

**VCI-Guideline**  
**on classifying environmentally hazardous**  
**substances and mixtures (aquatic environment)**  
**according to the dangerous goods regulations**  
**for transport**

**As of 15 July 2010**

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**Responsible Care**

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## **1. Introduction**

This guideline is an update of the June 2009 edition. It considers all regulations according to ADR/RID/ADN, IMDG-Code und ICAO/IATA applicable since 2009/2010 and changes which are already published for 2011/2012.

To a large extent the classification criteria for the different modes of transport have been harmonized in 2009/2010.

Although the criteria for “environmentally hazardous“ have also been widely harmonized for all modes, there are still some deviations/variations, which are described in this guideline.

Additionally, there will be new disharmony in 2011 between regulations for sea versus land/air shipments due to an elongated transition period of two years for the ecotox-criteria according to the 3<sup>rd</sup> edition of GHS. The disharmony will make this issue even more complicated.

The layout and structure of the present guideline varies from the previous version in that it is based on the system of the dangerous goods regulations: introduction, classification, labelling and documentation.

Thus, redundant information is avoided and the guideline becomes more compact and easier to understand for the user. At the end of each main chapter there is a tabulated summary but the reader is advised not to refer exclusively on this summary as all details cannot be incorporated.

All used expressions were harmonized for land and air transport with the GHS. For sea shipments, the terms “environmentally hazardous (aquatic toxicity)” and “marine pollutant” are used in parallel.

## **List of abbreviations and regulatory sources:**

### **ADR:**

European Agreement concerning the International Carriage of Dangerous Goods by Road (Accord européen relatif au transport international des marchandises Dangereuses par Route)

[Referring to the 2009 and 2011 editions]

### **RID:**

Rules concerning the International Carriage of Dangerous Goods by Rail (Règlement concernant le transport International ferroviaire de marchandises Dangereuses)

[Referring to the 2009 and 2011 editions]

### **ADN:**

European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways

(Accord européen relatif au transport international des marchandises Dangereuses par voie de Navigation intérieure)

[Referring to the 2009 and 2011 editions]

### **EPA**

United States Environmental Protection Agency

### **IMDG-Code:**

International Maritime Code for Dangerous Goods - Code

[Referring to the 34th Amendment (currently mandatory) and the 35th Amendment (mandatory from 1st Jan 2012)]

### **IMO**

International Maritime Organisation

### **ICAO**

International Civil Aviation Organisation

### **ICAO-TI**

Technical Instructions (TI) for the safe Transport of Dangerous Goods by Air of ICAO

[Referring to the 2009-2010 edition]

### **IATA**

International Aviation Transport Association

#### IATA-DGR

Dangerous Goods Regulations (DGR) of IATA

[Referring to the 51st (2010) and 52nd (2011) editions]

#### GHS (UN-GHS)

Globally Harmonized System of Classification and Labelling of Chemicals of the United Nations (UN)

[Referring to the 3rd edition 2009]

#### CLP

REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

#### EU-directive 67/548/EEG (DSD)

Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances

[amended by regulation (EG) Nr. 1272/2008]

#### EU-directive 1999/45/EG (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

[amended by directive 2006/8/EG of the commission, 23. January 2006]

#### OECD

Organisation for Economic Co-Operation and Development

[OECD Test methods:

OECD Test Guideline 201 (1984) Alga, Growth Inhibition Test

OECD Test Guideline 210 (1992) Fish, Early Life Stage Toxicity Test

OECD Test Guideline 211 (1998) Daphnia Magna Reproduction Test]

#### QSAR

Quantitative Structure Activity Relationship

#### 49 CFR

Code of Federal Regulation, TITLE 49—Transportation

## **2. Classification**

### **2.1 Classification criteria for all modes of transport**

In 2009/2010, the characteristic "environmentally hazardous (aquatic environment)" was implemented for all transport modes.

Several years ago, this characteristic had already been implemented in ADR/RID/ADN, although with reduced requirements. Starting in 2009/2010 the classification criteria will be harmonised with the UN-GHS (2nd. edition). This will also trigger a change to the classification criteria for environmentally hazardous substances and mixtures for ADR/RID/ADN.

All substances and mixtures must be checked for "environmentally hazardous (aquatic environment)" applicability, even if already assigned to one or more of the classes 1 – 8 (with the exemption of air freight, see 2.3.4). If the environmental hazard is the only hazard of a substance or mixture, the UN-numbers UN 3077 or UN 3082 are assigned.

UN 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

#### **2.1.1 Classification of substances on the basis of criteria**

The basic elements for classification of environmentally hazardous substances (aquatic environment) are:

- Acute aquatic toxicity;
- Potential for or actual bioaccumulation;
- Degradation (biotic or abiotic) for organic chemicals; and
- Chronic aquatic toxicity.

The following categories have been implemented, based on the criteria presented in the GHS:

- Acute Category 1
- Chronic Category 1
- Chronic Category 2

If even one of these categories is met, packing group III is assigned to the hazard "environmentally hazardous". If the material meets classification criteria of classes 1 – 9 and based on these hazards another packing group applies, this packing group takes

precedence as the packing group for that substance. This means that the environmentally hazardous category is added to an already existing classification, e.g.

1. a substance fulfils the classification criteria for environmentally hazardous  $\Rightarrow$  UN 3077 or UN 3082, 9, packing group III
2. a substance fulfils the following classification criteria: flammable liquid, packing group II and the classification criteria for environmentally hazardous substances  $\Rightarrow$  assign most suitable UN-number for the flammability hazard, 3, packing group II (additional marking or additional entry in the transport paper for the hazard environmentally hazardous may be required)

Substances shall be classified as "environmentally hazardous substances (aquatic environment)", if they satisfy the criteria for Acute 1, Chronic 1 or Chronic 2, according to the following tables:

#### Acute toxicity

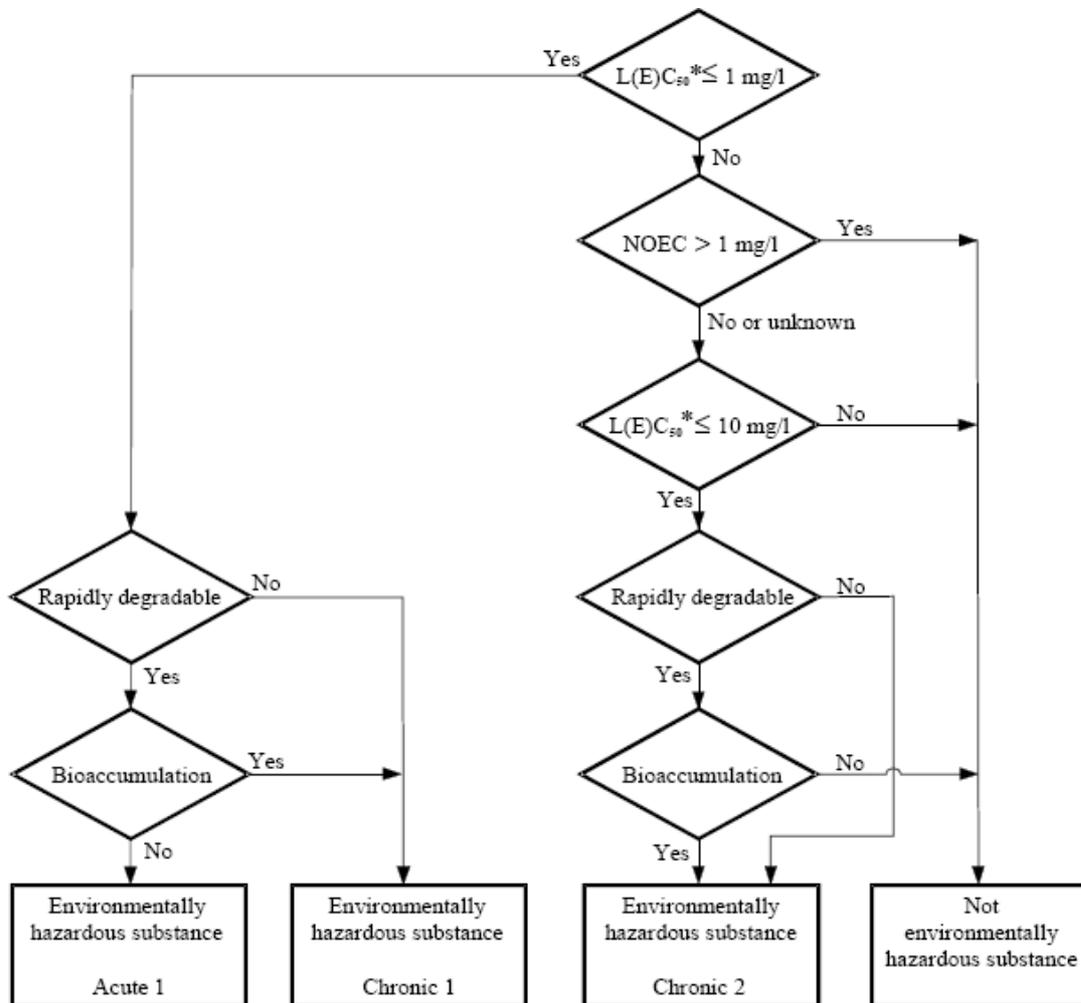
|  |                      |
|--|----------------------|
| <b>Category: Acute 1</b>   |                      |
| Acute toxicity:  |                      |
| 96 hr LC <sub>50</sub> (for fish)                                | $\leq 1$ mg/l and/or |
| 48 hr EC <sub>50</sub> (for crustacea)                           | $\leq 1$ mg/l and/or |
| 72 or 96hr ErC <sub>50</sub> (for algae or other aquatic plants) | $\leq 1$ mg/l        |

#### Chronic toxicity

|   |                      |
|---|----------------------|
| <b>Category: Chronic 1</b>  |                      |
| Acute toxicity:   |                      |
| 96 hr LC <sub>50</sub> (for fish)   | $\leq 1$ mg/l and/or |
| 48 hr EC <sub>50</sub> (for crustacea)  | $\leq 1$ mg/l and/or |
| 72 or 96hr ErC <sub>50</sub> (for algae or other aquatic plants)  | $\leq 1$ mg/l        |
| and the substance is not rapidly degradable and/or the $\log K_{ow} \geq 4$ (unless the experimentally determined BCF $< 500$ ) |                      |

|   |                               |
|---|-------------------------------|
| <b>Category: Chronic 2</b>  |                               |
| Acute toxicity:   |                               |
| 96 hr LC <sub>50</sub> (for fish)   | $>1$ to $\leq 10$ mg/l and/or |
| 48 hr EC <sub>50</sub> (for crustacea)  | $>1$ to $\leq 10$ mg/l and/or |
| 72 or 96hr ErC <sub>50</sub> (for algae or other aquatic plants)  | $>1$ to $\leq 10$ mg/l        |
| and the substance is not rapidly degradable and/or the $\log K_{ow} \geq 4$ (unless the experimentally determined BCF $< 500$ ), unless the chronic toxicity NOECs are $> 1$ mg/l |                               |

3. The classification flowchart below outlines the process to be followed:



\* Lowest value of 96-hour  $LC_{50}$ , 48-hour  $EC_{50}$  or 72-hour or 96-hour  $ErC_{50}$ , as appropriate.

### **New classification criteria 2011**

There will be changes to these classification criteria, when transport regulations of the different transport modes are harmonized with the 16th edition of the UN Model regulations. The changes will also harmonise with the 3rd edition of the GHS. Implementation into the different transport modes will not be a synchronized process:

- ADR/RID/ADN ⇒ 01/01/2011 (transition period until 31/12/2013, see 1.6.1.19 ADR 2011, transition period extended by the joint meeting March 2010)
- IMDG Code ⇒ 01/01/2014 (can be used starting 01/01/2013).
- IATA-Dangerous Goods regulations: the text of the classification contains a reference to the classification criteria of the UN Model regulations. Therefore the revised classification criteria will be applicable from 01/01/2011 without a transition period.

Four new classification criteria will be implemented when adequate chronic toxicity data are available: 2 for Non-rapidly degradable substances and 2 for rapidly degradable substances. The criteria  $\text{NOEC} > 1 \text{ mg/L}$  will be moved to the new category “chronic 2”. Besides the changes to the classification criteria, the basic elements will also be changed as follows:

- (a) Acute aquatic toxicity;
- (b) Chronic aquatic toxicity;
- (c) Potential for or actual bioaccumulation; and
- (d) Degradation (biotic or abiotic) for organic chemicals.

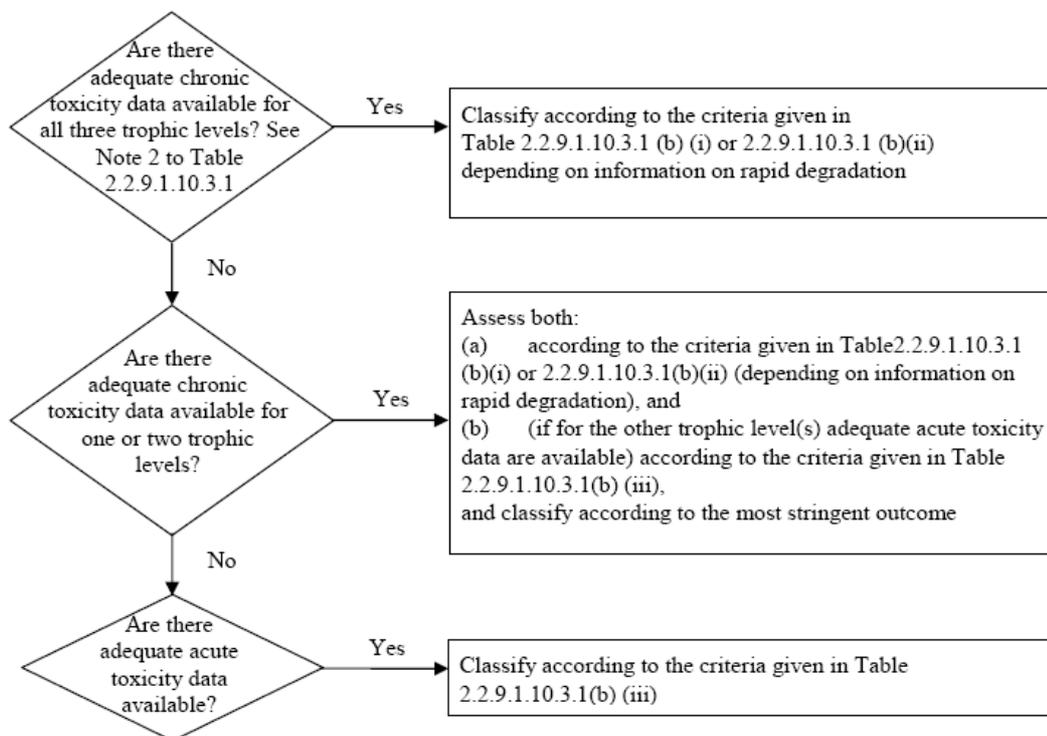
There are only a few valid test methods regarding chronic toxicity criteria. Tests consistent with OECD Test Guideline 210 (Fish Early Life Stage), the fish life-cycle test (US EPA 850.1500), or equivalent can be used in the classification scheme. However, other validated and internationally accepted tests could be used, if data based on the OECD-test methods are not available.

Below is an overview on the new criteria. The existing criteria will remain valid, with the exception of the NOEC, which will be moved to the new categories.

| Classification categories    |   |   |   |
|------------------------------|---|---|---|
| Acute hazard<br>(see Note 1) | Long-term hazard<br>(see Note 2)                  |   |   |
|                              | Adequate chronic toxicity data available          |   | Adequate chronic toxicity data not available<br>(see Note 1)  |
|                              | Non-rapidly degradable substances<br>(see Note 3) | Rapidly degradable substances<br>(see Note 3) |   |
| <b>Category: Acute 1</b>     | <b>Category: Chronic 1</b>                        | <b>Category: Chronic 1</b>                    | <b>Category: Chronic 1</b>  |
| $L(E)C_{50} \leq 1.00$       | $\text{NOEC or } EC_x \leq 0.1$                   | $\text{NOEC or } EC_x \leq 0.01$              | $L(E)C_{50} \leq 1.00$ and lack of rapid degradability and/or $\text{BCF} \geq 500$ or, if absent $\log K_{ow} \geq 4$        |
|                              | <b>Category: Chronic 2</b>                        | <b>Category: Chronic 2</b>                    | <b>Category: Chronic 2</b>  |
|                              | $0.1 < \text{NOEC or } EC_x \leq 1$               | $0.01 < \text{NOEC or } EC_x \leq 0.1$        | $1.00 < L(E)C_{50} \leq 10.0$ and lack of rapid degradability and/or $\text{BCF} \geq 500$ or, if absent $\log K_{ow} \geq 4$ |

The new criteria are only applicable if data is available for all trophic levels and taxonomic groups. These consist of the 3 normal water organisms (fish, crustacean species, algae species). These species are considered as surrogates for all aquatic organisms and data on other species may also be considered if the test methodology is suitable. To avoid unnecessary testing, QSAR or expert judgment can also be used. If these data are not available, the remaining classification criteria are applied.

This results in the following flow chart (ADR 2011):



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*The changes compared to the current flow chart are only the new criteria.*

## 2.1.2 Classification of mixtures

When the mixture as a whole has been tested to determine its aquatic toxicity, it is classified according to the criteria that have been agreed for substances, but only for acute hazard. It is not possible to apply the criteria for chronic classification to mixtures because the data from degradability and bioaccumulation tests of mixtures cannot be interpreted; they are meaningful for single substances only.

Therefore the classification of mixtures must be based on bridging principles or the summation method.

Agreed bridging principles include the following rules:

- Dilution
- Batching
- Concentration of mixtures which are classified with the most severe classification categories (acute 1 and chronic 1)
- Interpolation within one toxicity category
- Substantially similar mixtures

When data are available for all or some of the components, the classification of the mixture may be determined by application of the summation method using the following additivity formula:

$$\frac{\sum C_i}{L(E)C_{50m}} = \sum \frac{C_i}{L(E)C_{50i}}$$

where:

$C_i$  = concentration of component  $i$  (weight percentage)

$L(E)C_{50i}$  = (mg/l)  $LC_{50}$  or  $EC_{50}$  for component  $i$

$n$  = number of components, and  $i$  is running from 1 to  $n$

$L(E)C_{50m}$  =  $L(E)C_{50}$  of the part of the mixture with test data

Use of the summation method based on the classification of the components is common practice. It is applied for mixtures with known classifications for all components as well as for mixtures with data gaps. The summation is not performed with the toxicity data of the components, but with the concentrations of the components having a classification of acute 1 or chronic 1 or 2:

**Sum of components classified as:**

Acute Category 1 × M ≥ 25 %  
 Chronic Category 1 × M ≥ 25 %  
 (M × 10 × Chronic Category 1) + Chronic Category 2  
 ≥ 25 %

**Mixture is classified as:**

Acute Category 1  
 Chronic Category 1  
 Chronic Category 2

The M-Factor (see table above) must be used for the weighting of highly toxic components. The M-Factor for a specific highly toxic component is derived from its L(E)C<sub>50</sub>-value as shown in the table below:

**Multiplying factors for highly toxic components of mixtures**

| L(E)C <sub>50</sub> - value            | Multiplying factor (M) |
|--|------------------------|
| 0,1 < L(E)C <sub>50</sub> ≤ 1          | 1                      |
| 0,01 < L(E)C <sub>50</sub> ≤ 0,1       | 10                     |
| 0,001 < L(E)C <sub>50</sub> ≤ 0,01     | 100                    |
| 0,0001 < L(E)C <sub>50</sub> ≤ 0,001   | 1000                   |
| 0,00001 < L(E)C <sub>50</sub> ≤ 0,0001 | 10000                  |
| (continue in factor 10 intervals)      |                        |

**2.2 Classification of hazardous substances versus dangerous goods**

ADR/RID/ADN 2009 includes a classification provision based on the classification according to the European Dangerous Substance Directive (67/548/EEC) and the Dangerous Preparations Directive (1999/45/EC). This provision requires a substance or a mixture which has been allocated the symbol N in connection with one of the R-phrases R50, R50/53, R51/53 to be classified as dangerous for transport.

The criteria for classification of dangerous substances according to the old EU directives (67/548/EEC and 1999/45/EC) as well as the new, CLP Regulation (EC)1272/2008 are widely harmonized with the UN GHS criteria and the dangerous goods criteria based thereon. However, there are still some small differences. On the one hand, there are deviations from the old EU directives to the GHS criteria based regulations for dangerous goods and the CLP Regulation. Although both are based on GHS criteria, differences between the CLP and the dangerous goods criteria will occur because of different adoption dates of the most recent GHS version. For example, today (June 2010) the CLP regulation is based on the second revised edition of the UN GHS while the current UN Model Regulations (16th ed. 2009) are based on the third revised edition.

Consequently, the new criteria for categories chronic 1 and 2 (see "new criteria 2011" in chapter 2.1.1.) are not yet adopted to the CLP Regulation. The amendment of the CLP is in progress, but the date of the entry into force is not yet known.

Deviations from the old EU directives (67/548/EEC and 1999/45/EC) to GHS-based CLP (EC1272/2008) and dangerous goods regulations 2009 occur for

- the determination of the bioaccumulation
- and for the NOEC exit provided by GHS 2nd rev. ed.

|   | 1272/2008/EG (CLP) and dangerous goods 2009                          | 67/548/EEC   |
|---|--|--|
| <b>Chronic 1</b>  |  |  |
| L(E)C <sub>50</sub>   | ≤ 1 mg/l   | ≤ 1 mg/l   |
| not rapidly degradable  | Dissolved carbon degradation < 70 % / 28 days<br>or<br>BOD/COD < 0,5 | Dissolved carbon degradation < 70 % / 28 days<br>or<br>BOD/COD < 0,5 |
| bioaccumulation   | Log K <sub>ow</sub> ≥ 500  | Log KOW ≥ 100  |
|   | Unless the experimentally determined BCF ≥ 4                         | Unless the experimentally determined BCF ≥ 3                         |
| <b>Chronic 2</b>  |  |  |
| L(E)C <sub>50</sub>   | ≤ 10 mg/l  | ≤ 10 mg/l  |
| not rapidly degradable  | Dissolved carbon degradation < 70 % / 28 days<br>or<br>BOD/COD < 0,5 | Dissolved carbon degradation < 70 % / 28 days<br>or<br>BOD/COD < 0,5 |
| bioaccumulation   | Log KOW ≥ 500  | Log KOW ≥ 100  |
|   | Unless the experimentally determined BCF ≥ 4                         | Unless the experimentally determined BCF ≥ 3                         |
| NOEC exit   | Unless the chronic toxicity NOECs are > 1 mg/l.                      | -  |
| <i>Comparison of chronic category classification of the old EU-directives with GHS-based CLP and dangerous goods regulations 2009. Deviations of bioaccumulation criteria are marked orange, the NOEC exit criteria are marked green.</i> |  |  |

An example of a substance for which these differences are relevant is pentane. According EU directive 67/548/EEC it must be classified "environmentally hazardous" with symbol "N" and risk phrases R51/53. This legal classification is transferred to Annex VI of the CLP regulation, so according to CLP, pentane must be classified "environmentally hazardous" in category chronic 2 with hazard statement H411, although it doesn't meet the CLP classification criteria. For transport regulations, the criteria must be applied, therefore the classification is different:

| <b><i>Pentane (109-66-0)</i></b> |       |           | GHS / UN Model Regulations | CLP  | EU directive 67/548/EEC |
|----------------------------------|-------|-----------|----------------------------|--|-------------------------|
| LC <sub>50</sub> (Fish)          | 96 hr | 9,5 mg/L  | acute 2                    | Acc. annex VI legal classification as chronic 2, although not meeting the criteria | N, R51/53               |
| LC <sub>50</sub> (Daphnia)       | 48 hr | 10,7 mg/l |                            |  |                         |
| LC <sub>50</sub> (Algae)         | 96 hr | 7,0 mg/l  |                            |  |                         |
| Log K <sub>ow</sub>              |       | 3.39      |                            |  |                         |

This problem occurs for some substances having an entry in the dangerous substance list in annex VI of the CLP regulation, which contains the dangerous substance classification for the most commonly used substances in two tables. Table 3.2 contains the classifications in the old European format which have been maintained as Annex I of directive 67/548/EEC for many years. Table 3.1 contains the classification in GHS format according to CLP, but this table was generated by more or less simple algorithms (see translation table in annex VII of the CLP regulation). Unfortunately, it has not been checked for existing data, which leads to another classification as is the case for pentane (see above). According to the specific rule in the translation table, the classification "N, R51/53" in table 3.2 has been translated to category "chronic, H411", even though available data meets the criteria for CLP category acute 2, which is out of the scope of the dangerous goods regulations.

The application of a dangerous substance classification could cause a "worst case" transport classification.

## 2.3 Deviations between the modes of transport

### 2.3.1 ADR/RID/ADN (without tank vessels on inland waterways)

Notwithstanding the classification criteria, ADR/RID/ADN 2.2.9.1.10.5.2 requires substances or mixtures not otherwise classified in ADR/RID/ADN, to be classified under UN Nos. 3077 or 3082 if they have been allocated the N-symbol in connection with one of the R-phrases R50, R50/53, R51/53.

This is a deviation from the UN Model Regulations and other modal regulations, which may cause a substance, be classified in class 9 with UN 3077 or 3082 for ADR/RID/ADN but classified as non-dangerous for the IMDG Code and IATA DGR. For details of the different criteria responsible for this effect, see section 2.2 "Dangerous Substances/Dangerous Goods Classification".

To avoid this deviation in cases when data are available, the following amendments have been adopted for ADR/RID/ADN 2011:

- The adoption of the European Dangerous Substance classification shall only be applied-if data for classification, according the transport regulations, are not available.
- By adopting the development in the European Dangerous Substance legislation, references are now made not only to the directives 67/548/EEC and 1999/45/EC, but also to CLP.

The amendment, as adopted by the ADR/RID/ADN-Joint Meeting is:

*2.2.9.1.10.5 Substances or mixtures classified as environmentally hazardous substances (aquatic environment) on the basis of other criteria Regulation 1272/2008/EC.*

*If data for classification according to the criteria of 2.2.9.1.10.3 and 2.2.9.1.10.4 is not available yet, the classification “environmentally hazardous” shall be adopted either according to the Directives 67/548/EEC and 1999/45/EC (risk phrases R50; R50/53; R51/53) or according to the Regulation 1272/2008/EC\* (category Acute 1, Chronic 1 or Chronic 2).*

*This means that:*

- *If a substance, mixture or solution has been allocated such risk phrase(s) or category, it shall be classified as environmentally hazardous substance (aquatic environment).*
- *If a substance, mixture or solution has not been allocated such risk phrase(s) or category, it shall not be classified as environmentally hazardous substance (aquatic environment).*

*2.2.9.1.10.6 Assignment of Substances classified environmentally hazardous according provisions 2.2.9.1.10.3, 2.2.9.1.10.4 or 2.2.9.1.10.5*

*2.2.9.1.10.6.2 Substances or mixtures classified as environmentally hazardous substances (aquatic environment), not otherwise classified under ADR shall be designated: UN No. 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., packing group III; or UN No. 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., packing group III.*

*They shall be assigned to packing group III.*

*\* Regulation 1272/2008/EC of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (Official Journal of the European Union No. L 353 of 30/12/2008).*

### 2.3.2 IMDG-Code

The criteria in the IMDG Code for environmentally hazardous substances (for the aquatic environment) are harmonized with the EU regulations for the road rail and inland waterway transport modes since January, 01. 2010. This is based on the criteria of the 2nd. Edition of the UN-GHS

The following discrepancies still remain:

The index of the IMDG-Code (34-08) still contains substances and materials which are identified as "Marine Pollutants" according to GESAMP criteria and are marked with the letter "P". These substances and materials must be classified as "Marine Pollutants". These marked substances should not be extended with new substances in future.

With the approval of the competent authority, substances that are identified as marine pollutants, but which no longer meet the criteria as a marine pollutant need not to be transported in accordance with the provisions of the IMDG-Code to marine Pollutants.

Therefore, classification according to the IMDG-Code is based on a self responsible criteria based classification by the shipper (producer) as well as a list based principle.

A link to the EU-Directives (67/548/EWG, 1999/45/EG) or CLP is missing in the IMDG Code (and in the ICAO-TI / IATA-DGR too) and consequently, a link to marking according the EU-regulations.

As mentioned above, implementation of the new classification criteria, based on harmonization with the 16th. edition of the UN Model Regulations, will come into force with the 36th Amendment on January 01, 2014. IMDG Code amendments can be used one year before the mandatory compliance date, so the transitional periods for ADR/RID/ADN (ending December, 31. 2013, see 1.6.1.19) and the IMDG (in force beginning January, 01. 2014) will meet beginning of 2013. At this date, the new classification rules for these modes of transport could be implemented together with one year of transition period.

### 2.3.3 ADN (tank vessels on inland waterways)

For transport of packagings, tank containers and bulk containers, the same classification criteria for ADR and RID are applicable. (See also 2.2.9.1.10.1 ADN)

For carriage in tank ships, additional criteria are stipulated in chapter 2.4 ADN.

- For-environmental hazards, these are the GHS criteria "acute 2", "acute 3" and "chronic 3" (s. ADN 2.2.9.1.10.2). Substances meeting these additional criteria must be classified as Substance Numbers 9005 or 9006 instead of the UN-No.

3077 or 3082. (s. ADN 3.2.3 table C). Additionally, these environmentally hazardous substances must be assigned into groups N1, N2 or N3.

- Chapter 2.4 also includes criteria for substances with carcinogenic, mutagenic or toxic to reproduction properties (CMR). This also includes substances and mixtures which float on the surface of the water, do not evaporate and are slightly soluble in water (floaters) or sink to the waterway bed and are slightly soluble (sinker).

| Assignment into the groups N1 to N3 according 2.2.9.1.10.2 ADN | Substances which fulfill the named GHS criteria due to their environmental hazard |
|--|---|
| N1   | Category acute 1 or<br>Category chronic 1   |
| N2   | Category chronic 2 or<br>Category chronic 3                                       |
| N3   | Category acute 2 or<br>Category acute 3   |

#### 2.3.4 ICAO-TI/IATA-DGR

IATA-DGR (Chapter 3.9.2.4) and ICAO-TI (Chapter 9.2.1) have implemented a flexible reference to the criteria of the UN Model Regulations. Additionally, they make references to national or international regulations of the country of origin, transit or destination for environmentally hazardous substances. As a result, the EU classification criteria according to EU Directives (67/548/EEG und 1999/45/EG) and CLP regulation (1272/2008/EG) are indirectly relevant because of ADR/RID.

However, ICAO-TI and IATA-DGR define the "environmentally hazardous" classification only for substances or mixtures which are not assigned to Classes 1 – 8 or entries of Class 9 other than UN 3077 or UN 3082. If a substance or mixture is still classified because it meets the criteria of any other class or entry into class 9, it need not also be named as "environmentally hazardous".

## 2.4 Summary

Review about the implementation dates of the new criteria.

"X" means, this criterion is implemented already.

The criteria are collected again in the following table.

| Classification criteria   | UN Model Regulations     | UN-GHS                  | ADR/RID/ADN                                      | IMDG Code                             | ICAO/IATA | DSD - DPD                       | CLP                                 |
|---|--------------------------|-------------------------|--|---------------------------------------|-----------|---------------------------------|-------------------------------------|
| Acute ecotoxic Category 1   | X                        | X                       | X  | X                                     | X         | X                               | X                                   |
| Chronic ecotoxic Category 1 (sufficient data, rapidly degradable)     | From 16th Edition (2009) | From 3rd Edition (2009) | From 2011 (Transitional period until 31/12/2012) | From 2014 (Pre usage from 01/01/2013) | From 2011 | --                              | Implementation date still not fixed |
| Chronic ecotoxic Category 2 (sufficient data, rapidly degradable)     | From 16th Edition (2009) | From 3rd Edition (2009) | From 2011 (Transitional period until 31/12/2012) | From 2014 (Pre usage from 01/01/2013) | From 2011 | --                              | Implementation date still not fixed |
| Chronic ecotoxic Category 1 (sufficient data, not rapidly degradable) | From 16th Edition (2009) | From 3rd Edition (2009) | From 2011 (Transitional period until 31/12/2012) | From 2014 (Pre usage from 01/01/2013) | From 2011 | --                              | Implementation date still not fixed |
| Chronic ecotoxic Category 2 (sufficient data, not rapidly degradable) | From 16th Edition (2009) | From 3rd Edition (2009) | From 2011 (Transitional period until 31/12/2012) | From 2014 (Pre usage from 01/01/2013) | From 2011 | --                              | Implementation date still not fixed |
| Chronic ecotoxic Category 1 (no sufficient data)                      | X                        | X                       | X  | X                                     | X         | X (Deviation to UN Regulations) | X                                   |
| Chronic ecotoxic Category 2 (no sufficient data)                      | X                        | X                       | X  | X                                     | X         | X (Deviation to UN Regulations) | X                                   |

|   | 1272/2008/EG |        | 67/548/EWG  | ADR2009 / 2011 | GHS         |
|---|--------------|--------|-------------|----------------|-------------|
| <b>Aquatic hazard, Acute (short-term) effect, Category 1</b>                                    |              |        |             |                |             |
| 96 hr LC50 (for fish)   | ≤ 1 mg/l     | and/or | identically | identically    | identically |
| 48 hr EC50 (for crustacea)  | ≤ 1 mg/l     | and/or | identically | identically    | identically |
| 72 or 96 hr ErC50 (for algae or other aquatic plants)   | ≤ 1 mg/l     |        | identically | identically    | identically |
|   |              |        |             |                |             |
| <b>Aquatic hazard, chronic (long-term) effect, Category 1</b>                                   |              |        |             |                |             |
| <u>Non-rapidly degradable substances for which adequate chronic toxicity data are available</u> |              |        |             |                |             |
| Chronic NOEC- or ECx-value (for fish)   | --           |        | --          | ≤0,1 and/or    | identically |
| Chronic NOEC- or ECx-value (for crustacea)  | --           |        | --          | ≤0,1 and/or    | identically |
| Chronic NOEC- or ECx-value (for algae or other aquatic plants)                                  | --           |        | --          | ≤0,1           | identically |
|   |              |        |             |                |             |
| <b>Aquatic hazard, chronic (long-term) effect, Category 2</b>                                   |              |        |             |                |             |
| <u>Non-rapidly degradable substances for which adequate chronic toxicity data are available</u> |              |        |             |                |             |
| Chronic NOEC- or ECx-value(for fish)  | --           |        | --          | ≤1 and/or      | identically |
| Chronic NOEC- or ECx-value (for crustacea)  | --           |        | --          | ≤1 and/or      | identically |
| Chronic NOEC- or ECx-value (for algae or other aquatic plants)                                  | --           |        | --          | ≤1             | identically |
|   |              |        |             |                |             |
| <b>Aquatic hazard, chronic (long-term) effect, Category 1</b>                                   |              |        |             |                |             |
| <u>Rapidly degradable substances for which adequate chronic toxicity data are available</u>     |              |        |             |                |             |
| Chronic NOEC- or ECx-value (for fish)   | --           |        | --          | ≤0,01 and/or   | identically |
| Chronic NOEC- or ECx-value (for crustacea)  | --           |        | --          | ≤0,01 and/or   | identically |
| Chronic NOEC- or ECx-value (for algae or other aquatic plants)                                  | --           |        | --          | ≤0,01          | identically |
|   |              |        |             |                |             |

|  |                        |        |              |             |             |
|--|------------------------|--------|--------------|-------------|-------------|
| Aquatic hazard, <b>chronic (long-term) effect, Category 2</b>                        |                        |        |              |             |             |
| Rapidly degradable substances for which adequate chronic toxicity data are available |                        |        |              |             |             |
| Chronic NOEC- or ECx-value(for fish)   | --                     |        | --           | ≤0,1 and/or | identically |
| Chronic NOEC- or ECx-value (for crustacea)   | --                     |        | --           | ≤0,1 and/or | identically |
| Chronic NOEC- or ECx-value (for algae or other aquatic plants)                       | --                     |        | --           | ≤0,1        | identically |
|  |                        |        |              |             |             |
| Aquatic hazard, <b>chronic (long-term) effect, Category 1</b>                        |                        |        |              |             |             |
| 96 hr LC50 (for fish)  | ≤ 1 mg/l               | and/or | identically  | identically | identically |
| 48 hr EC50 (for crustacea)   | ≤ 1 mg/l               | and/or | identically  | identically | identically |
| 72 oder 96 hr ErC50 (for algae or other aquatic plants)                              | ≤ 1 mg/l               | and    | identically  | identically | identically |
| and the substance is   | not readily degradable | and/or | identically  | identically | identically |
| the experimentally determined  | BCF is ≥ 500           | or     | BCF is ≥ 100 | identically | identically |
| or, if absent  | log Kow ≥ 4            |        | log Pow ≥ 3  | identically | identically |
|  |                        |        |              |             |             |
| Aquatic hazard, <b>chronic (long-term) effect, Category 2</b>                        |                        |        |              |             |             |
| 96 hr LC50 (for fish)  | > 1 bis ≤ 10 mg/l      | and/or | identically  | identically | identically |
| 48 hr EC50 (for crustacea)   | > 1 bis ≤ 10 mg/l      | and/or | identically  | identically | identically |
| 72 oder 96 hr ErC50 (for algae or other aquatic plants)                              | > 1 bis ≤ 10 mg/l      |        | identically  | identically | identically |
| and the substance is   | not readily degradable |        | identically  | identically | identically |
| the experimentally determined  | BCF is ≥ 500           | and/or | BCF is ≤ 100 | identically | identically |
| or, if absent  | log Kow ≥ 4)           |        | log Pow ≥ 3  | identically | identically |
| unless the NOEC for the chronic toxicity is  | > 1 mg/l               |        | missing      | identically | identically |

### **3. Marking / Labelling**

#### **3.1 „Fish & tree“ mark (all modes of transport)**

Marking of the environmentally hazardous properties of a substance is carried out for all modes of transport by the “fish & tree” mark. Up to now the design of this mark was slightly different between the modal regulations. However, the design in the modal regulations has now been harmonized with the design shown in the UN Model Regulations, so that only marks meeting this design (see below) should be used (Note: The fish has no fins). In the IMDG Code, this has been amended by a respective corrigendum to the 34<sup>th</sup> Amdt. In the ADR/RID/AND, this will be implemented in the 2011 edition.

|  |   |
|--|---|
| <p><b>„Fish &amp; tree“ mark</b></p> <p>Source of information in the modal regulations:<br/>Symbol and description:</p> <p>ADR/RID/ADN 5.2.1.8.3:<br/>Environmentally hazardous substance mark</p> <p>IMDG Code 5.2.1.6.3:<br/>Marine pollutant mark</p> <p>IATA DGR 7.1.6.3:<br/>Environmentally hazardous substance mark</p> |  The image shows the "Fish & tree" mark, which is a diamond-shaped symbol with a thick black border. Inside the diamond, there is a stylized black silhouette of a tree on the left and a fish on the right. The tree has several branches and a horizontal line representing the ground. The fish is facing right and has a simple body with a pointed snout and a small eye. The background of the diamond is white. |
|--|---|

#### **3.2 Marking and labelling of packagings (all modes of transportation)**

##### **3.2.1 Marking requirements for packages**

The “fish & tree” mark is basically required for all packagings, containing substances that are “environmentally hazardous” according to the respective modal regulation, regardless of whether it is the only hazard or a subrisk.

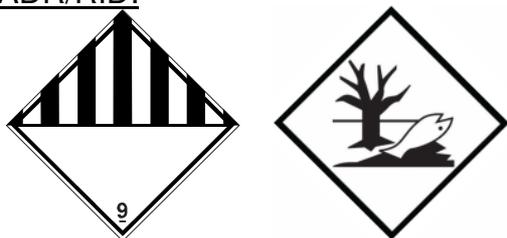
For labelling usage, the following requirements apply:

- To be placed adjacent to the UN number
- Readily visible and legible
- Shall be able to withstand open weather exposure without a substantial reduction in effectiveness (for the sea mode: Shall be such that this information will still be identifiable on packages surviving at least three month's immersion in the sea.)
- IBCs and large packagings > 450 L to be marked on two opposite sides

For marking of packagings, the following specifications for the "fish & tree" mark are required:

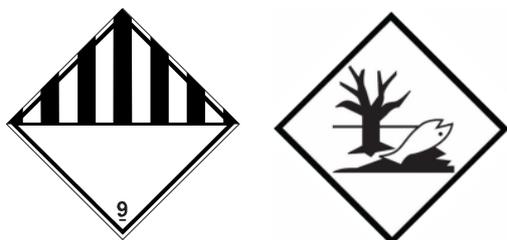
- The dimensions shall be at least 100 mm × 100 mm, except in the case of packages of such dimensions that can only bear smaller marks.
- Display of the Symbol ("fish & tree"): Black on white or suitable contrasting background

ADR/RID:



**UN3077**

IMDG-Code / ICAO-TI / IATA-DGR:

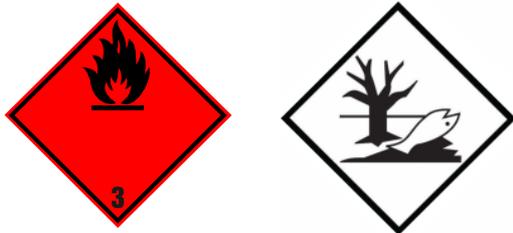


UN3077

Environmentally hazardous substance, liquid, n.o.s. (.....*Technical Name of environmentally hazardous substance*.....)

For dangerous goods of UN numbers other than UN 3077 or UN 3082, that have environmentally hazardous as a sub risk, there are the respective labelling/markings combinations. For example, a flammable paint (UN 1210) that meets environmentally hazardous (marine pollutant), the following labelling/markings combinations are required:

ADR/RID:



UN1210

IMDG-Code:



UN1210

Paint (.....*Technical Name of environmentally hazardous substance*.....)

ICAO-TI / IATA-DGR:



UN1219 Paint

For a generic describing the marking is as follows:

ADR/RID:



UN1993

IMDG-Code:



UN 1993  
Flammable liquid, n.o.s. (Technical Name of hazardous substance and technical Name of environmentally hazardous substance or the listed marine pollutant (all in English))

ICAO/IATA:



UN1993 Flammable liquid, n.o.s (Technical Name of hazardous substance)

### 3.2.2 Regulations for overpacks

When packages are combined into overpacks or unit Loads then:

- When packages in the overpack are marked with the fish & tree and this Symbol is not clearly visible from the outside, the overpack must be marked with the word "overpack" and the required markings on (see above) the packages contained in the overpack must be repeated on the outside of the overpack.
- Is it necessary to repeat the marking on the overpack, because the labelling and marking is not visible, so is a possibly existing Symbol „fish & tree“ also repeated. This currently only applies for the IMDG-Code, but from 2011 regulation applies for ADR/RID too.

### 3.2.3 Exception from the package labelling for small packing units

Packages containing 5 l or less for liquids or 5 kg or less for solids

- Per single packagings or
- Combination packagings per inner packaging,

may be waived from the "fish and tree" marking.

## 3.3 Marking of transport units

The specification for the "fish and tree" symbol for the marking of transport units is the same for the relevant mode of transport as in surface transport. However, the rules for the implementation of identification are different.

### **3.3.1 Specification of the symbol “fish and tree” for transport units (all modes of transport)**

For the marking of transport units, the following specifications for of the “fish & tree“ symbol are valid:

- A minimum dimensions of 250 mm by 250 mm
- Representation of the symbol in black on white or other suitable contrasting background

### **3.3.2 Marking of transport units for sea transport**

According to the IMDG Code, all transport units, which contain substances classified as environmentally hazardous, must be marked with the “fish and tree” symbol. This applies particularly if the transport unit carries packages excepted from the marking.

That means, any transport unit, with environmentally hazardous substances

- in Limited Quantities or
- contains by their content of less than 5 L or 5 kg exempted from the marking of packages

must be marked with the symbol “fish and tree“

In contrast, a transport unit, which contains only environmentally hazardous substances in excepted quantities, is exempted from marking the transport unit with the “fish and tree” symbol.

The application of marking transport units with the “fish and tree” symbol are analogous to the rules for the Placards:  
at least wagons on each side;

1. in cargo containers, semi trailers or portable tanks, one on each side and one at each end of the unit;
2. on wagons on each side;
3. on multi chamber tanks that contain more than one dangerous goods or its residues, on each side in the amount of the associations concerned;
4. for all other transport units, at least on two sides and the rear end of the unit.

### **3.3.3 Marking of transport units for land transport**

For land transport, the rules for affixing placards are in 5.3.1. Transport units, which contain substances classified as environmentally hazardous, must therefore be marked as follows with the „fish and tree“ symbol:

1. Freight containers, MEGCs, tank containers or portable tanks to both sides and at each end;
2. wagon at least every side;
3. on multiple compartment tanks that contain more than one dangerous goods or its residues, in addition along each side at the position of the relevant compartments;
4. bulk and tanker vehicles, battery vehicles and vehicles with demountable tanks to both sides and rear of the vehicle;
5. road vehicles used for carrying packages only, not at all (the same for swap-bodies on road vehicles).

### 3.3.4 Examples of special aspects for placarding of transport units

For environmentally hazardous substances

... in packages in road vehicles

- Transported by road, the "fish and tree" symbol is not required.
- IMDG-Code for maritime transport on ferries, the "fish and tree" symbol must be affixed along each side and the rear end of the unit.
- Transport by rail in piggyback transport, the "fish and tree" symbol can either be affixed and visible either on the road vehicle or on the wagons on both sides.

... transported in packages in swap bodies,

then the "fish and tree" symbol is

- Not required in pure road transport
- Multimodal transport by rail, barge or ship as well as for any other container is required on all four sides.

... in packages shipped in limited quantities (LQ) the "fish and tree" symbol on the transport unit

- Seas necessary
- Land transport not.

... in packages shipped as Excepted Quantities (EQ), the "fish and tree" symbol on the transport unit

- For all modes of transport is not required.

... transported in packages, where the maximum content of the packages or the biggest inner packaging is not more than 5 liters or 5 kg, for all means of transport no effect on the respective marking rules for the transport units.

### 3.4 Marking and labelling of packagings for air transport

In the ICAO-TI and the IATA-DGR does the "fish and tree" symbol apply only for packages of UN numbers 3077 and 3082.

For packages which contain other than these two UN numbers, according to the rules of other national or international transport regulations and are marked with the "fish and tree" symbol, these will be explicitly accepted (see the note to 7.1.6.3.1 from IATA-DGR 51st edition).

### 3.5 Summary

The information summarized in the table below relate only to the additional marks for environmentally dangerous substances and mixtures. Other "normal" markings for dangerous goods (such as labels for other dangers, UN number, proper shipping name, orientation arrows, etc.) are not addressed here, but must be considered when preparing packages for transport.

| ADR/RID/ADN   | IMDG-Code  | ICAO-TI / IATA-DGR   |
|---|--|--|
| starting on 01/01/2011  | starting on 01/01/2010   | starting on 01/01/2009   |
| Marking with "fish and tree"                                      | Marking with "fish and tree"   | Marking with "fish and tree" only for the UN-numbers UN3077 and UN3082 |
| --  | Add recognized chemical name of the marine pollutant for generic or "not otherwise specified" (N.O.S.) entries | --   |
| exception < 5 liters / 5 kilogram per packaging (inner or single) | exception < 5 liters / 5 kilogram per packaging (inner or single)  | exception < 5 liters / 5 kilogram per packaging (inner or single)      |
| Since 01/06/2009 in force for the UN-number UN 3077 and UN3082    |  |  |

## **4. Transport documents**

For different transport modes there are also different transport document requirements.

### **4.1 ADR/RID/ADN (without tank vessels on inland waterways)**

Today, there are no additional requirements regarding the transport documents in the regulations for road, rail and inland waterway transports (not applicable for tank vessels) with respect to environmentally hazardous substances.

Starting on 01/01/2011, a new entry will be required for ADR, RID and ADN with a transition period until 01/07/2011. New paragraph 5.4.1.1.18, "Special provisions for carriage of environmentally hazardous substances (aquatic environment)" will be implemented in chapter 5.4. From this date, a substance belonging to one of classes 1 to 9, which meets the classification criteria of paragraph 2.2.9.1.10 (ADN 2.2.9.1.10.1) shall carry in the transport document the additional notation "ENVIRONMENTALLY HAZARDOUS". This additional requirement does not apply to UN Nos. 3077 and 3082 or for the exceptions listed in 5.2.1.8.1 (exception of packages with less than 5 l or 5kg). This means the new notation is only needed, when the "fish and tree" marking is required (exception for UN-numbers UN3082 and UN3077).

Example: "UN 1133, Adhesives, 3, II (D/E) environmentally hazardous."

For carriage in a transport chain including sea transport, it will be allowed to replace the words "ENVIRONMENTALLY HAZARDOUS" by the statement "MARINE POLLUTANT", pursuant to Subsection 5.4.1.4.3 of the IMDG Code.

### **4.2 IMDG-Code**

For maritime transport, a mandatory declaration for environmentally hazardous substances as "marine pollutant" currently exists (see subsection 3.1.2.9 5.4.1.4.3.5 in connection with IMDG).

This obligation applies to all classes and for UN numbers 3077 and 3082.

Moreover, all generic and n.o.s.-entries for substances containing environmental hazards must be designated with a technical name. This means that even for generic entries where no danger triggers are required, it is necessary to add technical descriptors in the event of a marine pollutant.

Example: "UN 1133, Adhesives (contains Cyclohexane), 3, II, (-12 °C c.c.) marine pollutant"

### **4.3 ICAO-TI/IATA-DGR**

For air transport, no additional documentation requirements exist for environmental hazardous substances (except UN 3077 and UN 3082).

#### 4.4 ADN (tank vessels on inland waterways)

There are additional requirements regarding documentation for transport in a tank vessel on inland waterways. For the additional classifications of groups N1 to N3, this information must carry over in the transport documents. Furthermore, the hazards of the environment which meet the criteria of GESAMP must be documented. The latter are floaters ("F", to swim, does not evaporate and is poorly soluble) or Sinker ("S", drops to the ground and is poorly soluble). This information is included in Table C Section 3.2.3 in the ADN.

Example: "UN 1157, Diisobutylketone, 3 (N3, F), III"

It should also be noted that for tank vessel transport on inland waterways, substances also must be classified and declared in accordance with GHS in "Acute 2", "Acute 3" or "Chronic 3", with the substance identification number 9005 and the description "environmentally hazardous substance, solid, n.o.s., molten" or "9006 environmentally hazardous substance, liquid, n.o.s." assigned.

#### 4.5 Summary

| ADR/RID/ADN   | IMDG-Code   | IATA-DGR / ICAO-TI | ADN (tank vessel)   |
|---|---|--------------------|---|
| from 01/01/2011   |   |                    |   |
| Additional claim "ENVIRONMENTALLY HAZARDOUS" if the criteria are met.<br>"MARINE POLLUTANT" allowed in case of an sea-transport (from or to the harbor) | Additional claim "ENVIRONMENTALLY HAZARDOUS (MARINE POLLUTANT)", if the criteria are met.                       | --                 | Additional indication of the classification group (N1 - N3) and Floater or Sinker (F, S). Additional Declaration of GHS "Acute 2 and 3" substances. (substance identification numbers 9005 or 9006) |
| Exception: UN 3077 / UN 3082 and no markings with-fish and tree required (<5 liters / 5 kg per packaging)   | --  | --                 | --  |
| --  | Approved chemical name of the marine pollutants required for all generic or n.o.s. entries as a technical name. | --                 | --  |

## **5. Other**

### **5.1 Exceptions and special provisions for environmentally hazardous substances and mixtures**

For certain substances, the classification as environmentally hazardous substances (aquatic environment) may still be affected by special provisions of the Dangerous goods regulations.

#### **5.1.1 Viscous Substances**

Prior to 2009/2010 viscous, non-toxic and non corrosive substances with a flashpoint higher than 23 °C in packaging sizes smaller than 450 liters were not subject to ADR/RID/ADNR/ADN (according to Section 2.2.3.1.5) and packages less than 30 liters according to subsection 2.3.2.5 are more or less not subject to the IMDG Code (except the requirements for separation and documentation). From 2009/2010, a new condition for that exemption was introduced. This has now the consequence that viscous substances having a flash point above 23 °C cannot be exempted, if the substance is classified as a Class 3 substance, the packages are marked with "fish and tree" and if they are not exempted by the quantitative limitations of the marking.

#### **5.1.2 New Special Provision 335 for non-dangerous solids containing environmentally hazardous liquid substances (e.g. cleaning tissues)**

A **new** „special provision 335“ for not-hazardous solids, containing environmentally hazardous liquid substances is now listed in the Dangerous Goods Regulations:

##### **ADR/RID/ADNR/ADN**

Mixtures of solids which are not subject to the requirements of ADR and environmentally hazardous liquids or solids shall be classified as UN 3077 and may be carried under this entry provided there is no free liquid visible at the time the substance is loaded or at the time the packaging or vehicle or container is closed. Each vehicle or container shall be leak proof when used for carriage in bulk. If free liquid is visible at the time the mixture is loaded or at the time the packaging or vehicle or container is closed, the mixture shall be classified as UN 3082. Sealed packets and articles containing less than 10 ml of an environmentally hazardous liquid, absorbed into a solid material but with no free liquid in the packet or article, or containing less than 10 g of an environmentally hazardous solid, are not subject to the requirements of the ADR / RID.

##### **IMDG-Code**

335 Mixtures of solids which are not subject to the provisions of this Code and environmentally hazardous liquids assigned to UN 3082 may be classified and transported

as UN 3077, provided there is no free liquid visible at the time the substance is loaded or at the time the packaging or cargo transport unit is closed. Each cargo transport unit shall be leak proof when used as a bulk packaging. Sealed packets and articles containing less than 10 ml of an environmentally hazardous liquid assigned to UN 3082, absorbed into a solid material but with no free liquid in the packet or article, or containing less than 10 g of an environmentally hazardous solid assigned to UN 3077, are not subject to the provisions of this Code.

### **5.1.3 Exception from the packaging requirements for receptacles with contents of 5 liters/5 kilograms or less**

With respect to paints (UN 1210 / UN 1263), adhesives (UN 1133) and resin solutions (UN 1866), valid facilitations for packaging requirements for packages not more than 5 liters are applicable from 2009 for environmentally hazardous paints, adhesives and resin solutions.

PP 1 – For UN Nos. 1133, 1210, 1263 and 1866 and for adhesives, printing inks, printing ink related materials, paints, paint related materials and resin solutions which are assigned to UN 3082, metal or plastic packagings for substances of packing groups II and III in quantities of 5 liters or less per packaging are not required to meet the performance tests in Chapter 6.1 when carried:

- a) in palletized loads, a pallet box or unit load device, e.g. individual packagings placed or stocked and secured by strapping, shrink or stretch-wrapping or other suitable means to a pallet; or
- b) as inner packagings of combination packagings with a maximum net mass of 40 kg.