

COMMON SAFETY TARGETING FOR THE EUROPEAN RAILWAYS: A REGULATORY TOOL FOR MONITORING SAFETY AND REDUCING DIFFERENTIATION

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1. THE EUROPEAN UNION LEGISLATION ON SAFETY TARGETING

1.1 Introduction

The European Union (EU) first introduced common safety targeting for railways in 2004, with the railway Safety Directive [1]. Common Safety Targets (CSTs), together with Common Safety Methods (CSMs) and Common Safety Indicators (CSIs), are in fact the pillars on top of which the EU intended to develop, on the basis of the mentioned Directive, a common approach to a risk based railway safety regulation in the different Member States.

Detailed harmonisation of safety monitoring within the EU began in 2003, with two specific regulations [2], [3], establishing a common framework for reporting national railway transport and accident statistics to Eurostat, starting from year 2004. The safety directive took this approach forward, by introducing a set of CSIs which considers, amongst others, a more detailed classification of individuals exposed to risk and also includes some economic indicators related to the cost of accidents. In the medium term Eurostat and CSI statistics on railway accidents will converge into a single consolidated CSI-based statistical framework.

The European Railway Agency, following the requirements of the Safety Directive, developed further the CSIs by providing common definitions and modifying the economic indicators, with a view of making CSIs more suitable for calculating and enforcing CSTs [4]. A common methodology (CSM) was also developed for calculating and assessing achievement of CSTs by Member States. This methodology was adopted by the European Commission on the 5th of June 2009, by means of a specific Decision [5].

The Agency is now ready to recommend to the European Commission the adoption of the 1st set of CSTs, calculated on the basis of the mentioned CSM by using Eurostat data as input. Development of CSTs will continue with a 2nd set which will make full use of CSIs data.

1.2 The EC Decision establishing the CSM for calculating and assessing achievement of CSTs

The European Commission established the methodology for calculating and assessing the achievement of CSTs by means of a Decision [5] addressed to the member States of the EU, which entered into force on the 14th of June 2009.

The scope of this Decision is limited to the whole railway system in operation within each Member State, with the exclusion of the metros, trams or other specific networks like e.g. private networks (for more details refer to Article 2, point (a), (b) and (c) of the Safety Directive).

The methodology is based on the general underlying principles directly coming from Article 7 of the Safety Directive, to base the 1st set of CSTs on an examination of existing targets and safety

performance of railway systems in Member States, as well as to ensure that the current safety performance of the railway system is not reduced in any Member State.

The concept of National Reference Value is introduced at this regard, aimed at attributing quantitative reference values to safety performances of railway systems in Member States and monitoring compliance with the requisite of maintaining the current safety performance of railways.

The requisite of ensuring consistency of national safety rules with the regulatory framework introduced by NRVs and the 1st set of CSTs is also addressed to Member States, in compliance with Articles 7 and 8 of the Safety Directive.

The statistical data to be utilised as input for implementing the methodology are those provided by Eurostat and National Safety Authorities of Member States. In particular, time series of accident data and related consequences, respectively issued in compliance with Regulation [2] and Annex I to the Safety Directive (CSIs), will be considered. A criterion is introduced for giving priority to Eurostat data with respect to CSIs in case of numerical inconsistencies between the two datasets, based on the consideration that Eurostat data span over a longer period of time (4 years instead of 2) and are less biased by differences existing between the national definitions of statistical indicators reported. The situation will, however, change in the medium term (i.e. approx 5 years) when, as anticipated in Section 1, the Eurostat and CSIs statistics on railway accidents will converge into a single consolidated CSIs-based statistical framework. As a consequence, starting from the 2nd set, the CSTs will be established only on the basis of CSIs data.

The measurement units of NRVs and 1st set of CSTs for the categories of individuals referred to in Article 7 of the Safety Directive take into account the consequences of significant accidents, measured in terms of equivalent fatalities (FWSIs, i.e. fatalities + 0.1 serious injuries) ⁽¹⁾ per year, and are normalised by means of an estimate of the exposure to risk (measured in terms of traffic volumes, such as the number of train-km per year, etc.).

The methodology considers weighted averages for calculating and assessing achievement of NRVs and CSTs by the Member States. These weighted averages are based on 4-year time series of data (2004-2007), with weights calculated to significantly smooth down the influence of high-consequence low-frequency accidents. If the number of zero values within the time series is more than two, the NRVs are established according to similarity criteria (i.e. by attributing the same NRVs as for one or more adjacent Member States). Independently from the 2nd set of CSTs, the methodology foresees an update of NRVs and 1st set of CSTs in 2011 by considering time series of data extended to 6 years (2004-2009).

Reference values of current safety performance will also be calculated at EU level, by cumulating the data related to the different Member States. This in order to calculate a sort of “European Reference Value” (EURV) for each risk category and identify the boundary of the EU risk tolerability zone by multiplying the EURV by a factor 10 (EURVx10) ⁽²⁾.

In compliance with Article 7(4) of the Safety Directive, a CST will be set for each of the risk categories listed in Table 1 of this paper; the value of the CST will be the lower between the highest NRV and

¹ Fatalities and serious injuries as defined by Regulation [3].

² The 10 value was estimated on the basis of current practice and research in the field of risk assessment.

the value identifying the boundary of the EU tolerability zone for the considered risk category. According to this, in the large majority of cases the achievement of NRVs will also automatically imply the achievement of CSTs.

In those very rare cases where the NRVs lie beyond the above mentioned EU risk tolerability zone (and therefore beyond the CST), the methodology establishes that in the Decision laying down the CSTs shall be described the procedure and, where applicable, the timetable for gradual implementation of the CSTs themselves, as required by Article 7(3) of the Safety Directive.

The methodology for assessing the achievement of NRVs consists of a 4-step semi-quantitative assessment model, which includes qualitative, in depth analysis for gaining a deeper insight into the real safety performance of railways in Member States, together with some reasonably enforceable measures to be adopted in case of non compliance.

In other words, the methodology for assessing the achievement of NRVs is essentially based on the obligation, coming from the Safety Directive for Member States, to at least maintain the current safety performance of national railway systems, but also on the full consciousness that the statistical monitoring of compliance with NRVs cannot inform - without additional and qualitative expert analysis - any decision or “judgement” on safety levels performed or to be attained by Member States.

2. THE FIRST SET OF COMMON SAFETY TARGETS

2.1 The problems coming from differentiation of sufficient safety performance within the EU

A founding principle of the Safety Directive stems from the acknowledgment that the current safety performance of railways is good in each of the EU Member States. On the other hand, diversification of railway systems operating in the different Member States does produce different safety performance, with a consequent negative impact on interoperability of national railway systems, on the mutual trust between the safety authorities of the different Member States and, in turn, on the creation of a fully open EU market for railway transport.

The NRV framework introduced by Decision [5] provides a tool for quantifying and reducing the current diversification of railway safety performance across the EU, even if a number of caveats reduce the reliability of this quantification. Notwithstanding the above mentioned legislation on harmonisation of railway statistics, the data reported by Member States on accidents and related consequences are, in fact, still lacking full comparability, due to persisting differences in scope and detailed definition of data. This, of course, generates a significant contribution to the amount of diversification we detect today. However the system is gradually improving, thanks to the work carried out by the Agency and Eurostat in this field, and the current framework is already able to provide us with a sufficiently reliable estimation of the orders of magnitude of such diversification.

According to calculations made by the Agency for developing the 1st set of CSTs, the diversification of safety performance across the EU, expressed in terms of difference between the collective risk ⁽³⁾

³ Measured as the ratio between the total equivalent fatalities and the total train-km operated p.a. within each Member State.

observed for the best and the worst performer, extends up to a factor 45 (ref. to chapter 2.2 for more details).

The framework introduced by Decision [5] for enforcing compliance with NRVs and CSTs by Member States is to be intended as a further step of a long term regulatory process at EU level, aimed at gradually steering safety performance of national railway systems towards a reasonably reduced diversification. This in full consistency with the long term process launched by the EU for creating a fully interoperable European railway system, where open competition between railway undertakings can exert its beneficial effects on the overall efficiency of railway transport.

2.2 The recommendation on 1st set of CSTs by the Agency

The first application of the methodology established by the Decision [5] is being made by the Agency for calculating the NRVs and the 1st set of CSTs. These values will be included in a specific recommendation that will soon be addressed to the European Commission for adoption.

The results of these calculations provided a further confirmation of the low levels of risk to which railways expose their customers, especially compared with road transport, but also confirmed the differentiation existing between the safety performance of railways within the different Member States of the EU, expressed in terms of both individual and collective risk. This is shown in Table 1 below.

Table 1 – Range of draft NRV values for the Member States of the EU

Risk Category	Range of NRV values (draft) (xE-09)		EURV (draft) (xE-09)	Measurement units
	NRV 1.1	NRV 1.2		
Risk to passengers	NRV 1.1	4,91 ÷ 250	34,4	Number of passenger FWSIs per year arising from significant accidents / Number of passenger train-km per year
	NRV 1.2	0,0557 ÷ 2,01	0,288	Number of passenger FWSIs per year arising from significant accidents / Number of passenger-km per year
Risk to employees	NRV 2	1,5 ÷ 77,9	14	Number of employee FWSIs per year arising from significant accidents / Number of train-km per year
Risk to level crossing users	NRV 3.1	21 ÷ 743	117	Number of level-crossing user FWSIs per year arising from significant accidents / Number of train-km per year
	NRV 3.2	Not available	Not available	Number of level-crossing user FWSIs per year arising from significant accidents / [(Number of Train-km per year * Number of level crossings) / Track-km]
Risk to "others"	NRV 4	1,90 ÷ 18,5	4,93	Yearly number of FWSIs to persons belonging to the category "others" arising from significant accidents / Number of train-km per year
Risk to unauthorized persons on railway premises	NRV 5	22,6 ÷ 2030	234	Number of FWSIs to unauthorised persons on railway premises per year arising from significant accidents / Number of train-km per year
Risk to the whole society	NRV 6	55,2 ÷ 2510	395	Total number of FWSIs per year arising from significant accidents / Number of train-km per year

The highest values of the ranges also identify the corresponding CSTs, because in no cases these values are beyond the corresponding EURVx10 ceiling for the tolerability of risk referred to in Chapter 1.2.

Several NRV values will be established on the basis of the territorial similarity criterion anticipated in Chapter 1.2., due to the already mentioned limitations on the quality of the data used for these calculations, but also as a consequence of the relevant number of zero values reported by some Member States within the considered time series.

The logic used for applying this criterion will be a sequential one (e.g. with reference to a given risk category, if Member State A has one adjacent Member State B having also more than two zero values for the considered FWSIs, it will be looked at the Member State C adjacent to Member State B, and so on until a Member State with two or less zero values for the considered FWSIs is found).

3. THE ROLE OF COMMON SAFETY TARGETS IN THE LARGER CONTEXT OF A LIBERALISED EU RAILWAY SYSTEM

3.1 The short term perspective

The 1st set of CSTs, which is due to enter into force in the short term, will introduce a transparent and harmonised platform for quantifying global railway safety performance in each Member State.

This will have the immediate benefit of preventing Member States from enforcing safety targets which are not consistent with the current safety performances of their respective railway systems as identified by the NRVs.

3.2 The long term perspective

In a longer term perspective, NRVs and CSTs will progressively reduce the range of variation of safety performance between Member States ⁽⁴⁾, increasing the degree of mutual trust between Member States and thus avoiding the use of safety as a barrier to market opening. Unfortunately, the fact that safety performance (i.e. the NRVs) varies a lot between Member States makes impossible the achievement of this objective in a short time frame.

The evolution of the CSTs has then to be regarded as a multistep process, which takes into account the effects of a number of other regulatory tools and actions introduced by the Safety Directive and requires several phases before sufficiently harmonised safety levels and interoperability can be achieved across the EU.

This evolution process will extend in the long term and its main steps can be briefly outlined as follows:

- 1) Through the 1st set of CSTs and NRVs, all MSs will get used to harmonised measurement and monitoring of their safety performance in terms of **risk levels**;
- 2) The updating of NRVs and 1st set of CSTs by using 6-year Eurostat time series, cross checked with CSI data, will improve reliability of NRVs and CSTs;
- 3) The 2nd set of CSTs will focus on any priority areas which should emerge from the experience of the 1st set, by gradually enforcing targeted safety improvements. In so doing a further step towards a more harmonised European safety performance will be achieved, also for the parallel improvement of accident statistics;
- 4) Meanwhile, as more railway subsystems and constituents are built or updated, and new operators enter new markets, the application of provisions and measures related to CSMs/TSIs/Safety Certification will facilitate a progressive reduction of differences in safety levels. This because:
 - a. the same technical specifications will be used when subsystems and constituents are built or significantly changed, or other decisions covered by the TSIs are taken;
 - b. for each “substantial change” introduced into the railway systems, the harmonised CSM framework introduced by Regulation [6] will be applied, regardless of which MS is implementing the change;
 - c. the Safety Certification framework will ensure that all railway undertakings have to go through the same level of scrutiny in all MSs and have the same level of procedures and safety management systems, etc. in place.

⁴ A significant help in achieving this objective will come from the fact that the margin of NRV differentiation due to the different data reporting systems currently adopted by the Member States will progressively diminish, thanks to the progress of the harmonisation policies put in place by the Safety Directive.

- 5) Then, any further revision of CSTs and NRVs will be able to “capture” the effects progressively produced by actions under points 2) and 3), until NRVs will become superfluous and CSTs will finally become truly common quantitative ceilings of the risk tolerability range to be considered within the EU.

4. REFERENCES

- [1] [Corrigendum to Directive 2004/49/EC](#) of the European Parliament and of the Council of 29 April 2004 on safety on the Communities railways, etc. Official Journal of the European Communities OJ L220, 21.6.2004, p.16-39.
- [2] [Regulation \(EC\) No 91/2003](#) of the European Parliament and of the Council of 16 December 2002 on rail transport statistics. Official Journal of the European Communities OJ L 14, 21.1.2003, p. 1-15.
- [3] [Regulation \(EC\) No 1192/2003](#) of 3 July 2003 amending Regulation (EC) No 91/2003 of the European Parliament and of the Council on rail transport statistics. Official Journal of the European Communities OJ L 167, 4.7.2003, p. 13-16.
- [4] European Railway Agency – Recommendation for the revision of Annex 1 to Directive 2004/49/EC: common definitions for the CSIs and methods to calculate the economic impact of accidents ([ERA/REC/SAF/02-2008](#)).
- [5] [Commission Decision No 2009/460/EC](#) of 5 June 2009 on the adoption of a common safety method for assessment of achievement of safety targets, as referred to in Article 6 of Directive 2004/49/EC of the European Parliament and of the Council. Official Journal of the European Communities OJ L 150, 13.6.2009, p. 11-19.
- [6] [Commission Regulation \(EC\) No 352/2009](#) of 24 April 2009 on the adoption of a common safety method on risk evaluation and assessment as referred to in Article 6(3)(a) of Directive 2004/49/EC of the European Parliament and of the Council. Official Journal of the European Communities OJ L 108, 29.4.2009, p. 4-19.