to classification problems that result from unclear definitions in chapter 19 in general and section 19 03 'stabilised and solidified wastes' in particular:
 - Obviously, the definitions for solidified wastes, stabilised wastes and partly stabilised wastes are seen as totally insufficient and regularly lead to problems. The UK generally questions the term 'partly stabilised waste' because stabilisation is considered as an all or nothing situation.
 - The French association FNADE points out that in France even stabilised wastes are considered to remain hazardous on account of H14. They propose therefore to delete the two non-hazardous entries 19 03 05 and 19 03 07.
- Another comment of UK concerns the codes 19 02 05*/19 02 06. These codes can include sludgy waste from physical treatment, chemical treatment and chemical and physical treatment. UK considers this interpretation as too wide and proposes to classify under these entries only waste that has been both chemically and physically treated.
- Two further comments concerning chapter 19 come from Austria and from FEAD:
 - Austria asks how profoundly a mechanical treatment must be carried out in order to classify waste in chapter 19.
 - FEAD states that it is unclear whether codes of the chapter 19 refer to licensed treatment facilities only or also to on-site waste treatment.

- A comment from Sachsen-Anhalt, Germany, refers to the general lack of a definition for waste, sludges, liquid wastes, suspensions, etc. In some sections (e.g. 08 01, 08 04) the LoW provides different codes for solid, sludgy and liquid wastes without providing clear criteria for distinction.

5. Rules on the application of H-criteria

5.1. Introduction

The terms of reference (TOR) require for this subtask that – based inter alia on the information gathered in the course of task 1 – appropriate definitions of the criteria H9, H12, H13 and H13 shall be developed. The criteria and definitions to be developed shall take account of the aim to reduce analytical efforts for the characterisation of waste.

Stakeholder stressed that the H-criteria approach is not applied in practice in most cases where waste are to be characterised. The reasons are that such approach is complex and complicate and necessary testing is often seen as too expensive. In the day to day practice the characterisation is done based on existing knowledge and experience and expert judgement. Sometimes, in case of uncertainties, it is preferred to characterise a waste for transport within a Member State as hazardous in order to avoid the costs of testing. However, the system of H-criteria are used in cases where no agreement can be found based on existing knowledge/experience regarding the characterisation of waste between involved parties (e.g. authorities and waste producers/waste management companies).

One Member State stated that they do not use the H-criteria H12, H13 and H14 and do not experience serious problems from this (see also the specific sections on the application of H-criteria in the Member States in sections 5.2, 5.3, 5.4 and 5.5).

5.2. Criterion H9 - infectious

The objective of this subtask is to develop potential definitions of the criterion H9 aiming, inter alia, at ensuring consistency of the approaches in the Member States.

In the Hazardous Waste Directive²⁷ (HWD) the criterion is worded as:

“H9 ‘Infectious’: substances containing viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms.”

5.2.1. Outcome from questionnaire

This section summarises the results of the questionnaire survey with regard to the application of H9. Detailed information by country is provided in Annex 8.7

Definitions for H9 ‘infectious’

In most Member States the classification of infectious waste is based on the definition in the HWD Annex III.

Some countries like Italy and Estonia draw further information on the interpretation of H9 from the wording of the LoW codes for infectious wastes:

18 01 03 Waste (from natal care, diagnosis, treatment or prevention of disease in humans) whose collection and disposal is subject to special requirements in order to prevent infection*

18 02 02 Waste (from research, diagnosis, treatment or prevention of disease involving animals) whose collection and disposal is subject to special requirements in order to prevent infection*

Several countries specify the definition of H9 and the respective waste codes:

- in specific national regulations or guidance notes on infectious waste;
- through reference to national health care regulations relating to infectious diseases;
- through reference to international or European or national regulations or standards.

Specific national regulations on infectious waste in general or waste from the health care sector in particular are adopted in Hungary, Italy, Romania, France and Spain (In Spain there exist regulations in some regions). In the Netherlands, the relevant LoW codes are specified in the National Waste Plan, section Hospital Care Waste. Specific guidelines on the management of infectious waste are mentioned by Germany, Finland and Denmark.

²⁷ Directive 91/689/EEC

As regards international or European regulations reference is made to:

- ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road) (e.g. mentioned by Finland, UK, the Netherlands)
- Technical guidelines on the environmentally sound management of bio-medical and healthcare wastes, published by the Secretary of the Basel convention in 2003 (e.g. mentioned by Finland)
- Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption (e.g. mentioned by the Netherlands)
- Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work (e.g. mentioned by Austria)

Estonia and Sweden point out that questions of definitions concerning H9 do not fall under the responsibility of the Ministry of Environment (EE) and the EPA (SE) respectively but under the responsibility of other institutions (e.g. the Ministry of Social Affairs in Estonia).

Methods for determination of H9 and related experience

In nearly all Member States the classification of infectious waste is based on the knowledge about the origin of the waste and on the clinical assessment of the contained micro organisms or toxins. This approach relies very much on the knowledge of the health care professionals that handle the potentially infectious materials, and on their responsible conduct. The application of H9 thus follows mainly a risk-based approach.

The responding Member States agree that microbiological testing is inappropriate and of little use as a key part of the assessment, at least in the health care sector. UK for instance emphasises that in the health care sector waste has to be handled before the laboratory results would be available. Furthermore, the vast range of hundreds of potential pathogens that would need to be screened for make the application of testing impractical. This view is confirmed by most other countries. The use of laboratory methods is mainly limited to the retroactive verification of a classification, or for instance in liquid waste emerging from large waste treatment autoclaves as part of the process monitoring.

Slovenia is the only country where the application of microbiological test is said to be the central part of the classification approach but does not specify how this approach works in practice.

Hungary has established a provision to perform testing in order to prove the non-hazardousness of waste that would in general be classified as infectious.

The approach to base the classification on the knowledge about the origin of the waste and on clinical assessment is mainly seen as satisfying. The Netherlands point out that the method is transparent, easy to apply and the analytical burden for administration and health care sector is small. On the other hand, it is em-

phasised that *'a lot of effort was needed to get an agreement with all stakeholders on an acceptable explanation of the definition'.*

Italy reports that the definition of national classification rules has clearly improved and facilitated the classification and management of infectious wastes in health care institutions but points to the problem that the acceptance and application of the established rules is not satisfying in non-health care institutions (beauty salons, etc.).

Sweden indicates that there is an ambiguity about the scope of H9. It is unclear whether the scope includes waste from building materials containing mold toxins, called mycotoxins that may be present in the waste although the producing organisms have died.

Germany stresses the fact that the classification is very much in the responsibility of the medical staff.

Estonia points out the classification of infectious waste is done differently from hospital to hospital due to a lack of a clear definition.

The French association FNADE indicates that problems could appear where chemical wastes are contaminated by "prions" or legionellosis. The problem, however, is not further specified.

Waste types that might be infectious

Infectious waste arises mainly in human health care and veterinary activities. Potentially infectious waste is thus found predominantly in the LoW chapter 18 which is dedicated to *'Wastes from human or animal health care and/ or related research (except kitchen and restaurant wastes not arising from immediate health care)'*. Most wastes from these activities bear the risk of being infectious and have to be assessed for infectiousness with the methods described above. Wastes from health care classified as infectious are assigned either to LoW-code 18 01 03* (waste from human health care) or to code 18 02 02* (waste from animal health care).

The property of H9, however, is not only relevant for the health care sector but for several waste categories from other sources. In response to the questionnaire the following waste types were named as potentially infectious:

- Wastes of animal origin (animal tissue waste, animal faces, manure etc.) from arising in agriculture, hunting, fishing, etc) (DE-SA, EE, ES);
- Animal wastes arising in food production (DE-SA, EE, ES);
- Wastes from waste and waste water treatment like sewage sludge and leachate from landfills (ES, EE);
- Municipal clinical waste that does not arise from healthcare (UK) (Examples provided by UK: substance abuse litter; sharps from body art and body piercing)
- Construction and demolition waste containing viable spores or toxins; (UK, SE)
- Canal dredging contaminated with cyanobacterial algal toxins (UK);

Some of the waste types mentioned, like infectious C&D waste and canal dredging are rather specific. UK reports that there have been cases where horsehair plaster from historical buildings contained viable anthrax spores. UK points out that the arising of canal dredgings with algal toxins does exist but seems rather unlikely.

The relevance of infectious waste from agriculture, food processing and waste and waste water treatment is certainly higher, both with regard to quantities and with regard to frequency.

5.2.2. Analysis of selected guidance documents

For a compilation of useful definitions and approaches the following two guidance documents were chosen to represent the approaches in the member states:

- The German “Guidelines on the Application of the Waste Catalogue Ordinance of 10 December 2001” [DE 2005]
- The “Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1)” [UK 2005B].

Both guidelines give a detailed assessment including examples and references to other documents.

Firstly the terminology regarding the criterion H9 ‘infectious’ is of interest:

The guideline of the United Kingdom [UK 2005B] uses the definition of the property H9 ‘infectious’ of the Hazardous Waste Directive 91/689/EC (HWD):

- *“substances containing viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms”*

The terms used for this definition are defined as follows:

- *"micro-organisms" - a microbiological entity, cellular or non-cellular, capable of replication or of transferring genetic material (includes algae, bacteria, fungi, parasites, plasmids, prions, viruses, rickettsia, and genetically modified variants thereof)*
- *"viable" - micro-organisms that have been killed are not considered infectious. Viability relates solely to the state of the organism at the point and time of the production of the waste.*
- *"or their toxins" - Toxins produced by micro-organisms render the waste 'infectious' even if the producing organism is no longer present.*
- *"cause disease " - This includes any disease regardless of severity.*
- *"man or other living organisms" - This includes animals, but not plants. The European Waste Catalogue provides sub-chapters for human and animal healthcare only.*

The German "Guidelines on the Application of the Waste Catalogue Ordinance"[DE 2005] starts with a reference to the waste codes of 18 01 and/or 18 02 of the ELW. The guidance document specifies the definition of infectious waste by making reference to national regulations on infectious diseases in human and animals:

- Infektionsschutzgesetz §7 (Act on the prevention and control of infectious diseases in man) (see Annex 8.1)
- Verordnung über anzeigepflichtige Tierseuchen (Ordinance on notifiable animal epidemics) (see Annex 8.2)
- Verordnung über meldepflichtige Tierkrankheiten (Ordinance on notifiable animal diseases) (see Annex 8.3)

These additional and specific national regulations contain lists explicitly naming micro-organisms or infectious substances. The German LoW- guideline [DE 2005] defines a waste as infectious according to H9 if it contains one of the micro-organisms or infectious substances mentioned by these additional regulations.

For further guidance the German document refers to the 'LAGA-Guideline on the proper management of wastes from healthcare institutions' of January 2002 [DE 2002] which is a guidance for the waste separation at health care institutions.

The guidance document of the UK [UK 2005B] contains decision trees to assist the waste holder in categorization of the waste with regard to H9/infectious.

The categorization is divided into 3 different areas:

- Human or animal healthcare (identical with chapter 18 of the LoW)
- Potentially infectious waste from other sources (LoW-chapters 1-17 19 and 20)
- Microbial toxins

The decision trees are displayed in Annex 8.4 and in Annex 8.5.

Both guidance documents point out that the professional assessment of individual cases is important.

Four different application fields are reviewed more profoundly in the following:

1. Infectious waste from human and animal healthcare
2. Infectious waste from other sources
3. Microbial toxins
4. Sharps and medical equipment

Infectious waste from human and animal healthcare

In Germany, the 'Guideline on the proper management of wastes from health-care institutions' [DE 2002] is the resource for the correct classification of waste streams at source and gives advice for handling and disposal of wastes at source. The guideline emphasises the following: *"As infection-epidemiological and hygienic knowledge is indispensable for the judgement on infection risks, all necessary measures in medical services are determined case by case taking into account the local conditions and requirements in consent with the doctor commissioned for hygiene or any other accredited personnel, works doctor and officials in charge of waste management and worker's safety"*.

Testing methods were not described in any of the guidelines. Usually testing methods are only applied retrospectively because for the handling of infectious waste it is necessary to take decisions before the laboratory results are available [UK 2007A]. The UK guideline also states that the main focus here is the assessment done by qualified personnel.

Infectious waste from other sources (LoW chapters 1 to 17, 19 and 20)

For the assessment of waste from other sources an established risk-based assessment as for health care waste does not exist. Furthermore, there are no limit values for criterion H9. For these cases the UK guidance document [UK 2005B] introduces the term *"concentration on a level naturally encountered"* as a criterion for the distinction between infectious and non-infectious waste. In case of low probability for the presence of infectious substances, or where concentration is at a level naturally encountered, the waste should not be classified as hazardous by H9.

It is pointed out in the document that:

“The term ‘a level naturally encountered’ is difficult to define, but can be taken to accept the presence of pathogens in wastes arising from a generally healthy population or environment. For example this may include the majority of food-stuffs, soil, construction and demolition waste, wastes treated to eliminate pathogens and domestic refuse.” [UK 2005B, Appendix C9.4.2]

Toxins

The UK guidance document explicitly includes microbial toxins into the definition of the H9 property. Examples of toxin-producing bacteria given in the UK document include:

- Clostridium botulinum and C. perfringens,
- Toxigenic Vibrio sp . and verocytotoxin or enterotoxin producing E.coli
- Cyanobacteria - blue green algae ,
- Dinophyceae - (Paralytic/Diarrhetic Shellfish Poisoning, Fish Kills)

The document points out that risk assessment, analysis or knowledge should be used to determine if the waste is likely to contain a microbial toxin above a level naturally encountered. Toxins from micro-organisms are assessed in the same manner as chemical toxins. With regard to the limit values the document refers to the assessment of the properties H5 ‘Harmful’ and H6 ‘Toxic’

The Latvian draft guideline [LV 2005A] uses the same classification scheme as described in the UK document, but refers for toxins to a limit value of 0.1 %.

The UK document provides the following examples for possibly relevant waste types:

- Canal dredgings, or surface skimmings, from a site where a cyanobacterial bloom has occurred.
- Sludges from an industrial effluent plant where industrial or commercial activity has increased the numbers or ranges of pathogens normally present.

Sharps and medical equipment

As answers from the questionnaire suggested that in some countries (e.g. Netherlands, Italy, Hungary) used sharps and needles might be generally classified as hazardous, specific attention to this point was paid in the analysis of the guidelines. The analysis showed that in none of the guidance documents of member states sharps were generally classified as hazardous. Sharps are subject to the same classification methods applied for any other hospital waste, but secondary regulation and guidance documents such as the LAGA Guideline [DE 2002] give more detailed information on the handling and disposal of sharps (cp. Annex 8.6).

The UK guideline [UK 2005B] does not generally categorize sharps as infectious, but gives additional classification advice where a separate assessment is necessary and where not. The document concludes:

“Clinical waste classified in chapter 20 of the EWC2002 (that does not arise from Human or Animal Healthcare and/or related research.) is therefore not subject to assessment”?

- *Sharps litter from substance abuse (20 01 99),*
- *Sharps waste from cosmetic body piercing and application of tattoos (20 01 99).*

This waste is still subject to a requirement to be rendered safe. (This does not include community healthcare waste, for example diabetic sharps, which should be classified under chapter 18 and are subject to assessment)“.

5.2.3. Basel Convention

In the Basel Convention criterion H6.2 reads:

“Substances or wastes containing viable micro-organisms or their toxins which are known or suspected to cause disease in animals or humans”.

It is explained as follows: “Any waste known or clinically assessed to be at risk of being contaminated with any of the infectious substances in Category A of Division 6.2 of chapter 2.6 of the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations, 13th Edition, or any waste known to contain cultures of Category B of the substances listed in Division 6.2” [Basel 2004 p.2].

The technical guidance document concludes its analysis of the criterion H6.2 that “infectiousness is not an intrinsic hazard” [Basel 2004 p.4] and explains: “Infectiousness is an inherently unstable and variable property dependent on biological qualities. Different test results can be obtained at different times under the same test conditions” [Basel 2004 p.6].

5.2.4. Other legal provisions

Directive 98/8/EC (Biocides Directives) requires placers on the market of biocide active substances to have these included in one of its Annexes. Inclusion of an active substance is preceded by the submission of a technical dossier containing information on the active substance by the placer on the market. In case the active substance is a biological material (fungi, micro-organisms or viruses), information on its pathogenicity is required as part of the Dossier (Annex IVa of Directive 98/8/EC).

Pesticides (Directive 91/411/EC) may also be of biological origin and hence, a dossier for such active substances to be used in plant protection products is to contain information on the respective organism as well. It is to be specified how persistent it is in the environment under the condition of application of the plant

protection product, its sensitivity towards the main parameters (temperature, humidity, pH etc.).

In the biocides and the pesticides legislation, the terms “infectious” or “pathogenic” are not defined. Furthermore, no specific test methods or criteria are given to decide whether or not an organism is infectious or not. Also, no guidance documents exist clarifying which information is to be generated. This is mainly due to the fact that the organism as such is the product and knowledge on its infectivity becomes available as part of its development process. Furthermore, a qualitative description is needed rather than an ‘objective’ measure of whether or not an infection is likely and at which concentration. The respective legislation does therefore not contain any helpful information to use in the work on H9.

5.2.5. Conclusions

It was stated by stakeholders that the definition of H9 ‘infectious’ in the HWD Annex III, and the wording of the respective waste codes are not specific enough for practical application. Several countries have specified the scope of H9 by reference to other national/international regulation or additional guidance documents for classification which provide list of diseases or organisms/ substances causing diseases. The classification of infectious waste from health care is generally based on the assessment by qualified personnel. Laboratory testing is not seen as appropriate key element for classification, but suitable only for specific purposes like subsequent verification of the clinical assessment.

It seems that most of the national regulations and guidance documents refer to the human health care sector and related research and, to a lesser degree, to waste from veterinary activities. The classification of possibly infectious waste from other sources and the connected classification problems seems to attract less attention in the guidelines. Possibly infectious waste types are assumed to arise in agriculture, food processing, waste and waste water treatment, in the municipal sector and in special cases also in the construction sector. The UK guidance note tackles the problem of waste from other sources.

Ambiguity exists with regard to the scope of the property ‘infectious’. It seems unclear whether H9 covers waste containing microbial toxins, even when the producing organisms have died.

Chemicals legislation does not provide an appropriate definition of the criterion H9. In plant protection and biocides legislation, no specific concepts for classifying active substances which may be pathogenic are described, but individual expert judgement and non-standardised information is required. The analysis of the criterion H6.2 (“infectious substances”) of the Basel Convention concludes that this criterion is not an intrinsic hazard and a risk based approach is required.

Two approaches are conceivable regarding the definition of the criterion H9:

A: Use of the Basel Convention's definition as new wording for the criterion H9 including adaptation of the references to UN Recommendation on the Transport of Dangerous Goods.

"Substances or wastes containing viable micro-organisms or their toxins which are known or suspected to cause disease in animals or humans".

"Any waste known or clinically assessed to be at risk of being contaminated with any of the infectious substances in Category A of Division 6.2 of chapter 2.6 of the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations, 13th Edition, or any waste known to contain cultures of Category B of the substances listed in Division 6.2" [Basel 2004 p.2].

B: Keep the current wording of criterion H9 and add commonly agreed definitions of key terms in a legally binding way: "micro organism", "viable", "their toxins", "disease" and "living organism".

Example for definitions from the UK Guidance Document [UK 2005b]

- • *"micro-organisms"* - a microbiological entity, cellular or non-cellular, capable of replication or of transferring genetic material (includes algae, bacteria, fungi, parasites, plasmids, prions, viruses, rickettsia, and genetically modified variants thereof)
- • *"viable"* - Micro-organisms that have been killed are not considered infectious. Viability relates solely to the state of the organism at the point and time of the production of the waste.
- • *"or their toxins"* - Toxins produced by micro-organisms render the waste 'infectious' even if the producing organism is no longer present.
- • *"cause disease"* - This includes any disease regardless of severity.
- • *"man or other living organisms"* - This includes Animals, but not plants. The European Waste Catalogue provides sub-chapters for human and animal healthcare only.

In a first step characterisation of waste could be done in a non-testing procedure from knowledge based judgement. The applied criteria are:

- origin: a common list of relevant economic sectors (e.g. health care, laboratories) and activities (e.g. waste from culture or enrichment of micro-organism) should be elaborated. The origins mentioned during the consultation processes comprise, inter alia, households (diabetic sharps), municipal (substance/drug abuse), wastewater treatment (sludge), agriculture, food processing, demolition waste, beauty salons
- type of waste: a common list on European level of wastes for which criterion H9 is to be seen as fulfilled in any case could additionally ensure consistency in the Member States,
- other properties: e.g. sharps, contamination with microbial toxins.

Testing is proposed as a second stage, where necessary, in order to check the results from the knowledge based approach.

The decisive role of the personnel at the place of origin should be emphasised and appropriate guidance shall be made available in order to support their choice.

5.3. Criterion H12 – release of toxic or very toxic gas

This subtask aims at developing quantified values on how to apply the H12 criterion to waste. Quantification should include the allocation of concentrations limits if possible.

In Annex III to the Hazardous Waste Directive the criterion is worded as:

“H12: Substances and preparations which release toxic or very toxic gases in contact with water, air or an acid.”

5.3.1. Results from questionnaire

This section summarises the results of the questionnaire survey with regard to the application of H12. Detailed information by country is provided in Annex A9.6

In the questionnaire it was asked whether the criterion H12 is actually applied for the classification of hazardous waste in the Member States. The answers show that H12 is applied at least in 9 of the 18 Member States which answered to the questionnaire. In 5 countries the responding institutions had no reliable information on the application, and Italy stated that H12 is not applied. The remaining countries did not answer this question.

Table 8: Answers to question 27 concerning the application of H12

Criterion is applied in:	AT, DK ² , FI, FR ¹ , DE, HU, SI, ES, UK
No information available whether H12 is applied in:	EE, LT, RO, NL, SE
H12 is not applied in:	IT

1) FR: Information from Arcelor and FNADE

2) DK: Information from DAKOFA

Methods for determination and concentration limits applied

The application of H12 in Member States is based on the following approaches:

- Classification on the R phrases, sometimes in combination with quantitative determination of gas release;
- Analytical determination of purgeable/reactive sulphides and cyanides in combination with limit values;
- Calculation of potential release based on the composition of the waste.

The application of H12 is primarily based on the following risk phrases:

R29: Contact with water liberates toxic gas

R31: Contact with acids liberates toxic gas

R32: Contact with acids liberates very toxic gas

Wastes that contain substances/preparations labelled with one of these R-phrases have to be assessed for the potential release of toxic gases.

In Germany, Spain and UK these R-phrases are applied in combination with the limit value of 1 l of toxic/very toxic gas released per kg and hour. Spain points out that in order to apply this criterion the mass of gas determined is transformed to volume of gas at standard temperature and pressure.

Testing is mainly based on test method A12 according to Annex V of Directive 67/548/EEC, a method that is primarily intended to test for R15 (release of flammable gases). A12 is applied in Germany, Slovenia, Spain, UK and Finland:

- UK proposes method A12 to test for R29; for R31 and R32 modified versions are recommended in the UK guidance document [UK 2005B]. Finland refers to the UK guidance document.
- Spain combines test method A12 with other methods that include US EPA standards.
- Slovenia mentions in addition to method A12 the DIN standard 38414-8 for the determination of the amenability to anaerobic digestion of water, waste water and sludges.

In Denmark and Latvia the classification is also based on the R-phrases mentioned above but no testing is done.

Differences exist with regard to the gases that are considered. In Austria H12 applies only to waste with a yield of purgeable sulphides and cyanides above legally defined limits. The other countries consider the release of other hazardous gases. This includes in the UK for instance hydrogen fluorides, sulphur dioxide, chlorine, nitrogen dioxide and ammonia.

Limit values for sulphides and cyanides are reported by Austria, Slovenia and Spain. Austria and Slovenia use the following limits:

- Sulphide: 10,000 mg/kg (dry mass)
- Cyanide: 1,000 mg/kg (dry mass)

Spain has no legally defined limit values. According to information from a Spanish laboratory, US EPA criterion for reactive sulphide (500 mg/kg) and cyanide (250 mg/kg) are often used in practice.

Slovenia points out that, in addition to the limit values for sulphide and cyanide the assessment is based on maximum exposure levels (MEL) and on a risk analysis for each individual case.

In the Spanish questionnaire it is criticised that none of the methods applied is risk-based and thereby quite useless. It is concluded that if no risk based thresholds and associated 'reactivity' methodology is agreed at the EU level it would be best to eliminate criterion H12.

Relevant waste types

Information on waste types that might be hazardous on account of criterion H12 were provided by Austria, Germany, Latvia, Slovenia, Spain, Sweden and by the associations FNADE (FR) and Dakofa (DK). The reported waste types are spread among several LoW-chapters. Relevant waste types are mainly found in the chemical industry (chapter 06), in the metal industry (chapter 10) and surface treatment (chapter 11). The most frequently types of waste are the following:

- Wastes from inorganic chemical processing (chapter 06), in particular
 - solid salts and solutions containing cyanides (06 03 11*);
 - wastes containing dangerous sulphides from MFSU of sulphur chemicals, sulphur chemical processes and desulphurisation processes (06 06 02*);
- Wastes from thermal metallurgy, e.g.:
 - skimmings, salt slags and flue-gas dust from aluminium metallurgy (10 03 08*, 10 03 15*, 10 03 19*)
 - dross and skimmings from zinc and other non-ferrous metallurgy (10 05 10*, 10 08 10*)
- wastes containing cyanide from tempering processes (11 03 01*);
- acid-generating tailings from processing of sulphide ore (01 03 04*);
- lithium batteries.

The detailed list of waste reported as relevant by the questionnaire respondents is provided in Annex 9.6.

5.3.2. Analysis of selected guidance documents

The guidance documents "Guidelines on the Application of the Waste Catalogue Ordinance of 10 December 2001" [DE 2005] and "Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1)" [UK 2005B] contemplate the application of the hazard criterion H12 most profoundly and are taken into consideration of the discussion of different approaches to assess this parameter.

Additionally, the UNEP Document "Guidance document on the application of hazard characteristic H10 of Annex III" [Basel 2005] is further discussed.

Terminology/Definition

The UNEP and the EU definition of the H12 criteria differ with respect to the contact with acid. Contact with acid is used by EU only and excluded by UNEP definition. All guidance documents of EU countries use the definition, which includes contact with acid.

The "Guidelines on the Application of the Waste Catalogue Ordinance" [DE 2005] determines the hazard H12 based on the R-phrases R29, R31 and R32. The German guideline renders a waste hazardous, if a minimum 1 l/kg h of toxic or very toxic gases are released and gives examples of constituents to which property H12 may apply:

- aluminium nitride, aluminium phosphide, phosphorus(V) sulphide (R29),
- sodium hypochlorite, chlorinated lime, alkali and alkaline earth sulphides and polysulphides, sodium dithionite (R31),
- salts of hydrocyanic acid, sodium azide (R32).

The guidance document UK 2005B states that one of the following risk phrases has to be identified for a substance or preparation in the waste if the waste is to have the potential to exhibit hazard H12:

R29 Contact with water liberates toxic gas

Substances and preparations which in contact with water or damp air evolve very toxic/toxic gases in potentially dangerous amounts. Examples of such substances include aluminium phosphide and phosphorous pentasulphide.

R31 Contact with acids liberates toxic gas

Substances or preparations which react with acid to evolve toxic gases in dangerous amounts. Examples of such substances includes sodium hypochlorite and barium polysulphide.

R32 Contact with acids liberates very toxic gas

Substances or preparations which react with acid to evolve very toxic gases in dangerous amounts. Examples of such substances includes salts of hydrogen cyanide, sodium azide.

Any combined risk phrase including R29, R31 or R32 with other risk phrases indicates the potential to exhibit Hazard H12. A special case is the combined risk phrase:

R15/29 Contact with water liberates toxic, extremely flammable gas

This risk phrase indicates that Hazard H3A (fifth indent) also applies. The assessment methodology is similar, and the threshold for H3A (v) will be the same as that for H12.

In relation with these R-phrases the guidance document gives examples of and limit values for substances which may cause a waste to exhibit hazard H12 and

explains the regarding chemical reaction in order to understand the reason for the application of this hazard criterion.

This selection of substances is explained as follows in the guidance document UK 2005B: *"From the listing of substances on the ASL [Approved Supply List, national chemical law] which exhibit this hazard property, the toxic or very toxic gases which could be released by chemical reaction with water, air or an acid appear to be limited at present to those set out in Table C12.1."* The respective table is set out in Annex 9.2.

As mentioned the UNEP [Basel 2005] document defines the hazard criterion for "Liberation of toxic gases in contact with air or water"; a definition that does not include acids. Consequently under this definition only R29 is mentioned from the R-phrases. But the guideline states that in practice most chemical reactions form an acid as a key precursor.

Appendix A of the UNEP guideline contains a list of *"Water-Reactive Materials Which Produce Large Amounts of Toxic Gas(es) When in Contact with Water."*, which derives from the US Emergency Response Guidebook. This list comprises more substances than the equivalent European list on R29 and makes no use of two substances, which are only mentioned in EU legislation. Additionally the Appendix A includes a list from the Slovak Republic on general substance groups.

Test methods

Regarding test methods, the German guideline [DE 2005] refers to Annex V of the Directive 67/548/EEC.

The guidance document UK 2005B offers a calculation method for waste with a known composition (s. Annex 9.5). Limit values and chemical reactions are described in the document and test methods, which are based on A12 of the Directive 92/32/EEC, are indicated. Also gas release tests for SO₂ are included here (see Annex 9.4).

UNEP [Basel 2005] document, which also makes reference to the SO₂ gas release test of UK 2005B, suggest the following assessment strategy:

- "(a) Initial assessment based on lists of hazardous and non-hazardous waste as included in Annexes VIII and IX;*
- (b) Assessment based on knowledge of the composition of the waste and its content of hazardous chemicals" including*
analysis of the 'history of waste' before testing
- (c) Tests (three methods are described to detect the probability of certain types of gas release)"*

5.3.3. Definition in the Basel Convention

The Basel Convention comprises the hazard characteristic “H10 Liberation of toxic gases in contact with air or water - Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.”

In the definition of the Basel Convention, acids are not included as reactants; hence the scope of the H10 is narrower than for criterion H12 of the HWD.

If a waste is not contained in Annex VIII or IX of the Basel Convention, it should be assessed whether or not substances known to liberate toxic gases in contact with air or water are contained in the waste in concentrations above 0.5%. This value has been set based on experience. A list of substances derived from various sources, including the EU classification and labelling data base (R29) is contained in the Appendix of the guidance document for the application of the criterion [Basel 2005].

If the composition is unknown, tests should be conducted if there is suspicion that toxic gases could be released. 3 methods are indicated and described in an appendix of the guidance document and relate to the suspicion of release of different types (cyanides, sulphides etc.).

Further development needs which are acknowledged in the guidance document relate, among other, to the concentration limits for substances fulfilling the H10 criterion and potential additive/synergistic effects of several H10-substances below the concentration limits.

5.3.4. Concept in chemicals legislation

The R-phrase R29 “Contact with water liberates toxic gas”, R31 “Contact with acids liberates toxic gas” and R32 “Contact with acids liberates very toxic gas” can be regarded as describing the danger addressed by H12 of the LoW. The definitions²⁸ in the Dangerous Substance Directive 67/548/EEC (DSD) do not specify any concentration limits but only give a qualitative indication as to when to assign this R-phrase, including examples of what is a ‘(very) toxic gas’. These R-phrases only have to be assigned as addition to other classification. There is no differentiation for applying this R-phrase between substances and preparations and there are no test methods specified in Annex V of the DSD. The EU risk phrase R29, R31 and R32 have been implemented in the GHS regulation as additional hazard statement (EUH029, EUH31 and EUH032).

The Seveso Directive (96/82/EC) was assessed as it regulates installations handling substances that may cause risk of accidents. The R-phrase R29 is one

²⁸ “For substances and preparations which in contact with water or damp air, evolve very toxic/toxic gases in potentially dangerous amounts, e.g. aluminium phosphide, phosphorus pentasulphide.”

triggering obligations under the said directive, but no concentration limits of further specifications are made that could be used for waste classification.

5.3.5. Summary and conclusions

The criterion H12 is actually applied in half of the responding countries. The effective number of countries that apply H12 is probably higher. However, not all responding institutions were able to provide reliable information on the subject.

The classification is mainly based on the R-phrases R29, R31 and R32. Test methods and limit values are applied in most of the 9 countries that apply H12. Testing is mainly done using test method A12 according to Annex V of Directive 67/548/EEC, sometimes in combination with other methods or in modified forms. In Germany, Spain and UK the R-phrases are applied in combination with the limit value for toxic gas release of 1 l/kg.h.

Austria and Slovenia have established limit values for sulphide and cyanide (sulphide: 10,000 mg/kg; cyanide: 1,000 mg/kg). In Spain, lower limits are applied on an unofficial basis.

The concept of substances / preparations releasing toxic gases is only an addition to classification under existing chemicals legislation. It will be also part of the GHS-implementing regulation. The explanation of when to assign the R-phrases to chemicals does not provide helpful information for the development of a concept for classifying wastes.

The classification with R-phrases (and hazard statements under GHS) is an important indication on the likelihood of a waste fulfilling the criterion H12.

Concluding from the available information it is proposed:

- Set a quantification of released gas volume based on expert judgement. The convention in some Member States is 1l/kg*h.
- A list of most relevant gases related to R-phrases can be used to further elaborate on a common understanding (see example below).
- A list of most relevant substances and concentration limits for substances in waste can be applied in order to reduce analytic efforts in cases where the composition of the waste is known (see example of such a list below).

Substance	Chemical Formula	By Risk Phrase(s)		
		R29	R31	R32
Hydrogen sulphide	H ₂ S	✓	✓	✓
Hydrofluoric acid / hydrogen fluoride	HF	✓		✓
Carbon disulphide	CS ₂		✓	
Sulphur dioxide	SO ₂		✓	
Chlorine	Cl ₂		✓	
Nitrogen dioxide	NO ₂			✓
Ammonia	NH ₃		✓	
Hydrogen cyanide	HCN			✓

Table 9: Some toxic gaseous substances released by H12 waste [UK 2005b]

Table 10: Threshold values related to criterion H12 [UK 2005b]

Substance name	Risk phrases	Equation	Threshold Conc. % ¹
Phosphorus pentasulphide	R29	$P_2S_5 + 8H_2O \rightarrow 5H_2S + 2H_3PO_4$	0.1
3,5-dichloro-2,4-difluoro-benzoyl fluoride (DCDFBF)	R29	$DCDFBF + H_2O \rightarrow HF + \text{Prod.}$	1.0
Metam-sodium	R31	$CH_3NHCSSNa + H^+ \rightarrow CH_3NH_2 + CS_2 + Na^+$	0.5
Barium sulphide	R31	$BaS + 2H^+ \rightarrow H_2S + Ba^{2+}$	0.8
Barium polysulphides	R31	$BaS_n + 2H^+ \rightarrow H_2S + Ba^{2+} + S_{n-1}$	0.8
Calcium sulphide	R31	$CaS + 2H^+ \rightarrow H_2S + Ca^{2+}$	0.3
Calcium polysulphides	R31	$CaS_n + 2H^+ \rightarrow H_2S + Ca^{2+} + S_{n-1}$	0.3
Potassium sulphide	R31	$K_2S + 2H^+ \rightarrow H_2S + 2K^+$	0.5
Ammonium polysulphides	R31	$(NH_4)_2S_n + 2H^+ \rightarrow H_2S + 2NH_4^+ + S_{n-1}$	0.3
Sodium sulphide	R31	$Na_2S + 2H^+ \rightarrow H_2S + 2Na^+$	0.4
Sodium polysulphides	R31	$Na_2S_n + 2H^+ \rightarrow H_2S + 2Na^+ + S_{n-1}$	0.4
Sodium dithionite	R31	$Na_2O_6S_2 + 2H^+ \rightarrow 2Na^+ + SO_2 + H_2SO_4$	0.9
Sodium hypochlorite, solution % Cl active ²	R31	$2NaOCl + 2H^+ \rightarrow Cl_2 + 2Na^+ + H_2O$	2.9
Calcium hypochlorite % Cl active ²	R31	$Ca(OCl)_2 + 2H^+ \rightarrow Cl_2 + Ca^{2+} + H_2O$	0.6
Dichloroisocyanuric acid	R31	$C_3HCl_2N_3O_3 + 2H^+ \rightarrow C_3H_3N_3O_3 + Cl_2$	0.9
Dichloroisocyanuric acid, sodium salt of	R31	$C_3Cl_2N_3O_3Na + 3H^+ \rightarrow C_3H_3N_3O_3 + Cl_2 + Na^+$	1.0
Sodium dichloroisocyanurate, dihydrate	R31	$C_3Cl_2N_3O_3Na + 3H^+ + 2H_2O \rightarrow C_3H_3N_3O_3 + Cl_2 + Na^+ + 2H_2O$	1.1
Trichloroisocyanuric acid	R31	$2C_3Cl_3N_3O_3 + 6H^+ \rightarrow 2C_3H_3N_3O_3 + 3Cl_2$	0.7
Hydrogen cyanide, salts of (with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide)	R32	$NaCN + H^+ \rightarrow HCN + Na^+$	0.2
Sodium fluoride	R32	$NaF + H^+ \rightarrow HF + Na^+$	0.2
Sodium azide	R32	$NaN_3 + H^+ + H_2O \rightarrow NO_2 + NH_3 + Na^+$	0.3
Aluminium phosphide	R32	$AlP + 3H^+ \rightarrow PH_3 + Al^{3+}$	0.3
Trizinc diphosphide	R32	$Zn_3P_2 + 6H^+ \rightarrow 2PH_3 + 3Zn^{2+}$	0.6
Calcium cyanide	R32	$Ca(CN)_2 + 2H^+ \rightarrow 2HCN + Ca^{2+}$	0.2
Cadmium cyanide	R32	$Cd(CN)_2 + 2H^+ \rightarrow 2HCN + Cd^{2+}$	0.4
Calcium phosphide	R15/29 ³	$Ca_3P_2 + 6H_2O \rightarrow 2PH_3 + 3Ca(OH)_2$	0.4
Aluminium phosphide	R15/29 ³	$AlP + 3H_2O \rightarrow PH_3 + Al(OH)_3$	0.3
Magnesium phosphide	R15/29 ³	$Mg_3P_2 + 6H_2O \rightarrow 2PH_3 + 3Mg(OH)_2$	0.3
Trizinc diphosphide	R15/29 ³	$Zn_3P_2 + 6H_2O \rightarrow 2PH_3 + 3Zn(OH)_2$	0.6

5.4. Criterion H13 – yielding another substance after disposal

The objectives of the task relating to criterion H13 are to identify approaches for the classification of wastes according to the criterion H13 and to develop respective threshold values.

The criterion is worded as follows in the Hazardous Waste Directive:

“H13 Substances and preparations capable by any means, after disposal, of yielding another substance, e.g. a leachate, which possesses any of the characteristics listed above”

The wording of criterion H13 is open to interpretation in different ways:

- From the perspective of chemicals legislation, the term ‘yielding another substance’ would address a situation where a new substance, meaning one that has not been part of the waste, is formed. Thus either a chemical reaction or a degradation of substances contained in the waste would take place. In the definition itself however, leachate is given as an example which, from the chemical perspective, would normally not be regarded as ‘another’ substance but as a mixture of substances which have already been part of the waste. From the chemical perspective, a leachate would not fulfil the definition of a substance.
- From the perspective of waste legislation, the term ‘after disposal’ could be understood as after ‘final disposal’ on a landfill or by incineration or after a recycling process, from which a new product or material is obtained. The ‘other substance’ could also be understood as part of the recycled material.

5.4.1. Evaluation of ‘yielding another substance’ in the context of REACH and recycling activities

In the context of REACH a ‘new substance’ can result from any process, including recovery and disposal of waste. A new substance can be obtained either by

- Chemical reaction of two compounds (synthesis) or
- Purification of substances contained in mixtures or raw materials to an extent that the definition of ‘sameness’ of a substance no longer applies. No clear-cut criteria can be formulated as to when during a purification process the substance identity changes

Any substances which are formed unintentionally (e.g. during storage), or the formation of which would be neither wanted nor known to the owner of the material (e.g. unintended reactions during formulation or due to equilibrium reactions between weak acids or bases), are regarded as ‘new substances’ but are

exempted from the obligation to be registered. Hence, the exact identity of substances arising from such processes does not need to be determined.

If a substance is obtained from a material, such as during processing of secondary raw materials or wastes, and it can be documented that the substance has been part of that material before that processing, it is not regarded as 'new' but as part of the life-cycle of the original (registered) substance. Thus, in the context of REACH a leachate would not be regarded as a new (or another) substance but be covered by the original material.

5.4.2. Evaluation of the definition in the Basel Convention guidelines of Annex III

In the Basel Convention, the definition of the H13 criterion is worded as follows: *"Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above."*

In this definition, the term 'another substance' is not used but 'another material'. In the guidance document²⁹ on the application of H13 some clarification is made with respect to the understanding of the definition.

The question whether or not the term 'another material' could relate to a 'new substance' being formed after disposal is not relevant under the Basel Convention and no misunderstandings as in the EU Directive are possible. Here the wording of 'another material' in combination with the example of the leachate is not ambiguous.

In the guidance of the Basel Convention, there is a discussion as to whether or not leachate is the only type of material that could be formed and it appears that residues and air emissions are understood as 'another material' as well. Any type of recycled material placed on the market seems not to be regarded as 'another material'.

If the 'other material' yielded does not have dangerous properties, the criterion H13 is not fulfilled.

A difficulty is seen in the determination of H13 for the original waste; currently the actual eluates, emissions or residues from the various waste processing technologies are tested.

The term 'after disposal' implies that the properties or the assignment of H13 to a waste could depend on the method of disposal. It is discussed that this should not be the case, as it would introduce a risk based waste classification and would create inconsistencies with other H criteria. As indicated by the replies from several contracting parties of the Basel Convention, 'after disposal' is understood as including also recycling operations.

The contracting parties submitted information on which types of tests could be applied to test the hazardousness of waste, most of which referred to testing of

²⁹ Interim guidelines on hazard characteristic H13 of Annex III to the Basel Convention

leachate. This could be extracted either from solid wastes by elution or extracted with a solvent from liquid wastes.

5.4.3. Landfill Decision

Members of TAC workshop on the implementation of the LoW concluded in March 2006 that the solid waste judgement for H 13 should be based on elution tests. The concentration limits for hazardous waste disposed of on landfills for non hazardous waste, in particular those for heavy metals, should be taken into account.

Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC) ("Landfill Decision") specifies in its Annex (Criteria and procedures for the acceptance of waste at landfills) in section 2.3 criteria for hazardous waste acceptable at landfills for non-hazardous waste pursuant to Article 6(c)(iii):

"The following leaching limit values apply to granular hazardous waste acceptable at landfills for non-hazardous waste, calculated at $L/S = 2$ and 10 l/kg for total release and directly expressed in mg/l for C_0 (the first eluate of percolation test at $L/S = 0,1 \text{ l/kg}$). Granular wastes include all wastes that are not monolithic. Member States shall determine which of the test methods and corresponding limit values should be used.

Components	L/S = 2 l/kg	L/S = 10 l/kg	C ₀ (percolation test)
	mg/kg dry substance	mg/kg dry substance	mg/l
As	0,4	2	0,3
Ba	30	100	20
Cd	0,6	1	0,3
Cr total	4	10	2,5
Cu	25	50	30
Hg	0,05	0,2	0,03
Mo	5	10	3,5
Ni	5	10	3
Pb	5	10	3
Sb	0,2	0,7	0,15
Se	0,3	0,5	0,2
Zn	25	50	15
Chloride	10 000	15 000	8 500
Fluoride	60	150	40
Sulphate	10 000	20 000	7 000
DOC (*)	380	800	250
TDS (**)	40 000	60 000	—

(*) If the waste does not meet these values for DOC at its own pH, it may alternatively be tested at L/S = 10 l/kg and a pH of 7,5-8,0. The waste may be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 800 mg/kg (A draft method based on prEN 14429 is available).

(**) The values for TDS can be used alternatively to the values for sulphate and chloride.

Table 11: Acceptance criteria according to Decision 2003/33/EC

5.4.4. Application of H13 in Member States (Outcome of questionnaire survey)

This chapter summarises the results of the questionnaire survey with regard to the application of H13. Detailed information by country is provided in Annex 10.4.

Scope and application of H13

As shown in Table 12, the criterion H13 is actually applied for the classification of hazardous waste at least in 9 of the 18 Member States from which information is available.

Table 12: Application of H13 in Member States

Criterion is applied in:	AT, DE, DK ²⁾ , FI, HU, SI, UK, LV, ES
No information available whether H13 is applied in:	EE
H13 is not applied in:	NL, SE, IT, FR ¹⁾

1) FR: Information from Arcelor and FNADE

2) DK: Information from DAKOFA

The criterion H13 is not applied by NL, SE, IT and FR³⁰ for different reasons:

- The Netherlands point out that according to Dutch experience H13 is dispensable as there will always be another H property which is also applicable
- Sweden does not apply H13 in general but the EPA indicates that leaching test data gathered for other purposes seem to be used in some instances as indicative data for waste classification.
- The French association FNADE says that the release of substances from waste is relevant only in combination with H14. H14, however, is explicitly excluded from the definition of H13. (A response from French authorities is not available)
- Italy does not apply the criterion H13 because of the lack of European-wide standardised test methods. Furthermore, Italy believes that the classification of wastes as hazardous can be fulfilled by the other criteria.

³⁰ information from FNADE

Methods for determination and concentration limits applied

The available information shows that H13 is understood and applied rather differently in Member States. The existing approaches can be classified as follows:

- Classification solely on the basis of risk phrases, without testing and limit values (e.g. Denmark);
- Classification based on the leachability of contaminants determined by means of eluate testing and defined limit values (e.g. Germany);
- Classification considers not only leachate but also the total content of specific contaminants (e.g. Austria, Slovenia)
- A comprehensive assessment is done that uses relevant risk phrases and considers all possibilities of the production and release of other hazardous substances (e.g. UK)

Several countries limit the application of H13 to the leachability of waste. Concerning the test methods and the limit values for leachate those countries mostly refer to the acceptance criteria for the landfilling of waste as laid down in Decision 2003/33/EC³¹. This is done for instance by Hungary, Spain, Finland, Germany and Austria. Nevertheless, there exist several differences concerning the limit values applied:

- Some countries refer to the lower limit values of section 2.3.1 of Decision 2003/33/EC (limit values for the acceptance of hazardous waste at landfills for non-hazardous waste) whereas others refer to the higher values of section 2.4.1 (limit values for the acceptance of waste at hazardous waste landfills).
- The list of the parameters used varies between countries and within countries.
- Concentration limits for individual parameters are modified.

According to Decision 2003/33/EC the leaching tests shall be done pursuant to the following standards:

- prEN 14405 Leaching behaviour test - Up-flow percolation test (Up-flow percolation test for inorganic constituents)
- EN 12457/1-4 Leaching — Compliance test for leaching of granular waste materials and sludges

³¹ Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC) (OJ L 011, 16.01.2003, p.27)

Germany indicates that recently a new method was set up and is currently evaluated by a ring test. The method is described as short-time column percolation elution method, suitable especially for mineral waste material.

Some countries, including Austria, Germany and Slovenia, have established limit values for the total content of organic and inorganic contaminants, in addition to the limit values for leachate:

- Austria and Slovenia have established limit values for the total content of
 - Mercury, arsenic, cadmium, lead (only SI);
 - PAO, PCB, PCDD/PCDF, POX, Hydrocarbons, BTEX, Phenols)
- Germany has established a limit value for the total content of hydrocarbons in its national guidance document ([DE 2005] (see also chapter 5.4.5).

An overview of the available information on parameters and concentration limits applied in Member States for the assessment of H13 are shown in Annex 10.1 and Annex 10.2.

Risk phrases are used for the assessment of H13 by UK and Denmark (R1, R4, R5, R6, R16, R18, R19 or R44). Denmark relies solely on the classification by risk phrases; no testing is done. The UK follows a comprehensive approach, which is explained in more detail in chapter 5.4.5.

Relevant waste types

The range of wastes, which are considered as relevant to be assessed for H13 by Member States, is rather broad. It encompasses a variety of mineral wastes and sludges, in particular:

- Mineral construction wastes (sect. 17 01, 17 08, 17 09)
- Contaminated soils and dredging spoil (sect. 17 05))
- Mineral wastes from thermal processes (chap. 10);
- Wastes from the processing of minerals (chap. 01).
- Wastes from inorganic chemical processes (chap. 06)
- Sludges from chemical/physical waste treatment (sect. 19 02)
- Wastes from chemical surface treatment and non-ferrous metallurgy (sect. 11 01, 11 02).

The detailed list of wastes named by Member States is shown in Annex A10.5.

5.4.5. Analysis of Guidance Documents

Guidance on the application of H13 is provided by the following three documents which are assessed more closely:

- Guidelines on the Application of the Waste Catalogue Ordinance of 10 December 2001 [DE 2005]
- Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1) [UK 2005B]
- Vollzugshinweise zur Zuordnung von Abfällen zu den Abfallarten eines Spiegeleintrages (MLUV Brandenburg) [DE 2007C]

Following a rather broad interpretation, the UK guidance document determines that H13 applies to all wastes that could produce another substance, which would exhibit one or more of the hazards H1 to H12. Such a substance can be produced / released through:

- (microbial) degradation;
- leaching processes;
- reaction with other wastes or substances;
- combustion.

As a further element of the assessment, the following unassigned or associated R-phrases which might cause hazard H13 to arise should be taken into account:

R1 Explosive when dry

R4 Forms very sensitive explosive metal compounds

R5 Heating may cause explosion

R6 Explosive with or without contact with air

R16 Explosive when mixed with oxidising material

R18 In use may form flammable/explosive vapour-air mixture

R19 May form explosive peroxides

R44 Risk of explosion if heated under confinement

UK [UK 2005B] gives examples for wastes and treatment routes possibly bearing hazard H13 like:

- Storage of explosive substances;
- Uncontrolled combustion of organic waste containing chlorine that might release dioxins or hydrochloric acid;
- Accidental mixing of incompatible materials during chemical treatment;
- Building of leachates and digestates produced in landfills or anaerobic digestion.

For testing methods and limiting concentration UK [UK 2005B] refers to those for hazards H1 to H12.

The UK document structures the proposed assessment process in form of a decision tree which is shown in the Annex A10.4.

The national German guideline [DE 2005] does not provide a comprehensive specification of all circumstances that may lead to waste being classified as hazardous according to H13. The recommended approach is limited to the testing of risks from leachate. The proposed limit values are the same as in table 2.3.1 of Decision 22003/33/EC which defines the criteria for hazardous waste that is acceptable at non-hazardous waste landfills. In addition, the Guideline establishes a limit value for the total content of hydrocarbons.

The German Guideline does not refer to risk phrases because there exist no specific R-phrases that would describe the risk from the formation of eluates.

The Guideline of the German State of Brandenburg [DE 2007C] also focuses on leachate only. The concentration levels defined in Annex V are similar but not identical with the ones given in the national guideline [DE 2005]. The list of parameters as well as the limit values for a few parameters differ.

The list of parameters and limit values of the two German guidelines are included in the Annex A10.2 and A10.3.

5.4.6. Further input from stakeholders

Most input from the Internet Stakeholder Consultation regarding criterion H13 was similar to the input given via questionnaire.

In addition it was stated that the criterion H13 differs from the systematic of the other H-criteria since it differs from the characterisation of chemical legislation and is combined with waste management activities [Bimboes 2007]. Because it would not be possible to operationalise the criterion H13 with acceptable efforts the author proposes to delete the criterion.

5.4.7. Summary and conclusions

Hazard property H13 is applied in at least half of the countries for which information is available. Some countries do not apply the criterion at all because they consider it as dispensable suggesting that the classification can be done on the basis of other H-criteria.

The available information shows that H13 is understood and applied rather differently in Member States. The main approach is the classification based on the leachability of contaminants determined by means of eluate testing and defined limit values. Further approaches are:

- Classification solely on the basis of risk phrases.
- The definition of limit values for the total content of selected contaminants.
- A comprehensive assessment taking into account all possibilities of the production and release of other hazardous substances.

Although the assessment of the leachate is mainly based on the concentration limits for eluates defined in the Landfill Decision³² differences exist in the Member States with regard to the parameters and the limit values applied.

The available information show that the wording of the definition in the Hazardous Waste Directive is ambiguous and currently hardly implementable. Clarification can be achieved in line with the interpretation by the Basel Convention by rewording it as follows:

“H13 - Substances and preparations capable by any means, of being emitted from any disposal operation as part of a leachate, air emission or other residue, and which possesses any of the characteristics listed above.” [Basel Convention Annex III]

The following explanation could be added to further clarify the meaning of the criterion:

“This definition includes substances which are present in the material submitted to disposal operations as well as wastes being capable of forming new substances during processing of wastes.”

For clarification purposes a common set of risk phrases related to the criterion H13 could be determined. It should be taken into account that most risk phrases are assigned to hazards already. An example of most likely unassigned or associated risk phrases is given below.

³² 2003/33/EC

R1 Explosive when dry R4 Forms very sensitive explosive metal compounds R5 Heating may cause explosion R6 Explosive with or without contact with air R16 Explosive when mixed with oxidising material R18 In use may form flammable/explosive vapour-air mixture R19 May form explosive peroxides R44 Risk of explosion if heated under confinement [UK 2005B]
--

Regarding leachate a common set of parameters and concentration values should be developed. Limit values for the disposal of hazardous waste on landfills for non hazardous waste could be a starting point.

Information about concentration limits for other risks are not available.

It has been stressed by stakeholders that (here as well as for the other H-criteria under discussion) a decision could only be taken based on further detailed descriptions of impacts (e.g. impacts of rewording of the H-criterion).

It is intended to provide further details on the impacts of the proposed changes in the next report.

5.5. Criterion H14 – ecotoxic

The objective of this task is to develop a classification system with regard to H14 and outline respective parameters and concentration thresholds to make the criterion operational. The criterion is defined as follows:

H14 'ecotoxic': substances and preparations which present or may present immediate or delayed risks for one or more sectors of the environment.

The reference in the Hazardous Waste Directive to chemicals legislation for further definition of the H-criteria and information on respective testing methods do not include a link to the property 'dangerous for the environment'. Thus, the current definition of "dangerous to the environment" is not explicitly linked to H14. Also in the European list of waste, the reference is not extended to include "dangerous for the environment". In conclusion, apart from the wording of the definition of H14, which is in line with the definition in Directive 67/548/EEC, there is no indication in the legal text on how to understand and apply that criterion.

5.5.1. Application of H14 in Member States (Outcome of questionnaire survey)

This chapter summarises the results of the questionnaire survey with regard to the application of H14. Detailed information by country is provided in Annex 11.5.

Application of H14 in Member States

According to the questionnaire return H14 is applied in at least 14 of the 18 Member States from which information was received. In 2 countries the responding institutions had no reliable information on the application of H14. Italy was the only country that stated explicitly that H14 is not applied to wastes. Italy does not apply H14 because of the lack of reference criteria for their application on the EU level.

Table 13: Application of H14 in Member States

Criterion is applied in:	EE, SE, FI, UK, SI, LV, BG, HU, DE, NL, DK ¹ , AT, FR ² , ES
It is not known whether the criterion is applied in:	LT, RO
Criterion is not applied in:	IT

1) DK: Information was provided by DAKOFA

2) FR: Information provided by FNADE

Definitions and scope of application

Most countries refer either to the definition of H14 as laid down in Directive 91/689/EEC, or to the definition of 'ecotoxicity in the Dangerous Preparations Directive 1999/45/EC.

Estonia refers to Directive 91/689/EEC but seems to have adapted the definition by including the wording 'dangerous for the environment' from Directive 1999/45/EC³³.

Austria and Slovenia make reference to the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). Class 9 of the ADR covers among others 'environmentally hazardous substances' (M6 and M7).

³³ Wording of the Estonian Definition: Substances and preparations which are ecotoxic or dangerous for the environment and present or may present immediate or delayed risks for one or more sectors of the environment)

Table 14: Definitions used for the application for H14

Definition	Legal document	Used by
"Substances and preparations which present or may present immediate or delayed risks for one or more sectors of the environment"	Hazardous Waste Directive 91/689/EEC, Annex III	EE ¹ , FI, LV, LT, BG, HU, NL ² , ES
"Substances and preparations which are dangerous for the environment; substances and preparations which, were they to enter the environment, would or could present an immediate or delayed danger to the environment"	Dangerous Preparations Directive 1999/45/EC (Article 2)	SE, UK, DE
Environmentally hazardous substances: liquid or solid substances pollutant to the aquatic environment and solutions and mixtures of such substances	European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), Class 9	AT, SI

1) Estonia refers to Directive 91/689/EEC but has adapted the definition by including the wording 'dangerous for the environment' from Directive 1999/45/EC

2) NL refers to definition for H14 based on Directive 91/689/EEC and to R50/53 according to Directive 67/548/EEC

Differences between Member States exist with regard to the scope of properties considered. Some countries limit the application of H14 to the risks for the aquatic environment and the ozone layer. This includes Austria, Denmark, the Netherlands and the UK.

- Denmark and the UK refer to the R-phrases R50 – R53 and R59. UK is currently revising their national guidance document in order to include additional criteria.
- Austria considers the risks to aquatic environment and ozone layer without referring to the risk phrases. It is set out in the national Abfallverzeichnisverordnung (Ordinance on waste classification) that H14 applies to:
 - wastes with a total yield of FCKWs, HFKWs, FKWs and Halones over 2000 mg/kg DM, and
 - environmental hazardous substances due to class 9, M6³⁴ and M7³⁵ ADR
- The Netherlands limit the assessment to the aquatic environment (R50 – R53).

A broader application of H14 that includes risks to the terrestrial environment is applied in Bulgaria, Finland, France, Germany, Hungary and Sweden. These countries apply testing methods that include terrestrial biotests.

³⁴ M6 Pollutant to the aquatic environment, liquid

³⁵ M7 Pollutant to the aquatic environment, solid

Table 15: Overview of relevant risk phrases for classification according to criterion H14

R-phrase	Designation
R50-53	very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R50	very toxic to aquatic organisms
R51-53	toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R52-53	harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R52	harmful to aquatic organisms
R53	may cause long-term adverse effects in the aquatic environment
R54+	toxic to flora
R55+	toxic to fauna
R56+	toxic to soil organisms
R57+	toxic to bees
R58+	may cause long-term adverse effects in the environ
R59	dangerous for the ozone layer

+ means that no official criteria exist in EU chemicals legislation

Methods for determination and concentration limits applied

As regards the limit values for R50 – R53 and R59, most countries follow the provisions of the chemical legislation. In cases where a substance is classified as ecotoxic in the chemicals legislation the limit values are also used for the evaluation of the ecotoxicity of the waste by most countries (FI, DK, EE, DE, LV, SE, UK). The limit values for R50 – R53 and R59 according to Directive 1999/45/EC as applied in Member States are shown in Table 16.

Table 16: Concentration limits for H14 according to 1999/45/EC, Annex III, Part B

total concentration of $\geq 0.25\%$ of one or more substances classified as dangerous for the environment with R phrases R50 – R53.
total concentration of $\geq 2.5\%$ of one or more substances classified as dangerous for the environment with R phrases R51 – R53.
total concentration of $\geq 25\%$ of one or more substances classified as dangerous for the environment with R phrases R52 – R53.
total concentration of $\geq 0.1\%$ of one or more substances classified as dangerous for the environment with R phrases R59.

Some countries have established or refer to other limit values:

- Austria applies a concentration limit of 2000 mg/kg DM for ozone depleting substances.
- As regards concentration limits for POPs Sweden makes reference to Annex 4 of the EC POPs Regulation.

Several countries apply biotests for the assessment of H14. This includes tests according to chemical legislation (methods according to EC Directive 67/548/EC, Annex V) but also additional test. Testing is done with eluate but also with solid waste. The following test methods were named by the responding countries.

- | | |
|--|--------------------|
| • Fish test for acute toxicity | BG |
| • Daphnia tests for acute toxicity | FI, ES, DE, FR, UK |
| • Algal inhibition test | FI, HU, DE, FR, UK |
| • Vibrio fischeri luminescence test | FR, FI, ES |
| • Test for chronic toxicity with Ceriodaphnia dubia | FR |
| • Test for chronic toxicity with Brachionus calyciflorus | FR |
| • Test for genotoxicity with Salmonella typhimurium | DE |
| • Earthworm test for acute toxicity | DE, FR |
| • Tests on soil flora | DE, FR, BG, HU, |
| • Tests with plants (without specification) | BG, FI |

Sweden stresses that the use of bioassays for assessing acute and subchronic toxicity in aquatic and terrestrial environment is the “last resort”-option in the classification process.

The Netherlands follow a different approach for H14. They have defined a set of relevant parameters that include (Heavy) metals, PAH, PCB, pesticides, cyanide, tetrachlorethene, trichlorethene. As there are no specific concentration levels defined for H14 in decision 2000/532 the classification and concentration levels of H3-H8, H10 and H11 are applied.

The approaches of UK and France (FNADE) as well as the work carried out concerning the standardisation of biotests for waste is described in more detail in chapter 5.4.5.

Experience with applied methods

Substantial input to the assessment of the applied methods was provided by UK, Germany³⁶, Sweden and Spain.

UK points out that the calculation methodology set forth in the national Chemical Regulations (CHIP) and the Dangerous Preparations Directive (DPD) supported by chemical analysis is clear and highly satisfactory. It aligns directly with chemical risk phrase classification systems and therefore with other hazardous properties

UK holds the view that animal testing of solid wastes is of little or no scientific value and generates results of debatable significance. Testing is described as of often poor quality, overlooks key criteria in relevant guidance, and results often suggest that the waste is non-hazardous where that is clearly not the case. UK assumes that in more than one case the analysis appears to have been undertaken principally because chemical analysis would show the waste to be hazardous, so ecotoxicity testing is being used (badly) in an attempt to obtain a different result.

³⁶ The input of Germany is described in chapter 5.5.2

UK emphasises that thresholds for ecotoxicity, or reference to thresholds in the Dangerous Preparations Directive, should be included in the LoW.

Sweden on the other hand doubts the suitability of the reference to the chemicals legislation. As an example the stringent ecotox-hazard classification of zinc-oxide is given. In addition, Sweden sees “many practical problems in applying the chemical legislation (dealing with separate metal compounds) in assessing hazards from metal containing solid waste, as its composition in its solid waste state in most case hardly can be analysed at a reasonable cost. Instead the stakeholder assessing his waste by leaching metals, has to cope with the problem of comparing metal concentrations in the leachate with the concentration limits for individual metal compounds to be found due to the hazard classification in the chemical legislation”.

Spain highlights that there are often problems due to the fact that wastes are complex matrices (coloured, oily, particulates, precipitates, etc). Considering that often the ecotoxicity test is the only real bioassay performed on waste, as it is by far the cheapest, it seems reasonable to use a test battery.

Relevant waste types

In the questionnaire the countries and stakeholders were asked to give examples of waste types that are classified as hazardous on account of criterion H14 but would not be considered as hazardous according to any other H-criterion. Input to this aspect was provided by Germany, UK, Sweden and Estonia.

According to German experience there exists a manageable number of waste types, which needs to be classified hazardous exclusively according to H14. An example would be bottom ashes from the thermal treatment of municipal waste incineration (section 19 01). These are classified as hazardous according to H14 whereas none of the other hazard criteria are appropriate. This may also be the case for slags from combustion, metallurgy and other ashes currently listed in mirror entries (section 10 01).

Sweden also considers ashes from waste incineration as possibly hazardous according to H14. Relevant waste types are:

- 19 01 11* Bottom ash and slag containing dangerous substances
- 19 01 13* Fly ash containing dangerous substances
- 19 01 15* Boiler dust containing dangerous substances

In Estonia, oil-shale semi coke is classified hazardous on account of H14. Oil-shale coke is a specific Estonian waste type for which an additional waste code (05 06 97*) has been introduced into the Estonian waste list.

UK points out that under the revised Dangerous Preparations Directive the thresholds for extremely ecotoxic substances have been lowered. These thresholds are now lower than for any other hazardous property. In future, any waste containing an extremely ecotoxic substance may therefore potentially be classified as hazardous solely on the basis of ecotoxicity. According to UK, this is likely to include certain biocides/pesticides, certain medicines (anti-parasite),

and perhaps a few metal compounds. These could conceivably occur in some sludges, treated wastes, contaminated land, as well as in off spec/waste products. The waste type 17 06 03* 'other insulation materials consisting of or containing dangerous substances' might be an example.

5.5.2. Analysis of Guidance Documents

For the guidance on the application of H14 the following documents were analysed, because they provided additional information on the matter.

- Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1) [UK 2005B]
- Methodological guide Waste classification. Practical application to storage centres [FNADE 2003].
- Executive summary: Results of an EU-wide ring test for the determination of ecotoxicity (H14) of three waste substrates. Evaluation of a validation study on CEN 14735 [DE 2007D]

The content of the German Guidance document is similar to the answers given in the questionnaire and is thus already reflected in the previous section.

The second and the third document are not exactly guidelines on the application of the LoW. The scope of FNADE 2003 is intended to be a practical tool for operators to dispose waste in suitable landfills and DE 2007D summarises results from a ring test. They were included to highlight specific approaches regarding the hazard criterion H14.

The approach of the UK guidance document [UK 2005B] is based on the classification criteria for substances that are 'dangerous to the environment' as laid down in the Dangerous Preparations Directive (1999/45/EC). The document uses Directive 1999/45/EC which specifies concentration limits for ecotoxic substances within preparations as the basis of the threshold concentrations for substances within a waste.

The UK approach considers only the hazards to the aquatic environment (R50 to R53) and to the ozone layer (R59). Risk phrases relating to the terrestrial environment (i.e. R54 to R58) are not considered as they are not currently included in the Directive 1999/45/EC. The UK supports the view of the OECD which states that "research has suggested that in the majority of cases possibly with the exception of some pesticides, an assessment of ecotoxic hazard based solely on aquatic toxicity data would result in the same classification as an assessment that included terrestrial effects" (OECD series on testing and assessment No. 33).

Combined or joint risk phrases are common for substances that are dangerous to the aquatic environment. Accordingly, the guidance document sets out the six possible classification combinations along with the resulting classification criteria. For more detail please refer to Annex 11.1.

For R59 (dangerous for the ozone layer) the UK document refers to Annex I of Council Regulation No 2037/2000 EC.

The UK document outlines that specific concentration limits are necessary for highly toxic substances due to their pollution potential and persistence in the environment. For PCBs and PCTs a limit of 50 mg/kg waste is proposed. Further substances shall be considered once international agreements on concentration limits are achieved.

The document proposes the following classification procedure:

1. It should be determined whether the waste contains any substances classified with one or more of the relevant risk phrases (R50 to R53, R59). It should be considered that under the DPD, some of the risk phrases associated with aquatic toxicity are additive i.e. the concentrations of substances with the same and/or different risk phrases need to be added together to determine the correct classification for a preparation and subsequently the threshold concentration for determining whether the waste is hazardous by ecotoxicity. The combinations of additive effects are complex. The document simplifies the combinations and sets out four equations which detail the threshold levels for classifying a waste as ecotoxic on the basis of aquatic toxicity.
2. It should be determined if the waste contains any highly toxic substances with specific concentration limits (at present only PCBs/PCTs are considered)
3. The use of biotests should be limited to cases where the hazards cannot be adequately determined from the composition of the waste, i.e.:
 - waste contains substances for which not aquatic toxicity data are available;
 - waste is an uncharacterised mixture.

The classification procedure is summarised in a Decision tree that is shown Annex 11.2.

Concerning the testing for aquatic toxicity the document proposes the EC test methods C2 (Acute toxicity for Daphnia) and C3 (Algal inhibition test). No methods are proposed for potential effects on the terrestrial environment.

The purpose of the guide of FNADE [FNADE 2003] is *“to give operators the practical tools to direct waste to suitable storage centres”*. This guidance document combines the LoW with the landfill criteria of EC Directive 1999/31/EC.

For mirror entries the guideline suggests a four steps assessment:

1. Storable character of waste
 2. Control of hazardous character by documentation
 3. Control of hazardous character by an analytic approach documented by the waste producer
 4. Control of hazardous character by an environmental approach – property
- H14

The step 4 on “Control of hazardous character by an environmental approach” is of interest in this context and is applied if no data or information are available for the assessment steps 1-3.

The evaluation of property H14 in FNADE 2003 is based on the list of the Basel agreement and the OCED recommendations (Annex 11.3). In case of negative response the ecotoxicity tests are conducted in stages (first bacteria luminescence, then Daphnia immobilisation (see Annex 11.4). If these standard ecotoxicity tests for acute toxicity by ISO 11348-3 and ISO 6341 do not yield the waste as hazardous, chronic toxicity tests based on French standards have to be applied in a second step. They include algae growth inhibition 7d, Cerio Daphnia dubia or Brachionus calyciflorus inhibition growth tests. Here the approach of [FNADE 2003] is more profound than others.

Tests on raw waste are optional. Further on three tests for water and three methods for ground soil are named in Appendix 3 (Annex 11.3); all of them are standard test methods. Appendix 4 of FNADE 2003 gives examples of results on ecotoxicity tests on different types of waste. Appendix 5 discusses the influences of the pH value of on the ecotoxicity tests.

Useful methodological information can be drawn from a study lead by the German Umweltbundesamt (UBA). The UBA has organised a European ring test evaluating the use of biological test systems for waste and waste eluates [DE 2007D]. The ring test was conducted as evaluation study of the EN 14735 “Characterisation of waste – preparation of waste samples for ecotoxicity tests”. The purpose of this standard is to provide guidance on the taking of samples, transport, and storage of waste and to define preparation for the determination of testing either as raw wastes or water extracts from wastes. As a result a harmonised methodology standard should be available after the statistical assessment and normalisation process will be completed. The test was carried out with three different substrates (bottom ash from municipal waste incineration, contaminates soil, contaminated wood). For the ring test the following test systems were used:

- Bioassays for waste eluates:
 - Determination of the inhibitory effect on the light emission of *Vibrio fischeri* (Luminescent bacteria test) (EN ISO 11348)
 - Determination of the inhibition of the mobility of *Daphnia magna* Straus (Cladocera, Crustacea) - Acute toxicity test (EN ISO 6341)
 - Freshwater algal growth inhibition test with *Scenedesmus subspicatus* and *Pseudokirchneriella subcapitata* (EN ISO 8692)
- Bioassay for solid waste material:
 - Soil quality - Determination of the effects of pollutants on soil flora - Part 2: Effects of chemicals on the emergence and growth of higher plants (ISO/DIS 11269-2)
 - Soil quality - Effects of pollutants on earthworms (*Eisenia fetida*) - Part 1: Determination of acute toxicity using artificial soil substrate (ISO 11268-1)

The results show that the standard EN 14735 is in general suitable for ecotesting. The aquatic tests have proven to be practical and sensitive. Regarding the terrestrial tests the plant tests can be recommended. The test with earthworms is generally suitable but shows low sensitivity. Further questions concerning the details of testing and validity criteria remain to be further investigated.

5.5.3. Basel Convention

According to the Basel convention, the H-criterion 12 is analogous to H14 in the EU. The Basel Convention defines the criterion as:

“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.”

The definition of the Basel Convention, as clarified in the interim guidelines³⁷ does not differ systematically from that in the EU. Although the wording of ‘if released’ from the waste suggests considering exposures in assigning the criterion, the guideline confirms a hazard based approach for waste classification. Hence its intrinsic properties are to be determined without consideration of the potential for release. This corresponds to the classification approach for chemicals in the EU³⁸.

³⁷ Secretariat of the Basel Convention: Interim guidelines on the Hazardous characteristics H12 Ecotoxic, published in September 2003. The guideline indicates that issues related to environmental hazards other than via the aquatic route, exposure via the food chain and endocrine disruption are not yet included and further work is needed on testing methods for waste. Furthermore, metals, for which the assessment of environmental risks is specific, are not considered either.

³⁸ There are very few exemptions with regard to the labelling of preparations (not classification!) of substances which are very firmly included in matrices, such as metal alloys.

In classifying waste according to the Basel Convention the first step is to consider the known composition and the second step is to conduct testing, when necessary. Testing of waste for environmental hazards is stated to require further elaboration in the respective guideline.

For substances which would be classified as acutely or chronically toxic according to the criteria of the globally harmonised system for classification and labelling of substances and preparations (GHS), concentration thresholds are defined above which a waste would be ecotoxic. For determining if the thresholds (de minimis values) are exceeded, the content of all substances with the respective classification has to be summed up. The concentration of substances with a toxicity below 1 mg/l, in particular active substances used in plant protection products or biocide products, have to be considered after multiplication with respective factors.

Specific limits for POPs are foreseen in the future, in addition.

The approach to classify waste for H12 under the Basel Convention (which is analogous to H14 in the EU) is the same as for classifying substances and preparations in the GHS implementing regulation in the EU.

For testing waste, it is proposed to start with a screening test and continue with more specific testing, if it is suspected that the waste is ecotoxic. The proposed tests include well established aquatic toxicity testing, such as tests with daphnia, as well as tests on terrestrial organism, which are less well established.

5.5.4. Classification 'dangerous to the environment' according to Directive 67/548 and 99/45 as well as the GHS-implementing regulation

General classification rules

The current EU system of classifying substances and preparations for the environment corresponds to that for human health hazards. The conventional method always has precedence over substance testing for bioaccumulative and persistent properties (R53) and testing may be performed for the aquatic toxicity in case this is regarded as more appropriate. Aquatic effects are regarded as additive and therefore, all substances contributing to the classification have to be considered, when they exceed the consideration thresholds of 0.1 or 1% w/w or any specific limit in Annex I of Directive 67/548/EEC.

The R-phrases R50 to R52 indicate the acute aquatic toxicity of a substance. The combination with R53 indicates that delayed effects can be expected due to the substance being bioaccumulative and/or persistent.

Further R-phrases addressing environmental hazards in the current classification system are:

- R54 Toxic to flora
- R55 Toxic to fauna
- R56 Toxic to soil organisms
- R57 Toxic to bees
- R58 May cause long-term adverse effects in the environment.

Although worded and organised in a slightly different way, the classification rules and criteria for environmental hazards are the same in current chemicals legislation (Directive 67/548/EEC and 99/45/EC) and the proposed GHS implementing regulation. Differences are that

- the above listed R-phrases are not part of the GHS implementing regulation.
- the GHS implementing regulation contains an additional hazard class - the category chronic toxicity, category 4 - which is a so called safety net and allows to classify substances and preparations which do not fulfil the classification criteria. This could be either because testing and therefore a comparison with the classification criteria is not possible or because other data suggests that classification and labelling would be required.

Harmonised classification

Annex I of Directive 67/548/EEC contains a list of approximately 3300 substances, for which the classification and labelling as well as specific concentration limits³⁹ have been agreed at the level of EU.

In Annex I of Directive 67/548/EEC (state: 29th ATP⁴⁰), 36 substances have been assigned specific concentration limits for the environment. These are decreasing the generic limits by the factor 10, 100 etc. In a recent revision of the Dangerous Preparations Directive this has been included in the classification rules by relating the aquatic toxicity also below 0.1 mg/l to classification thresholds.

Only four substances⁴¹ have a harmonised classification for R59 (dangerous for the ozone layer) and one⁴² is classified with R58, supporting respective discussions that the R-phrases which have not been included in the GHS-implementing regulation are either not relevant or not yet operational, as criteria and testing methods are not available.

³⁹ Not for all substances in the Annex, a specific concentration limit has been developed. The specific concentration limits replace the generic ones in the classification of a preparation. Hence, when exceeding the concentration in a preparation that is specified in Annex I, the classification of the preparation has to be derived accordingly. The specific limits are normally lower than the generic ones.

⁴⁰ Adaptation to technical progress

⁴¹ Bromomethane, tetrachloromethane, methyl chloroform and dichlorofluoroethane

⁴² lead methanesulfonated

The harmonised classification of Annex I of Directive 67/548/EEC, as well as the specific concentration limits will be included in Annex IV of the GHS-implementing regulation as so called 'minimum classification'. This means that the harmonised classification is to be applied as a minimum by the placer on the market of a substance and, if additional information suggesting a more stringent classification is available to him, he shall apply that, more stringent, classification.

5.5.5. Substances of very high concern under REACH

Under the REACH regulation, some substances are considered as very hazardous for human health and/or the environment. Many but not all of them are classified as dangerous and are thus not necessarily captured by secondary legislation⁴³. These so called substances of very high concern (SVHC) are substances fulfilling the criteria of Article 57 of REACH, which are:

- Substances which are carcinogenic, mutagenic or reprotoxic (CMRs), category 1 or 2 or
- Substances which are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative substances (vPvB) fulfilling the criteria of REACH Annex XIII or
- Substances for which there is evidence giving rise to an equivalent level of concern

The last criterion aims to capture all substances which cannot be identified as dangerous in a standard procedure, but for which expert judgement and the use of additional data is necessary. This applies e.g. to endocrine disruptors or POPs. The identification of PBTs and vPvBs is a distinct work step for any registrant of a substance in amounts exceeding 10 t/a – the so called PBT-assessment in the scope of the chemical safety assessment. For PBTs the communication limit in safety data sheets is 0.1 % w/w.

Some specific provisions may apply to the identified SVHC⁴⁴ under REACH. They may be subject to authorisation, which means that an authorisation has to be granted by the Commission to any actor applying that substance for a specific use. In addition, for all identified SVHCs information on their content in articles if exceeding 0.1% w/w in the article has to be forwarded along the supply chain, as well as any information necessary for safe handling and disposal. SVHC and in particular substances with persistent and bioaccumulative properties (which may be classified with an R53) may be of particular relevance for waste handling because:

⁴³ One example is decabrom diphenylether: this substance is not classified as dangerous but is under discussion for years because there is a suspicion of it being a PBT-like substance.

⁴⁴ Identified means that it has been agreed at EU-level that the substance fulfils the criteria of an SVHC and is listed on the so called candidate list for authorisation

- recycling and reuse operations may (re-)introduce these substances into secondary raw-materials and products – with or without the waste operator being aware of that,
- certain waste management operations may result in a wide dispersive distribution of these substances, whereas a high level of control of these substances' emissions is required under REACH,
- information on the content of these substances could be forwarded together with the article and, in order to show that emissions of these substances are minimised during the life-cycle, the registrant will need information on waste handling more urgently than for other substances.

5.5.6. Summary and conclusions

For the application of H14 most countries refer to the risk phrases, the methods and the limit concentrations laid down in the chemicals legislation. Some countries also use the transport regulations (ADR) as reference.

The national approaches differ with regard to the scope and the methods applied. Some countries limit the application of H14 to risks to the aquatic environment (R50 to R53) and to the ozone layer (R59) because EU chemicals legislation provides no methods and limit values for the risks to the terrestrial environment. Other countries include the terrestrial environment in their assessment.

Sweden and UK mention the necessity to apply specific concentration limits for highly toxic substances. For this purpose Sweden makes reference to the Annex 4 of the EC POPs Regulation.

The feedback highlighted that a harmonised application of H14 is highly dependant on the availability and reliability of standardised biotests. An important step in this direction is made with the EU ring test on the validation of EN 14735.

Concluding from the available information it is proposed to link the criterion H14 directly to the definition of chemical legislation. The current proposal for a GHS-implementing regulation does not change the classification methodology or criteria for this property. Hence, an update of the link to the GHS-implementing regulation is possible without changes at content level.

Consequently the following R-phrases can be applied that are related to H14

R50-53	very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R50	very toxic to aquatic organisms
R51-53	toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R52-53	harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R52	harmful to aquatic organisms
R53	may cause long-term adverse effects in the aquatic environment
R54 ⁺	toxic to flora
R55 ⁺	toxic to fauna
R56 ⁺	toxic to soil organisms
R57 ⁺	toxic to bees
R58 ⁺	may cause long-term adverse effects in the environ
R59	dangerous for the ozone layer

Concentration limits related to the R-phrases are:

Annex III part B to DPD “concentration limits to be used for the evaluation of environmental hazards

- Related to acute aquatic toxicity and long term adverse effects: Table 1 of Annex III Part B
- Hazards for the ozone layer: Table 5 of Annex III Part B

In addition the ecotoxicological characterisation of waste via biological test batteries and test strategies shall be further considered for the review of the LoW.

It is stated that the basis test battery includes aquatic and terrestrial biotests, for which test specific limit values are defined to identify an ecotoxic signal in the test system. In order to differ between hazardous and non hazardous waste, which means referring the test signal to a hazard classification, the determination of threshold values is intended by a Member State.

Germany reports the following limit values:

Basic test battery	Test organism	Reference	Limit values
Eluate testing	Algae	DIN EN ISO 8692	25%
	Daphnids	DIN ISO 6341	20%
	<i>Salmonella typhimurium</i>	ISO 13829	Dmin ≥ 2
Solid waste testing	Earth worm	ISO 11268-1	20%
	plants	ISO 11269-2	30%

Table 17: Proposal for concentration limits

5.6. Other H criteria

5.6.1. Problems concerning other H-criteria

The application of the other H-criteria is not seen as problematic in most of the Member States according to the questionnaire evaluation. Most countries did not answer this question or have the opinion that these criteria are easy to apply and robust.

Sweden, Germany, and Italy address problems concerning the application of criterion H7 'carcinogenic' as classification instrument.

According to Sweden, in some cases the concentration limits given in Decision 2000/532/EEC and Substance Directive 67/548/EEC for H7 are too high for waste management purposes. Sweden gives an example for this problem. The 0.1 % concentration limit of the H7-criterion for carcinogenic substances is considered too high for waste that contains polychlorinated dioxins or furans comparing to concentration limits of the POP-ordinance (15µg/kg). Germany agrees with this opinion.

Italy misses a common methodological approach for several hydrocarbons. This hampers the application of H7. The approach taken by UK by setting a concentration limit for the overall concentration of PAH is used to solve this problem in Italy.

(See also discussion of concentration limits for POP wastes in chapter 6.3 of this report.)

5.6.2. Analysis of Guidance Documents

The property H7 is not further contemplated in most guidance documents. The following 3 guidelines discuss the hazard criterion H7 more profoundly and are therefore further described in this chapter:

- Guidelines on the Application of the Waste Catalogue Ordinance of 10 December 2001 [DE 2005]
- Hazardous waste. Interpretation of the definition and classification of hazardous waste (Technical Guidance WM 2.1) [UK 2006]
- European Waste List EURAL by OVAM [BE 2004]

According to Annex II of the Hazardous Waste Directive 91/689/EEC the H7-property "carcinogenic" is defined as follows: "Substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence."

For the application of H7 the guidelines use different approaches to set limit values.

The UK guideline follows the general approach by applying European legislation and firstly using risk phrases to define the property H7:

- R45 "May cause cancer"
- R49 "May cause cancer by inhalation"
- R40 "Limited evidence of a carcinogenic effect" respectively
- R40 "Possible risk of cancer" updated text for R40 in accordance with directive 2001/60/EC [DE 2005]

The guidance document refers to Annex VI of the Substance Directive 67/548/EC and the separation of these R-phrases into three carcinogenic categories. R45 is applied in Category 1, R49 is applied in Category 2 and R40 is applied in Category 3. Furthermore, concentration values are given for these categories, which are also adopted by the Decision 2000/532/EC. The concentration limits are:

- 0.1 % for Category 1(R45) or 2 (R49) and
- 1 % Category 3.

The UK guideline presents a decision tree and gives specific guidance with regard to the classification of 'waste containing oil'. No further guidance is provided concerning the classification problems with H7 mentioned above. As no tests correspond directly to hazard criterion H7, the UK suggests in its guideline to test for genotoxicity and mutagenity as an indicator for carcinogenic properties but doesn't give further limit values for H7.

In addition to this general approach described in the UK document, Germany [DE 2005] also takes substances into account, which may already be classified as carcinogenic, damaging for reproduction and mutagenic according to:

- the criteria of Annex VI of the Substance Directive 67/548/EC,
- National regulations such as
 - MAK list (Maximum Exposure limits MEL)
 - TRGS (Technical rules for hazardous substances)

The Technical Rules for hazardous substances (TRGS) reflect the state of the art of occupational medicine and work hygiene as well as further scientific facts for activities with hazardous substances. The TRGS are compiled and adapted to the development by a commission of hazardous substances (Ausschuss für Gefahrstoffe AGS). This promotes the timeliness of limit values because the TRGS are quicker to adapt than laws. The used TRGS in this context are

- TRGS 905 "Verzeichnis krebserzeugender, erbgutverändernder oder fortpflanzungsgefährdender Stoffe" (List of carcinogenic, teratogenic or mutagenic substances) (Federal Labour Gazette 8/9-2005)
- TRGS 551 "Teer und andere Pyrolyseprodukte aus organischem Material" (Tar and other pyrolysis products from organic materials) (Federal Labour Gazette 8/1999, p. 39)

In general the German guidance document [DE 2005] relates the property H7 to two different substance groups for which concentrations limits are given:

- For organic sum parameters such as PAH, BTX, PCBs, Highly Volatile Halogenated Hydrocarbons (given in **Fehler! Verweisquelle konnte nicht gefunden werden.**)
- Concentration limits for metal compounds related to H7 are found in Table [DE 2005] (see Annex 12.2).

Table 18: Concentration limits for organic substances according to [DE 2005]

Analysis parameter		Concentration limit in %
PAHs	Substance mixtures such as tar or creosote	0.1
	Benzo(a)pyrene	0.005
BTX		
	Benzen	0.1
High volatile halogenated hydrocarbons		
	1,1,1-Trichlorethane	0.1 per substance or total value 0.1
	Trichlorethylene	
	Carbon tetrachloride (tetrachloromethane)	
	1,2-Dichlorethane	
	Bromomethane	
	1,2-Dibromoethane	
	1,1,2,2-Tetrabromoethane	
	1,1-Dichloro-1-fluoroethane	
	1,2-Dibromo-3-chloropropane	
	1,1,2,2-Tetrachloroethane	
	3-Chloropropene	
PCBs		0.005

It is obvious, that concentration limits for some substances are lower than the concentration limits of Decision 2000/532/EEC. For individual hydrocarbons and petroleum products, such as gasoline, no limit values for H7 are suggested by Germany. Testing methods for heavy metals and organic sum parameters in solids and in eluates are also listed in guideline [DE 2004](see Annex 12.4).

The great majority of the petroleum products are listed in the Substances Directive anyway and classified as carcinogenic (H7) due to contaminants from processing, such as aromatic compounds, PAHs etc. Here, the Substances Directive requests the measurement of the carcinogenic constituents and gives a concentration limit of 0.1% for these contaminants. Even if the concentration is below this threshold, waste oil and wastes containing oil ought to be assigned to the hazardous types of waste with an absolute entry (Decision 2000/532/EC). Still in the case of a concentration of more than 0.8% of hydrocarbon in content the hazardous property H13 is fulfilled (see Annex 12.3)."

Furthermore, the guideline emphasises to take care of assessing concentration limits in the original substance (waste).

The Belgium guideline EURAL by OVAM [BE 2004] has a completely different but practical approach. It names different products or wastes, which might contain tar, offers a test method to confirm the presence of PAH and selects the relevant waste codes for the waste generators from the list of waste (100317*, 100812*, 170301*, 170303*, 170410*). The test method to detect tar in general is e.g. “*spray test PAH-marker*”, which detects PAH in asphalt products, drill kernel or debris from buildings, roofing material etc.

The different products containing tar that may constitute waste, e.g. coal tar, tar containing binder for asphalt etc. and their approximate PAH content are mentioned, so that the waste generator is able to understand the problems related with tar containing material.

The guideline by OVAM [BE 2004] permits to use the mirror entry for the hazardous codes if the PAH concentration is below 0.1 %. A gas chromatographic detection method is given by a link to the compendium for analyses of VITO, an independent Belgium research organisation.

5.6.3. Summary and conclusions

Problems with the application of H-criteria (other than H9, H12, H13 and H14) are mentioned by Member States for the criterion H7 ‘carcinogenic’ with regard to limit values and test methods. For some substances (e.g. dioxins, furans) the limit values are considered to be too high for waste management purposes.

UK and Germany use a similar approach in their guidelines, connecting R-phrases to the criterion H7 and set limit values according to the Decision 2000/532/EEC and the EC chemical legislation. Germany takes a further step by also using additional regulations, which define carcinogenic substances. Therefore concentration limits are lower for some substances such as benzo(a)pyrene or PCBs.

Belgium uses a different approach by connecting the H-criteria H7 with known properties of wastes.

Nevertheless no guideline offers solutions for PCDD/F or other POPs.

Additional discussion regarding POP waste can be found in chapter 6.3 of this report.

6. Review of concentration limits

6.1. The role of classification of substances and preparations in chemicals legislation

6.1.1. Main principles of classification

Classification of chemicals is a standardised way to characterise the inherent dangerous properties of a chemical. According to the DSD and DPD the classification consists of a letter, indicating the overall category of danger, and so called risk phrases which specify the adverse effect, e.g. toxic or explosive (Example: Symbol: N - Dangerous for the environment; R-Phrases: R50/53 - Very toxic to aqueous organisms, may cause long-term adverse effects in aquatic environment; S- Phrases: S61 - Avoid release to the environment).

Three areas of hazards are distinguished: physical-chemical hazards, hazards to human health and hazards to the environment. For human health hazards the pathways (oral, inhalation, dermal uptake) upon which the chemical could cause an adverse effect are specified in the R-phrases. Most hazards are distinguished with regard to the level of severity of the effect (e.g. very toxic, toxic or harmful).

The classification of a substance is determined by comparing results from testing with the criteria for the respective dangerous property. The classification of preparations can be determined either by testing the preparation as a whole, which is necessary for most physico-chemical properties or by assessing the dangerous properties of the substances in the preparation and applying calculation rules to deduce the classification. A third approach is to use epidemiological data. The calculation approach based on the classification of ingredients is called conventional method.

The classification and labelling of chemicals is strictly hazard-based. It is determined without consideration of any exposure of humans or the environment. This means that the classification describes the potential of a chemical to cause damage. Whether or not and in which dosage a chemical comes into contact with humans or the environment determines which damage is actually caused. If a substance or a preparation is classified for any of the dangerous properties defined in the DSD, it is called 'dangerous' or 'classified' substance or preparation.

The GHS implementing Regulation which is planned to enter into force by the end of 2008 will introduce some changes to the current classification and labelling rules for chemicals. The main changes relate to

- The GHS adds hazard classes, which do not exist in the Dangerous Substances Directive.
- The GHS has more 'subdivisions' in some of the hazard classes.
- Classification rules for physico-chemical hazards will be based on the rules for classifying dangerous goods under transport legislation.
- Some criteria and cut-off values for classification are different in the GHS.
- Different rules apply for the classification of mixtures for some of the end-points, in particular for classifying human health hazards.

6.1.2. Communication of dangerous properties

The classification of a substance or preparation is to be communicated on the label of a chemical (and its packaging) and with the safety data sheet.

The classification on the label is abbreviated and supplied together with a danger symbol, alerting on the specific danger. The label is to ensure that the person handling the chemical is informed of any hazard in a concise way. There are several rules on how much information should be supplied and in which sequence and format.

The safety data sheet is required for any substance or preparation placed on the market that is classified as dangerous or that is a substance of very high concern or that contains such substances in relevant amounts (REACH Article 31). Apart from the classification information, the safety data sheet contains several other information for appropriate protection of workers and the environment, such as specific advice on safe handling and storage or on risk management measures, as well as further legal information. If an exposure scenario is attached to the safety data sheet, more specific information on how to use a substance or preparation is included therein.

6.1.3. Consequences of classification

In addition to information on a chemical's hazards, the classification of a substance or preparation also triggers that it falls under other legislation. For example:

- chemicals legislation: substances which are classified as carcinogenic, mutagenic or reprotoxic Category 1 or 2 (CMR Cat. 1 or 2) are not allowed in preparations sold to the general public (Directive 76/769/EC on marketing and use restrictions, in the future Annex XVII of REACH)
- installation-related legislation: emissions of volatile organic compounds classified as CMRs Cat 1 or 2 have to meet specific emission limit values (Directive 99/13/EC)
- workers protection legislation: risks from the use of substances and preparations at workplaces which are classified in general have to be assessed under the Chemicals Agents Directive (Directive 98/24/EC)
- environmental legislation: certain substances classified as dangerous for the environment are frequently controlled by means of specific emission limit values.
- product-related legislation - substances with specific dangers are excluded from the use in certain products, such as cosmetics or children's toys.

According to the LoW, wastes containing substances classified with certain R-phrases under chemical legislation above specified concentrations trigger that a waste is regarded as hazardous.

6.2. Links related to the classification procedure of preparations and waste

Waste is a mixture of various substances and is thus in principle similar to a preparation. Whereas a preparation is intentionally mixed and its composition is known to its producer, waste is frequently the result of a process where a chemical has been used ...

- ... and remnants of that chemical remain in its packaging or in the equipment with which it has been applied (e.g. remaining paints in paint containers and spray pistons) → the composition of the waste is almost⁴⁵ the same as that of the paint and the classification of the waste can be derived from the classification of the preparation directly.
- ... as processing aid (e.g. lubricants) → the composition of the resulting waste is not the same as the original chemical as new (unknown) sub-

⁴⁵ volatile substances would have evaporated and thus would not or at much lower concentrations be present in the waste and cleaning agents may be added if equipment is cleaned

stances (may) have contaminated the original chemical. The classification of the waste would be based on the classification of the original preparation but contamination has to be considered.

- ... to become part of an article → the classification or content of chemicals in articles is normally not communicated and the one producing waste (disposing of the article) has no respective information⁴⁶. The classification of waste cannot be based on information on the input materials but has to be derived by other means (e.g. identification of substances in the article likely to trigger the application of an H-criterion).

Considering waste as a special 'preparation' would imply that the same rules for classification would apply. However, the Hazardous Waste Directive and the LoW

- do not describe the procedure and rules for classifying wastes in detail,
- make imprecise links to chemicals legislation with regard to the analogous H-criteria and do not link H14,
- do not take into account the more differentiated classification and labelling system for substances and preparations, resulting to some mismatches,
- make reference to testing methods which have been developed for 'pure' substances and preparations.

The concentration limits above which a waste has to be regarded as hazardous as defined in the LoW are in accordance with those specified in the DPD, except for irritant substances. As some of the H-criteria aggregate R-phrases of different danger levels in chemicals legislation, the links are slightly imprecise.

In the following the similarities and differences in the classification of chemicals and wastes is further assessed in order to recommend how waste legislation could be improved.

6.2.1. Comparison of classification of wastes and of chemicals

According to the LoW, wastes are to be classified as hazardous, if they display any of the criteria in Annex III of the Hazardous Wastes Directive and, if for the criteria H3 to H8, H10 and H11 the specified conditions are met. These criteria are analogous to those defined as 'dangerous properties'⁴⁷ in the Dangerous Substances Directive (67/548/EEC) and the respective criteria of Annex VI of the DSD are to be applied. Furthermore, reference is made to the respective tests needed to determine whether or not the criteria are fulfilled. Waste can be classified either based on knowledge of its composition or based on testing, just as it is the case for preparations.

⁴⁶ An exemption from this general issue is e.g. the disposal of end of life vehicles, where the ELV Directive requires that producers have to inform the treatment operators and disposal companies about the presence (and the location) of „restricted substances“. Similar provisions exist in the WEEE-/RoHS Directive.

⁴⁷ The property of sensitisation is the only type of property contained in Directive 67/548/EEC, which does not occur as H-criterion in the hazardous waste directive

The assessment of waste should consider the different exposure routes (inhalation, ingestion and penetration of skin are listed in the definition of the H-criteria) but the final classification only specifies the H-criterion. The classification of a chemical indicates the type of effect and, for some categories of danger, the relevant exposure route⁴⁸. It also distinguishes different levels of danger (e.g. very toxic, toxic and harmful, whereas the H-criterion only distinguishes between toxic and harmful) and indicates whether prolonged exposure (e.g. R-phrase 48) or long term health effects (e.g. R-phrase 39) have to be expected. Hence, the classification and labelling of substances and preparations is more complex and has been summarised and aggregated for the purpose of classifying wastes. With regard to the protection of workers, it may be helpful to include the more detailed information on exposure routes and exposure durations in the classification of wastes.

In most cases the definition of the H-criteria is either identical to the respective definition of a dangerous property in the DSD or it is worded in a way to fit to the test method underlying the identification of a dangerous property of a substance/ preparation. In the following cases, the H-criteria include two or three levels of danger as defined in the DSD:

- Extremely explosive (R3) and explosive substances (R2) are covered in H-criterion 1. The classification of the substance does differentiate by means of two different R-phrases, whereas the danger symbol would not distinguish between the different levels of explosiveness
- Extremely flammable (R 12) and highly flammable (R11) are covered in H-criterion H3-A. Also R15 - contact with water liberates extremely flammable gases and R17 - spontaneously flammable with air are covered under this criterion. On a chemical's label, the three levels of flammability would be shown differently (F+ and flame, F and flame and no danger symbol)
- Very toxic (R26, R27, R28, R39), toxic (R23, R24, R25, R48) and harmful are covered both by the H-criterion toxic. On a chemical's label, they would be distinguished (T+ and skull; T and skull).
- The H-criterion 14 – ecotoxic – covers acute and chronic toxicity in the aquatic and terrestrial environment. Directive 67/548/EEC contains several R-phrases which indicate different types of environmental risks.

6.2.2. Classification process

Both waste and substances / preparations can be classified on two (alternative) routes: either they are tested as a whole and the test result is compared to the definition of the criterion for dangerousness/hazardousness or the fulfilment of the criterion is 'calculated' based on the knowledge of the dangerous and con-

⁴⁸ However, it may happen that a classifier has not enough information to classify for all the potential exposure routes (which would probably be an issue for self-classified substances in particular).

centrations of the components (conventional method described in the DPD). A third way to derive the classification would be to use epidemiological data⁴⁹.

For the classification of preparations with regard to physico-chemical properties, testing is the preferred route and the conventional method is only applicable to exclude the classification as explosive, flammable or oxidising under certain circumstances. In contrast to that, for human health hazards, testing of the preparation should only be used, when the conventional method is found to be over- or underestimating dangers or where other evidence suggests that testing is the more appropriate classification method.

Testing

The Hazardous Waste Directive (HWD) makes reference to Annex V of the DSD with regard to test methods. Thus, the same tests are to be applied as for substances and preparations. In many cases it is questionable, whether this is possible, as waste may have properties which disable testing.

For many wastes, the composition will be unknown and therefore testing will be the only means to obtain information on its dangers. It is therefore essential that in particular the methods for taking samples and processing the waste to a state, where it can be applied in any test method are further elaborated. These activities are ongoing under the Basel Convention as well.

Conventional method

The dangerous properties of preparations, in particular for human health hazards, with the exception of the properties carcinogenicity, mutagenicity and reprotoxicity, are to be determined by the so called 'conventional method'. In principle, the concentrations of all substances which contribute to a certain hazard class are divided by the threshold value above which they trigger the respective classification, and are summed up. If different substances contribute to the same type of hazard but are classified more strictly, these substances are taken into account for the identification of the less hazardous end-point. For example, substances which are corrosive are considered in determining whether the concentration limit for irritation is exceeded and substances which are very toxic are considered in determining the properties toxic or harmful. The generic concentration limits for the respective end-points are used in the calculation.

If the sum of substances contributing to a hazard exceeds 1, then also the preparation is to be classified for that dangerous property. If substances representing different hazard levels of a certain effect and are contained in a preparation, they are also added up.

$$\sum \left(\frac{P}{L} \right) \geq 1$$

P are the concentrations of each substance contributing to the hazard and
L is the lower concentration limit of that substance for that hazard.

⁴⁹ See also Directive 1999/45/EC Art 6(3)

If the effects of substances are not regarded as additive (CMRs and substances with R39 or R48, which indicate either long term effects or effects due to prolonged or repeated exposures), then the concentrations of the individual substances is not summed up. The values for L are either generic ones as specified in the Annex of the DPD or they are individual and listed in Annex I of the DSD. The specific concentration limits are usually lower than the generic ones. This results in an increase of the relevance of these substances in the classification of the preparation.

The classification of wastes according to the LoW criteria is carried out in analogy except that the individual classification thresholds (L) are not considered and no differences are made with regard to the additivity (except for CMRs). Notably the H-criterion 14 – ecotoxic has not been specified in the LoW, although similar reference as for the health hazards could have been made.

The DPD defines so called cut-off limits for considering substances in classifying preparations. These depend on the level of danger of the substance and are either 0.1% or 1% (w/w) for liquid preparations and 0.02%, 0.2% or 0.1% (vol/vol) for gaseous preparations. Such cut-off limits do not exist for the classification of waste in accordance with Article 3.

In summary, there are three differences in the classification rules for preparations and wastes if the conventional method is applied:

- Concentrations of dangerous components in a preparation are summed up across the categories before the comparison with the classification criterion for an end-point (additivity),
- Components with specific concentration limits in Annex I get more importance and weight in the classification of preparations.
- There are no cut-off limits defined for considering dangerous substances contained in wastes, which means that the classifier would in a narrow sense have to take any substance into account.

Re-classification needs

The Dangerous Preparations Directive (DPD) specifies that no new classification has to be done, when the composition of a preparation is changed within certain ranges, which depend on the initial concentration of the component that is varied (c.f. Table in Article 6(4) of the DPD).

No respective possibilities are covered in the HWD. However, in the acceptance procedure for wastes at landfills and the basic characterisation of wastes in the acceptance procedure, testing can be dismissed for wastes which are regularly generated under the condition that source and processes of waste generation don't change and respective documentation is provided.

Classification criteria

In the following table, the classification criteria under LoW and in the preparation Directive are compared. Due to the fact that some hazard classes are aggregated in the H-criteria, some categories contain two sets of R-phrases.

In the first column the H-criteria are listed, which have a corresponding definition under the Dangerous Substances Directive. In the second column, the pertaining R-phrases are listed (for the three exposure routes, the concentration limits triggering classification don't differ). In the third column, the generic concentration thresholds triggering classification of a preparation if one or more substances with the respective R-phrase in the same hazard level are contained. E.g. if a substance classified with R28 is contained in a preparation above 7%, then the preparation would also be classified with R28. In the fourth column the thresholds are listed which would trigger a classification of the preparation at all. If e.g. the same substance was contained in a concentration of 0.2%, the preparation would still be classified as dangerous, because it fulfils the criteria of being harmful.

In all column, differences between the thresholds in the DPD and in the planned GHS-implementing regulation are indicated (if the values are the same, no information on GHS is included).

Table 19: Classification criteria under LoW and preparation Directive

H - criterion	67/548/EEC R-phrases	Criteria LoW in addition to HWD	conc. Leading to same classification	conc. Leading to 'dangerous' in low-est classification	Exemptions preparations
H1, Explosive	R2 - risk of explosion , R3 - extreme risk of explosion	None	As for substances (testing)	As for substances (testing)	No components classified, composition changes
H2, Oxidizing	R7 - may cause fire, R8 - Contact with combustible material may cause fire, R9 - explosive when mixed with combustible material	None	As for substances (testing)	As for substances (testing)	No components classified, composition changes. Peroxides always oxidising, preparations: concentration values
H3-A, Highly, flammable	R12 - extremely flammable , R11 - highly flammable , R15 - contact with water liberates extremely flammable gases, R17 - spontaneously flammable with air	FP ≤ 55	As for substances (testing)	As for substances (testing)	No components classified respectively, composition changes borders
H3-B, Flammable	R10 - flammable	FP ≤ 55	As for substances (testing)	As for substances (testing)	No components classified, composition changes
H4, Irritant	R38 irritant to skin – inflammation, R36 irritant to eyes, R41 serious damage to eyes	R41: 10% , R36, R37, R38: 20%	R41: 10% , R36, R37, R38: 20%	R41: 5%, R36, R37, R38: 20% GHS: 10%	
H5, harmful	R20, R21, R22 harmful	R20, R21, R22 ≥ 25%	R20, R21, R22 ≥ 25%	Harmful --> Harmful: ≥ 25%	
H6 , Toxic	R26, R27, R28, R39 very toxic , R23, R24, R25, R48 toxic	R26, R27, R28 ≥ 0.1% R23, R24, R25 ≥ 3%	R26, R27, R28: ≥ 7%, R23, R24, R25: ≥ 25%	Very toxic --> harmful: ≥ 0.1, Toxic --> harmful ≥ 3	
H7 , Carcinogenic	R45, R49 (Cat 1+2), R40 (Cat 3)	Cat 1 and 2 ≥ 0.1, Cat 3 ≥ 1%	Cat 1 and 2 ≥ 0.1, Cat 3 ≥ 1%		non additive effect --> individual concentrations
H8, Corrosive	R34 causes burns, R35 causes severe burns	R35 ≥ 1% R34 ≥ 5%	R34 and R35 --> 10% GHS: 1 and 5%	R35: 1% , R34: 5%	
H10 , reprotoxic	R60, R61 (Cat 1 + 2, R62, R63 (Cat 3)	Cat 1 and 2 ≥ 0.5 , Cat 3 ≥ 5%	Cat 1 and 2 ≥ 0.5 , GHS: Cat 1: 0.3% Cat 3 ≥ 5% GHS: Cat 2⁵⁰ 3%		non additive effect --> individual concentrations
H11, Mutagenic	R46 (Cat 1 + 2), R68 (Cat 3)	Cat 1 and 2 ≥ 0.1, Cat 3 ≥ 1%	Cat 1 and 2 ≥ 0.1, Cat 3 ≥ 1%		non additive effect --> individual concentrations
H14, Ecotoxic ⁵¹	R50, R51, R52, R53	None	All R-phrases: ≥ 25%	2.5 ⁵² %	

⁵⁰ In the GHS system, the categories are numbered differently. Category 2 in the GHS equals Category 3 in the current classification system.

⁵¹ Only the R-phrases to classify aquatic toxicity are considered relevant. A more detailed assessment is made in the Chapter discussing H14.

The comparison of concentration thresholds shows that only the concentration threshold differs for the property damage to eyes (R41). There is a concentration range (5% for R41 and app. 9.9%), where the classification as 'dangerous in principle' would be different for waste and a chemicals preparation. Furthermore, for H14 no criteria are defined to compare with.

The planned GHS-system differs from the current classification system for several hazard classes (dangerous properties) for human health. The acute toxicity of a preparation is determined by using a totally different calculation system. For long term effects a separate hazard class is defined, called "system target organ toxicity" (STOT), for which single and repeated exposures are differentiated. With regard to the generic concentration thresholds, differences exist for irritancy, corrosiveness and toxicity to reproduction.

6.2.3. Conclusions from comparing generic classification rules

As most far reaching proposal, the H-criteria could be fully replaced by a link to the 'dangerous properties' in the DSD or the hazard classes of the GHS-implementing regulation, respectively. This would result in an extension of properties rendering a waste hazardous, i.e. sensitising health effects if linking to the DSD and in addition 'system target organ toxicity' if linking to the GHS-implementing Regulation would be added. The H-criteria which do not exist in chemicals legislation would have to be maintained (H9, H12 and H13).

This replacement of H-criteria should be accompanied by also linking to the classification methods and rules currently defined in the DPD and in the GHS-implementing Regulation in the future. This would signify to give wastes the status of a preparation in the sense of chemicals legislation (mixtures of substances) and treat them equally with regard to the assessment of their dangers.

Replacing the H-criteria and linking to the classification methodology of chemicals legislation has several advantages:

- Clear rules and procedures on how to assess and classify chemicals, which have been developed and refined over more than 40 years would make the decision on the hazardousness of waste more transparent and straight forward for waste generators.
- Existing knowledge and guidance from chemicals legislation could be used.
- The classification of chemicals being part of the wastes can be more easily used to derive the hazardousness of waste.
- Confusion about mismatches and differences in systems would be avoided.
- Dynamic links would ensure that new developments are taken into account.

⁵² For substances with LC₅₀ or EC₅₀ values below 1 mg/l, this factor is reduced. In the amendment of the preparations directive in 2006, a factor 10 is to be applied (i.e. if LC₅₀ = 0.1 mg/l, the concentration limit is 0.25%, if the LC₅₀ is 0.01 mg/l the concentration limit is 0.025%)

- The level of protection for workers and the environment could be enhanced if also the communication system for chemicals (hazard pictograms, R-phrases and S-phrases) were taken over.

The disadvantage of this option is that classification of wastes will be more complex and require more work as currently undertaken by the waste generators. Whether or not the costs of a more detailed classification and thus increased level of knowledge on the hazardousness of the waste would be offset by a corresponding improvement of risk management, is hardly to assess because necessary data are not available.

If the replacement of the H-criteria is not an option, a less far reaching possibility would be to establish a fixed link to the respective R-phrases and a dynamic link to the concentration limits of the DPD.

Table 20: Example for linking the H6 to chemicals legislation

H-criterion	R-phrases covered H-statements covered	Classification of waste	Criteria for classifying hazardous
H6: Toxic	R23, R24, R25, R26, R27, R28	Classification according to Directive 99/45/EC	Directive 99/45/EC, Annex II, Part B
H6: Toxic	Acute toxicity (oral), Hazard Category 1, 2; 3; Acute toxicity (dermal), Hazard Category 1, 2, 3; Acute toxicity (inhal.), Hazard Category 1, 2, 3	According to ATE method	GHS-implementing Regulation, Annex III, Section 3.1
H6: Toxic	Specific target organ toxicity – single exposure, Hazard Category 1; 2; Specific target organ toxicity – Single exposure, Hazard Category 3, Respiratory tract Irritation; Specific target organ toxicity – Single exposure, Hazard Category 3, Narcosis; Specific target organ toxicity – Repeated exposure, Hazard Category 1, 2s	No additivity, components separately	GHS-implementing regulation, Annex III, Section 3.8 and 3.9

This type of link would ensure that misunderstandings are avoided on the correlation between H-criteria and R-phrases (which will be obsolete after the GHS-implementing Regulation enters into force) and that the classification of a waste would correspond to that of a preparation.

A clarification of coverage of R-phrases by H-criteria would in any case be useful for all waste producers for their classification. The current implementation in the LoW does not link the R-phrases and concentration limits to the respective H-criteria. This is particularly true also for the H-criteria which have less levels of danger than the respective dangerous properties under chemicals legislation (flammable, toxic, ecotoxic).

The specific concentration limits in Annex I of the DSD ensure that respective substances are considered for classification also in concentrations below the generic limits and that their importance is increased in the classification of a preparation. This principle and this method is not part of the waste classification rules and thus, the dangerousness of wastes could be underestimated in comparison to the preparations. Thus, in order to enhance protection of workers and the environment, a link to Annex I could be helpful. If a link to the classification rules of the DPD is made, the specific mentioning of Annex I of the DSD is not necessary any more, as it is part of the classification methodology.

The existing harmonised classifications including specific concentration limits of Annex I of the DSD will also be part of the GHS-implementing regulation (Annex VI). In the future, this Annex will be filled only with harmonised classification of substances with the dangerous properties carcinogenic, mutagenic, reprotoxic and respiratory sensitisation.

The classification and specific concentration limits of substances which are not CMRs or respiratory sensitisers will be published in the European Classification and Labelling Inventory established according to the REACH regulation. This classification (including concentration limits) will be derived by the manufacturers and importers of the substances and will not be cross-checked by authorities or harmonised at EU level. If substances dangerous for the environment and other substances with specific concentration limits should be taken into account in the classification of wastes, a link to the classification and labelling inventory would be needed in addition to the Annex of the GHS implementing regulation.

6.3. Concentration limits for POP waste

The objective of this task is to evaluate whether there are grounds and/or scientific evidence to set concentration limits for POP in wastes in the context of the LoW that are lower than those in Annex IV of Regulation 850/2004 (POP Regulation) for the classification of waste as hazardous. Focus is set on PCDD/F, pesticide POPs and DDT.

6.3.1. Background

Annex IV of the POP Regulation as amended by Regulation 1195/2006 lists persistent organic pollutants and assigns concentration limit values. For wastes where those ELV are exceeded the POP regulation requires specific processes for the treatment, recovery or disposal of those wastes.

The European list of waste serves for the encoding of waste properties and/or compositions in order to establish a harmonised communication instrument between the parties involved in the management of waste.

Wastes that require specific measures because of an increased risk for humans and/or the environment are classified in the LoW as hazardous. Consequences of classifying a waste as hazardous are that

- They are subject to control requirements of the Hazardous Waste Directive 91/689/EEC as amended.
- The European Waste Shipment Regulation 1013/2006 provides for specific requirements for shipment of hazardous waste
 - between Member States, within the Community or with transit through third countries;
 - imported into the Community from third countries;
 - exported from the Community to third countries;
 - in transit through the Community, on the way from and to third countries.

The export to non OECD countries is prohibited according to the Waste Shipment Regulation.

- Potentially additional regulations might apply resulting from national systems for supervision and control of shipment of waste within a Member State according to Article 33 of the Waste Shipment Regulation.

In the international context the “Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal” provides a list of wastes (Annex VIII) that are classified as hazardous wastes as long as it is not proven that the waste does not fulfil the hazard criteria of Annex III of the Basel Convention. Entries relevant in the context of this discussion paper on POP wastes are for example [Pohlmann 2006]:

Wastes potentially contaminated or containing PCDD/PCDF:

- A1100 Dusts and residues from gas cleaning systems of copper smelters
- (A1150 Precious metal ash from incineration of printed circuit boards not included on list B *further information is necessary*)
- (A2040 Waste gypsum arising from chemical industry processes, when containing annex I constituents to the extent that it exhibits an Annex III hazardous characteristic *further information is necessary*)
- (A2060 Coal fired power plant fly-ash containing annex I substances in concentrations sufficient to exhibit Annex III characteristics *further information is necessary*)
- A3010 Waste from the production or processing of petroleum coke and bitumen
- A4110 Wastes that contain, consist of or are contaminated with any of the following:
 - Any congener of polychlorinated dibenzo-furan,
 - any congener of polychlorinated dibenzo-dioxin
- A4160 Spent activated carbon not included on list B

Wastes potentially contaminated or containing POPs pesticides:

- A3090 Waste leather dust, ash, sludges and lours when containing hexavalent chromium compounds or biocides
- A3110 Fellmongery wastes containing hexavalent chromium compounds or biocides or infectious substances
- 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 chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics

Wastes potentially contaminated or containing PCB

- A3040 Waste thermal (heat transfer) fluids – *to be discussed in relation of A3180*
- A3120 Fluff – light fraction from shredding
- (A3180 *only needs adaptation if a new classification limit will be adopted*)

Within the context of the Basel Convention technical guidelines have been elaborated and are still under further development that provide for the environmentally sound management of wastes “consisting of, containing or contaminated with persistent organic pollutants (POPs)”. The technical guidelines provide a framework for addressing issues referred to in Article 6, paragraph 2 of the Stockholm Convention.

6.3.2. Analysis of existing concentration limits

The need to communicate information about the properties of a waste via the classification as “hazardous” and use of the asterisk of the waste code might result from different contexts:

- a) Requirements related to storing of waste,
- b) Requirements related to transport of waste,
- c) Requirements related to treatment, recovery and final disposal of waste including the reclamation of components of the waste and the use of components of the waste in resulting recycling products,
- d) Requirements related to occupational health and safety.

Storage and transport

The “European Agreement concerning the international carriage of dangerous goods by road” (ADR) provides in ANNEX A (General Provisions and Provisions concerning Dangerous Substances and Articles) that 2,3,7,8-TCDD in concentrations considered highly toxic (...) shall not be accepted for carriage [ADR Annex A PART 2 CHAPTER 2.2.61.2.2] (same as specific provision 614 of ADR). The approach taken with the ADR regime differs from the H-criteria approach of the LoW and is differentiated by effects on humans or animals (see table below).

Table 21: ADR requirements of chapter 2.2.61

	Oral toxicity LD50 (mg/kg)	Dermal toxicity LD50 (mg/kg)	Inhalation toxicity by dusts and mists LC50 (mg/l)
Highly toxic	≤5	≤ 50	≤0.2
Toxic	> 5 and ≤ 50	> 50 and ≤ 200	> 0.2 and ≤ 2
Slightly toxic	> 50 and ≤ 300	> 200 and ≤1 000	> 2 and ≤ 4

No general limit values applicable to PCDD/F or POP pesticides containing waste are provided in ADR.

In some Member States differing provisions exist like the German requirements laid down in the GGVS as shown in the textbox below.

Table 22: Example of transport requirements in Germany

Transport of materials is prohibited if they contain more than the following concentrations of substances

- >1 µg/kg (ppb) PCDD/F of letter a or d below, or
 - >5 µg/kg (ppb) PCDD/F of letter a+b or d+e below, or
 - >100 µg/kg (ppb) PCDD/F as sum of letter a to c below
- a. 2,3,7,8-Tetrachlordibenzop-dioxin (TCDD),
1,2,3,7,8-Penta-CDD,
2,3,7,8-Tetrachlordibenzofuran (TCDF),
2,3,4,7,8-Penta-CDF,
 - b. 1,2,3,4,7,8-Hexa-CDD,
1,2,3,7,8,9-Hexa-CDD,
1,2,3,6,7,8-Hexa-CDD,
1,2,3,7,8-Penta-CDF,
1,2,3,4,7,8-Hexa-CDF,
1,2,3,7,8,9-Hexa-CDF,
1,2,3,6,7,8-Hexa-CDF,
2,3,4,6,7,8-Hexa-CDF,
 - c. 1,2,3,4,6,7,8-Hepta-CDD,
1,2,3,4,6,7,8,9-Octa-CDD,
1,2,3,4,6,7,8-Hepta-CDF,
1,2,3,4,7,8,9-Hepta-CDF,
1,2,3,4,6,7,8,9-Octa-CDF,
 - d. 2,3,7,8-Tetrabromdibenzop-dioxin (TBDD),
1,2,3,7,8-Penta-BDD,
2,3,7,8-Tetrabromdibenzofuran (TBDF),
2,3,4,7,8-Penta-BDF,
 - e. 1,2,3,4,7,8-Hexa-BDD,
1,2,3,7,8,9-Hexa-BDD,
1,2,3,6,7,8-Hexa-BDD,
1,2,3,7,8-Penta-BDF.

[Neufassung der Gefahrstoffverordnung Straße und Eisenbahn vom 24. November 2006, Anlage 2 Abweichungen von den Teilen 1 bis 7 des ADR und RID und den Teilen 8 und 9 des ADR für innerstaatliche Beförderungen]

Recovery and disposal operations

Annex IV of the POP regulation as amended describes concentration levels agreed on European and international level that triggers the application of specific waste disposal techniques. Regarding PCDD/F this value is at 15 µg/kg (ppb). For other POPs the limit value is set at 50 mg/kg (ppm).

In order to communicate along the waste management chain (waste producer to final disposal or recovery) that the waste needs specific attention it can be con-

cluded that the concentration limit that render waste hazardous in the LoW should not be above these values.

For a number of recovery activities lower concentration levels may be required. A possible example is the use of waste on soil (e.g. sewage sludge). The Stockholm Convention Precautionary Principle requires that the background concentration of POP should not be increased from the use of POP waste. This suggests that the concentration of POP in wastes used in this recovery path should not be above 0.001 to 0.1 µg/kg (ppb) for PCDD/F and 0.01 to 0.1 mg/kg (ppm) for pesticides (= background concentrations [BIPRO p. 334]). However the precautionary principle of the Stockholm Convention is not reflected in the mechanism of H-criteria according to the LoW.

The POP regulation aims, inter alia, at preventing POPs from wastes to be transferred into new products. It requires that POP from wastes must not be recovered, recycled, reclaimed or re-used [Article 7.3]. Examples of product for which transfer of POPs in the course of recycling activities could be an issue are secondary construction materials or secondary plastics. In order to put this general provision in concrete terms recycling operations and product related concentration limits must be considered. Corresponding data on European level is not known.

Human health effects

According to [BIPRO p.350] an appropriate limit value resulting from human health risk considerations is at 1 µg/kg (ppb) for PCDD/F and 50 mg/kg (ppm) for POP pesticides and other POPs [BIPRO p. 351]. For further discussion about the limit values evaluated in that study see section 6.3.4 of this document.

Concentration limits in the context of occupational health and safety regulations are usually related to concentrations of hazardous substances in air (or sometimes liquids). No limit values related concentrations of PCDD/F, POP pesticides or DDT in solid materials are known.

Chemicals legislation

The classification of waste in the LoW is related to the Directive on classification, packaging and labelling of dangerous substances 67/548/EEC (Dangerous Substance Directive DSD) and Directive on classification, packaging and labelling of dangerous preparations 99/45/EEC (Dangerous Preparation Directive DPD). Both Directives are focussing on substances/preparations and not on contaminations in wastes. New findings are considered preferably for substances/ preparations that are intentionally produced. This is not the case for PCDD/F and not any more the case for POP pesticides and DDT.

Where the Directives do not provide specific concentration limits generic concentration limits would apply, which is of 0.1% (1000 mg/kg or 1000 ppm).

Based on aquatic toxicity concentration limits to classify waste contaminated with POPs as hazardous can be developed as shown below⁵³.

Table 23: Substance profiles for persistent organic pollutants

LC50*	NOEC*	Hazardous if	
> 10 µg/l	> 1 µg/l	> 0.025%	250 mg/kg
> 1 µg/l	> 0.1 µg/l	> 0.0025%	25 mg/kg
> 0.1 µg/l	> 0.01 µg/l	> 0.00025%	2.5 mg/kg
> 0.01 µg/l	> 0.001 µg/l	> 0.000025%	0.25 mg/kg
> 0.001 µg/l	> 0.0001 µg/l	> 0.0000025%	25 µg/kg

* Data from: <http://www.chem.unep.ch/pops/indxtms/asses6.html#SUB>

ALDRIN: The 96-h LC50 values range from **2.2-53 µg/L** for fish.

LC50*	NOEC*	Hazardous if	
> 1 µg/l		> 0.0025%	25 mg/kg

CHLORDANE: The acute toxicity of chlordane to aquatic organisms is quite variable, with 96-hour LC50 values as low as **0.4 µg/L** for pink shrimp.

LC50*	NOEC*	Hazardous if	
> 0.1 µg/l		> 0.00025%	2.5 mg/kg

DDT: DDT is highly toxic to fish, with 96-hour LC50 values in the range of **0.4 µg/L** in shrimp to 42 µg/L in rainbow trout.

LC50*	NOEC*	Hazardous if	
> 0.1 µg/l		> 0.00025%	2.5 mg/kg

DIELDRIN: The acute toxicity of dieldrin is quite variable for aquatic invertebrates, with insects being the most sensitive group (values range from **0.2-40 µg/L**). It is highly toxic to most species of fish tested in the laboratory (values range from **1.1-41 µg/L**).

LC50*	NOEC*	Hazardous if	
> 0.1 µg/l		> 0.00025%	2.5 mg/kg

NB: Borderline case, it could be also

LC50*	NOEC*	Hazardous if	
> 1 µg/l		> 0.0025%	25 mg/kg

⁵³ Provided by: Sylvain Bintein (DG Environment)

POLYCHLORINATED DIBENZO - p - DIOXINS AND FURANS:

Exposure of fish to dioxins and furans results in a delayed mortality that can continue many days post-exposure. Rainbow trout exposed to 2,3,7,8-TCDD and to 2,3,7,8-TCDF for 28 days, followed by a 28 day depuration period had a 56-day LC50 of 46 µg/L for TCDD, and a NOEC for TCDD based on growth and mortality below the lowest exposure concentration of 38 µg/L. **The 56-day NOEC** for TCDF was calculated to be 1.79 ng/L for mortality and **0.41 ng/L** for growth. Mortality and behavioural changes such as lethargic swimming, feeding inhibition and lack of response to external stimuli continued after the 28 day exposure period ended. Early life stages of fish are very sensitive to the effects of dioxins, furans, and PCBs. Parts per trillion concentrations of these structurally related chemicals in lake trout and rainbow trout eggs exhibit toxicity through sac fry mortality associated with yolk sac edema and hemorrhages.

LC50*	NOEC*	Hazardous if	
	> 0.0001 µg/l	> 0.0000025%	25 µg/kg

ENDRIN:

Endrin is highly toxic to fish, with most **LC50 values below 1.0 µg/L**. Sheep-head minnows embryos exposed for 23 weeks to 0.31 and 0.72 µg/L hatched early, and all those exposed to 0.72 µg/L died by the ninth day of their exposure, while those exposed at 0.31 µg/L were initially stunted and some died. The reproductive ability of the survivors of the 0.31 µg/L was impaired. **No significant effects were observed at an exposure concentration of 0.12 µg/L.** The lowest observed adverse effect level (LOAEL) for aquatic organisms was 30 ng/L over 20 days for reproduction in mysid shrimp.

LC50*	NOEC*	Hazardous if	
	> 0.1 µg/l	> 0.0025%	25 mg/kg
> 0.1 µg/l		> 0.00025%	2.5 mg/kg

HEXACHLOROBENZENE

HCB is unlikely to cause direct toxicological effects in aquatic animals at or below saturation concentrations (approximately 5 µg/L) in water. At an exposure concentration of 4.8 µg HCB/L for 32 days, there was no observed effect on embryonic through juvenile stages in developing fathead minnows (*Pimephales promelas*) giving a NOEC of 4.8 µg/L. The caldoceran *Daphnia magna*, the amphipods *Hylella azteca*, and *Gammarus lacustris*, the annelid worm *Lumbricus variegatus*, and the fathead minnow *Pimephales promelas* were exposed to HCB at saturation concentration (5 µg/L) for 68 days. No effects on survival, growth or reproduction were observed.

no data allowing to calculate a proper NOEC or LC50 on aquatic toxicity

HEPTACHLOR: no data on aquatic toxicity.

MIREX: Crustaceans are the most sensitive aquatic organisms, with larval and juvenile stages being the most sensitive. Delayed mortality is typical of mirex poisoning in crustaceans. Larval crabs exposed to 0.1 and 10 µg/L did not exhibit any adverse effects on survival for 5 days after hatching. Delayed mortality then occurred at the 1 and 10 µg/L exposure levels. Mirex is also toxic to fish and can affect fish behaviour.

LC50*	NOEC*	Hazardous if	
> 1 µg/l	> 0.1 µg/l	> 0.0025%	25 mg/kg

POLYCHLORINATED BIPHENYLS: PCBs are toxic to aquatic organisms, with 96-hour **LC50** values in the range of **0.015 mg/L** in fathead minnows to 2.74 mg/L in bluegills. Fathead minnows were exposed to Aroclor 1242, 1248 or 1254 in a continuous flow bioassay for 9 months. Reproduction occurred at and below 5.4 µg Aroclor 1242/L, however, results were highly variable. **A significant reduction in spawning was observed in fish exposed to 1.8 µg Aroclor 1254/L.** Early life stages of fish are more sensitive to the effects of dioxins, furans, and PCBs. Parts per trillion concentrations of these structurally related chemicals in lake trout and rainbow trout eggs produce toxicity through sac fry mortality associated with yolk sac edema and haemorrhages.

LC50*	NOEC*	Hazardous if	
> 10 µg/l	> 1 µg/l	> 0.025%	250 mg/kg

NOEC > 1 µg/l => 0.025% => 250 mg/kg or lower as NOEC is < 1.8 µg/l but without additional info.

TOXAPHENE: In general, toxic effects have been observed only at levels much higher than the recommended usage level. Toxaphene is highly toxic, with 96-hour **LC50** values in the range of **1.8 µg/L** in rainbow trout to 22 µg/L in bluegill. Brook trout exposed to toxaphene for 90 days experienced a 46% reduction in weight at **0.039 µg/L**, the lowest concentration tested. Egg viability in female trout was significantly reduced upon exposure to a concentration of 0.075 µg/L or more. Long term exposure to 0.5 µg/L reduced egg viability to zero

LC50*	NOEC*	Hazardous if	
> 1 µg/l		> 0.0025%	25 mg/kg
	> 0.01 µg/l	> 0.00025%	2.5 mg/kg

NOEC > 0.01 µg/l => 0.00025% => 2.5 mg/kg or lower as NOEC is < 0.039 µg/l but without additional info.

6.3.3. Impacts

Affected waste streams

According to [BIPRO 2005] an amount of 2.1 million tonnes of waste [BIPRO 2005 p.361] would be additionally affected if the limit value for classifying PCDD/F waste as hazardous would be set according to the value of 1 µg/kg above which human health could be affected.

Information about exports of those wastes to non-OECD countries is not available.

Administrative efforts

It is stated, that most of these wastes are classified as hazardous wastes anyhow because of other constituents like heavy metals [BIPRO 2005]. Thus it can be assumed that the additional administrative efforts for supervision and control are low. Detailed quantifications are not yet available.

Environmental aspects

By setting the concentration limit value for PCDD/F at 1 µg/kg (ppb) a higher amount of waste will be subject to accelerated supervision and control. The total additional amount of PCDD/F covered compared to a limit value of 15 µg/kg (ppb) (which is the value of Annex IV of the POP Regulation) is at around 5 kg/y⁵⁴ [BIPRO 2005 p.362]. Further information will be provided in a later stage of the project.

6.3.4. Discussion

The analysis of existing concentration limits for POP waste revealed a broad range of values. For PCDD/F, for example, the values range from 1 000 000 µg/kg (ppb) as general concentration limits in the Dangerous Substances/ Preparations Directives to 0.001 to 0.1 µg/kg (ppb) from the application of the precautionary principle of the Stockholm Convention. From considerations of potential human health effects⁵⁵ 1 µg/kg (ppb) has been deducted and with the background of the determination of appropriate disposal routes a value of 15µg/kg (ppb) has been set for PCDD/F and based on aquatic toxicity a value of 25 µg/kg has been found.

Identified concentration limit values for POP in waste follow their own objectives and logic and refer to different backgrounds. The general concentration limits of the DPD and DSD are focussing at intentionally produced substances and preparations. The precautionary principle of the Stockholm Convention consid-

⁵⁴ The overall amount of PCDD/F in waste is estimated by the same source at 15 kg/y [BIPRO 2005 p.362].

⁵⁵ "As with most other organochlorines, food is a major source of dioxins and furans in the general population, with food of animal origin contributing the most to human body burdens" [UNEP <http://www.chem.unep.ch/pops/indx.htm#asses6.html#POLYDIOX>]

ers a maximum daily intake. Annex IV of the POP Regulation⁵⁶ restricts the allowed types of waste treatment operations.

The LoW itself usually does not include direct restrictions⁵⁷ but aims at an accelerated control and supervision of waste flows.

A possible criterion for limit values of the LoW could result from the requirements of the most sensitive disposal path or most sensitive environmental concern related to the respective waste (use of waste on soils, transfer of substances into the food chain) and human health effect considerations. Marking the waste with an asterisk in the LoW would then indicate that accelerated attention is required regarding the management of this waste.

According to the analysis of [BIPRO 2005] such a value could be 1 µg/kg for PCDD/F and 50 mg/kg for other POPs including POP pesticides and PCB.

One Member State and some stakeholders stated that they do not support to include any concentration limit value for specific wastes or substances in the waste. Arguments provided have been that the LoW is based on intrinsic hazards and that the approaches described in the first interim report regarding the finding of concentration limits for POPs in waste are risk based.

⁵⁶ as amended by Regulation 1195/2006

⁵⁷ Restrictions might result (in consequence) from the export ban of hazardous wastes to non OECD countries. Where the use of hazardous wastes is restricted in certain waste treatment installations by installation related regulations the classification of a waste as hazardous might result in additional restrictions. However, this seems to be a rare case because usually those restrictions are results of an assessment whether the concrete installation is able to handle the concrete potential risk of the waste.

7. Linking waste and chemical legislation regarding the classification of waste as hazardous waste – 4 scenarios

In the following, four scenarios are described on how the waste classification system could be linked to the classification of substances and preparations under chemicals legislation.

The scenarios are focussing exclusively on the general link between the two legislative areas. The individual elements of the different H-criteria H9, H12 and H13 are discussed in section 5 as a separate solution has to be found, which cannot be derived from chemicals legislation.

Linking is discussed here for mirror entries of the LoW. The approaches for wastes with an asterisk and for (always) non hazardous wastes remain unchanged in these scenarios.

7.1. Scenario 1 - baseline scenario

7.1.1. Brief description of the scenario

This scenario describes the situation without any change to the system for classifying wastes as hazardous.

Wastes are classified as hazardous, when they fulfil one or more of the H-criteria. The H-criteria are defined in the hazardous waste directive. In the decision on the European list of waste, concentration limits are defined specifying which concentration of a substance with a certain dangerous property in a waste would lead to the classification of the waste as hazardous. No EU-level guidance on how to interpret the criteria and which procedure to apply for details of the waste classification exist. The criterion H14 lacks any detailing for classifying wastes.

7.1.2. Future perspectives of the baseline scenario

This scenario describes the status quo against which the other scenarios are compared. However, as chemicals legislation will change (GHS will replace DSD and DPD) it will be necessary to adjust the provisions of the Hazardous Waste Directive and the LoW.

The main adaptation need relates to the link between H-criteria in the LoW and R-phrases (DSD), which will not exist under the GHS-regulation. The classification according to the GHS will comprise the naming of a hazard class and a

signal word. So called hazard statements will be used to communicate the dangers of a substance or preparation. These will not be part of the classification but only the labelling.

The proposal for a GHS-regulation contains a table⁵⁸ which supports the translation of a classification according to the DSD to the GHS. A respective translation, i.e. which hazard statements would have to be considered when determining if an H-criterion applies or not, would have to be implemented in the LoW and replace the current Article 2.

Annex V of the DSD is repealed by REACH and hence, the link of the hazardous waste directive – and the H-criteria - to the testing methods has to be replaced. REACH itself does not contain any provisions for test methods and leaves it up to the classifier which test to use.⁵⁹

7.1.3. Key issues related to current problems in classifying wastes as hazardous

Identified problems with the current system for classifying hazardous wastes are:

- The H criteria H9, H12, H13 and H14 are not well defined in the LoW and no concentration limits are provided.
- The non-testing rules for classifying wastes as hazardous are regarded as too complex. It has been stated that waste producers rather classify conservatively (assign H-criteria although they are unsure if they actually apply) than to collect data to assign H-criteria at a more detailed level and in accordance with the concentration limits of the LoW.
- The exact composition of a waste is frequently not known, as substances may be produced inside or introduced into a waste during processing, as wastes may be heterogeneous etc. Hence, for a large fraction of wastes, testing is the more adequate method for classifying wastes and applying H-criteria. This would be based only on the definitions in the hazardous waste directive.

7.1.4. Advantages and disadvantages of the scenario

The advantage of the baseline scenario are that neither industry nor authorities have to apply a new classification system and all related legislation and implementation systems may stay in place. However, this would also imply that none of the currently experienced problems in the implementation would be solved. In addition the adaptation needs due to changing chemicals legislation will require a change of the LoW anyhow (see section 7.1.2).

⁵⁸ Annex VII of GHS

⁵⁹ The only pre-condition is that new tests have to be performed according to good laboratory practice and hence a standardised and accepted test is to be applied, such as provided in OECD guidelines

7.2. Scenario 2 - Amendment of LoW by partially adapting H-criteria to hazard classes of the GHS

7.2.1. Brief description of the scenario

The definitions of the H-criteria in the Hazardous Waste Directive are defined in accordance with the GHS. For this, the 'translation table' in Annex VII of the GHS is used to most closely correlate the categories of danger to the hazard classes. The concentration limits for applying the H-criteria are not amended in Article 2 of the European list of waste⁶⁰. No additional H-criteria are introduced into waste legislation.

The waste producer has to classify a waste as hazardous, if one or more of the H-criteria are fulfilled.

7.2.2. Main changes compared to baseline scenario

The definition of some H-criteria, e.g. acute toxicity would change. The criterion H14 would be defined and concentration limits included.

7.2.3. Key issues related to current problems in classifying wastes as hazardous

The problem of unclear definitions and lack of guidance for implementation would be solved as far as possible by taking over the definitions of the GHS.

7.2.4. Advantages and disadvantages of the scenario

The H-criteria would be clearly defined, leaving less room for interpretation. Furthermore, the link to chemicals legislation would suggest the use of respective guidance. The compatibility of H-criteria and the European list of waste would be maintained and different classifications of wastes would be limited.

⁶⁰ Background: The Commission Services' report (dated August 2006): "Analysis of the Potential Effects of the Proposed GHS Regulation on Its EU Downstream Legislation" says on page 182: "With regard to generic concentration limits, the GHS Regulation will lower the concentration limits for the following health hazards:

Table V.1.1: Health hazard-related concentration limits for the classification of mixtures

EU category of danger, R-phrases	EU concentration limit	Most closely corresponding GHS hazard classification	GHS concentration limit
Corrosive C, R34	10%	Skin corrosion, cat. 1B and 1C	5%
Corrosive C, R35	5%	Skin corrosion, cat. 1A	3%
Irritant Xi, R38 and R36	20%	Skin irritation, cat. 2	10%
Irritant Xi, R36	20%	Eye irritation, cat. 2A	10%
Irritant Xi, R41	10%	Serious eye damage, cat. 1	3%
Reproductive toxicity, R60 or R61	0.5%	Reproductive toxicity, cat. 1	0.3%
Reproductive toxicity, R62 or R63	5%	Reproductive toxicity, cat. 2	3%

Inconsistencies in the classification of wastes and chemicals (in particular preparations) would be reduced.

Disadvantages of this scenario would be that changes in the system of chemicals classification (which are likely to occur, as the GHS is further developed at international level) have to be implemented separately in waste legislation to stay aligned. Furthermore, certain hazards, which also play a role in waste handling and disposal would not be reflected in the waste classification (PC hazards, sensitisation), hence information for e.g. workers protection and transport would still be lacking.

7.3. Scenario 3 - simplified GHS: Classification of waste as mixture according to the GHS with some simplifications

7.3.1. Brief description of the scenario

Wastes are regarded as mixtures in the sense of chemicals legislation and are classified for all hazard classes of the GHS. The chemicals classification and the hazard statements are used to communicate the dangerous properties of the waste. If the waste is dangerous according to the GHS⁶¹, it is also a hazardous waste. The labelling system of the GHS is also used for wastes (hazard statements, pictograms).

In order to keep the system simple for the classification of wastes, the following simplifications compared to the full application of the GHS and its rules for preparations:

- Additivity⁶² does not have to be taken into account.
- Specific concentration limits do not have to be taken into account when applying the conventional method, except for H14 and for POPs.
- The thresholds for consideration of substances when using the conventional method are adapted?⁶³

⁶¹ The term 'dangerous' under the GHS corresponds to the definition of dangerous properties in Directive 67/548/EEC. The classification under the GHS comprises additional hazard classes, which would not lead to the conclusion 'dangerous'. The definition of dangerous in the GHS has been introduced in order to facilitate the alignment of classification with downstream legislation.

⁶² This means that substances in higher categories within a hazard class do not contribute to the classification in a lower category. This is currently the case for the classification of wastes. The adding up of substances with a classification in the same hazard class and the same hazard category (same R-phrase) is taken into account. However, diverging interpretations have been stated here.

⁶³ For each hazard class, it is defined above which concentration a substance is to be considered when applying the conventional method. The waste classification rules do not contain respective provisions. This is not relevant in cases, where wastes are tested for classification purposes. Additional discussion seems to be required here. Whereas for reasons of simplification, the concentration limits should be increased, the level of protection would thereby decreased and furthermore, it has been stated by stakeholders that the limits (< 1 or 0.1%) are seen as far too high.

7.3.2. Main changes compared to baseline scenario

The H-criteria in the Hazardous Waste Directive would be replaced by a phrase such as “A waste is classified as dangerous, if it fulfils the criteria for being ‘dangerous’ according to the GHS. In classifying according to the conventional method, no additivity or specific concentration limits have to be applied, except for any environmental classification. Specific rules exist for POPs” The cut-off limits for considering substances in wastes would have to be defined separately.

By implementing this, the classification rules for wastes would be standardised across the EU, as the GHS is a regulation. Whereas the types of criteria leading to the classification as hazardous would not change, some of the concentration limits would be changed for some of the properties, potentially resulting in more wastes being classified as hazardous wastes.

Communication of hazards is changed along the waste chain. Substances below certain concentrations could be neglected in applying the classification procedure to wastes.

7.3.3. Key issues related to current problems in classifying wastes as hazardous

The H-criteria would be clearly defined in the GHS. Differences due to different national implementations of the LoW would be harmonised at EU-level. The classification rules are more complex, although not addressing different properties. Hence, the complexity of the system is increased rather than decreased.

7.3.4. Advantages and disadvantages of the scenario

The classification of wastes and of chemicals would be harmonised and made more consistent. However, justification for simplifying the waste classification is not possible on scientific grounds. The hazard communication would be simplified, as only one system would be applied.

The simplifications in classification rules (less level of detail) for waste classification takes account of the fact, that less knowledge is available on the content of waste. The possibility to apply methods like the bridging principles as defined in the GHS support a more flexible approach for the (re-)classification of wastes.

The classification system will become more detailed and hence it will require more time and expertise to decide whether or not a waste is hazardous or not. Furthermore, the incomplete alignment with chemicals legislation is difficult to justify (although partially in place today). The introduction of the cut-off limits (theoretically) lowers level of protection.

7.4. Scenario 4 - GHS: Classification of waste as mixture according to the GHS

7.4.1. Brief description of the scenario

Wastes are regarded as mixtures and are classified according to the rules of the GHS. They are regarded as hazardous if they are “classified” according to the GHS and not only if they are “dangerous”. The communication instruments of the GHS are also used for labelling of hazardous wastes.

7.4.2. Main changes compared to baseline scenario

Wastes would be treated in the same way as chemical mixtures and any classification would lead to it being hazardous.⁶⁴ The rules of additivity as described in the GHS as well as the consideration of any specific concentration limit for specific substances would be implemented. Furthermore, the same cut-off for consideration of substances in applying the conventional method would be implemented.

7.4.3. Key issues related to current problems in classifying wastes as hazardous

All H-criteria would be defined and their implementation fully harmonised across the EU. The classification rules as such would be more complex, rather increasing the problem of resources and competence / experience required to classify a waste. However, instruments like software to create safety data sheets for chemicals could be used to facilitate the classification process also for wastes.

7.4.4. Advantages and disadvantages of the scenario

This scenario would lead to a full and consistent alignment of waste classification with the classification of mixtures. The same set of rules would be applied and the same communication instruments (hazard statements, pictograms) be used. Furthermore, the classification for physico-chemical hazards could largely be taken over from existing procedures for transport classification of waste. The level of protection would be increased by taking up additional end-points in the classification of wastes.

The classification rules in the GHS are very complex and more work and experience are required to apply them as currently necessary for implementing the LoW. Furthermore, the knowledge on the content of substances (and their classification) in wastes will (in many cases) not allow to apply the conventional method of the GHS to wastes. Testing of wastes would require at least some guidance for waste actors on which tests to apply.

⁶⁴ The differences of the GHS compared to the current system of C&L are described on page 14-25 of the downstream effects study by the COM. The classification for PC-hazards will be aligned with the principles for the classification of transport, here classifications could be compared. Current categories of danger are split and merged into GHS hazard classes and different concentration limits apply. The classification for the environment is mostly the same.

7.5. Outcome from the stakeholder consultation

In the course of the stakeholder consultation process a number of stakeholders stressed that they are not in favour of any change and do not have preference for any of the described scenarios. No proposal was submitted in those cases on how to fulfil the existing adaptation requirements (e.g. resulting from replacement of existing chemicals legislation by GHS and REACH).

In one feedback an approach was proposed that comprises the following main elements:

- Scenario 2 is taken as a starting point,
- Additivity is taken into account,
- Specific concentration levels are included,
- Sensitisation is added as a new hazard,
- Guidance on testing of waste is provided to users.

The advantages seen in such an approach are that the H criteria would be improved, but the basic method for classification is kept the same. This means less efforts and costs compared to an introduction of a new classification method.

Further information was required on the concrete impacts of the different scenarios. This will be part of the next report.

8. Individual entries of the LoW

8.1. Classification of individual waste types

8.1.1. Batteries

The LoW comprises the following entries for batteries:

16 Wastes not otherwise specified in the list

16 06 Batteries and accumulators

16 06 01* lead batteries

16 06 02* Ni-Cd batteries

16 06 03* mercury-containing batteries

16 06 04 alkaline batteries (except 16 06 03)

16 06 05 other batteries and accumulators

20 Municipal Wastes (Household waste and similar commercial, industrial and institutional wastes) including separately collected fractions

20 01 separately collected fractions (except 15 01)

20 01 33* batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries

20 01 34 batteries and accumulators other than those mentioned in 20 01 33

In addition the LoW comprises the following entry for fractions of batteries:

16 06 06 separately collected electrolyte from batteries and accumulators*

Batteries that are labelled as either “lead batteries” or “Ni-Cd batteries” and batteries containing mercury are classified as hazardous as well as separately collected electrolyte from batteries and accumulators (without differentiation regarding the type of electrolyte).

A stakeholder stated that justification is given to characterise a much broader range of batteries as hazardous. The rationale provided (see Annex to this report for details) states that the hazard criteria H 13 leachate, H14 ecotoxic, H4 irritant, H5 harmful and H8 corrosive are fulfilled for different battery systems.

It is argued: “All batteries contain classified substances, in both cases, charged and discharged. However the content of classified substances might not trigger a hazardous classification in any case. Especially in low grade batteries the casing might constitute a major part of the battery and consequently the percentage of hazardous substances related to the total mass is decreased. Based on the precautionary principle all batteries should be classified as hazardous anyway since the hazardous substances (e.g. solvents, potassium hydroxide, etc.) may leak and spill into the environment.”

It is proposed by the stakeholder to consequently mark entry 16 06 05 as hazardous (16 06 05*). In addition it is proposed to mark entry 09 01 12 (single-use cameras containing batteries other than those mentioned in 09 01 11) as hazardous waste.

8.1.2. WEEE

The WEEE Directive 2002/96/EC comprises, inter alia, requirements regarding the collection, treatment and recovery of 10 product categories of waste electrical and electronic equipment. The Directive implements certain elements of the producer responsibility principle and producers (Manufacturers + Importers) are obliged to take financial and organisational respon-

ANNEX IA of the WEEE Directive
Categories of electrical and electronic equipment covered by the Directive

1. Large household appliances
2. Small household appliances
3. IT and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
7. Toys, leisure and sports equipment
8. Medical devices (with the exception of all implanted and infected products)
9. Monitoring and control instruments
10. Automatic dispensers

sibility for the disposal of their product in the end of life phase. Fulfilment of these obligations has to be monitored. The Member States have to report recycling and recovery rates per product category to the European Commission.

Annex II of the WEEE Directive describes details of the selective treatment for materials and components of waste electrical and electronic equipment in accordance with Article 6(1).

The WEEE Directive is presently in the review phase. Concluding from the European Commissions' questionnaire⁶⁵ it can be assumed that the scope of the Directive as well as the categorisation of the products in the scope of the Directive (the 10 product categories) are under discussion and might be changed in the future.

The Directive is implemented in the Member States in a way that often different product categories are collected together in so called collection groups. Germany as an example has established a system where the 10 product categories are collected in 5 collection groups. Reporting per product category shall be enabled by calculating the amount per product category from the amount per collection group.

Stakeholders proposed to amend the LoW in a way that monitoring of WEEE collection, treatment and recovery is better supported. Additional entries have been proposed related to the 10 product categories of Annex I of the WEEE Directive, to the WEEE collection groups of the national implementation of the WEEE and/or related to the product types that are treated together in practice in Member States and the fractions resulting from treatment of WEEE. It became obvious in the discussion that such an approach touches the basic question of

⁶⁵ (see

http://circa.europa.eu/Public/irc/env/weee_2008_review/library?l=/stakeholder_consultation&vm=detailed&sb=Title)

the configuration of the LoW and its structure. Thus, this issue I further analysed in the context of the review of the structure of the LoW in chapter 9.

The classification of WEEE and fractions/components from WEEE as hazardous or non-hazardous waste has consequences for its shipment in a way that additional restrictions and/or additional monitoring (notification) apply (see Waste Shipment Regulation and Basel Convention).

Stakeholders provided different input related to the discussion about waste codes for WEEE and the classification of WEEE in general (for specific waste types see following sections). One detailed list was provided where WEEE and fractions from treatment of WEEE have been assigned to entries of the LoW. The list aims at finding an appropriate entry for every relevant waste type and fraction with the background to support competent authorities and custom concerning the control of shipments of WEEE. No additional codes have been required. No information about a possible application of H-criteria is available.

Regarding the classification of unsorted WEEE the following approach was proposed by stakeholders: WEEE that is subject to depollution requirements of the WEEE Directive and where hazardous waste fractions (potentially) result from treatment that is mandatory according to the WEEE Directive are to be classified as hazardous waste. After treatment (separation of hazardous components) or approval that no hazardous components are present the WEEE is re-classified. It was noted that a certain threshold for the content of hazardous components (e.g. as percentage per appliance) could be set in order to increase practicability.

It is proposed to take this approach as basis for the further stakeholder discussion.

8.1.3. Printed circuit boards

Printed circuit boards (PWB⁶⁶) can contain a number of heavy metals and flame retardants. It was proposed to classify PWB as hazardous waste. However, no comprehensive analysis **based on the application of H-criteria of the LoW** is available yet that shows that PWB must be classified as hazardous waste in any case. One Member State stressed that the metallic lead as used in solders is not teratogenic. "Only lead fumes and lead compounds are teratogenic Cat.1; Cat.3; Xn; N!" Printed circuit boards are considered to be hazardous in that Member State only, if they "contain hazardous components such as electrolyte capacitors, PCB-capacitors and other PCB components, batteries, mercury switches, etc., but not because of the lead content (solder)". Printed circuit boards (depolluted / without hazardous assemblies) are not classified as hazardous wastes only due to the content of hazardous flame retardants..

⁶⁶ It is proposed to use the abbreviation "PWB" (printed wiring board) in order to avoid mix-up with polychlorinated biphenyls.

It was also suggested by stakeholders that PWB are to be characterised as hazardous according to criterion H13 “Substances and preparations capable by any means, after disposal, of yielding another substance, (...) which possesses any of the characteristics listed above” (the other H-criteria of Annex III of the HWD). No further detailing was provided. The context of the proposal was the situation where improper treatment of PWB (thermal treatment in simple combustions without proper off gas treatment) is done in order to get the containing metals. The result of classifying PWB as hazardous waste would be that export restrictions apply and that further restrictions for the export in non-OECD countries come into effect. The shipment within the EU would not be restricted but monitoring would be improved.

It is proposed to take this approach as a basis for further stakeholder discussion.

8.1.4. Shredder light fraction

The LoW comprises the following entries for shredder light fraction (SLF):

19 WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE

19 10 wastes from shredding of metal-containing wastes

19 10 03* fluff-light fraction and dust containing dangerous substances

19 10 04 fluff-light fraction and dust other than those mentioned in 19 10 03

A stakeholder proposed to characterise shredder light fraction (SLF) as non hazardous waste. No factual basis was provided yet for justification.

8.2. Use of 99 codes

The 99-codes are intended to be the last resort in the process of waste classification. According to the classification procedure as defined in Decision 2000/532/EC waste should be assigned to 99-codes only in the last step after all chapters were searched for an appropriate code.

The use of 99-codes may indicate that:

- suitable entries are lacking in the waste list;
- the classification procedure is not strictly followed which results in an excessive use of 99-codes. Reasons may be problems with the list and the classification procedure, or simply laziness, or the deliberate use of 99-codes in order to disguise the character of the waste.

This chapter analyses on the basis of the available statistical information which quantities of waste are assigned to 99-codes in Member States and to which 99-codes they are preferably assigned. In a second step, the impact of 99-codes on the compilation of waste statistics according of the Waste Statistics Regulation 2000/2150/EC is investigated.

8.2.1. Quantities assigned to 99 codes

In this section the quantities assigned to 99-codes are presented on the basis of the analysis described in chapter 1.2.2. The results will be presented by increasing level of detail.

Initially the amounts assigned to 99-codes will be presented in relation to the total national waste generation in order to assess the overall dimension of the usage of 99-codes. In the second step, the results shall give an insight as to which chapters of the LoW are characterised by the highest amounts of 99-codes which could be an indicator for a lack of suitable entries in these particular chapters.

Table 24 provides an overview on the fractions of amounts of 99-codes per country and year as percentage of the national total amounts. Note that the table contains the results for data from both the questionnaire and the data request and that some countries provided data for more than one reference year.

Table24: Fractions of amounts of 99-codes per country and year as percentage of total amounts – overall

Country	Year	Source	Fraction 99-codes	Data Coverage
BG	2004	Questionnaire	0.04%	All sectors
CZ	2004	Data Request	2.49%	All sectors
DE	2005	Questionnaire	0.54%	All sectors
EE	2005	Data Request	0.43%	All sectors
EE	2006	Data Request	0.32%	All sectors
EL	2004	Data Request	5.98%	All sectors
FI	2006	Data Request	3.63%	All sectors
FR	2006	Data Request	0.45%	only HW with gaps for agriculture and services
HU	2004	Data Request	1.58%	All sectors
HU	2005	Questionnaire	1.60%	All sectors
HU	2006	Questionnaire	1.56%	All sectors
IE	2004	Data Request	17.86%	Waste from manufacturing sector
IT	2004	Questionnaire	2.73%	All sectors
LT	2005/06	Questionnaire	38.36%	All sectors
LV	2004	Questionnaire	7.48%	All sectors
LV	2006	Data Request	9.32%	All sectors
NL	2004	Data Request	9.54%	Non-haz. industrial waste (NACE C-E)/ Hazardous waste
NL	2006	Questionnaire	2.82%	All sectors
PL	2004	Data Request	2.03%	All chapters except 20
PT	2004	Data Request	6.20%	All sectors
RO	2004	Questionnaire	0.17%	All sectors
SI	2004	Data Request	1.41%	All sectors
SI	2004	Questionnaire	1.44%	All sectors

1) For data from questionnaire, the missing total amounts were estimated on the basis of the available WStatR-data 2004

It can be seen that the fractions are in most cases generally low in the order of magnitude below 5 %. In only two cases (IE 2004 and LT 2005/06) the values exceed 10 %. In the case of LT, the reason for the very high fraction of almost 40 % is due to the fact that LT reported an amount for the LoW code 060999 (group 0609: “wastes from the MSFU of phosphorous chemicals and phosphorous chemical processes”) which makes up already 37.6 % of the total national amount. In the case of IE, the high value of 18 % appears to be a result of the coverage of only the manufacturing sector which is characterised by the highest variety by waste types and presumably the most complex classification problems. The data of the NL 2004 (All sectors: 3 %) and 2006 (dominated by industrial waste from NACE C-E: 10 %) suggest the same. Unfortunately, there are not enough data on the level of NACE to prove this.

In terms of the overall dimension the usage of 99-codes appears to be not so problematic. However, it should be kept in mind that 99-codes are present in only 16 of the 20 chapters and that the number of 99-codes can make up more than one fifth of all available codes, as is the case in chapter 06. Thus, the issue might as well be relevant for specific chapters. This question shall be tackled in Table25 which shows the fractions of the amounts of 99-codes in relation to the total amounts on the basis of all relevant chapters of the LoW. In order to assess the question, whether the available number of 99-codes has an influence

on the reported amounts, the number of 99-codes and that of all codes as well as their ratio is provided for each chapter. Note that only those 16 chapters are shown, in which 99-codes exist. For better illustration, country shares larger than 30 % and average shares larger than 10 % are marked by shading.

Table25: Fractions of amounts of 99-codes per country and year as percentage of total amounts - by LoW chapter

Chapter	Country (Year)										Average	No. of 99-codes	Total no. of codes	Ratio by no.
	CZ (2004)	EE (2006)	EL (2004)	FR (2006)	HU (2004)	IE (2004)	LV (2006)	PL (2004)	PT (2004)	SI (2004)				
01	0.2%	0.0%	7.4%		0.0%	20.8%		0.1%	3.3%	12.4%	4.9%	3	23	13.0%
02	6.8%	1.3%	3.8%		3.7%	13.5%	23.8%	5.4%	14.7%	1.4%	8.3%	7	38	18.4%
03	0.7%	1.7%	0.1%		1.8%	0.0%	2.1%	10.4%	4.7%	1.1%	2.5%	3	19	15.8%
04	1.3%	4.2%	0.7%		10.9%	7.5%	42.6%	2.7%	26.7%	3.6%	11.1%	2	21	9.5%
05	39.0%		45.6%		0.0%		0.2%	59.9%	0.2%	0.2%	16.1%	3	24	12.5%
06	3.3%		0.1%		2.1%	64.9%	0.0%	3.5%	9.8%	0.7%	9.4%	11	48	22.9%
07	22.7%	11.8%	0.5%		30.8%	29.4%	4.1%	16.1%	24.9%	10.7%	16.8%	7	78	9.0%
08	1.5%	0.0%	13.8%		6.0%	14.3%	0.0%	34.0%	6.7%	12.7%	9.9%	4	38	10.5%
09	2.0%		0.0%		0.3%	12.6%		36.8%	1.7%	10.3%	7.1%	1	13	7.7%
10	6.0%	0.1%	0.7%		0.9%	4.2%	6.5%	3.3%	7.7%	1.1%	3.4%	13	173	7.5%
11	0.3%		15.7%		3.1%	3.9%	0.8%	0.8%	1.5%	0.3%	2.9%	3	27	11.1%
12	0.3%	0.3%	5.1%		26.1%	2.6%	0.0%	10.2%	3.8%	0.6%	5.5%	1	23	4.3%
13	0.1%	6.5%	0.6%	10.5%	0.7%	13.8%	0.0%	5.6%	2.0%	1.4%	4.1%	1	34	2.9%
16	0.5%		1.8%		0.3%	0.3%	0.8%	0.5%	18.2%	1.7%	2.7%	2	71	2.8%
19	2.3%	0.5%	85.2%		0.7%	0.2%	0.5%	1.7%	6.7%	0.4%	10.9%	7	98	7.1%
20	2.8%	0.1%	1.4%		8.5%	0.5%	1.8%		3.9%	1.5%	2.6%	2	40	5.0%

It can be seen that for most chapters there are very high variation of the shares between the countries. The highest average shares of amounts assigned to 99-codes occurred in chapters 04 (11 %), 19 (11 %), 05 (16 %) and 07 (17 %). In chapter 19, the average is largely due to the overall highest country value of EL (85 %). Other chapters with very large values of individual countries are chapter 05 (PL: 60 %) and 06 (IE: 65 %). The lowest shares around 3 % occurred in chapters 03, 11, 16 and 20.

It is difficult to draw a conclusion from the table. However, chapters 04, 05 and 07 can be seen as those with the largest shares over a variety of different countries whereas in the remaining chapters, despite some larger averages, the series is mostly dominated by extremely high shares of only one or a few countries. No relation can be observed between the degree of usage of 99-codes and possible parameters of influence such as the total number of available codes per chapter, the number of 99-codes per chapter or the ratio of these. In addition, the above results by chapters show no relation to the number of proposed additional codes as presented in Annex 13.

A similar analysis on the basis of sub-chapters was performed but showed even larger variations and thus allows no clear conclusions that would be representative over the countries covered by the analysis. The results of the analysis by sub-chapter are presented in Annex 4.9.

The analysis of the 99-codes on the level of six-digit codes showed that the average shares from the national totals of all 99-codes are below 1 %, with the largest averages observed for 100299 (group 1002 “wastes from the iron and steel industry”; median: 0.1 %, mean: 0.3 %). Only 16 of all 99-codes have an average share from the national totals of 0.01 % and larger. They are mostly from chapters 02, 10 and 19 (refer shaded codes in Annex 4.8, where the frequency of usage and the descriptive parameters of share from national amounts are presented for all 99-codes).

8.2.2. Consequences of the use of 99-codes for waste statistics

As mentioned above, an additional analysis was carried out aiming at a quantitative evaluation of the effect of the usage of 99-codes on waste statistics. For this task, all available amounts on six-digit level were converted to EWC-Stat on the basis of the conversion table in Annex III of the WStatR. In order to include the additional codes used by some countries, the conversion table was extended appropriately according to the additional conversion information provided by the countries (mainly PL and EE).

As shown in Annex 4.4, the 99-codes of the LoW are assigned to 15 waste items of the EWC-Stat. The following table presents the shares of 99-codes for these 15 items, similar to the presentation by chapters of LoW above (Table 25). Again high shares (>50 %) are marked.

Table26: Fractions of amounts of 99-codes per country and year as percentage of total amounts - by EWC-Stat items acc. to Annex I WStatR

Item	EWC-Stat	haz	Description	BG (2004) ¹	CZ (2004)	DE (2005) ¹	EE (2005)	EE (2006)	EL (2004)	FI (2006)	FR (2006)	HU (2004)	IE (2004)	IT (2004) ¹	LV (2006)	NL (2004)	PL (2004)	PT (2004)	RO (2004) ¹	SI (2004)	average	No. of LoW codes (99-codes)	Ratio 99-codes/all cdoes
2	01.2	nh	Acid, alkaline or saline wastes	22.9%	12.4%	11.8%	0.0%		0.0%	1.2%		5.8%	98.2%	24.0%	42.1%	0.2%	80.8%	4.6%	14.9%	89.4%	27.2%	13(5)	38%
7	02	nh	Chemical preparation wastes	3.7%	43.7%	9.3%	99.2%	99.4%	3.1%	95.5%		38.9%	21.2%	13.8%	79.0%	90.6%	61.0%	80.6%	97.6%	60.3%	56.1%	47(11)	23%
9	03.1	nh	Chemical deposits and residues	0.1%	25.5%	35.0%	27.7%	22.5%	1.0%	55.1%		82.4%	98.8%	23.3%	2.8%	24.4%	16.2%	6.3%	1.4%	1.2%	26.5%	28(10)	36%
10	03.1	hz	Chemical deposits and residues	0.0%	0.1%	0.8%	6.1%	6.5%	0.5%	3.5%	2.4%	0.6%	4.2%	0.3%	0.0%	9.7%	3.3%	1.8%	1.1%	0.8%	2.5%	75(1)	1%
11	03.2	nh	Industrial effluent sludges	0.0%	17.8%	0.7%	0.0%	0.0%	79.2%	0.8%		4.5%	0.1%	9.2%	1.9%	0.3%	3.2%	1.2%	16.8%	2.0%	8.6%	47(6)	13%
15	06	nh	Metallic wastes	0.0%	0.0%	0.0%	0.0%	0.2%	18.6%	0.0%		0.0%	2.4%	0.6%		1.1%	0.2%	2.3%	0.0%	0.0%	1.7%	26(1)	4%
19	07.2	nh	Paper and cardboard wastes	0.0%	0.3%	6.3%			1.1%	12.5%		0.9%		0.3%		0.1%	33.4%	7.0%	2.1%	1.1%	5.4%	5(1)	20%
24	07.6	nh	Textile wastes	0.4%	0.1%	0.2%	11.7%	2.7%	0.0%	5.3%		0.4%		12.6%	9.9%		1.5%	8.6%	5.6%	2.0%	4.4%	12(1)	8%
26	08 (excl. 08.1, 08.41)	nh	Discarded equipment (excluding discarded vehicles and batteries and accumulators waste)	15.1%	6.3%	2.4%			89.3%	3.5%		5.0%	0.2%	0.6%	58.9%	76.1%	16.2%	76.3%	44.5%	22.0%	29.7%	9(1)	11%
32	09 (excl. 09.11, 09.3)	nh	Animal and vegetal wastes (excluding animal of food preparation and products; and excluding animal faeces, urine and manure)	6.3%	5.1%	9.4%	23.9%	1.3%	2.6%	16.9%		16.4%	12.9%	9.3%	63.4%	23.8%	56.6%	23.4%	15.9%	4.5%	18.2%	24(5)	21%
35	10.1	nh	Household and similar wastes		5.8%	0.2%	0.1%	0.1%	1.5%	0.5%		14.7%	1.3%	0.1%		7.3%		3.1%		1.4%	3.0%	4(1)	25%
36	10.2	nh	Mixed and undifferentiated materials	35.1%	27.8%	3.1%	41.6%	64.2%	97.1%	44.5%		75.6%	95.7%	31.6%	96.7%	37.4%	58.5%	90.7%	4.7%	35.8%	52.5%	22(13)	59%
38	10.3	nh	Sorting residues		4.1%	0.9%	13.9%	0.3%	0.0%	2.6%		0.2%		6.9%			2.7%			0.0%	3.2%	11(1)	9%
40	11 (excl. 11.3)	nh	Common sludges (excluding dredging spoils)		0.1%		1.0%	0.1%	0.0%	0.0%		0.1%	0.0%	0.1%	0.0%	0.1%	3.1%	0.4%	0.0%	0.0%	0.3%	17(1)	6%
42	12 (excl. 12.4, 12.6)	nh	Mineral wastes (excluding combustion wastes, contaminated soils and polluted dredging spoils)	0.0%	4.4%	0.0%	0.0%	0.0%	5.7%	1.3%		0.2%	26.4%	0.7%	10.3%	1.8%	2.4%	6.5%	0.0%	3.4%	3.9%	72(12)	17%

1) Data from questionnaire, missing totals were estimated on the basis of the available WStatR-data (All wastes covered by these codes have the property "wet")

It can be seen that the variations of the shares between the countries are again very high. The highest average shares of more than 50 % can be observed for EWC-Stat Items 7 (Chemical preparation wastes) and 36 (Mixed and undifferentiated materials), the two items that contain the largest number of 99-codes (11 and 13, respectively). The highest values of individual countries can make up to almost 100 % and exist mainly in the two EWC-Stat items with the highest average shares (item 7 and 36), but also in items 2 (Acid, alkaline or saline wastes) and 9 (Chemical deposits and residues - nh). The lowest shares of up to 3 % occurred in items 10 (Chemical deposits and residues - hz), 15 (), 35 (Household and similar wastes) and 40 (Common Sludges). There is a relation between the quantitative usage of 99-codes and the ratio between 99-codes and available codes but there are some exceptions such as item 19 (ratio 20 %, 99-share-average 5 %), 26 (30 %, 11 %), 35 (25 %, 3 %) and 42 (17 %, 4 %), so that the R^2 -value of the linear correlation is low (0.49).

8.3. Unused LoW codes

8.3.1. Statistical analysis

Codes that are unused by most or even all of the countries may be redundant. The same applies to codes which are used more frequently but which are characterised by very small amounts. If a chapter or sub-chapter of the LoW contains mostly codes which may be redundant because of their little relevance in terms of usage or amounts, the chapter may be reviewed accordingly. The Member States and stakeholders provided little information in the questionnaire on the question which codes may, in their view, be completely removed (refer Annex 14). On the other hand, many countries provided lists of codes which were not used in their country (questionnaire) or even provided all national amounts on the basis of six-digit codes (data request) (refer Table4). This information were used to determine the chapters from the LoW, which contain a high percentage of unused codes. In addition, the analysis by frequency of usage and average share from national total amounts may serve to identify specific codes which may be redundant from the viewpoint of relevance.

Table27 shows the results of the analysis of unused codes as provided in the lists from the questionnaire and the data request. The percentage values refer to the share of unused codes by chapter and total from the available codes. The number of available codes is shown in the right column of the table. Shares within the country data of 50 % and more are displayed in shaded cells, the averages over all countries are marked in case of 35 % or more.

Table27: Frequency of waste-codes not used per country and year as percentage of available number of codes - overall and by chapter

	Country (Year)														Total	
	CZ (2004)	DE (2005)	EE (2006)	EL (2004)	FI (2006)	HU (2004)	HU (2006)	IT (2004)	LT (2005/06)	LV (2006)	NL (2006)	PL (2004)	PT (2004)	SI (2004)	Average	No. of codes
01	17%	9%	74%	48%	83%	17%	30%	0%	70%	87%	22%	26%	35%	48%	38%	23
02	3%	8%	37%	18%	21%	8%	5%	0%	32%	26%	8%	3%	8%	8%	13%	38
03	11%	16%	58%	47%	5%	11%	32%	5%	42%	47%	11%	11%	0%	21%	23%	19
04	14%	14%	67%	52%	24%	10%	19%	0%	29%	67%	24%	10%	10%	29%	26%	21
05	33%	17%	92%	58%	58%	33%	46%	4%	71%	75%	25%	29%	46%	67%	45%	24
06	19%	13%	79%	54%	48%	21%	31%	2%	46%	75%	10%	17%	44%	46%	36%	48
07	21%	1%	86%	71%	31%	9%	10%	0%	71%	77%	12%	9%	36%	23%	30%	78
08	5%	11%	61%	53%	18%	8%	8%	0%	21%	66%	8%	5%	11%	5%	20%	38
09	23%	8%	54%	38%	31%	0%	15%	0%	31%	46%	8%	8%	31%	15%	22%	13
10	24%	17%	82%	68%	60%	40%	43%	8%	79%	84%	31%	32%	49%	53%	45%	173
11	11%	7%	74%	52%	19%	4%	4%	0%	56%	70%	7%	11%	30%	33%	25%	27
12	0%	9%	43%	30%	4%	0%	0%	0%	22%	35%	4%	4%	9%	0%	12%	23
13	3%	0%	35%	29%	6%	0%	9%	0%	24%	35%	12%	6%	15%	12%	13%	34
14	0%	0%	40%	20%	0%	0%	0%	0%	20%	20%	0%	0%	0%	0%	7%	5
15	0%	0%	17%	8%	0%	0%	0%	0%	0%	17%	0%	0%	0%	0%	3%	12
16	4%	4%	45%	34%	15%	6%	6%	0%	25%	56%	1%	1%	24%	8%	16%	71
17	0%	3%	29%	63%	16%	3%	0%	0%	13%	47%	0%	3%	18%	8%	14%	38
18	0%	6%	31%	94%	25%	6%	0%	0%	31%	31%	19%	0%	69%	6%	23%	16
19	22%	4%	61%	65%	40%	24%	23%	1%	52%	69%	12%	16%	44%	51%	35%	98
20	0%	0%	8%	45%	5%	0%	0%	0%	8%	23%	0%		8%	3%	8%	40
Total	14%	8%	61%	54%	33%	17%	20%	2%	47%	63%	14%	19%	31%	30%	29%	839

It can be seen in Table27 that the issue of unused codes is clearly a matter of country size, i.e. in larger countries the shares of unused codes are generally much lower than in smaller countries. Or more precisely, the issue of unused codes depends mostly on the diversity of economic activities, leading to country totals in the bottom row that range from 2 % for IT to more than 60 % in EE or EL. However, the overall range of the averages over all available countries (second column from the right) suggest that there is also a catalogue specific effect on the usage rates, as these vary widely between 3 % for chapter 15 and 45 % for chapters 5 and 10. In the cases of chapters 10 and 19, the large number of available codes might be the major reason for the high shares of unused codes. Nevertheless, the number of available codes is not overall related to the usage rate. For further information, the results of the analysis by sub-chapter are presented in Annex 4.10.

LoW codes with low usage and/or small amounts

In the following, the codes with the lowest usage and smallest amounts are discussed on the basis of the lists presented in Annex 4.11 and Annex 4.12, where these codes are listed for hazardous and non-hazardous waste, respectively.

For hazardous and non-hazardous waste, the tables contain those codes that were used by less than 25 % of the countries which provided information on the usage of the codes (used by 3 countries or less).

For hazardous waste, all codes with an average values (mean AND median) below 4×10^{-5} of the national total were filtered as amounts with the smallest amounts. The corresponding limit for non-hazardous waste was 4×10^{-6} , because the number of codes with small amounts is much higher for non-hazardous waste (refer frequency distributions above in Figures 2 and 3).

The resulting tables on codes with lowest usage reflect the results of the discussion above, as they contain mostly codes from chapter 10 (altogether 25 codes). It is particularly interesting that all together 11 waste types of this chapter labelled “wastes from cooling-water treatment” appear in the lists which are used by only up to three countries. In 10 cases even both available codes of mirror entries are rarely used (100409/10, 100508/09, 100609/10, 100707/08, 100819/20). (see also proposals for deletion of LoW codes in chapter 8.3.2). The same applies for 4 codes for “waste crack-indicating agent” with two complete mirror entries (100915/16, 101015/16). All these rarely used codes had, if available, also low average amounts below 10^{-2} % of the national totals.

On the other hand, the code 100211 “wastes from cooling-water treatment containing oil” was with 0.9 % median and 7.7 % mean among the 20 codes with the overall largest amounts, and was used by 7 of 14 countries (see Annex 4.13). 100212 had average amounts of 0.02 % and was used by 5 of 13 countries.

Another mirror entry of low usage but with higher amounts is that for “wastes from treatment of salt slags and black drosses” (100329, 100330). The average amount for the non-hazardous code 100329 was with 0.5 % median and 2.9 % mean among the 20 codes with the largest amounts (see Annex 4.13).

Another interesting group of wastes listed are the three codes of single use cameras (090110/11/12). These three codes have higher usage rates (used by 4 to 6 countries) but very small amounts of less than 10^{-4} %. (see also proposals for deletion of LoW codes in chapter 8.3.2).

Most of the remaining other codes may as well be checked on an individual basis. At least some of the hazardous wastes with very small amounts appear necessary, as the particularly dangerous nature of the substances requires separate registration. Examples of such codes include 160108 (components containing mercury), 160109 (components containing PCBs), 160110 (explosive components (e.g. air bags)), 160401 (waste ammunition), 160901 (permanganates, e.g. potassium permanganate) or 180110 (amalgam waste from dental care). Quite consequently, all of these wastes are used by a majority of the countries covered.

8.3.2. Outcome from questionnaire

Preliminary remarks

In the course of the stakeholder consultations and as part of the literature research it was asked/analysed whether entries in the LoW are seen as superfluous. It became obvious that this question touches a number of other questions like the assumed function of the LoW and its structure. Thus this section lists the details of the feedback given by the stakeholders and the outcome from literature research. The discussion of this issue will be performed in section 9 of this report.

Compared to the considerable quantity of proposals for additional waste codes, the number of concrete suggestions for codes and sections that could or should be deleted is rather low. Specific proposals for deletions were made by only 4 countries (DE, PL, LV, SE). Six Member States (ES, SI, RO, NL, IT, HU) stated that no waste code should be deleted. Estonia and the UK have difficulties to give recommendations which codes should be deleted. UK suspects that codes may be redundant but did not have enough time to analyse it. Estonia points out that a lot of waste codes are not used in Estonia due to its limited industry but maybe useful in other countries. Some countries made only very general remarks or did not respond to the question.

Three stakeholders said that there are no codes or sections that should be deleted (FNADE, Arcelor, WEEE-Forum). Two stakeholders (FEAD, Waste Denmark) stated in a general manner that the number of codes should be reduced without specific proposals. Especially chapter 1-12 and 17-20 are too detailed according to FEAD.

The following text highlights the main proposals for the reduction of codes. The detailed list of contributions is shown in Annex 14. The statistical data on the amount and the frequency of waste codes used in Annex XX provides useful background information for the assessment of the proposals.

Some authorities provided differentiated input.

- Poland makes some very specific proposals of waste codes that could be deleted because they are overly detailed and/or not necessary:
 - Poland states that the definition of three different codes for single-use cameras is not justified considering the low amounts and the increasing importance of digital photography. Single-use cameras could be either assigned to code 16 02 14 (discarded equipment other than those mentioned in 16 02 09 to 16 02 13), or only one of the three entries should be kept.
 - The waste codes 05 01 13 *Boiler feedwater sludges* and 10 01 26 *Wastes from cooling-water treatment* are not necessary. The respective wastes could be assigned to section 19 09 *Wastes from the preparation of water intended for human consumption or water for industrial use*.
 - The waste codes of section 16 09 '*Oxidising substances*' should be integrated into section 16 04 '*Waste explosives*'. On the one hand, the four codes in section 16 09 are rarely used and the amounts are low. On the other hand, the concerned wastes are often explosive and would therefore fit into section 16 04.
- The German Bundesland Sachsen-Anhalt makes some proposals for restructuring that would result in a reduction of codes:
 - With regard to chapter 10, Sachsen-Anhalt proposes to summarise wastes for which the determining components are mostly independent from their origin in a separate section of chapter 10. Examples are wastes from cooling-water treatment, or flue-gas dusts and solid wastes from gas treatment. The proposal would result in a new section but would reduce the number of waste codes in chapter 10.
 - The two sections 10 09 '*Wastes from casting of ferrous pieces*' and 10 10 '*Wastes from casting of non-ferrous pieces*' could be consolidated in one section. The only difference between the waste codes of the two sections is the casted material (ferrous/non-ferrous) which is not relevant for the classification of the waste.
 - According to Sachsen-Anhalt, the section 16 10 '*Aqueous liquid wastes destined for off-site treatment*' could be deleted because the relevant codes can be classified under other more specific codes.
 - Sachsen-Anhalt and Poland agree that the code 20 01 31 '*Cytotoxic and cytostatic medicines*' should be deleted. An identical waste code exists in chapter 18 (18 02 07* '*Cytotoxic and cytostatic medicines*') and it is unlikely that cytostatic wastes should be generated in households or other institutions outside of medical institutions. Furthermore, a separate collection would hardly be possible as such medicine is not marked.
- Latvia assumes that section 16 03 off-specification batches and unused products could be deleted.

- The German Environmental Ministry provided two general proposals without going into:
 - With regard to chapter 16, Germany proposes to reintegrate the codes into the substance related waste codes.
 - The future revision should provide that waste codes which lead to the possibility that waste could fit into more than one waste type will be brought together in one code. Germany does not specify relevant waste codes.

Sweden supposes that obsolete codes can be found among those which are repetitions for the same type of was. Precise answers could not be given due to the lack of recent compilations of regional statistics.

8.4. Missing entries

8.4.1. Preliminary remarks

In the course of the stakeholder consultations and as part of the literature research it was asked/analysed whether additional entries in the LoW are missing. It became obvious that this question touches a number of other questions like the assumed function of the LoW and its structure. Thus this section lists the details of the feedback given by the stakeholders and the outcome from literature research. The discussion of this issue will be performed in section 9 of this report.

8.4.2. Outcome from questionnaire

In the questionnaire survey Member States and stakeholders were asked whether additional entries in the LoW would be needed. If so, the respondents were invited to specify the waste types for which a separate specific entry is regarded as necessary. Considering that the List of Waste with its 839 entries is already rather comprehensive the high number of proposals was astonishing.

Suggestions for new codes were made for every chapter of the LoW, except for the chapter 14. A complete list of the proposals made in the questionnaires is provided in Annex 13. This chapter tries to summarise the responses and to highlight some proposals that were frequently mentioned or that are considered particularly relevant for other reasons.

- Several proposals for additional codes refer to **wastes from agriculture and food preparation (chapter 02)**. Some of the proposals reflect national specificities in food production. Others have a more general character. Additional waste codes were proposed for:
 - hazardous wastes in the sections 02 01 and 02 02, e.g.
 - pesticides,

- out-dated seeds that generally contain pesticides and should be treated in hazardous waste plants,
 - hazardous animal carcasses (so far assigned to 18 02)
- Non-hazardous animal by-products
- Beet pulp and beet slices
- Whey
- Several comments address the problem that EU waste legislation establishes reporting obligations on waste types that are not adequately specified in the LoW. This concerns in particular **waste electrical and electronic equipment (WEEE)**:
 - The problem that section 16 02 should be adapted to the needs of Directive 2002/96/EC was addressed by several countries and stakeholders (e.g. by IT, BG; LT, UK, PL, WEEE-Forum, FNADE). Detailed proposals for a specification of section 16 02 were made by the WEEE-Forum and by Italy. The proposal of the WEEE-Forum which is based on the structure of a data collection tool for WEEE compliance systems is very detailed and sophisticated. The main features are presented in a separate table in Annex 13.2. The proposals of Italy are contained in the overview table in Annex 13.1.
 - The French association FNADE proposes to include more detailed codes for waste from treatment of WEEE in section 19 02.
 - Finland and Estonia have expanded the scope of section 16 02 in their national LoW-versions to equipment other than WEEE because no appropriate section or codes exist for discarded equipment not containing electronic or electrical components.
- The lack of codes for **mixed industrial and commercial waste** was addressed by several countries (UK, EE, PL, ES):
 - UK pointed out that a code for mixed waste (household and similar waste) is generally needed for each origin-based chapter because it is not consistent to allocate all this waste to the municipal waste (chapter 20)
 - Estonia has already introduced a national code in chapter 19 for mixed industrial and commercial waste that is not similar to household waste and should not be allocated to chapter 20.
 - PL and ES would like to have a special code in chapter 09 for mixed waste from developer and fixer of the photographic industry. It is outlined that the lack of such a code leads to burden due to correct classification according to OECD.
- Several countries (UK, IT, SI, LT) propose additional **codes for unused or expired products**, especially for chapter **07 Wastes from organic chemical processes**:

- UK points out that chapter 07 does not include codes for products although the heading refers to manufacture, formulation, supply and use (MFSU) of organic chemicals. UK concludes that either product codes should be inserted, or it should be ensured that appropriate codes are used from elsewhere for the products.
- Italy proposes to introduce specific codes for unusable and expired products in everyone of the sections 07 04 (MFSU of organic plant protection products...), 07 05 (MFSU of pharmaceuticals) and 07 06 (MFSU of fats, grease, soaps, detergents, disinfectants and cosmetics).
- Slovenia and Lithuania generally miss codes for expired products (Slovenia) and / or damaged products like food, textile etc. (Lithuania).
- Spain and the Germany (Sachsen-Anhalt) propose a specific code for the increasing amounts of wastes from biodiesel production. Sachsen-Anhalt proposes to introduce such a code in chapter 02, Spain refers to chapter 07.
- Sachsen-Anhalt also proposes:
 - a separate code for contaminated wood from construction and demolition (so far summarised under 17 02 04* together with glass and plastics)
 - a specific code for compost from sewage sludge. Such composts still have waste properties and are currently assigned to 19 08 05 '*sludges from treatment of urban waste water*' which is the main constituent of the compost.
- A very detailed and extensive proposal is made by Italy for chapter 03 *Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard*. This includes new sections and codes for:
 - waste from the polygraphic industry;
 - waste from production and/ or processing of plastic laminate and decorative panels

8.4.3. Introduction of 98*-codes

At present, the LoW offers only two entries for the allocation of hazardous waste that cannot be assigned to an existing entry:

11 01 98* other wastes (from chemical surface treatment and coating of metals and other materials) containing dangerous substances

13 08 99* (oil) wastes not otherwise specified

This situation bears the risk that hazardous wastes that can not be assigned to a specific code are misclassified as non-hazardous under a 99-code or assigned to other hazardous codes that do not reflect their characteristics in a proper way. Member States and stakeholders were therefore asked for their opinion whether the introduction of 98*-codes in other sections of the LoW is seen as helpful.

19 answers have been received on the introduction of 98* codes. This includes 14 answers from Member States and 5 answers from stakeholders.

Statements in favour of 98*-codes

Statements in favour of the introduction of 98*-codes were made by DE, EE, FI, SE, UK, PL and ES, and by the associations FEAD, FNADE (FR) and SYPRED (FR). The main argument for the introduction of 98*-codes is the prevention (or at least the reduction) of the misclassification of hazardous wastes that are currently assigned to 99-codes because suitable codes are missing. This position acknowledges that it is neither possible nor intended to compile an exhaustive list of wastes. Thus, there will always exist hazardous waste types without an appropriate entry.

Different opinions exist with regard to the number of 98*-codes needed.

- Most of the countries that are generally in favour of the 98*-codes point out that their number should be kept limited and their use should be properly defined in order to avoid misuse. Finland emphasises that the nomenclature and classification should be so extensive and precise that the need to use 98-codes would be minimal.
- Estonia points out that 98*-codes would be desirable in sub-chapters where most waste types are hazardous because hazardous substances are used as raw materials (e.g. in chapter 07). In such cases it seems likely that waste types of the same origin that are not listed in the LoW will also be hazardous and should not be assigned to 99-codes.
- Sweden states that 98*-codes should preferably be introduced in sub-chapters where a frequent misuse of 99-codes is assumed.
- Poland points out that the introduction of codes should be based on an analysis of the specificities of the economic sectors. The variety of production processes in the pharmaceutical industry, for instance, makes it impossible to define specific entries for all hazardous wastes. The use of 98*-codes seems appropriate in such sectors. The same might apply for other sectors. The necessity of 98* codes should preferably be assessed for the sections 04 01, 05 06, 06 11, 07 05, 16 03, 16 04 and 16 05.
- The Bundesland Sachsen-Anhalt, Germany, proposes that 98*-codes should be generally introduced in all sub-chapters that contain at least one hazardous entry. In sub-chapters that contain only hazardous wastes the 99-code (if existent) could be declared as hazardous (or changed into a 98-code).

- UK supports hazardous codes that mirror 99 wastes whenever appropriate as a preventative measure against the temptation to assign 99-codes simply to avoid hazardous waste classification. However, the use of 98*-codes should be seen as secondary to increasing the number of explicit hazardous entries in the list.
- The associations FEAD, FNADE and SYPRED support the general introduction of a 98*-mirror entry to every existing 99-code.

Statements against the introduction of 98*-codes

The main argument against the introduction of 98*-codes is that all hazardous waste should have a specific entry in order to be properly identifiable and characterised. The loss of information that results from unspecific 98*-codes and the possibility to disguise hazardous wastes under unspecific 98*-codes should be avoided.

- Italy emphasises that hazardous waste should not, under any circumstances, be tagged with a generic code "98*". Hazardous waste, should always be identified by specific codes and a name that identifies the origin, characteristics and hazardous substances contained therein.
- Slovenia and Austria also favour the extension of the LoW in order to have specific entries for all hazardous waste types to the use of unspecific codes.
- The Netherlands expect that 98*-codes would *give only a little bit more accuracy in the distinction between hazardous waste and non hazardous waste without an important benefit for the environment and against a substantial extra administrative burden for the waste sector. A decision to add additional 98*-codes would be against the EU policy on better regulation, because the environmental benefit of the extra rule will be low. A real improvement and simplification, which would reduce the administrative burden for waste producers and waste treaters, would be the introduction of a limitative list of compounds (contaminations) and the related concentration levels as a tool to distinguish hazardous waste from non hazardous waste when mirror entries are applied.'*
- The German association BDE opposes the introduction of 98*-codes for reasons of data comparability with previous years.
- The Danish association DAKOFA favours a totally different structure of the LoW that would make the use of 98*-codes obsolete

The benefits and problems of 98'-codes can be summarised as follows. Expected benefits of the supporters of 98'-codes are:

- Misclassification of hazardous wastes under 99-codes can be reduced.
- 98*-codes are needed as the LoW can never be exhaustive
- The application of the LoW would be simplified.

The supporters generally emphasise that that 98*-codes will only be helpful when proper guidance is provided on the European level.

The expected problems are generally the same as for the 99-codes. This includes:

- The non-harmonised and abusive use of these codes could be the main problem. 98*-codes might be used for reasons of convenience although more specific codes might be available.
- Loss of information on the characteristics of the waste.
- Break in statistical time series.
- Hazardous wastes for which a correct code is now searched in chapters 13 – 16 would be more often classified under sector-specific 98*-codes.

8.5. Conclusions

The general questions that can be concluded from the list of potential new entries and the proposals to delete entries are which degree of detail of the entries of the list is appropriate and which function shall the list serve?

Requirement from private companies that the LoW support communication between involved parties about aspects that are relevant for performing proper waste management and, inter alia, fulfilment of legal requirements (like in the context of WEEE, ELV, Batteries, Packaging, etc.). It can also serve as a tool to improve communication about quality requirements between involved parties

Public authorities require a common European list that supports fulfilment of monitoring obligations (context mainly WEEE). For monitoring in the national context national detailing of the European List of Waste have been mentioned as appropriate.

Common ground in the contributions from stakeholders is the relevance of the LoW as an instrument to communicate hazardous properties of waste.

These aspects will be discussed in section 9 of this report.

Regarding the potential deletion of the '99-codes' the arguments brought by the stakeholders lead to the conclusion that potential positive effects from deletion do not outweigh the potential negative effects. It has been expected that there is always a possibility that a waste can not be assigned properly to existing specific waste codes. However, the need to (further) reduce the cases where

wastes are assigned to 99-codes is seen and further impetus in this direction is expected from the review of the LoW.

Regarding the extended use of 98-codes for hazardous waste a more heterogeneous situation exists. It has been stated that if additional codes ending on '98' are introduced, additional requirements must be fulfilled like limitation of number of 98-codes clearly defined rules for the use of these codes. Further information is needed on how this could look like and about cases where 98-entries are justifiable and examples where this is not the case.

9. Review of the structure of the LoW

Task 3 of the project comprises the review of the structure of the LoW. It is the objective of this task to develop proposals for a new structure and to assess the impacts of those options.

9.1. Present structure of the LoW

Presently the European list of waste comprises 839 waste codes. 405 codes are codes for hazardous wastes and 131 codes are mirror entries.

The coding of the waste keys is done via a six digit decimal classification (XX YY ZZ). The information which codes could deliver basis on the following structure:

- | | |
|-----------|--|
| XX | main section 1 to 20, provides general information about the group of wastes (e.g. group with a same origin) |
| YY | subsection, provides more detailed information about the subgroup of wastes |
| ZZ | current number which delivers information about the waste itself. |

The LoW is structured by 20 sections ("**XX**"). The header of section 1 to 12 and 17 to 19 refers to industry sectors and/or processes. The headers of sections 13 to 15 are referring to materials and section 16, which is material based as well, is reserved for wastes not otherwise mentioned. Section 20 covers municipal wastes (which includes household waste and similar commercial, industrial and institutional waste).

The analysis from the year 2006 [Ökopol 2006] gave the following overview of the different criteria of the main headers on the LoW.

Table 28: Structuring elements of the LoW (main header)

Section	Sector	Process	Main component	Type of waste
1		X		
2	X	X		
3		X		
4	X			
5		X		
6		X		
7		X		
8		X		
9	X			
10		X		
11		X		
12		X		
13			X	
14			X	
15			X	
16				X
17		X		
18		X		
19		X		
20	X			

The number of subsections (“YY”) differs. Section 9 for example comprises just one subsection while section 10 has 14 subsections. Most of the subsections also include entries for wastes which can not be assigned to other entries (where “ZZ” is “99” “Wastes not otherwise specified”).

Within the entries itself (“ZZ”) a wide variety of types of descriptions of the waste can be found that uses different descriptors for the characterisation of wastes. The entries include:

- 66 entries providing exclusively information about the origin,
- 260 waste codes that give information about the process where the waste has been generated,
- 245 waste codes that give information about the physical state of the waste and
- 514 waste codes that give information about the material or substance present in the waste as main component.

The table below shows some examples for the diverging use of descriptors.

Table 29: Example for descriptors in the entries of the LoW

Descriptor	Example of the entry	
	Full name	Code
origin	<ul style="list-style-type: none"> waste from forestry waste otherwise not specified 	020107 XXYY99
process	<ul style="list-style-type: none"> wastes from cooling-water treatment wastes from solvent extraction 	100126 020303
material	<ul style="list-style-type: none"> plastic solvents 	170203 200113*
substances	<ul style="list-style-type: none"> components containing PCBs wastes containing mercury 	160109* 050701*
product groups	<ul style="list-style-type: none"> end of life vehicles, containing neither liquids nor other hazardous components batteries and accumulators other than those mentioned in 20 01 33 	160106 200134
consistency	<ul style="list-style-type: none"> solid wastes containing dangerous substances aqueous liquid wastes 	070413* 191103*
function	<ul style="list-style-type: none"> absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances insulation materials containing asbestos 	150202* 170601*
nature	<ul style="list-style-type: none"> sharps (except 180103) other waste explosives 	180101 160403*
handling	<ul style="list-style-type: none"> wastes whose collection and disposal is subject to special requirements in order to prevent infection 	180202*
haz (*)- non haz- ardous	<ul style="list-style-type: none"> solid salts and solutions containing heavy metals solid salts and solutions other than those mentioned in 06 03 11 and 06 03 13 	060313* 060314
Codes with mixed criteria	<ul style="list-style-type: none"> sludge containing dangerous substances from other treatment of industrial waste water construction and demolition wastes containing PCB (for example PCB containing sealants, PCB-containing resin-based floorings, PCB-containing sealed glazing units, PCB-containing capacitors) metallic packaging containing a dangerous solid porous matrix (for example asbestos), including empty pressure containers 	190813* 170902* 150111*

9.1. Outcome from questionnaire

Stakeholders were asked which structural changes they would consider as most important assuming that the structure of the LoW will be revised. The following text summarises the answers. It is structured according to the following aspects:

- Discussion of LoW structure and proposals for structural changes
- (Non)-compatibility with the Basel Convention

9.1.1. Discussion of LoW structure

Comments on the structure of the LoW were received from 15 Member States and from 9 stakeholders. The answers can be divided into two groups:

- Some countries and stakeholders would like to see the LoW fundamentally revised. The preferred options are either a material-based classification or a 2-dimensional matrix system.
- Most other countries and stakeholders see the need for improvements but prefer to keep the changes limited in order to minimise the burden on stakeholders and administration.

Comments in favour of a fundamental revision

One Authority summarises the most frequent critique of the LoW as follows.

- the LoW is incomplete;
- it combines several approaches in one list;
- classification by technical processes results in a lot of redundancy;
- the list is too detailed for specific purposes (authorisations and permits);
- the list is not detailed enough for other purposes (WEEE-reporting)

One Member State argues that the origin of waste in form of NACE codes is registered anyways in the context of the Waste Statistics Regulation, i.e. this information is basically doubled. The waste data system in the Member State tries to follow the waste flows from the generator to the final disposal. This approach is hampered by the fact that the LoW uses different codes for one and the same material (e.g. for glass waste). However, the Member State emphasises that for some waste types (WEEE, ELV, packaging) it will remain important to collect additional information on the origin.

Another Member State criticises that the use of the current LoW does not provide the information necessary for an environmentally sound and sustainable waste management. The Member State points out that:

- The LoW does not correspond with the product-, recovery- and disposal-related EU directives.
- Due to the origin as structuring element the LoW contains similar wastes in several chapters which is not necessary especially regarding the further treatment. Much more relevant for the treatment is the knowledge of the characteristic properties of the waste. In some cases the origin gives enough information on the properties, in other cases it does not.

Other Member States

- See it as an important problem that the LoW is very detailed with regard to origin but does not reflect the treatment needs.
- state that the origin as part of the waste code is not necessary.

Private stakeholders stress that information about the origin of waste is available from waste statistics and should thus not be part of waste classification.

Some Member States and private stakeholders argue in favour of a **material-based system** because they assume that:

- the classification procedure is easier;
- it is easier to track the waste flow from generation to disposal;
- a material-oriented structure is more effective regarding trans- and international waste shipment regulation;
- the classification could be kept simpler (fewer codes).

Some Member States mention preference for a system of freely combinable identifiers (descriptors) to describe waste:

- One Member State proposes to use a combination of three or four characteristics that describe the relevant aspects of the waste (e.g. main component, NACE of producer, hazard characteristics). Each characteristic should be encoded by a user-friendly code list. The final waste code would be a combination of the elements from the code lists. The Member State points out as advantages that the list can be easily expanded, new aspects can be added and data could be grouped in different ways for reporting.
- Another Member State suggests using the system of freely combinable identifiers as a starting point for a new structure. The origin of waste could remain as an identifier but the material approach is seen as more important. The basic system should be simple and easy to understand and use. The list should be short and free of repetitions. A further differentiation on national level within the given structure should be possible. The new no-

menclature should become a living document to support all EC waste legislation.

- One Member State favours a double matrix that uses at the one hand the origin of waste (for instance the NACE codes as in the Waste Statistics Regulation), and on the other hand codes that describe the waste (again probably the aggregated types of waste from the Waste Statistics Regulation of – if more appropriate – the OECD codes from Basel Convention).

Comments in favour of limited changes

A number of stakeholders are either satisfied with the LoW, or they prefer to keep changes limited because they expect that fundamental changes would impose a considerable burden to companies and administration. The main arguments are that :

- The current structure allows a smooth classification and no need for general changes is seen.
- The current origin-based approach is established and known in all Member States. A new approach would considerably disturb the situation.
- One Authority proposes to maintain the origin-based structure but to extend the material-oriented elements with regard to the main purpose of the classification which is the characterisation of waste in view of the treatment. For the decision on the treatment the origin of waste is, at least in most cases, considered as irrelevant. A fundamental change should be avoided and priority should be given to continuity and further development.
- Member States argue that a thorough revision must not be done without very strong reasons. It is expected that fundamental changes would lead to a long period of misclassification because all perceivable approaches are assumed to result in a new complicated system.
- Private stakeholders point out that the current structure based on the activities generating waste and then the nature of the waste is convenient and should be maintained. The hierarchy among the sub-chapters (nature of the waste) should be better structured and eventually reduced. It is seen that the main structural problem in the determination of the hazardous characteristic of the waste, i.e. how to use H1 to H14, which methodology to choose. To ensure compatibility with the Stockholm Convention and the European Regulation 2004/250/EC on Persistent Organic Pollutants, there should be a reference stating that all POPs are hazardous waste.
- An industry association emphasises that the current structure by sectors is appropriate and major changes should be avoided. Changing the structure would lead to difficulties, for example in the case of waste statistics or for comparisons, and to practical problems since people are already familiar for years with the LoW as it is.

9.1.2. (Non)-compatibility of LoW with the Basel Convention

The comments of Member States and stakeholders concerning the non-compatibility of LoW and Basel Convention go mostly in the same direction and can be summarised as follows:

- The nomenclature of the Annexes VIII and IX of the Basel Convention are not seen as a suitable basis for waste classification in the EU. The LoW should thus not be adapted to the Basel Convention.
- A table of correspondence between Basel Convention and the LoW is considered as helpful and sufficient for the practical application and would be welcomed by the majority of countries and stakeholders.

These conclusions shall be illustrated by some statements:

- One Member State emphasises that the nomenclature of Annexes VIII and IX is very crude, not extensive and does not suit for describing amounts of waste produced or treated within one country. The classification is an even more complex combination of material-based and source-based entries than the LoW and is therefore no suitable basis for waste classification in the European Union.
- Another Member State points out that the compatibility of the two systems must be solved using transposition tables rather than by changing the structure of the LoW.
- Public authorities and private stakeholders shared the view that a correspondence table would be helpful and sufficient.

One Member State supports the integration of some codes from the Basel nomenclature into the LoW but also opposes an adaptation of European waste classification to the Basel system.

9.2. TOR requirements regarding options for a revised structure

The TOR describes two options for a structural review of the list:

- a) In the first option the identifier "waste origin" is detached from the six digit waste code. The structure of the remaining content may be oriented at material properties. For the identifier "waste origin", which is still a part of the waste code but not a structuring element of the list any more, the NACE code is mentioned as an option.

This code may be applied, inter alia, based on Regulation 2150/2002/EC as last amended by Regulation 1893/2006/EC which includes a transposition table between the waste nomenclature for statistics and the EWL.

- b) The second option is based on the material oriented structure laid down in Annex VIII and IX of the Basel Convention. Here the assessment shall also consider whether or to which extent the list must be complemented

9.2.1. Detaching the descriptor "origin"

The basic element of this approach is to separate the description of the origin of the waste from the waste code. The origin is still a descriptive element of the waste but no more a structuring element of the LoW as it is the case at the moment.

The analysis of the LoW shows that several entries of the present LoW are identical or at least very similar and differ just regarding the descriptor "origin". This results in a high number of entries of the list. The table below shows 5 exemplary waste types and their numerous repetition in the waste list.

Table 30: Examples of repetitions of waste types

sludge from on-site effluent treatment	sludge from on-site effluent treatment containing dangerous substances	sludge and filter cakes from gas treatment*	wastes from cooling-water treatment containing oil*	other filter cakes and spent absorbent*
020204, 020305, 020403, 020502, 020603, 020705, 030311, 040220, 050110, 060503, 070112, 070212, 070312, 070412, 070512, 070612, 070712, 100121, 101213, 191106,	040219, 050109, 070111, 070311, 070411, 070511, 070611, 070711, 100120, 191105,	100407, 100607, 100705, 100817, 101117,	100211, 100327, 100407, 100508, 100609, 100707,	070110, 070210, 070310, 070410, 070510, 070610, 070710,

Based on a preliminary evaluation of the waste codes it was estimated that in total around 40% of the waste codes are listed twice or more times in the list⁶⁷. This means that by freely combining the descriptor “origin” with the other descriptors of the waste properties (the remaining digits) the number of entries could be reduced by probably more than 150 entries without losing information about the waste from the waste codes.

9.2.2. NACE code as descriptor for the waste origin

The NACE rev.2 code describes economic sectors in 20 different level 1 categories (see table below).

Table 31: List of heading of level 1 in the NACE system (NACE rev.2)

CODE	EN DESCRIPTION
A	AGRICULTURE, FORESTRY AND FISHING
B	MINING AND QUARRYING
C	MANUFACTURING
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES
F	CONSTRUCTION
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES
H	TRANSPORTATION AND STORAGE
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES
J	INFORMATION AND COMMUNICATION
K	FINANCIAL AND INSURANCE ACTIVITIES
L	REAL ESTATE ACTIVITIES
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES
N	ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY
P	EDUCATION
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES
R	ARTS, ENTERTAINMENT AND RECREATION
S	OTHER SERVICE ACTIVITIES
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE
U	ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES

The list is further differentiated by 88 level 2 headings (see example in the table below).

⁶⁷ based on assumption regarding the necessary degree of detail of the codes, similarity of wastes and potential aggregation of codes.

Table 32: Heading of level 2 in the NACE rev.2 system (example "Manufacturing")

CODE	EN DESCRIPTION
C	MANUFACTURING
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment

The list is further differentiated by level 3 and level 4 headings (see example in the table below).

Table 33: Heading of level 3 and 4 in the NACE rev.2 system (example "Manufacture of chemicals and chemical products")

CODE	EN DESCRIPTION
20	Manufacture of chemicals and chemical products
20.1	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms
20.11	Manufacture of industrial gases
20.12	Manufacture of dyes and pigments
20.13	Manufacture of other inorganic basic chemicals
20.14	Manufacture of other organic basic chemicals
20.15	Manufacture of fertilisers and nitrogen compounds
20.16	Manufacture of plastics in primary forms
20.17	Manufacture of synthetic rubber in primary forms
20.2	Manufacture of pesticides and other agrochemical products
20.20	Manufacture of pesticides and other agrochemical products
20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
20.4	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
20.41	Manufacture of soap and detergents, cleaning and polishing preparations
20.42	Manufacture of perfumes and toilet preparations
20.5	Manufacture of other chemical products
20.51	Manufacture of explosives
20.52	Manufacture of glues
20.53	Manufacture of essential oils
20.59	Manufacture of other chemical products n.e.c.
20.6	Manufacture of man-made fibres
20.60	Manufacture of man-made fibres

The NACE code is used in the EWCSStat system as descriptor of the origin of the waste.

It can be concluded:

- The NACE codes describes economic sectors while the LoW only partly describes economic sectors and partly technical (production) processes as origin.
- The LoW combines the descriptor "economic sector of origin" with the descriptor "process of origin"
- The LoW is more aggregated and/or aggregates economic sectors in another way (e.g. LoW section 10 01 wastes from chemical surface treatment and coating of metals and other materials).
- Conversion of the LoW related information into EWCSStat is hampered by these differences..
- Partly the general situation where the waste occurs is used in the LoW (e.g. "household waste and similar commercial, industrial and institutional wastes" in section 20) that can not be reflected by NACE codes.
- The LoW comprises numerous waste codes without specific description of the economic sector where the waste comes from (e.g. 13, 14, 15, 16).

9.2.3. Additional entries as sub-codes

In the course of the stakeholder consultation process a proposal was provided to further differentiate the LoW. Concrete background was the WEEE Directive and its collection, treatment and recovery requirements and the need of a monitoring of related mass flows (see section 8.1.2). A detailed list was provided that assigned waste codes to WEEE and fractions from treatment of WEEE. Here, the function of the LoW for European compliance schemes is that of a structure for the reporting of treatment result of WEEE and WEEE amounts collected, treated and recovered based on a set of 'common names' for WEEE fractions. It is stated by the stakeholder that the LoW is not sufficiently differentiated to fulfil this function. The main element of the proposal was to add sub codes. Examples are: shown in the table below.

Table 34: Waste codes for WEEE

16	WASTES NOT OTHERWISE SPECIFIED IN THE LIST	
16 02	wastes from electrical and electronic equipment	
16 02 09*	transformers and capacitors containing PCBs	
16 02 09* / 01		transformers containing PCBs
16 02 09* / 02		capacitors containing PCBs (<i>mix</i>)
16 02 09* / 02-1		PCB (suspect) capacitors - small
16 02 09* / 02-2		PCB (suspect) capacitors - large
16 02 10*	discarded equipment containing or contaminated by PCBs other than those mentioned in 16 02 09; appliances containing PCBs	
16 02 11*	discarded equipment containing CFC, HCFC, HFC	
16 02 11* / 00		mix of cooling & freezing appliances incl. CFC/HCFC/HFC-appliances
16 02 11* / 01		CFC/HCFC/HFC cooling & freezing appliances (<i>all</i>)
16 02 11* / 01-1		CFC/HCFC cooling & freezing appliances
16 02 11* / 01-2		HFC cooling & freezing appliances
16 02 11* / 01-3		CFC/HCFC/HFC freezing appliances 'chest type'
16 02 11* / 01-4		CFC/HCFC/HFC 'professional' cooling & freezing appliances
16 02 11* / 02		cabinets' containing CFC/HCFC-foam insulation (<i>all</i>)
16 02 11* / 02-1		CFC/HCFC-'cabinets' (after 1st-step treatment)
16 02 11* / 02-2		CFC/HCFC-appliances delivered without compressors
16 02 11* / 03		CFC/HCFC air conditioner appliances
16 02 12*	discarded equipment containing free asbestos; appliances containing (free) asbestos	
16 02 13*	discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	
16 02 13* / 01		large (household) appliances (incl. components to be removed)
16 02 13* / 02		non-CFC/HCFC/HFC cooling & freezing appliances (<i>mix</i>)
16 02 13* / 03		NH ₃ cooling appliances
16 02 13* / 04		HC cooling & freezing appliances
16 02 13* / 05		cabinets' containing HC-foam insulation (<i>all</i>)
16 02 13* / 05-1		HC-'cabinets' (after 1st-step treatment)
16 02 13* / 05-2		HC-appliances delivered without compressors
16 02 13* / 06		CRT-appliances with components to be removed
16 02 13* / 07		flatscreen-appliances (incl. components to be removed)
16 02 13* / 08		grey good' / IT&T appliances (incl. components to be removed)
16 02 13* / 09		brown goods' / consumer equipment (incl. components to be removed)
16 02 13* / 10		mobiles (incl. components to be removed)
16 02 13* / 11		small appliances (incl. components to be removed)
16 02 13* / 12		radioactive appliances
16 02 13* / open		other 'appliances' (incl. components to be removed)

Similar approaches could be developed for other areas like take back and recovery of ELV, batteries and packaging. The approach could also be applied

with regard to quality requirements and descriptions of compositions that are not related to EU legislation but are used for communication purposes between waste management parties or waste recovering installations.

9.2.4. Remaining content of the codes

The remaining content of the code is subject to restructuring when the description of the origin is detached from the code. One proposal for a structuring element is a material orientation.

The general descriptor “material” can comprise different aspects like e.g. most mass relevant components, components that determine physical properties of the waste (water content/sludge), the value of the waste (content of precious metals in the case of metal containing wastes and sludge from treatment and production processes) or a hazards (BFR, carcinogenic substances).

The number of aspects of the waste that are described in the remaining code is subject to discussion. A low number could support a simplified and clearly arranged LoW. The higher the number of aspects in a code the better the description of the waste is. The present LoW does not have a fixed number of descriptors in the waste code but the number is varying from case to case depending on the needs that have been seen during the development of the present list.

A material oriented list is the waste list of the Basel Convention. Actually the Basel Convention contains two waste lists. The wastes listed in Annex VIII are considered to be hazardous unless they do not possess any of the characteristics contained in Annex III of the Convention, which is a list of 14 “hazardous characteristics”. Waste listed in Annex IX is not considered to be hazardous unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic. The lists are material oriented.

Table 35: Annex VIII of the Basel Convention (Hazardous Wastes) (Example of section 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, etc.
A1080	Waste zinc residues not included on list B, containing lead and cadmium in concentrations sufficient to exhibit Annex III characteristics
A1090	Ashes from the incineration of insulated copper wire
A1100	Dusts and residues from gas cleaning systems of copper smelters
A1110	Spent electrolytic solutions from copper electrorefining and electrowinning operations
A1120	Waste sludges, excluding anode slimes, from electrolyte purification systems in copper electrorefining and electrowinning operations
A1130	Spent etching solutions containing dissolved copper
A1140	Waste cupric chloride and copper cyanide catalysts
A1150	Precious metal ash from incineration of printed circuit boards not included on list B ⁶⁸
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 ⁶⁹ 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) ⁷⁰
A1190	Waste metal cables coated or insulated with plastics containing or contaminated with coal tar, PCB ⁷¹ , lead, cadmium, other organohalogen compounds or other Annex I constituents to an extent that they exhibit Annex III characteristics.

⁶⁸ Note that mirror entry on list B (B1160) does not specify exceptions.⁶⁹ This entry does not include scrap assemblies from electric power generation.⁷⁰ PCBs are at a concentration level of 50 mg/kg or more.⁷¹ PCBs are at a concentration level of 50 mg/kg or more.

Table 36: Annex IX of the Basel Convention (Non-Hazardous Wastes) (Example of section 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, Chromium 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
B1031	Molybdenum, tungsten, titanium, tantalum, niobium and rhenium metal and metal alloy wastes in metallic dispersible form (metal powder), excluding such wastes as specified in list A under entry A1050, Galvanic sludges
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 ⁷²
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 H4.373
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 (...), Aluminium skimmings (or skims) excluding salt slag, Slags from copper processing for further processing or refining not containing arsenic, lead or cadmium to an extent that they exhibit Annex III hazard characteristics, Wastes of refractory linings, including crucibles, originating from copper smelting, Slags from precious metals processing for further refining, Tantalum-bearing tin slags with less than 0.5% tin
B1110	Electrical and electronic assemblies: Electronic assemblies consisting only of metals or alloys, Waste electrical and electronic assemblies or scrap ⁷⁴ (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 on list A A1180), Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse, ⁷⁵ and not for recycling or final disposal ⁷⁶
B1115	Waste metal cables coated or insulated with plastics, not included in list A1190, excluding those destined for Annex IVA operations or any other disposal operations involving, at any stage, uncontrolled thermal processes, such as open-burning.
B1120	Spent catalysts excluding liquids used as catalysts, containing any of: (...)
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 labelling
B1160	Precious-metal ash from the incineration of printed circuit boards (note the related entry on list A A1150)
B1170	Precious-metal ash from the incineration of photographic film
B1180	Waste photographic film containing silver halides and metallic silver
B1190	Waste photographic paper containing silver halides and metallic silver
B1200	Granulated slag arising from the manufacture of iron and steel
B1210	Slag arising from the manufacture of iron and steel including slags as a source of TiO ₂ 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
B1250	Waste end-of-life motor vehicles, containing neither liquids nor other hazardous components

⁷² Note that even where low level contamination with Annex I materials initially exists, subsequent processes, including recycling processes, may result in separated fractions containing significantly enhanced concentrations of those Annex I materials.

⁷³ The status of zinc ash is currently under review and there is a recommendation with the United Nations Conference on Trade and Development (UNCTAD) that zinc ashes should not be dangerous goods.

⁷⁴ This entry does not include scrap from electrical power generation.

⁷⁵ Reuse can include repair, refurbishment or upgrading, but not major reassembly

⁷⁶ In some countries these materials destined for direct re-use are not considered wastes.

In total the Basel list (Annex VIII and IX) comprises eight sections with 120 entries. While all headers of the sections are material oriented the picture of the individual entries is multifaceted:

- 102 entries contain information about materials/substances (constituents and contaminants) and partly complex (end of live) products,
- 14 about the physical state (e.g. sludge, dust, solution),
- 36 contain information about origin processes (e.g. waste from electrolyte purification processes) and
- 14 entries contain information about the origin sectors (e.g. chemical industry).

Some entries are more general and some entries are very specific (e.g. “Wastes that contain, consist of or are contaminated with leaded anti-knock compound sludges”, or “Used single-use cameras, with batteries not included on list A”).

Stakeholders proposed to join the LoW and the waste list of the Basel Convention in order to reduce the administrative efforts resulting from handling more than one list. Other stakeholders did not see the need to join lists but preferred to have a correspondence list for the conversion of LoW codes into Basel codes and vice versa.

9.3. Discussion

Resulting from the discussion and the input provided so far the following option for a revised LoW is proposed to be assessed in the further working steps against the present LoW:

- The descriptor “origin” can be freely combined with the remaining code. To describe the origin regarding the economic sector the NACE code is used. In addition specific descriptors of the origin are used where necessary in order to reflect waste specific requirements (e.g. technical process).
- The remaining code is structured in a way that waste components become a structuring element. Existing codes (4 digits) will be transferred into the amended list without changes where possible.
- Where appropriate a hierarchical structure for the remaining 4 digit codes is applied.
- The number of entries is reduced by aggregating similar entries.
- Where necessary and/or appropriate sub-codes are introduced.

Impacts

In the present state of knowledge the following positive impacts can be assumed from a revised list:

- Significantly reduced number of entries and by that an improved usability,
- Improved adaptability to specific needs of individual purposes (see discussion on WEEE Directive), Member States (specific waste codes for national purposes – see discussion on waste wood legislation) and other stakeholders (see discussion on quality standards for waste for recycling).
- Improved extensibility of the list,
- Improved compatibility with the EWCStat system,
- Improved usability from homogeneous structuring of the list.
- Potentially reduced number of wrong assignments of wastes to codes in a medium term perspective.

Negative impacts are assumed in the present state of knowledge regarding

- Administrative efforts necessary to re-assign wastes to entries of the list and from adapting procedures and documents of authorities (including electronic data management) (one-off impact),
- Potentially increased number of wrong assignments of wastes to codes in the transitional period (short term perspective).
- Homogeneous and systematic structuring of material based codes will only be possible with a complex system because the relevant characteristics of waste can not be described systematically in a simple system (sometimes the main component of a waste is relevant for proper waste management, sometimes it is the contamination or the most valuable component or the physical property and sometimes it is a combination of one or more of these descriptors).

9.4. Further process

It is intended to further elaborate details of the elements of a revised waste list. Concretion of advantages and disadvantages of options is expected from this working step.

Pros and cons will be further compiled from stakeholder input.

The arguments provided will be used as a basis for the determination of impacts of the different options.

Since the data situation for a quantitative assessment of the impacts of the existing and a revised structure is weak details of the methodological approach are still subject to discussion.

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