1.3 Guidance
The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and chemical hazards for beginners

This document is part of the *International Chemicals Management Toolkit for the Toy Supply Chain* developed by the United Nations Environment Programme (UNEP) in collaboration with the Baltic Environmental Forum (BEF) within the framework of the Global Environment Facility (GEF) project ID: 9771 on Global Best Practices on Emerging Chemical Policy Issues of Concern under the Strategic Approach to International Chemicals Management (SAICM).

This guidance briefly explains what "classification" is and why it is useful. It provides information on the globally harmonised system of classification and labelling – GHS (United Nations Economic Commission for Europe [UNECE] 2021a) and how you can find information on hazards of chemicals.

Information on the hazards of chemicals, which is expressed by their classifications, is useful to

- identify chemicals of concern
- communicate with suppliers
- indicate hazards in a chemicals inventory
- prioritise chemicals for taking action
- communicate with customers along the supply chain

The guidance gives only a brief overview of the GHS. There is further background information on the GHS in general (United Nations Institute for Training and Research [UNITAR] 2021a; UNITAR 2021b) including an e-learning course and guidance on how to apply the GHS classification criteria (UNECE 2021b).

Introduction

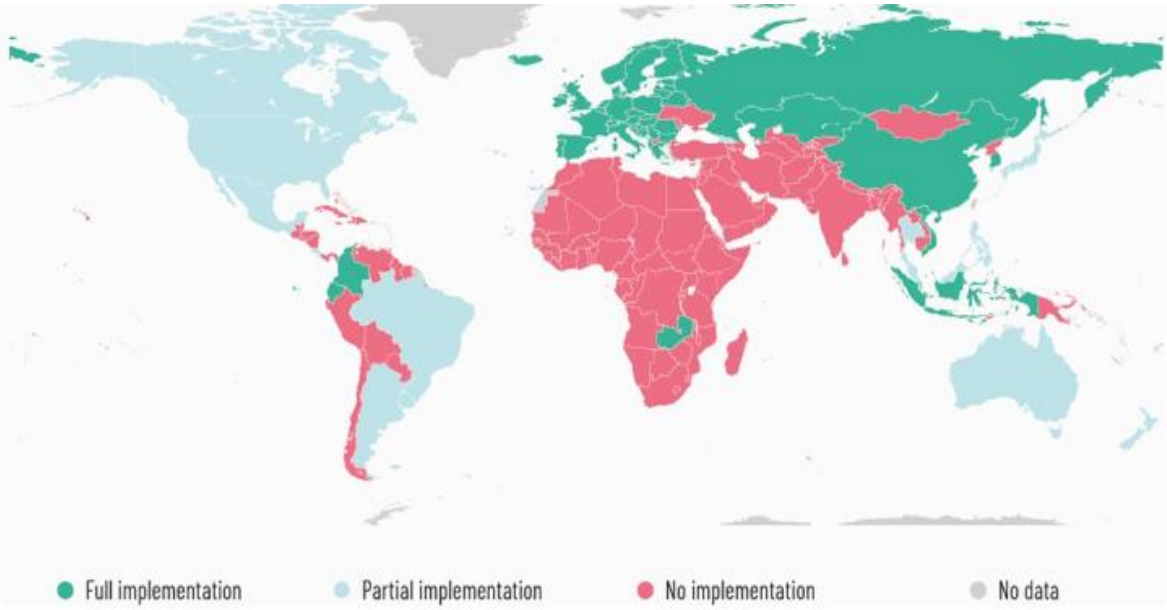
The Globally Harmonized System of Classification and Labelling (GHS) is a voluntary international agreement on a standardised approach to identify chemical hazards and communicate on them.

The GHS defines various types of chemical hazards (the hazard classes) and gives guidance on the process of analysing if a chemical has one or several hazards. In addition, it assigns standard phrases to each of the hazard classes and categories to ensure that the same wording is used across the globe to identify a chemical hazard to the users of these chemicals. The GHS applies to individual elements or compounds as well as mixtures of chemicals.

Many, but not all countries have implemented the GHS into their national (China) or regional (Europe) legislation on chemicals. As the GHS is voluntary, national authorities can decide which parts of it are, or are not implemented. Therefore, the classification and labelling provisions in countries/regions that have implemented the GHS are very much aligned but not always exactly the

same. Besides, as highlighted by UNITAR, it has been observed that even in countries where GHS is implemented, there is still a lack of understanding on hazard information communicated to the target audience (UNITAR 2021c).

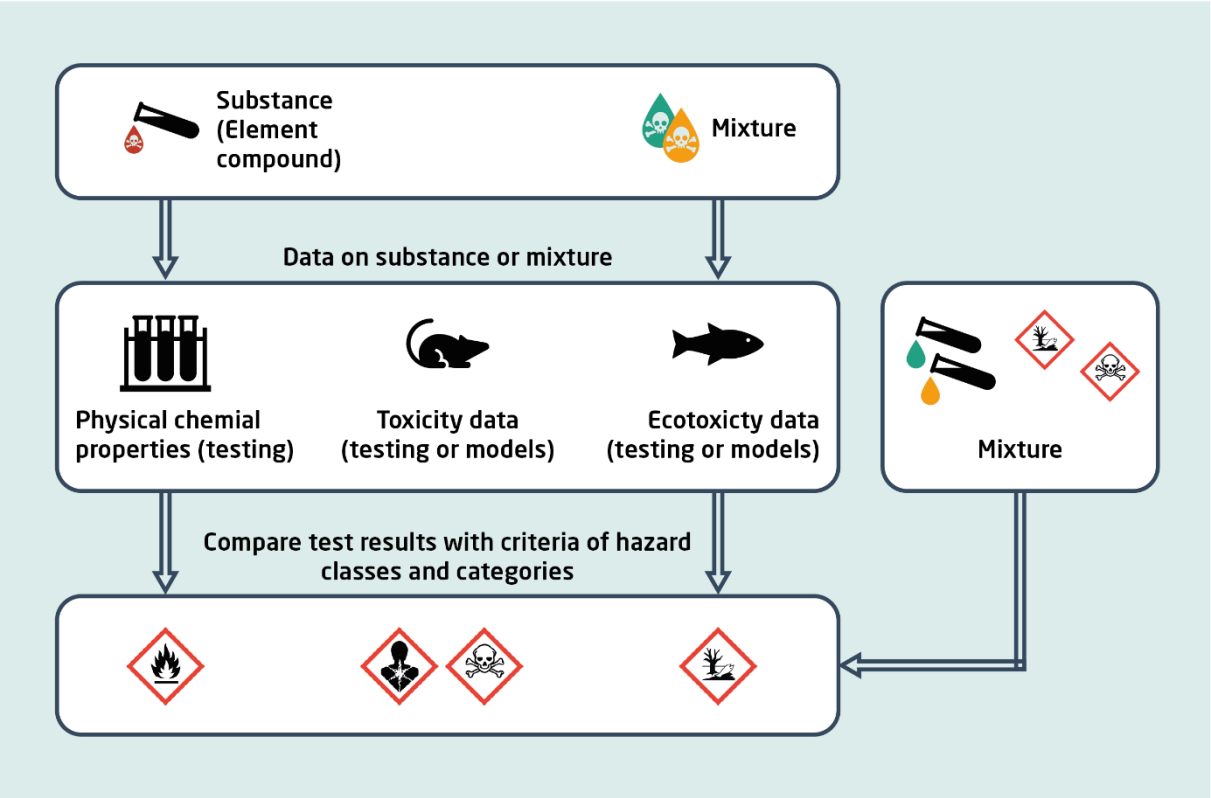
Map of countries that have implemented GHS (UNEP 2018)



Classification is the process of how the producers of substances and chemical mixtures identify if their chemicals are hazardous. It is a structured approach to generate knowledge on chemical hazards and it is therefore the precondition and basis of any hazard communication.

Basically, the classifier of a substance has to gather data from (animal) testing and compare the test results to the criteria of a chemical hazard. If a criterion is met, the hazard applies, and the chemical must be classified accordingly. For some hazardous properties, it is also possible to use computer models to identify if a criterion is met.

The classification of a mixture can be derived from the classification of its components, as the hazards of a mixture result from the hazards of the substances contained. Some hazards of mixtures must be tested because they cannot be predicted.



Source: Oekopol 2021.

The classification criteria are provided in three sections of the GHS: PART 2: Physical hazards, PART 3: health hazards and PART 4: environmental hazards.

Examples of classification criteria are provided in the next table.

Type of hazard	Criterion	Example
Physical Hazard: Flammable liquid	Flashpoint (PF) and initial boiling point (IBP). Categories: 1: FP < 23°C and IBP ≤ 35°C 2: FP < 23°C and IBP > 35°C 3: 23°≤ FP ≥ 60°C 4: 60 < FP ≥ 93°C	A classifier determines the flashpoint of his chemical as 22°C --> Category 1 or Category 2 may apply. He tests the initial boiling point as 45°C --> He classifies the chemical as Flammable Liquid, Category 2
Environmental Hazard: Acute aquatic toxicity	Ecotoxicity tests with fish, crustacea or algae Concentration at which 50% of the test organisms are either dead or show significantly decreased activity (LC/EC or ErC) Categories: 1: concentration ≤ 1 mg/l 2: 1 mg/l > concentration ≤ 10 mg/l 3 10 mg/l > concentration ≤ 100 mg/l	A classifier makes a test of his chemical with algae and crustaceans. He finds out that about half of the organisms are dead or do not grow anymore at a concentration of 25 mg/l, --> He classifies the chemical as hazardous to the aquatic environment (short-term) category 3

The term “hazard classification” is used to indicate that only the intrinsic hazardous properties of substances and mixtures are considered.

A hazard class describes the nature of the physical, health or environmental hazard, e.g., flammable, harmful, hazardous to the environment, etc.

In the following section you find all health and environmental hazards that are currently defined by the GHS and are commonly used to speak about chemical hazards. The physical hazards are not included here, because they are normally not, when chemicals are used in toys.

Health hazards

The most severe and irreversible health damage chemicals may cause are **C**ancer, **M**utations of the genes and altering the **R**eproductive system. These properties are abbreviated '**CMR**'.

Carcinogenicity refers to the induction of cancer or an increase in the incidence of cancer. The more general term is carcinogenic chemical.

Germ Cell Mutagenicity refers to heritable gene mutations. The more general term is genotoxic chemical.

Reproductive toxicity refers to adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring. The more general term is reprotoxic chemical.

Severe health damage to different body parts: STOT (RE/SE)

- **Specific target organ toxicity - single exposure (STOT-SE)** refers to specific, non-lethal target organ effects occurring after a single exposure to a substance or a mixture. This is an example of an acute effect.
- **Specific target organ toxicity - repeated exposure (STOT-RE)** refers to specific toxic effects on target organs occurring after repeated exposure to a substance or mixture. This is an example of an chronic effect.

Sensitisation

- **Respiratory sensitization** refers to hypersensitivity of the airways occurring after inhalation of a substance or mixture.
- **Skin Sensitization** refers to an allergic response occurring after skin contact with a substance or mixture.

Skin Corrosion refers to the production of irreversible damage to the skin.

Acute toxicity refers to serious adverse health effects (i.e. lethality) occurring after a single or short-term oral, dermal or inhalation exposure to a substance or mixture.

Serious eye damage refers to the production of tissue damage in the eye, or serious physical decay of vision, which is not fully reversible.

Irritation

- **Skin irritation:** refers to the production of reversible damage to the skin occurring after exposure to a substance or mixture.
- **Eye irritation:** refers to the production of changes in the eye, which are fully reversible, occurring after exposure of the eye to a substance or mixture.

Environmental hazards

- Acute Aquatic Toxicity
- Chronic Aquatic Toxicity
- Bioaccumulation

Acute aquatic toxicity means the intrinsic property of a substance to be injurious to an organism in a short-term aquatic exposure to that substance.

Chronic aquatic toxicity means the intrinsic property of a substance to cause adverse effects to aquatic organisms during aquatic exposures, which are determined in relation to the life cycle of the organism.

Bioaccumulation refers to the potential of a substance to accumulate in an organism (e.g. in humans or in animals).

Hazard category describes the division of criteria within each hazard class, e.g. oral acute toxicity includes five hazard categories [Category 1, 2, 3, 4, 5] and flammable liquids includes four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

In general, the hazard category indicates how potent a chemical is in causing an effect. The lower the dose or concentration at which a chemical causes damage, the more potent it is and the lower its hazard category.

There is one exemption to this: the hazard categories of CMRs. Here, the hazard category does not specify the potency but the quality of the evidence that points to the effect. If there is evidence from humans that a substance causes cancer, e.g. tobacco smoke, then it is a Cat 1A carcinogen. If there is evidence from animal studies of a substance causing cancer, it would be a Cat. 1B carcinogen. If there is some evidence of the cancer-causing effect but not sufficient for a classification in Cat. 1, the Cat. 2 (suspected carcinogen) would be selected.

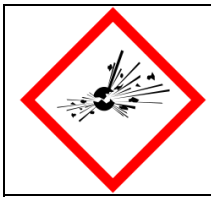
The hazards of a chemical are communicated so that everyone who uses it knows about them and can consider if they should be used in their own products, such as toys. Therefore, if you use a chemical, the label is an important information source on its hazards!

Hazard pictograms: means a graphical composition that may include a symbol plus other graphic elements, such as a border, background pattern or colour that is intended to convey specific information. Hazard pictograms convey health, physical and environmental hazard information, assigned to a GHS hazard class and category.

 Acute toxicity (severe)	 Corrosives
 Carcinogenic Mutagenic Reprotoxic Respiratory Sensitization Target Organ Toxicity Aspiration Toxicity	 Irritant Dermal Sensitizer Acute toxicity (harmful) Narcotic Effects Respiratory Tract Irritation


Hazardous to the aquatic environment

The following pictograms are included for reasons of completeness. They may be relevant for the safety of toy production but normally are not important in the ready toy or the parts of it.

			
Unstable explosives Explosives Self-reactive substances and mixtures Organic peroxides	Oxidising gases Oxidising liquids Oxidising solids	Flammable gases, aerosols, liquids, and solids Self-reactive substances and mixtures Pyrophoric liquids and solids Combustible solids and liquids Self-heating substances and mixtures	Compressed gases Liquefied gases Refrigerated liquefied gases Dissolved gases

		Substances and mixtures, which in contact with water, emit flammable gases, Organic peroxides	

Hazard statement: means standard phrases assigned to a hazard class and category that describes the nature of the hazards of a hazardous chemical substance or mixture, including, where appropriate, the degree of hazard.

For example: a chemical substance with an assigned **hazard class** "Carcinogenicity" and a **hazard category** "Category 1A" will have a **hazard statement** "May cause cancer".

Signal Words: "Danger" or "Warning" are used to emphasise hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category.

Apart from the hazard classes identified in the GHS, there are also other properties of chemicals that may give rise to concern for human health or the environment. These include, for example, endocrine disrupting properties or the persistence of a chemical.

Although there is no specific hazard class, persistence of a chemical in the environment is also considered a property that can be cause for concern. Persistence refers to insufficient degradation of a chemical in the natural environment, e.g. by sunlight or through degradation by microorganisms. As a consequence, persistent chemicals will not disappear from the environment. Persistence is one criterion that all substances fulfil that are regulated under the global Stockholm Convention on Persistent Organic Pollutants.

How you can find information on hazards of chemicals

If you are a producer of polymer pellets that will be used to produce toys: you should determine the hazards of the polymer pellets that you provide to your customers. Polymer pellets are a mixture of the raw polymer(s) and additives, such as plasticisers, colourants, fillers etc. Additives are frequently provided as mixtures with several ingredients. When you classify your polymer pellets, you can use the hazard and classification information of the ingredients in the polymer pellets. If you do not receive this information with the chemicals, contact your supplier and ask for it.

The producers of raw polymers and the producers of additive substances and mixtures of additives are responsible to classify the substances that they produce and use and that they supply you with.

If you are a producer of plastic toys or toy parts from plastic pellets: you should receive hazard information on the polymers and other chemicals you use, e.g. glues or lacquers from your suppliers. Check the labels of the materials and any accompanying documentation (technical data sheets or safety data sheets) etc. The information from your supplier is your first and primary information source and if needed, you may need to ask your supplier for the relevant information.

If you are an assembler of toys using plastic parts: you may use chemicals for the assembly process (e.g. glues) for which you should receive hazard information and a classification (cf. above).

However, you may not receive any information on the content of chemicals of concern in the toy parts you use and on the hazards of the chemical ingredients. If you want to have specific information, you may need to contact your supplier to learn more about hazards of chemical ingredients of your materials or parts.

If you are interested in the hazards of a specific chemical substance, e.g. because you know it is contained in your raw materials, you can also check databases to find information on the classification.

References:

Oekopol (2021). Das Vorgehen bei Einstufung und Kennzeichnung im Chemikalienrecht und die resultierenden Rechtsfolgen. Presentation by Antonia Reihlen at the Workshop: Dialoge an der Schnittstelle Abfall- und Chemikalienrecht 20.09.2021 (not published)

United Nations Economic Commission for Europe (2021a). Globally Harmonized System of Classification and Labelling of Chemicals (GHS). https://unece.org/about-ghs. Accessed 14 December 2021.

United Nations Economic Commission for Europe (2021b). Guidance on the application of GHS criteria. https://unece.org/transportdangerous-goods/guidance-application-ghs-criteria. Accessed 14 December 2021.

United Nations Environment Programme (2018). *Global Chemicals Outlook II. From Legacies to Innovative Solutions.* https://www.unep.org/resources/report/global-chemicals-outlook-ii-legacies-innovative-solutions. Accessed 14 December 2021.

United Nations Institute for Training and Research (2021a). Globally Harmonized System of Classification and Labelling of Chemicals. https://unitar.org/sustainable-development-goals/planet/our-portfolio/globally-harmonized-system-classification-and-labelling-chemicals. Accessed 14 December 2021.

United Nations Institute for Training and Research (2021b). *UNITAR GHS e-Learning course*. [online video]. 6 September. https://www.youtube.com/watch?v=X4PNnZe7Ju. Accessed 14 December 2021.

United Nations Institute for Training and Research (2021c). *Chemical Hazard Communication and the Globally Harmonised System of Classification and Labelling of Chemicals (GHS).* Guidance Documents. https://cwm.unitar.org/publications/publications/ghs.aspx. Accessed 14 December 2021.