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Working Party on the Transport of Dangerous Goods**

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**Reports of informal working groups**

**14 March 2014**

**Comments on document INF 14**

**Information by the Chairman of the Joint meeting**

1. In the annexes of the report on the first workshop on risk evaluation and assessment in the context of rail, road and inland waterways Transport of Dangerous Goods, 8-9 October 2013, a study undertaken by the European Commission had been mentioned and presented in its early stage.

2. On 14 February a more advanced summary of that study was presented in a workshop held in Brussels. This progress summary is annexed to this document only for information of the delegates that could not attend the workshop. It does not commit anybody or represent any official position at this stage.

PROGRESS SUMMARY REPORT

# Harmonised Risk Acceptance Criteria for Transport of Dangerous Goods

European Commission DG-MOVE

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**Task and objective:**

This document summarises the progress on a study analysing the feasibility of defining and using harmonised risk acceptance criteria in decision-making for justification of safety measures in the inland transport of dangerous goods in the European Union

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## 1 SUMMARY

This document summarises the progress on a study analysing the feasibility of defining and using harmonised risk acceptance criteria in decision-making for justification of safety measures in the inland transport of dangerous goods in the European Union.

## 2 BACKGROUND

The transport of dangerous goods (TDG) throughout the inland regions of the European Union (EU) is governed by the ADR, RID and ADN regulations for road, rail and inland waterways respectively<sup>1</sup>. In principle, these uniform regulations should permit free movement of dangerous goods (DG) at an acceptable level of safety. In practice, because Member States (MS) are also able to apply additional safety requirements where they are considered appropriate, this objective is not completely fulfilled. The additional requirements appear sensible in their intended area of application, but may produce inconsistencies and adverse impacts elsewhere, resulting in increases in cost for industries and unequal protection against risk for the public. One fundamental cause of these inconsistent and sub-optimal impacts may be the lack of explicit harmonised risk acceptance criteria (RAC) for TDG.

The European Commission Directorate-General for Mobility and Transport (DG-MOVE) has therefore commissioned Det Norske Veritas Ltd (DNV)<sup>2</sup> to perform a feasibility study on harmonising RAC for TDG in the EU.

## 3 OBJECTIVE

The objective of the study is to analyse the feasibility of defining and using harmonised risk acceptance criteria in decision-making for justification of safety measures in the inland transport of dangerous goods in the European Union.

## 4 APPROACH

Task 1 of the study surveyed the various approaches to RAC of TDG that are in use in the EU, Norway and Switzerland. Task 2 evaluated possible approaches to developing harmonised RAC, and drew conclusions on their technical feasibility. Task 3 considered the practical and legislative implications of the harmonised RAC and assessed the overall feasibility of the harmonised approach.

The present report summarises the progress on all three tasks of the study, prior to a public workshop with representatives of Member States.

## 5 APPLICATION

The intended scope of application of the harmonised RAC is as follows:

- Risks of accidents causing fatalities. The RAC are also intended to take account of other impacts, including injuries, damage to property and infrastructure, and environmental impacts.
- Transport by road, rail and inland waterways. The study also considers whether the RAC can also be applied to pipelines.


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<sup>1</sup> ADR: the European Agreement concerning the International Carriage of Dangerous Goods by Road, concluded at Geneva on 30 September 1957;

RID: the Regulations concerning International Carriage of Dangerous Goods by Rail, appearing as Appendix C to the Convention concerning International Carriage by Rail (COTIF) concluded at Vilnius on 3 June 1999;

ADN: the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways, concluded at Geneva on 26 May 2000.

<sup>2</sup> Following a merger with Germanischer Lloyd in 2013, DNV is now part of DNV GL.

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- Transport of dangerous goods under the scope of ADR/RID/ADN.
  - Transport within Europe. This includes the 28 EU MS, plus Norway and Switzerland. There is no technical reason why the harmonised RAC could not also apply world-wide.
  - Transport between fixed installations or ports, including temporary stop areas (lorry parking, marshalling yards etc). The RAC are intended to harmonise with existing approaches for fixed installations.
  - Transport at any scale, including individual DG shipments, whether existing or proposed, cumulative DG transport past a point or along a route, national totals and overall EU DG transport.

The harmonised RAC are intended to be used primarily for evaluation of decisions on additional restrictions under ADR/RID/ADN Chapter 1.9. They could also be used to evaluate other safety decisions such as approval of new DG transport or land-use developments near existing DG transport routes.

## 6 DEFINITION OF RAC

“Risk criteria” are defined by ISO as “terms of reference against which the significance of a risk is evaluated”. “Risk acceptance criteria” is a slightly more specific term, indicating the standard for evaluating risk that is adopted by a decision-maker. In this report, terms such as “risk criteria”, “tolerability limit” and “safety target” are all treated as broadly equivalent to RAC.


The report includes RAC of the following forms:

- Risk matrix RAC.
- Individual risk RAC.
- Societal risk RAC, including fatality rates and FN curves.
- Cost-benefit criteria, which are not strictly RAC but are closely connected to them.
- Consequence RAC.
- Qualitative RAC, defining the conditions under which a risk is accepted in any qualitative way.

RAC are small but critical elements within a larger methodology that defines how risks are assessed and managed. The metric chosen for the RAC may determine the methodology that is required in the assessment – for example, qualitative RAC or cost-benefit criteria require corresponding qualitative or cost-benefit approaches to the risk assessment. Therefore, in this report, the “approach” refers to the metric for the RAC and the implied approach to the risk assessment. For brevity, the report focusses on harmonising the RAC. In due course, it will be necessary to harmonise the other elements of the risk assessment process once the RAC have been chosen.

## 7 THE NEED FOR HARMONISED RAC

Under Chapter 1.9 of ADR/RID/ADN, national authorities may make decisions about restrictions beyond those specified in ADR/RID/ADN, as well as other safety measures for TDG.



At present, these decisions use a variety of implicit and explicit RAC. This non-harmonised system causes several problems and inconsistencies.

One key problem is that different RAC can lead to different restrictions on TDG for similar situations in different MS, causing unequal protection against hazards or competitive disadvantage for some transport operators. An operator wishing to transport DGs across Europe may be subject to various restrictions on the time of day, weather conditions, routes that may be taken, maximum permissible speeds and permissible locations to stop. These restrictions respond to local concerns, and vary widely between MS. They increase transport costs but do not necessarily manage safety in an effective way. A harmonised approach is required to eliminate these inconsistencies.

Another type of problem is that RAC applied for good reasons in one location can result in unexpected changes to TDG, as operators change routes, transport modes or supply patterns. These changes can alter the risk pattern, and in some cases may increase the overall risk. An approach that is harmonised across the whole transport and production operation has the potential to eliminate these unintended effects.

Most of the additional restrictions that have been adopted under Chapter 1.9 of ADR/RID/ADN prohibit TDG of certain types, in certain locations, weather conditions or times of day. These all impose costs on operators in an attempt to protect local populations or infrastructures. Few MS have attempted to manage their infrastructure to achieve an optimum balance between risk and investment in safety measures. RAC provide a possible way of achieving this, and harmonised RAC provide a way of achieving a consistent approach at the EU level.

Some of the issues described above can be managed by national authorities, following the principle of subsidiarity. However, DG production and distribution is an international operation, and restrictions within one country often affect others. Some important restrictions affect TDG at international borders (e.g. through tunnels or over bridges), where they inevitably affect at least two countries. Some countries, located on transport routes between DG producers and consumers, may be subjected to the risks of TDG without receiving any of the benefits. Despite the international nature of the problem, no international standard RAC have yet emerged. For these reasons, EU-wide harmonisation is required.

## **8 SURVEY OF APPROACHES**

To understand the approaches to RAC of TDG that are in use in the EU, a survey of practice was carried out. A response was received from 86% of the countries contacted, covering all but one MS with significant movement of dangerous goods. It is evident from the responses that TDG is not managed in a consistent way either within MS or between them.


Seven MS reported no use of RAC and no additional restrictions beyond those in ADR, ADN and RID. No responding MS applied any additional restrictions to TDG by inland waterway.

Considering road and rail, another seven MS reported some restrictions on TDG, but no specific RAC. They are considered to use implicit RAC, comprising local judgement-based decision making, to determine if a restriction is required.

Eleven countries (9 MS plus Norway and Switzerland) and the Channel Tunnel Safety Authority reported using explicit RAC, although the forms of these varied widely.

Most published restrictions on TDG have no risk-based justification associated with them and vary widely between MS for the same hazards. For those MS using RAC it is not obvious how





the restriction contributes to the achievement of the RAC. This suggests that even those MS that make use of RAC do not do so transparently or consistently.

## 9 LITERATURE REVIEW

A literature review was conducted to give further information on the possible approaches that could be used for harmonised RAC, including:

- More specific information on the RAC that were reported in the survey.
- Historical information on the development of RAC in MS.
- RAC used in major hazard installations and non-DG road and rail transport.
- RAC used in other industries, including aviation and maritime transport.
- RAC used in other countries world-wide.

## 10 EVALUATION OF APPROACHES

Based on the survey and the literature review, DNV identified a set of 10 different approaches to RAC that were considered candidates for use in a harmonised approach. These were evaluated in the following ways:

- Are they aligned with the fundamental principles that have been identified for developing RAC?
- How far are they already in use for TDG in the EU?
- Do their current users consider they are suitable for a harmonised approach?
- Would they reduce the inconsistencies that exist in the current non-harmonised approach?
- What are their overall strengths and limitations with respect to other challenges in setting harmonised RAC?

It was concluded that each approach is beneficial in some respects, but no one approach has overwhelming strengths or limitations. Therefore, a harmonised approach is proposed, combining elements from all of the candidate approaches, and addressing all the fundamental principles.

## 11 PROPOSED HARMONISED RAC

DNV's proposed harmonised approach to RAC includes seven distinct elements:

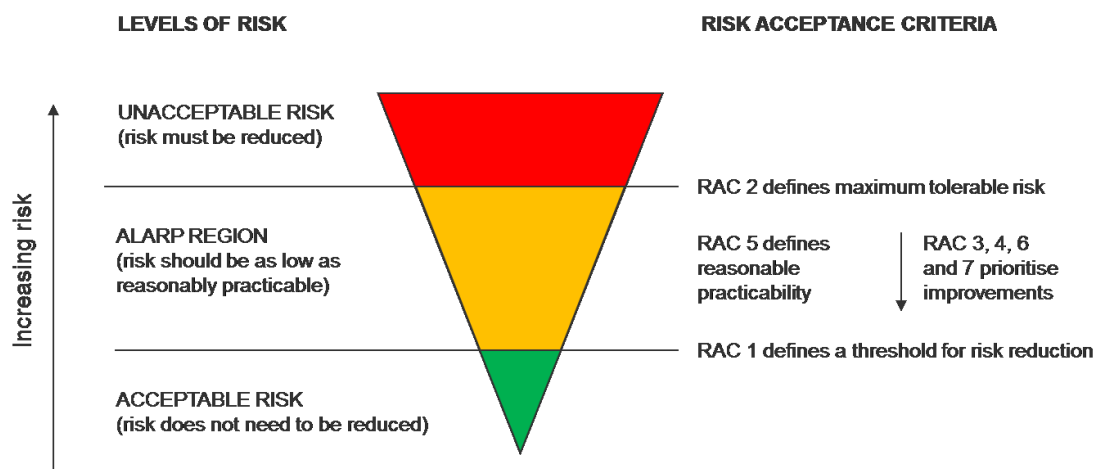
1. Threshold criteria, expressed as an expectation value of fatalities per year. Below this, detailed risk assessment and further risk reduction would not be required.
2. Individual risk (IR) criteria, expressed as maximum tolerable risks of death per year for the most exposed individuals. Above this, the risk would not be acceptable. This aims to protect individual workers or members of the public from unfairly high risks.
3. Societal risk (SR) criteria, expressed as FN curves for the most exposed communities. Above this, measures to reduce catastrophe risk should be investigated.



4. Scrutiny level, expressed as an expectation value of fatalities per tonne of DG transported over a route. Above this, justification of the transport would be needed, and additional restrictions or safety measures should be investigated. The scrutiny level aims to ensure that the risks of TDG are justified by its benefits.
5. ALARP criteria (i.e. defining what is as low as reasonably practicable), consisting of either qualitative or cost-benefit criteria for evaluation of additional restrictions or safety measures. This aims to ensure that restrictions are optimised, taking account of the costs and benefits of risk reduction.
6. Improvement target for TDG, expressed as an expectation value of fatalities per year from all modes of TDG. This would be used to monitor performance and propose additional restrictions or safety measures.
7. Improvement target for DG, expressed as an expectation value of fatalities per year from all production and transport of DG. This would be a possible way of monitoring and improving consistency with requirements for fixed installations.

Only two of these elements (RAC 2 and 5) would determine the need for additional restrictions or safety measures. The other RAC are aimed at minimising analysis effort (RAC 1) and focussing improvement efforts (RAC 3, 4, 6 and 7). The relationships are summarised in Figure 1.

**Figure 1 Summary of Harmonised RAC**



In most TDG cases the core of the evaluation would be the ALARP criteria (RAC 5). In simple terms, provided risks have been considered on a broad scale, and are not exceptionally high by any of the other RAC, a restriction on TDG can only be justified if it is necessary to make the risks ALARP, i.e. if the costs of the restriction are outweighed by its benefits in terms of risk reduction, or if it is judged to comprise part of good operating practice.

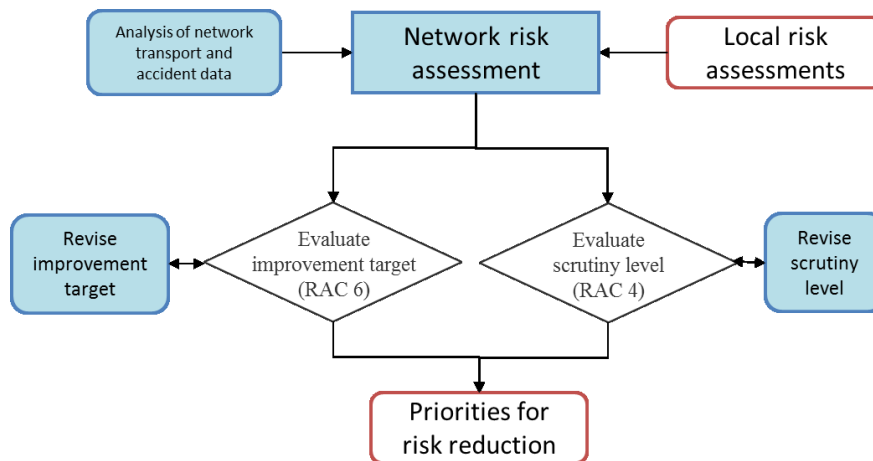
## 12 IMPLEMENTATION

The proposed implementation scheme is within a risk assessment that takes place at two levels:

- A network risk assessment, evaluating the whole TDG network (Figure 2). This would show whether the network was meeting its targets for continual improvement (RAC 6); and whether the risks from international trades were justified by their benefits (RAC 4).

It would determine if further risk reduction were necessary at a network level, and if so propose priorities for it. This would give direction to local risk assessments, but would not normally conclude on the need for specific risk reduction measures. In some cases it may also consider other RAC that are relevant at network level (RAC 2, 3 and 5), and ultimately could also address risks from fixed installations (RAC 7).

**Figure 2 Network Risk Assessment**



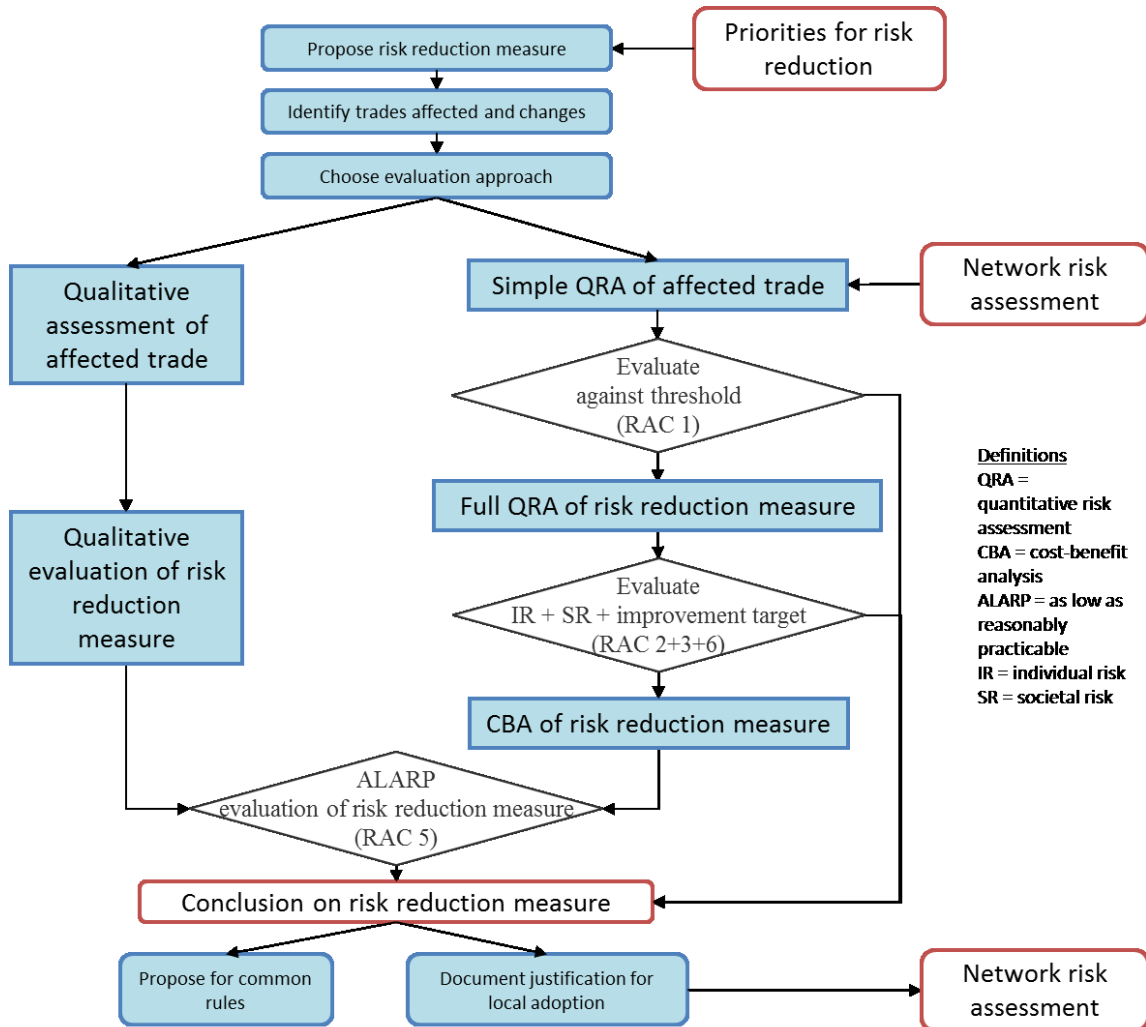
- Local risk assessments, evaluating specific risk reduction measures on individual TDG trades or at specific locations (Figure 3). This would show whether the risks exceeded the threshold requiring detailed evaluation (RAC 1); whether individual and societal risks arising from the specific TDG trade were acceptable (RAC 2 and 3) and improving at the required rate (RAC 6); and whether all reasonably practicable risk reductions had been adopted (RAC 5). Either qualitative or quantitative assessment would be possible. It would conclude on the need for additional restrictions or other risk reduction measures for the specific trade or location.

## 13 LEGISLATIVE IMPLICATIONS

Based on a brief review of the legislative options and preliminary discussion with DG-MOVE, DNV recommends the following changes to EU policies and legislation:

- A new directive on DG safety in all transport modes. This would include road, rail and inland waterways, but could also conveniently cover pipelines. It would state the harmonised RAC and explain how they are intended to improve safety. Where MS intend to apply restrictions on TDG, it would require them to make a risk assessment covering the complete scope of changes in TDG that may result, and supply the results to the Commission for use in the EU level network risk assessment.
- Adjustment of the Commission's existing policy on road safety to include TDG risks explicitly.
- Adjustment of the common safety targets (CSTs) for rail safety to include TDG risks explicitly.

**Figure 3 Local Risk Assessment**



In addition, DNV recommends the Commission should take the following organisational steps:

- Analyse the data on TDG activity and incidents that has been collected under existing legislation, in order to produce accident frequencies suitable for the network and local risk assessments.
- Develop a suitable methodology for the network and local risk assessments.
- Conduct an initial network risk assessment as a research study, using voluntary assistance from MS.
- Develop a process for setting the specific values of the harmonised RAC.
- Communicate with MS the priorities for risk reduction that are selected in the network risk assessment, and review the results of local risk assessments of TDG restrictions.
- Review periodically the harmonised RAC, in the light of practical changes to TDG restrictions that they support, and adjust the RAC if necessary.

## 14 IMPACT ASSESSMENT


The impacts of the harmonised RAC, if implemented through the preferred legislative options, are assessed as follows:

- Public safety - harmonised RAC are considered to be a contribution to maintaining the current levels of risk in TDG, and helping to ensure that they do not increase in the future, but are not expected to achieve any major reduction in risk.
- Internal market - a positive impact, which is considered to be one of the main benefits of harmonised RAC.
- Business costs - the net effect is expected to be large and positive in the long-term, although in the short-term there will be costs before any benefits occur.
- Public authorities – if restrictions are proposed, there will be a significant cost of performing risk assessments, but this is already required to justify restrictions under ADR and RID, so it is not strictly an additional burden.
- Specific transport modes - no major unwanted impacts on individual transport modes are anticipated.
- Transport infrastructure - any impacts are expected to be small.
- Climate change - impacts are expected to be beneficial, and any adverse effects will be fully justified.
- The environment - any impacts are expected to be small.

Overall, there will be costs to public authorities and (in the short-term) to TDG operators. In the long-term, beneficial impacts on the internal market are expected to dominate.

## 15 ACRONYMS

ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ALARP	as low as reasonably practicable
CBA	cost-benefit analysis
CST	common safety targets
DG	dangerous goods
DG-MOVE	Directorate-General for Mobility and Transport
DNV	Det Norske Veritas
EU	European Union
FN	frequency-number of fatalities
IR	individual risk
ISO	International Organization for Standardization
MS	Member State
QRA	quantitative risk assessment
RAC	risk acceptance criteria



RID	Regulations concerning International Carriage of Dangerous Goods by Rail
SR	societal risk
TDG	transport of dangerous goods



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