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ECONOMIC EVALUATION OF DRAFT RECOMMENDATION ERA-1175-1218 OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

The TSI revision package 2022 – Digital Rail and Green Freight

Document History

Version	*Date*	*Comments*
0.1	30/03/2022	Draft.
0.2	17/06/2022	Updated using feedback received.
1.0	08/07/2022	Final version for the recommendation.

Contents

1. Introduction

This annex contains the impact assessment (IA) on the total package of change request solutions that are part of recommendation ERA-1175-1218 of the European Union Agency for Railways which is part of the TSI revision package 2022 – Digital Rail and Green Freight.

In addition, separate IAs are provided for change requests with an important economic dimension, notably CR236 on transition, CR164 on derailment detection and CR171 on upgrading and renewal.

Considerable economic analyses have been performed for CR165 on the digital automatic coupler in conjunction with the European DAC Delivery Programme. As the detailed DAC specifications shall only be included in a future TSI revision, no separate IA is added here.

2. Impact Assessment – TSI Revision Package

1. Context and problem definition

1.1. Problem and problem drivers

The Technical Specifications for Interoperability (TSI) define the requirements for an optimal level of technical harmonisation for the Union rail system. Since the first TSI entered into force in 1999 (i.e. Decision 1999/569), multiple revisions fostered further harmonisation and the adaptation of the TSIs to technical progress, market trends and social requirements.

In January 2020, the European Commission (EC) requested the European Union Agency for Railways (ERA) to start a large revision of all TSIs. In the request the EC emphasised the need to promote digital rail and green freight. Importantly, the revision also allows to close open points, tackle deficiencies and address other topics that impede the development of the Union rail system.

The concurrent revision of multiple TSIs would enable a harmonised entry into force of several requirements, which enables the rail sector to better adapt to and plan for changes in requirements.

Several working parties were tasked to coordinate the revision. This impact assessment (IA) covers the work undertaken by the Working Party on the revision of TSIs (henceforth WP), which focuses on revising the INF, ENE, LOC&PAS, WAG, SRT, NOI and PRM TSIs. Beyond TSIs, the WP's work also results in recommendations for other legislation and documentation (e.g. the RINF Regulation, ETCS specifications).

It is important to note that the WP has embraced an approach in which the interfaces between TSIs were given particular attention. Resolving a number of inconsistencies and misalignments between TSIs have thereby been targeted.

By February 2022, the WP had received and processed 170 CRs. Of these, 54 CRs were assigned to a topical working group (TWG) or the ERA Core Team. Some CRs were rejected or superseded. Others CRs were postponed due to resource limitations and will be processed in a future revision cycle.

Each of the selected CRs was discussed in detail by National Safety Authorities (NSA), experts from representative bodies, ERA and others. The outcomes of these discussions are found in this recommendation.

Appendix 1 to this IA provides an overview of the key CRs and the underlying problem statements, benefits and costs. CRs that relate to editorial changes or that did not result in a material change to the TSIs (e.g. a C1 change) are not included in the Appendix.

1.2. Evidence of the problem

The full set of CRs in scope is provided in Appendix 1, including concise information on the evidence of the problem.

More evidence of the problem is provided by the details submitted by requestors of the CR in the ERA's CCM ClearQuest database. Each CR has unique identifiers and the full set of information about description, field of application, requestor, etc can be retrieved from the database.

It should be emphasized that the TSIs covered by this IA have been developed for over 20 years. As such, they are mature legal documents, with rather few open points and deficiencies. This makes that the number of CRs and magnitude of the problems are relatively limited.

1.3. Baseline scenario

Without a revision of the TSIs the issues that the sector observes with existing requirements or the absence thereof would persist. Moreover, there would be no contribution to the EC's digital rail and green freight agenda.

1.4. Main assumptions

This IA is based on the information provided by requestors and the TWGs on the problem statement, benefits, and costs. Additional data was collected where gaps were identified.

During the development of the CR solutions, alternatives have been discussed and assessed in-depth by the TWG and, where needed, additional economic analyses were performed. The solution as put forward by the WP is therefore considered the optimal proposal. That is why this IA assesses only one rather than multiple options. Appendix 1 highlights the benefits and costs of those proposals.

The WP aimed for all CR solutions to ensure compatibility with existing subsystems. All solutions comply with this principle with the probable exception of the CR on Digital Automatic Couplers (DAC). While DAC requirements are planned to come into force with the 2025 TSI revision, the discussions suggest that a certain degree of retrofitting of the existing fleet will be necessary.

A separate IA has been developed for three CRs for which there was a distinct economic aspect to the solutions discussed. These are CR236 (Transition), CR165 (Derailment Detection), and CR164 (Digital Automatic Couplers).

A final assumption is that the packaging of solutions to TSI CRs into one larger revision reduces the administrative burdens and potential misalignments associated with a fragmented, spread-out update of TSIs. The approach is therefore seen as more efficient compared to scattered proposals for solutions.

1.5. Stakeholders affected

The CRs covered by this IA affect a large number of TSI requirements and thus many stakeholders. The entire EU rail sector within the scope of the abovementioned TSIs is impacted. Some CRs also impact third countries with which transport connections exist.

The list below highlights those stakeholders that will experience the effects of the TSI changes most.

Railway undertakings (RU)	☒	Member States (MS)	☐
Infrastructure managers (IM)	☒	Third Countries (TC)	☐
Manufacturers (MA)	☒	National safety authorities (NSA)	☒
Keepers (KE)	☐	European Commission (EC)	☒
Entity Managing the Change (EMC)	☐	European Union Agency for Railways (ERA)	☒
Notified Bodies (NoBo)	☒	Citizens living nearby railway tracks	☐
Associations	☐	Persons with reduced mobility (PRM)	☐
Shippers	☐	Passengers	☐
Ticket vendors	☐	Other (Please specify) …	☐

1.6. Subsidiarity and proportionality

The Agency carries a legal mandate to coordinate the revision of the TSIs and submit recommendations to the EC (EU 2016/796 Art. 5 & Art 19(1)(a)). For each CR a subsidiarity assessment took place. Based on this analysis, some CRs were not retained. All CRs processed by the WP have passed the subsidiarity test.

2. Objectives

2.1. Specific objectives

The objectives are to:

- Revise TSIs to support the optimal harmonisation of the Union rail system
- Facilitate digital rail and green freight

The priority has been put on those CRs that deliver the greatest contribution to these objectives.

3. Options

3.1. List of options

The baseline scenario, Option 0, implies the status quo in which no TSI revision takes place.

Besides the baseline scenario, only one option can be considered which is the implementation of the full set of CR solutions as endorsed by the WP. As indicated, for each CR several options have been discussed and assessed by the TWGs. The final proposals were deemed as the optimal solutions.

4. Impacts of the options

4.1. Qualitative analysis

Stakeholder assessment

Details on each of the CR solution's costs and benefits are presented in Appendix 1. This section focuses on the complete batch of CRs. On this level of aggregation, the impacts per stakeholder group are hard to discern, which is why the impacts are aggregated on the level of sector organisations and for authorities and assessment bodies. This provides a high-level overview on the expected impacts for different types of stakeholders.

Option 0 (Baseline)			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector organisations (IM/RU/MA/…)	Positive	No need to adapt to changing legislation, which limits administrative burden on existing projects.	Neutral
	Negative	Under the baseline scenario, sector requests to improve the TSIs are not considered. The legal framework will not be adopted to facilitate digital rail and green freight. Open points remain as such, limiting the further harmonisation of the EU rail sector.	
	Positive	No need to adapt to changing legislation. Limits administrative impacts related to the revision of authorisation processes and training.	Neutral

Authorities & Assessment bodies (MS/NSA/EC/ ERA/NoBo…)	Negative	While recognising that the TSIs are mature documents, several inefficiencies and deficiencies in existing authorisation processes will not be addressed. No contribution is made to further facilitate the growth of rail transport.	

Option 1			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector organisations (IM/RU/ MA/…)	Positive	Implementation of new requirements ensures alignment with recent technological developments, the closing of open points and in some cases a reduction of administrative barriers (e.g. transition framework). This will lead to a more competitive railway sector.	Rather positive
	Negative	There are costs linked to adapting subsystems and ICs to the new TSIs. It should be noted however, that these costs are softened and spread thanks to the seven-year timespan that applies to TSI changes under a generic TSI transition regime (i.e. C2 changes). The TSI revision covers a multitude of changes. For some changes the preferences between discussed solutions differed between sector organisations. As such, the overall impact is labelled 'rather positive' instead of 'very positive'.	
Authorities & Assessment bodies (MS/NSA/EC/ ERA/NoBo…)	Positive	The changes improve the competitiveness of rail by reducing administrative burdens (e.g. new transition framework), facilitating freight (e.g. requirements on combined transport), the partial closing of open points (e.g. changes to Appendix E TSI INF), and ensuring an optimal level of harmonisation (e.g. derailment detection, multi-pantograph operations, etc.).	Very positive
	Negative	Changes to the TSI requirements require an update of knowledge and procedures within the authorities and assessment bodies. While the revision will not close all open points, it does provide several improvements compared to the baseline.	

Railway system assessment

	Option 0 (baseline)	*Option 1*
Safety	Current TSIs already ensure high level of safety. Any critical safety issue would be targeted by an Opinion. As such, no critical issues with safety are noted under the baseline scenario.	No significant impact on safety to be expected from the CR solutions.
Interoperability	Under this option, there is no further change to the interoperability of the EU rail system.	The closing of open points and setting of new requirements related to technological progress shall ensure a further harmonisation of the EU rail sector and thus interoperability.
Competitiveness	No change in the competitive situation of rail.	Lower administrative burdens, changes to facilitate freight, and harmonisation efforts contribute to the greater competitiveness of rail.
Effectiveness	Neutral	Rather high

Coherency assessment

	Option 0 (baseline)	*Option 1*
Policy analysis	All TSIs have been assessed on their coherence with other relevant legislation by various legal services.	A few changes have been introduced to comply with changes in EU legislation (e.g. Drinking Water Directive). Rail standards have been updated in the TSIs to ensure higher levels of coherence.
Coherence	Rather high	Very high

5. Comparison of options and preferred option

5.1. Comparison of options

	Option 0 (baseline)		*Option 1*	
Stakeholder impact	Sector org	Auth & AsBo	Sector org	Auth & AsBo
Effectiveness	Neutral		Rather high	
Coherence	Rather high		Very high	

Colour legend	Very low/neg.	Rather low/neg.	Neutral	Rather high/pos.	Very high/pos.

5.2. Preferred option(s)

Based on the above analysis, there are clear arguments in favour of the TSI Revision package.

5.3. Risk assessment

The solutions have been drafted in close cooperation with industry experts, representative bodies and national authorities over the course of two years. Considering the elaborate and iterative discussions, as well as the detailed analyses underlying each change, there are few risks associated with the package.

Beyond the key changes presented in Appendix 1, there were several minor updates related to editorial changes or so-called C1 changes (e.g. CR245, CR360), for which compliance with the previous TSI ensures compliance with the new TSI in all cases. As negligible risks are associated with such changes these were out of the scope of this IA.

More information on these changes can be retrieved through the ClearQuest database and the CR overviews presented to the WP.

5.4. Further considerations

For three specific changes that are part of the TSI Revision package there were broader economic considerations at play, leading to a separate IA. These reports can be consulted for more in-depth information on which options are supported from an IA perspective and which risks were identified.

6. Monitoring and evaluation

6.1. Monitoring indicators

The general effectiveness can be tracked by, for example, a tracking of change requests in the ClearQuest Database to see if new requests emerge to alter clauses affected by this TSI revision package. This can highlight issues connected to the revision that may need to be addressed.

6.2. Future evaluations

No formal evaluation has been set for this Recommendation.

7. Sources and methodology

7.1. Sources

Desk research	☒	Interviews	☒
ERA database	☒	Meetings	☒
External database	☒	Survey	☒

A large amount of TWG meetings, bilaterals and 14 WP meetings are the foundation of the recommendation and this IA. In addition, several data gathering exercises took place, as well as analyses on ERA and non-ERA databases to better understand the current status and potential impact of different solutions.

Appendix 1. Overview of key change requests under the 2022 TSI Revision

CR	Title	Description of problem and solution	TSI	Main SH impacted	Benefit of solution	Costs of solution
437	Wagon marking parking brake	Different parking brake force calculation methods and unclarity on whether the holding force marking refers to minimum or maximum values leads to operational uncertainty and the placement of additional scotches. Retrieving these scotches can delay parking operations considerably. The solution is therefore to update the parking brake clause to consider the latest EN standard (EN 14531-1:2019) and to specify the minimum parking brake force for an unloaded wagon, the maximum parking brake force for a fully loaded wagon, and the breakover loading mass. Additionally, these parameters will be included in ERATV.	WAG	RU, IM	The solution optimises planned and unplanned parking operations, reducing the need for ad hoc scotch management, thus improving operational efficiency.	Administrative costs for the calculation of the parameters and inclusion in the technical file and ERATV.
351	Lamp controls	Flashing/blinking mode is used in some countries to indicate an emergency. In other countries it is strictly forbidden. This divergence in approaches was not fully accounted for in the TSIs. As the harmonisation of practices across Europe was found to be not possible at this stage, the activation/inhibition of lamp controls were further specified in the requirements, and specific cases introduced.	LOC&PAS	RU, IM	The solution acknowledges and clarifies the divergent practices between MS, and as such, prevents situations that can be potentially dangerous in a country.	The solution codifies the diverging practices in MS, preventing the harmonisation of one single European practice, which has cost implications in material functionalities and driver training information.
163	Define a procedure for testing the acoustic performance of composite brake blocks	Currently, there is no generally agreed procedure to verify the acoustic quality of new CBB types coming onto the market. The effectiveness and acoustic quality of the CBBs used so far was proven by noise emission measurements in field tests with appropriately equipped freight wagons in a complete train composition. Field testing to measure the pass-by level of a whole train is very time-consuming and expensive to organise, especially for new manufacturers of individual components entering the market. To make matters even more difficult, pass-by noise measurements requires high demands on the track quality (TDR; rail-roughness etc.), which are only available in prepared sections and in many cases not compliant with the normal standard track.	NOI, WAG	RU, MA CBB	For RUs: Confirmation that the acoustic emission limits can be met (applying the appendix E method will make a wagon on a reference track comply the TSI pass by noise limits. Greater choice of suitable products, thereby expanding and consolidating the procurement market of brake blocks. For MA CBB: With the bench test, the acoustic performance of the new product to be tested can be checked at a very early stage during the design phase. Nonetheless, whenever necessary, the development can be terminated if it becomes obvious that the desired acoustic performance cannot be achieved before the expensive and time-consuming safety-relevant brake tests take place.	MA CBB: IC Certification of existing CBB

CR	Title	Description of problem and solution	TSI	Main SH impacted	Benefit of solution	Costs of solution
		With field-tests, the verification is only done for the whole system in the combination of wagon + the installed CBB.			The bench test is comparatively more robust (high reproducibility and comparability of the results), less expensive and easier to organize in short time. The development process of new “quiet” brake-blocks will be speeded up and will lead to a better understanding of their best noise design parameters. Keeper: Greater choice of suitable products, thereby expanding the procurement market of brake blocks	
169 170	Harmonise interface requirements ENE & LOC&PAS, and requirements on multiple pantograph operations	There are several interfaces between ENE and LOC&PAS TSIs. Some interface requirements were not fully aligned, leading to operational and assessment issues. The Task Force identified nine priority topics that have been resolved, including current at standstill, uplift, phase separation, and power supply. Moreover, the TSIs were incomplete on multiple pantograph operations, particularly regarding pantograph arrangement and performance testing of trains with multiple pantographs. This, again, led to diverging practices and associated issues.	ENE, LOC&PAS	RU, IM	The solution contributes to the harmonisation of ENE and LOC&PAS TSI, resolving misalignments and unclarities for assessments and operations.	As the solution introduces C2 changes, no ongoing projects nor existing rolling stock or infrastructure is immediately affected by the changes, limiting the financial impacts. The updated requirements imply trainings costs for inspectors working at conformity assessment bodies.
171	Improve provisions when to apply the TSIs in case of upgrade/renewal *(Separate IA performed)*	For the INF and ENE subsystems there are concerns about the great level of divergence in TSI compliance. One of the reasons is the varied approaches amongst MS to make fixed installation subsystems TSI compliant after upgrading or renewal. The EC argues that due to slow and imperfect harmonisation the ‘benefits of operational uniformity, rapid development of train services, lower unit costs through standardised equipment and flexible reuse of assets across the EU rail network are also all lost’.	ENE, INF	IM, NSA, ERA	Benefits are mostly linked to a greater harmonisation of fixed installations across the EU rail network. A detailed description of the benefits can be found in the separate IA that is part of this Annex.	Negative impacts are mostly linked to higher foreseen costs for upgrading projects, notably process costs for EC verification. A detailed description of the costs can be found in the separate IA that is part of this Annex.
172 179	Harmonise interface requirements INF & LOC&PAS, and close the open point relative to the EN Line Category in Appendix E, Tables 38 and 39	There are several interfaces between INF, LOC&PAS, and OPE TSI. Some interface requirements were not fully aligned, leading to unclarities in the certification process and operational inefficiencies. As part of this CR solution a range of issues were resolved, including that the EN Line category shall be documented, in accordance with the updated EN 15528:2021, as part of the axle load parameter. TSI OPE Appendix	INF, LOC&PAS, OPE	RU, IM	The harmonisation of the INF, LOC&PAS and OPE TSIs will substantially improve interoperability and reduce administrative burdens related to train operations.	The solution results in new elements being added (e.g. under the axle load parameter) that need to be assessed and registered, leading to additional administrative costs.

CR	Title	Description of problem and solution	TSI	Main SH impacted	Benefit of solution	Costs of solution
		D1 shall be updated to make that the above standard is used for static compatibility checks, further facilitating RCC. On top of these changes, a long-standing open point relative to the loading capability requirements for bridges was closed, besides for the 1520 and 1600 gauge tracks.				
165	Define the interoperability requirements for automatic couplers for freight wagons *(Ongoing economic analyses in conjunction with the EDDP)*	A key component of the digital freight agenda is the DAC. Compared with the current screw coupling, DAC facilitates automated (un)coupling and telematic functionalities, leading to time and quality gains. The implementation implies a high-cost retrofitting exercise, which makes that a cost-benefit analysis is key. The definition of the requirements occurs in cooperation with the EDDP. As the full specification for DAC was not complete on time for the TSI 2022 revision, the changes to the TSI are limited.	WAG, LOC&PAS, OPE	RU, IM, MA, KE, NSA, ERA	The initial CBA results show a positive benefit-cost ratio for DAC. Further analyses shall be conducted.	The initial CBA results show a positive benefit-cost ratio for DAC. Further analyses shall be conducted.
164	Consider the inclusion of the derailment detection function *(Separate IA performed)*	Relatively few (~1000) derailment detection (DD) units are installed on wagons today. Yet, in absence of legislation a risk of divergence between current pneumatic and any future solution may hamper interoperability. To counter this the CR on DD requirements was submitted. As the business case remains in most cases negative, any DD device shall be voluntary.	WAG, LOC&PAS	RU, IM, MA, KE, NSA	The solution introduces requirements for 3 DD functions. It pre-empts the risk of implementation divergences and enjoys support by the assessed stakeholder groups. Attention has been put on not pre-empting any future locomotive-based, or digital DD solutions. Given the voluntary nature of the fitting of a device, there are no geographical or distributional cost/benefit impacts that require particular attention.	The solution is compatible with existing DD devices, hence no obsolescence or retrofitting is implied. For vehicle manufacturers there are additional costs concerning conformity assessment of DD requirements in case such devices are fitted on a wagon.
166 525	Adapt the TSIs so as to facilitate intermodal freight transport	Several barriers exist that limit the efficiency of combined transport (e.g. in many MS CT is labelled ‘exceptional transport’, which implies additional administrative requirements). The solution sets out the rules on codification of wagons, lines, and ILUs, to facilitate route compatibility checks. Additionally, new RINF requirements are added to ensure that line information is available for the transport of swap bodies and semi-trailers.	OPE, INF, WAG	RU, IM	The solution strongly facilitates the operations of CT trains, lowering administrative costs.	The collection of line codes and insertion in RINF will lead to additional costs for some IMs, particularly for those IMs that have not collected this information thus far.
191 380 381 417	Monitor the evolution of standards and propose amendments to TSIs	The TSIs refer to over 160 standards. Many of these are regularly updated. If this update is not reflected in the TSIs, standardisation work and legal requirements are not in sync, leading to, in	All	RU, IM, KE, MA, NSA,	The update leads to higher alignment between standards and the TSIs, reducing administrative burdens and the adoption of up-to-date practices.	Trainings costs for inspectors working for conformity assessment bodies.

CR	Title	Description of problem and solution	TSI	Main SH impacted	Benefit of solution	Costs of solution
418 420 423 517 527		some cases, the attainment to outdated practices additional administrative burden. In other cases, the update does not have any material impact (e.g. C1 change) but references to the old standard may cause confusion. The solution under this CR is to update a wide range of standards in the TSIs, each of which has been validated by topical experts.		NoBo, ERA		
236	Review and streamline transitional provisions *(Separate IA performed)*	Presently, each TSI contains a specific chapter dealing with its transition arrangements which allow the use of older TSIs during a transition period once a new TSI comes into force. For the Rolling Stock related TSIs and CCS TSI the current transition arrangements are not coherent. This might cause additional efforts in the framework of the vehicle authorisation especially where there are no technical or safety related reasons to apply a newer TSI. A new harmonised transition framework with three change categories is introduced to counter the incoherence and associated costs.	LOC&PAS, WAG, NOI, PRM	RU, IM, MA, NSA, ERA	The harmonisation of transition provisions throughout the rolling stock TSIs leads to reduced costs for the sector to assess and adapt to new TSI requirements. Additionally, the new framework brings that: 1) The EC type or design examination certificate for the subsystem remains valid unless it is required to be revised according to the specific transition regime of a TSI change. 2) The same logic applies for the certificate at IC level. The certificate remains valid unless it is required to be revised according to the specific transition regime of a TSI change, and 3) all variants and versions of a type can use the same initial assessment framework as for the main type.	The new framework requires additional training of staff to understand the differences with the previous framework, especially compared to Phase A/B. This is believed to be a minor point.
261	Closure of open point linked to train detection systems	The class A train detection system (especially track circuits) is not yet fully specified in the interface document.	LOC&PAS, WAG	RU, IM	Closure of remaining open points (e.g. vehicle test method to demonstrate compliance with Class A track circuits, vehicle impedance), Improved requirements for sand quality, spoked wheels	No specific additional cost impact resulting from changes of the Interface Document (delta between V4 and V5)
392	Resolving a conflict with the Drinking Water Directive	Due to different transpositions of the Drinking Water Directive, water to wash hands can be equalled to drinking water. Yet, an RU is not able to guarantee that water remains drinkable in a tank, nor can IMs guarantee this for older water facilities. This leads to a conflict with the current TSI text that requires clarification, notably by deleting the reference to the Directive.	LOC&PAS INF	RU, IM	The solution removes ambiguity in the legislation.	Limited. The changes are either introduced through a generic transition regime or are so-called C1 changes.
251 427	Facilitating the retrofit of Energy measuring systems	Many existing EMS sensors were not tested in accordance with EN50463:2017, as referenced in TSI LOC&PAS. Retrofitting would imply replacement of existing material that is functioning but is not in compliance, leading to costlier replacements and impeding the fitment of EMS. Moreover, TSI compliant EMS devices hit the market only in June 2020, which troubled	LOC&PAS	RU, IM, MA	The solution enables the re-usage of existing sensors. It contributes to lowering the costs of retrofitting and supports the faster integration of EMS, as put forward in the sector declaration.	The provided flexibility in using existing sensors can lower the demand for new EMS. In turn, this may lead EMS manufacturers to revise their forecasts.

CR	Title	Description of problem and solution	TSI	Main SH impacted	Benefit of solution	Costs of solution
		implementation by the legal deadlines. To resolve these issues, a solution is proposed in which 1) an EMS intended to be installed on an existing vehicle, or 2) existing EMS or parts of it are upgraded, can comply with a limited set of requirements.				

3. Impact assessment – CR236 on Transition

1. Context and problem definition

1.1. Problem and problem drivers

Presently, each TSI contains a specific chapter dealing with its transition arrangements which allow the use of older TSIs during a transition period once a new TSI comes into force.

For the Rolling Stock related TSIs (LOC&PAS, WAG, NOISE, PRM) and the CCS TSI (especially for the ERTMS on-board part) the current transition arrangements are not coherent, for example:

- The LOC&PAS TSI allows a 7-year period (Phase A) to apply older TSIs
- The CCS TSI does not include the Phase A/B concept and provides specific regimes. E.g. clause 7.4.2.3 allows the application of older specifications (set #1) until December 2020.

This can cause additional efforts in the framework of the vehicle authorisation especially where there are no technical or safety related reasons to apply a newer TSI. Such efforts are for example:

- unnecessary re-certification against newer rules – depending on the amount of TSI changes
- administrative costs – need for derogations in one TSI but not in the other TSI
- opportunity costs due to delays in authorisation

1.2. Evidence of the problem

The evidence is embedded in the TSI text. The consequences of the unharmonized transition framework have been acknowledged by representative bodies, which identified CR236 as a key change for the 2022 TSI Revision package.

1.3. Baseline scenario

If no action were to be taken, the unharmonized approach towards transition persists. The problems as described in section 1.1 will persist.

1.4. Main assumptions

The main assumption is that harmonisation between rolling stock and CCS TSIs is possible, despite the nature of the inherent differences between the TSIs and the requirements they include.

1.5. Stakeholders affected

Railway undertakings (RU)	☒	Member States (MS)	☐
Infrastructure managers (IM)	☒	Third Countries	☐
Manufacturers (MA)	☒	National safety authorities (NSA)	☒
Keepers (KE)	☒	European Commission (EC)	☐
Entity Managing the Change (EMC)	☐	European Union Agency for Railways (ERA)	☒
Notified Bodies (NoBo)	☒	Citizens living nearby railway tracks	☐
Associations	☐	Persons with reduced mobility (PRM)	☐
Shippers	☐	Passengers	☐
Ticket vendors	☐	Entities in Charge of Maintenance	☒

The complexity of the current transition framework is likely to disproportionately affect smaller manufacturers and operators, for which the tracking of and compliance with new requirements is relatively more burdensome.

1.6. Subsidiarity and proportionality

The problem is grounded in how the current transition provisions are described in current EU legislation and, as such, requires EU action.

2. Objectives

2.1. Specific objectives

The main aim of the CR is to develop a coherent single framework for the transition phase for all vehicle related TSIs.

3. Options

3.1. List of options

The baseline (Option 0) implies:

- the continuation with the Phase A/B scheme under the LOC&PAS and WAG TSIS
- the absence of a general transition framework in CCS TSI
- time limited type certificates

Option 1 implies the adoption of the framework as developed by the TWG on Migration and Transition, as shown below:

TSI Change Category	**Transition regime (stage at which a project/vehicle is when the revised TSI enters into force)**			
	Design phase not yet started	**Design phase**	**Production phase**	**Vehicle in operation**
C1	Applicable	Directly applicable with no impact on existing projects.	Not concerned	Not concerned
C2	Applicable	Applicable **7 years after entry into force of TSI**	Not concerned	Not concerned
C3	To define: possible to delay the application of a C3 change after the entry into force of the TSI	To define: possible to require application of a C3 change to projects at design phase earlier than the generic application	To define: possible to require application of a C3 change to all new rolling stock delivered after a certain date	To define: possible to require the upgrade/renewal of existing rolling stock according to the C3 change under certain conditions

In addition, the following applies:

- The EC type or design examination certificate for the subsystem remains valid unless it is required to be revised according to the specific transition regime of a TSI change.

- The same logic applies for the certificate at IC level. The certificate remains valid unless it is required to be revised according to the specific transition regime of a TSI change.
- All variants and versions of a type can use the same initial assessment framework as for the main type.
- The CCM process within the TSI revision WP has been updated so that transition is discussed as an integral part of any solution to a change request.
- The IA procedure has been amended to clarify that a full IA is recommended for C3 changes.

4. Impacts of the options

4.1. Qualitative analysis

Stakeholder assessment

An overview of all benefits and costs associated to the options is provided in Appendix 1. In this section a summary is provided. As the impacts are broadly different for sector organisations and for authorities and assessment bodies, the impacts are assessed on this level of aggregation.

Option 0 (Baseline)			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector organisations (IM/RU/ MA/…)	Positive	The Phase A/B framework exists for the rolling stock TSIs. This regime provides a smooth transition, however with less flexibility than the framework under Option 1.	Rather negative
	Negative	The phase A/B transition framework shall not apply anymore after 31 December 2028 (see TSI LOC&PAS Art 11(3)), meaning that there would be no framework anymore for smoother transition regimes. This implies that there will be a need for the reassessment of the subsystem or changes of the subsystem against the new TSI, even for ongoing projects. To avoid these costs applicants might choose a derogation procedure, but this extends authorisation time and brings uncertainty to the concerned project. For CCS TSI there is no Phase A/B framework that smoothens the transitions between subsequent TSIs. Moreover, CCS TSI uses a completely different terminology which makes transitions between TSIs more cumbersome to assess in the framework of vehicle authorisations covering both CCS and LOC&PAS TSI.	
Authorities & Assessment bodies (MS/NSA/EC/ ERA/NoBo…)	Positive	To some extent, the lack of transition framework in CCS TSI enforced a quicker uptake of requirements from the newest TSI.	Rather negative
	Negative	The delta between the new and the current TSI was not transparent. This increased the administrative burden to understand where changes occurred and how they should be assessed in the framework of vehicle authorisations. Moreover, changes were not classified as editorial changes or changes in content with an impact on the conformity assessment, making it harder to assess the extent of the changes.	

Option 1			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector organisations (IM/RU/ MA/…)	Positive	The new transition framework makes that there is a replacement for the Phase A/B scheme that was set to end after 31 December 2028. Thanks to the new framework, the delta between the new and current TSI shall be clearly stated in the TSIs. Moreover, a transparent, harmonised transition framework is introduced where the type of changes is labelled, effectively reducing the administrative costs for the sector. Moreover, the EC type or design examination certificate for the subsystem remains valid unless it is required to be revised according to the specific transition regime of a TSI change. Also, all variants and versions of a type can use the same initial assessment framework as that for the main type. With the update of the CCM processes, transition will be treated as an integral part of the discussions on the CR solution, rather than an ex-post consideration.	Rather positive
	Negative	The transition framework allows for C3 changes, which may require a stricter transition regime. However, this was also possible under the existing TSIs. With the new transition framework coming into force, the Phase A/B framework will become obsolete. Projects that want to use the new transition framework would need to seek conformity against the 2022 TSIs. While this is a voluntary choice, it could lead to additional (administrative) costs.	
Authorities & Assessment bodies (MS/NSA/EC/ ERA/NoBo…)	Positive	A clearer transition framework that is harmonised between TSIs. The transition framework identifies the changes and categorises them as C1, C2, C3. The new framework also facilitates the authorisation process, improving efficiency.	Very positive
	Negative	The new framework requires additional training of staff to understand the differences with the previous framework, especially compared to Phase A/B. This is believed to be a minor point.	

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	Option 0 (baseline)	*Option 1*
Safety	The existing framework does not impact safety.	The proposed framework does not impact safety.
Interoperability	The existing framework does not impact interoperability.	The proposed framework does not impact interoperability.
Competitiveness	The existing framework increases certification costs and lowers project stability. The Phase A/B framework for LOC&PAS and WAG TSI have been welcomed, but its misalignment with CCS TSI is problematic.	The new framework reduces certification costs and lowers administrative burdens. This, in turn, leads to greater stability of projects and lower overall costs, contributing to the greater competitiveness of the rail sector.
Effectiveness	Rather low	Rather high

Coherency assessment

	Option 0 (baseline)	*Option 1*
Policy analysis	While the transition framework does not run counter to any legislation or policy, its unharmonized nature negatively impacts the coherence of the TSIs.	The harmonisation of the transition frameworks improves the coherence between TSIs.
Coherence	Neutral	Very high

5. Comparison of options and preferred option

5.1. Comparison of options

	Option 0 (baseline)		*Option 1*	
Stakeholder impact	Sector org	Auth & AsBo	Sector org	Auth & AsBo
Effectiveness	Rather low		Rather high	
Coherence	Neutral		Very high	

Colour legend	Very low/neg.	Rather low/neg.	Neutral	Rather high/pos.	Very high/pos.

5.2. Preferred option(s)

Option 1 has a substantial number of benefits over the baseline option at limited costs.

5.3. Risk assessment

A frequently heard concern related to the C3 changes; those TSI changes for which a specific transition regime is introduced. Some stakeholders voiced their worry that the introduction of this category would increase the risk of introducing TSI changes with retrofitting requirements or other high-cost implications.

First it should be noted that a C3 change is not new to the TSIs, albeit it was not labelled specifically as such before. The 2014 LOC&PAS TSI Art 7.1.3.1 (5) & (7) explicitly indicate that phase A/B transition periods can be altered if a future TSI explicitly specifies so. This flexibility was and is maintained to allow for the bespoke introduction of important requirements, such as is currently discussed for the Digital Automatic Coupler.

Second, it can be reasonably argued that the new transition framework may even limit the introduction of C3 changes as transition is now an integral topic of the change request discussion, rather than a decision that is being made later down the process. This follows from the updated CCM document (as found on the Extranet). Moreover, in line with the updated IA procedure, a full impact assessment is foreseen for C3 changes unless the WP decides otherwise.

5.4. Further considerations

/

6. Monitoring and evaluation

6.1. Monitoring indicators

- Number of derogations (decrease)

6.2. Future evaluations

The CCM procedure was revised to consider the new transition framework. It is important to review how in practice the transition topic is being treated as part of CR requests and whether subsequently any revision of the CCM procedure is needed.

7. Sources and methodology

7.1. Sources

Desk research	☒	Interviews	☒
ERA database	☐	Meetings	☒
External database	☐	Survey	☐

Within the TWG on migration and transition there were 11 subgroup meetings on transition. In addition, there were numerous bilateral and plenary discussions with sector representatives.

Appendix 1. Overview of key changes and impact on the sector

Transition Framework Today (Baseline scenario)	Proposed Transition Framework (Option 1)	Impact on the sector
No assessment of the TSI changes with regards to conformity to previous TSI.	Assessment is embedded in the revised TSI	Reduced costs for the sector for preparing the application for authorisation.
Different approaches towards transition between the TSIs.	One transition regime for all vehicle related TSIs (LOC&PAS, WAG, NOI, PRM, & CCS)	As above.
Sector is not involved in the assignment of transition arrangements for TSI changes.	The updated CCM process allows the sector to be involved in the assignment of a transition regime for proposed TSI changes.	The railway sector can express transition needs at an early stage before the CR solution is endorsed. This limits the risk that new TSI requirements are introduced with a problematic transition timing (as occurred in the past).
Transition rules did not clearly cover the situation of type, variants, and versions. Impact of the evolution of TSI requirements to vehicle projects is not assessed in the TSI revision scope, obliging applicants to assess the evolutions or, in some cases, to change the design without much value to the railway system.	Evolution of TSI requirements (including standards) is assessed and categorised in a harmonised way for the various 'phases' of a project: Impact to projects in design phase, production phase and existing vehicles in operation. Variants and versions enjoy the same initial assessment framework as the main type.	• Provision of full traceability of TSIs evolution • Provision of transparency in the TSI revision process • Provision of stability to ongoing vehicle projects • Streamlining the process of authorisation • Reduction of non-application of TSIs request
Transition rules not always clear between implementation rules in chapter 7 + articles.	Clarification of transition rules in one single place: Chapter 7 and in a harmonised way between all TSIs.	As above.
Certificates of NoBos refer to previous version of TSIs (e.g. projects in phase A).	Certificates of NoBos refers to TSIs in force at the time of submission of vehicle authorisation application	As above.
Production phase was limited to 7 years: Limited validity of certificates for subsystem (7 years) and ICs (5 years) obliging applicant to regularly revise the certificates.	Unlimited validity unless otherwise specified for limited cases (notably related to C3 requirements).	As above. + Reduction of assessment and vehicle authorisation cost for applicants + Economy of scale due to longer production period
Specific transition timings could be proposed for any TSI change (i.e. L&P 7.1.3.1 (5)(7)), independently of the CCM process. The sector was not involved in the discussion on transition, assuming that changes would never impact projects in Phase A or B.	Transition timing is determined as part of the CCM process.	Integral consideration of transition as part of any change request. Involvement of sector in determining transition timing.
No "clear" criteria when defining transition period.	Proposal to have 3 harmonised categories of changes: C1, C2 and C3	The framework improves transparency in the authorisation process. Only in duly justified cases there will be TSI changes with an impact on ongoing projects and existing rolling stock.

4. Impact assessment – CR164 on Derailment detection

1. Context and problem definition

1.1. Problem and problem drivers

Derailments of freight trains cause considerable human and economic costs. Derailment detectors with a brake actuation function are fitted to wagons to reduce the impact of derailments. Since 2009, several studies assessed whether the benefits of such derailment detectors outweigh the costs and whether they should be mandatory. Both points were generally answered negatively (DNV, 2011; ERA, 2009, 2012; OTIF, 2016). Subsequently, no actions were taken to define requirements for derailment detectors in the TSIs.

The voluntary use of derailment detectors remains nevertheless permitted and particularly in Switzerland a considerable number of wagons (i.e. over 1000) is equipped with pneumatic derailment detectors.

Renewed calls to define requirements for derailment detectors in the TSIs have been made, notably by the RID Committee of Experts' working group on derailment detection (OTIF, 2016) and through change request (CR) 164 as submitted by the European Commission.

The requests for codification are grounded in the notion that harmonised requirements facilitate the safe and interoperable operation of freight trains equipped with this technology. This need is particularly relevant as it was confirmed that false alarms do occur and the brake actuation carries the typical credible potential to cause a derailment (Bing, 2014; D-Rail project, 2014).

Moreover, novel approaches and digital solutions for derailment detection and prevention functions could make the benefit/cost ratio for such technology positive, which makes the need for harmonised requirements more urgent.

The Agency already issued guidelines concerning the use of derailment detectors (ERA, 2016). Now the Agency investigates options for a set of harmonised requirements for derailment detection and prevention functions in the TSI.

As stated above, the debate on derailment detectors and their legal embedding takes place for over a decade. This report builds on the studies, impact assessments, and discussions that predate CR164.

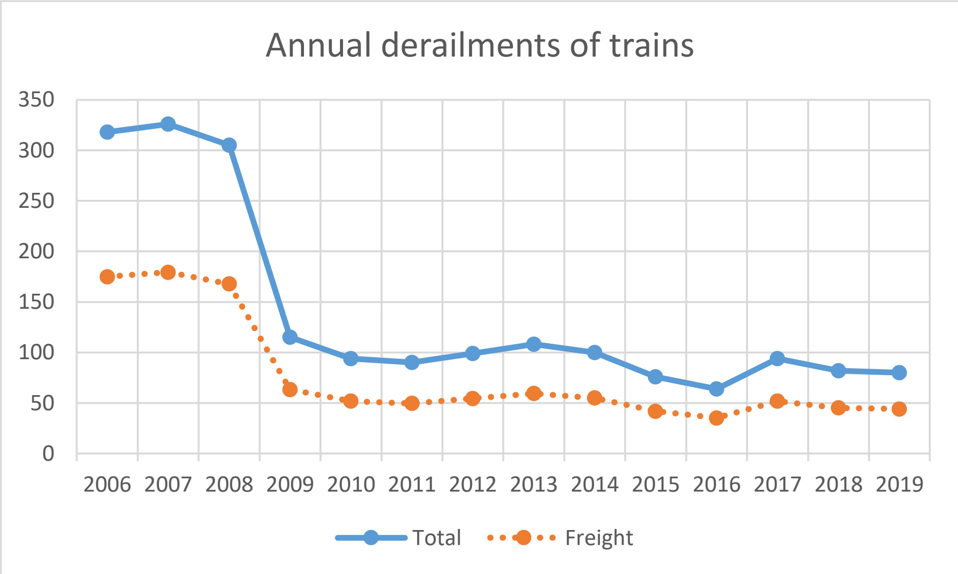
1.2. Evidence of the problem

The plot below shows the number of derailments in the EU27, Switzerland and Norway using CSI data. Of these accidents, 55% is approximated to be freight derailments (ERA 2012). After a strong drop in 2009, the figures remained stable over time.

It is important to note that the drop is a result from a change in definition, which made that the reporting threshold moved from damages of 50 000 EUR to 150 000 EUR. As freight traffic activity remained fairly stable over the shown period, it can be assumed that the number of derailments likely remained stable as well.

The uptake of derailment detectors has been relatively limited. An OTIF report (2016) indicates that about 1 000 Swiss wagons are fitted. A similar number of detectors was delivered to Germany. The uptake in other European countries is generally thought to be small.

The risk of false alarms and their consequences were assessed in a dissertation (Bing, 2014), which deemed that the increased longitudinal compressive forces that follow from an erroneous (i.e. false) brake actuation carry the typical credible potential to cause a derailment. Swiss evidence till 2016 points towards about 1 to 2 false alarms a year (OTIF, 2016) but no resulting derailments to date, which may be because of the way trains are operated. The risk is therefore assessed to be small but real.



Evidence on new derailment detectors consists of three distinct developments. Firstly, there is the market for pneumatic derailment detectors and brake actuators. The solution is mature and will be further marketed by several manufacturers. Second, derailment detection systems that are only installed on the locomotive are under development (TD2S Project, 2021). These solutions do not have a brake actuating function, but warn the driver based on abnormal stress on the traction hook, upon which the driver can act independently. Thirdly, new solutions are envisaged as part of DAC. As such, derailment detection and prevention solutions that are enabled by the data communication system are likely to enter the market alongside DAC (EDDP, 2021).

1.3. Baseline scenario

Without additional actions, it is expected that the uptake of pneumatic derailment detectors remains generally limited in Europe. It is however likely that new cost-effective solutions come into place that are either fitted in the locomotive or are enabled by DAC. The likelihood of a pan-European implementation of DAC is increased by ongoing legislative efforts and the concerted actions by the European DAC Delivery Programme. As a consequence, there is a higher probability that new derailment detection and prevention functions will enter the market. Considering the advent of such new approaches and digital solutions, the chance of non-interoperable solutions increases.

Without the codification of a minimum set of requirements in the TSIs, a risk exists that different derailment detectors enter the market with varying safety performance levels and characteristics. This, in consequence, may negatively affect safety and interoperability of the European railway system.

1.4. Main assumptions

A key assumption is that upon the introduction of new solutions, more RUs and keepers would fit locomotives and wagons with derailment detector and prevention functions.

Additionally, in absence of TSI requirements it is assumed that divergent solutions enter the market with different operational and safety performance characteristics.

1.5. Stakeholders affected

Railway undertakings (RU)	☒	Member States (MS)	☐
Infrastructure managers (IM)	☒	Third Countries	☐
Manufacturers	☒	National safety authorities (NSA)	☒
Keepers	☒	European Commission (EC)	☐
Entity Managing the Change (EMC)	☐	European Union Agency for Railways (ERA)	☐
Notified Bodies (NoBo)	☐	Citizens living nearby railway tracks	☐
Associations	☐	Persons with reduced mobility (PRM)	☐
Shippers	☐	Passengers	☐
Ticket vendors	☐	Other (Please specify) …	☐

RUs/Keepers are limited to those organisations with freight operations. Manufacturers concern the current and future producers of derailment detectors.

Geographical and organisational heterogeneity amongst stakeholder groups is of limited importance for this assessment, considering the options proposed.

1.6. Subsidiarity and proportionality

As expressed by the European Council (2014) and OTIF (2016), European action is needed to ensure a further harmonised implementation of derailment detectors.

2. Objectives

2.1. Specific objectives

Safety:

- Specifications should ensure that detectors undergo a risk assessment in accordance with Commission Implementing Regulation (EU) No 402/2013.

Interoperability

- Specifications should ensure the interoperable functioning and identification of detectors, particularly in light of possible false alarms and the need to deactivate an actuated brake.

Market access and competitiveness

- The TSIs should set the minimum requirements to ensure the safe and interoperable functioning of derailment detectors, without precluding the development of new innovations and solutions as those mentioned in section 1.2. The definition of requirements should moreover prevent the introduction of other rules that may impede access to parts of the European rail network.

3. Options

3.1. List of options

As indicated in section 1.1, derailment detectors and the definition of requirements in the TSI have been debated for over a decade. From this context, only one option besides the baseline scenario was defined.

Option 0: Baseline scenario

The baseline scenario implies the status quo, meaning that no requirements shall be defined in the TSI concerning derailment detection and prevention functions.

Option 1: Definition of requirements for a derailment detection, prevention and actuation functions, which can be voluntarily fitted to a unit.

This option results in the definition of requirements for three distinct functions:

- Derailment prevention function (DPF)
- Derailment detection function (DDF)
- Derailment detection and actuation function (DDAF)

However, the fitting of the functions remains voluntary.

4. Impacts of the options

4.1. Qualitative analysis

Stakeholder assessment

Option 0 (Baseline)			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
RU/Keeper	Positive	/	Rather negative
	Negative	Multiple not harmonised solutions entering the market. Different implementations may cause difficulties to identify and resolve situations where a false alarm caused a freight train to brake. This may exacerbate the impact of resulting operational disruptions.	
IM	Positive	/	Rather negative
	Negative	Multiple not harmonised solutions entering the market. Different implementations may cause difficulties to identify and resolve situations where a false alarm caused a freight train to brake. This may exacerbate the impact of resulting operational disruptions.	
Manufacturer	Positive	Solutions are permitted without being restricted by TSI requirements.	Neutral
	Negative	Higher risk of fragmented solutions being introduced that affect product design and, possibly, reduce economies of scale for the product.	
NSA	Positive	/	Rather negative
	Negative	Multiple not harmonised solutions entering the market, with potentially diverging (safety) performances.	

Option 1			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
RU/Keeper	Positive	The TSI proposal shall not have any impact on derailment detectors that are already fitted to wagons. As such there are no cost implications to the upgrade and renewal of detectors. As the fitting of detectors shall be voluntary, there are no additional cost implications.	Rather positive
	Negative	Minor administrative costs in case of equipment of existing wagons.	
IM	Positive	The proposed requirements shall ensure that units with an activated DDAF can be quickly identified and the consequences of a false alarm resolved faster. The harmonised approach may promote RUs/Keepers to equip their fleet with detection and prevention functions, reducing the number of derailments and their impacts.	Rather positive
	Negative	/	
Manufacturer	Positive	The proposal to amend the TSI shall introduce two key requirements for DDAF devices: - A risk assessment in accordance with Commission Implementing Regulation 402/2013 - Status and marking requirements These requirements shall not have any impact on the design of existing DDAF devices that are already on the market. The requirements for DPF and DDF devices relate to the signalling process. The requirements are mostly functional requirement allowing a multiplicity of currently existing and envisaged future technical solutions	Rather positive
	Negative	/	
NSA	Positive	The harmonised approach may promote RUs/Keepers to equip their fleet with detection and prevention functions, reducing the number of derailments and their impacts.	Rather positive
	Negative	/	

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	Option 0 (baseline)	*Option 1*
Safety	Risk of diverging safety performance of devices.	Higher levels of safety performance for units fitted with DDF/DPF/DDAF
Interoperability	Risk of diverging implementations of devices.	Higher levels of interoperability for units fitted with DDF/DPF/DDAF, ensuring the efficient identification and operation of such devices, particularly in case of a false alarm.
Market access	/	/
Competitiveness	Risk of negative impact on single wagon load traffic in case of wagons fitted with incompatible devices.	Improves legal certainty and economies of scale because of clear technical requirements for the different functions.
Effectiveness	Rather low	Rather high

Coherency assessment

Option 1 is aligned with RID (2021) section 7.1.1 which states that:

1.1 'NOTE: Wagons are allowed to be equipped with detection devices which indicate or react to the occurrence of a derailment, provided that the requirements for the authorisation for placing into service of such wagons are met.
1.2 The requirements for placing into service of wagons cannot prohibit or impose the use of such detection devices. The circulation of wagons shall not be restricted on the grounds of the presence or lack of such devices.'
While the baseline scenario is not necessarily in contradiction to existing legislation, Option 1 fulfils the requests by OTIF (2016). Moreover, Option 1 clarifies the first paragraph of RID (2021) 7.1.1. As such the coherency of Option 1 is deemed higher than that of the baseline scenario.

4.2. Quantitative analysis

Considering that the fitting of DDF/DPF/DDAF remains voluntary, the cost impacts of the proposal are limited.

As the DDAF requirements are aligned with existing pneumatic derailment detectors on the market, there are no substantial upgrade/renewal and or redesign costs implied.

Considering the assigned change category (i.e. C2) no impact occurs on existing projects and rolling stock.

The proposal facilitates the development of new DDF/DPF devices, including those enabled by DAC. As such, ongoing development activities are not impeded.

Based on these considerations, no further quantitative assessment analysis shall be conducted. For past analyses on the costs and benefits of DDAF we refer to ERA (2009, 2012) and OTIF (2016).

5. Comparison of options and preferred option

5.1. Comparison of options

	Option 0 (baseline)					*Option 1*				
Stakeholder impact	RU	WK	IM	MA	NSA	RU	WK	IM	MA	NSA
Effectiveness	Rather low					Rather high				
Coherence	Neutral					Rather high				

Colour legend	Very low/neg.	Rather low/neg.	Neutral	Rather high/pos.	Very high/pos.

5.2. Preferred option(s)

Based on the above analysis, Option 1 is to be preferred over the baseline scenario.
It pre-empts the risk of implementation divergences and can be supported by the assessed stakeholder groups.
Given the voluntary nature of the proposal, there are no geographical or distributional cost/benefit impacts that require particular attention.

5.3. Risk assessment

Considering the duration of the debate on derailment detection, the large number of studies conducted, and the broad sector representation in the TWG, the described impacts are thought to be accurate and comprehensive.

Yet currently there are no operational measures indicated. Such measures may need to be considered pending the return of experience.

A final uncertainty concerns the extent to which fleets will actually be fitted with DDF/DPF/DDAF. If the requirements facilitate the development and implementation of such functionalities in a cost-effective manner, the number of derailments and their impacts would drop.

5.4. Further considerations

/

6. Monitoring and evaluation

6.1. Monitoring indicators

CSI - N02 - Derailments of trains

Tentative - ISS – A2 – Derailments (plus information on precursors)

6.2. Future evaluations

A standard approach towards evaluation can be proposed, meaning that after five years a stock taking exercise takes place to understand whether the current TSI text does not restrain any innovative approaches towards derailment detection and prevention, particularly in light of DAC developments.

7. Sources and methodology

7.1. Sources

Desk research	☒	Interviews	☒
ERA database	☒	Meetings	☒
External database	☐	Survey	☐

The study builds on the following sources:

- TWG Freight – Derailment Detection: 6 meetings with sector experts
- Bilateral discussions with TWG participants
- Several previous studies (OTIF / DNV / ERA) on the impact of derailment detection devices, legal implications and economic impacts
- Safety statistic database (ERAIL/CSI) to assess evolution of derailments

References

Bing, D. (2014), Derailment detection in rail freight transport – Analysis of influences on longitudinal train dynamics, ISBN: 978-3-87154-520-7

DNV (2011), Assessment of freight train derailment risk reduction measures, BA000777

D-Rail (2014), Deliverables retrieved from http://d-rail-project.eu/

ERA (2009), Impact Assessment on the use of Derailment Detection Devices in the EU Railway System, ERA/REP/03-2009/SAF

ERA (2012), Prevention and mitigation of freight train derailments at short and medium terms, ERA/REP/02-2012/SAF

ERA (2016), Guidelines from the European Union Agency for Railways concerning the use of derailment detectors, ERA-WKG-015

OTIF (2016), Report of the 5th session of the RID Committee of Experts' working group on derailment detection, OTIF/RID/CE/GTDD/2016-A

RID (2021), Convention concerning International Carriage by Rail (COTIF) Appendix C - Regulations concerning the International Carriage of Dangerous Goods by Rail (RID).

5. Impact assessment – CR171 on Upgrading/Renewal

1. Context and problem definition

1.1. Problem and problem drivers

The interoperability directive (EU 2016/797 or IOD) sets the conditions under which national safety authorities (NSAs) can decide whether a new authorisation for placing in service (APIS) is needed after an upgrade or renewal of the energy (ENE) and infrastructure (INF) subsystems. TSI ENE and TSI INF specify that the parts of the subsystem falling under the scope of the upgrading or renewal shall comply with the TSI.

A recent report by the EC took stock of the current state of TSI implementation and noted that the rail network is moving too slowly towards being TSI compliant. Particularly for the INF and ENE subsystems there are concerns that there is a great level of divergence in TSI compliance amongst Member States (MS). One of the reasons is the varied approaches amongst MS to make fixed installation subsystems TSI compliant after upgrading or renewal. The EC report argues that due to slow and imperfect harmonisation the *'benefits of operational uniformity, rapid development of train services, lower unit costs through standardised equipment and flexible reuse of assets across the EU rail network are also all lost'.*

Notwithstanding justified reasons for non-application of TSIs (IOD Art 7), the legal framework sets the clear goal to achieve the progressive implementation of rail interoperability and the gradual reduction of legacy systems. From this premise, the Agency was tasked through Change Request 171 to improve the provisions on when to apply the TSIs in case of upgrading or renewal. The relevant Topical Workgroup on the interface between Fixed Installations and Rolling Stock (TWG FI:RST) worked on proposals in the following three fields:

- **Specification:** The criteria to distinguish upgrade, renewal and maintenance for the ENE and INF subsystems shall be clarified.
- **Implementation:** The conditions on whether conformity with the TSI is mandatory after upgrade or renewal, regardless of whether a new authorisation for placing in service is needed or not.
- **Scope:** The extent to which after upgrading the entire subsystem shall be made TSI compliant, instead of only the parameters affected by the change.

Several sector stakeholders expressed the concern that a stricter regime on upgrading and renewal would lead to substantially higher costs for fixed installation projects, which in some cases are believed to be disproportional to the benefits in terms of interoperability.

This IA evaluates the impacts of the proposal versus the baseline situation.

1.2. Evidence of the problem

The evidence of partial TSI implementation is captured by the EC '*Discussion paper on the implementation of the TSIs (input for RISC 9-10 February 2022)'*. The TWG FI:RST collected further evidence on divergent practices on upgrading and renewal.

1.3. Baseline scenario

Without a TSI change, the situation as is would persist, meaning a prolongation of the divergence in how MS apply the TSI after upgrading and renewal of fixed installations and thus a slower process towards the harmonisation of the EU rail network.

1.4. Main assumptions

The specifications of upgrading/renewal as used in the proposal discussed on 11 May 2022 (TWG FI:RST) are used. In addition, the IA considers the discussions on the topic that took place up to 8 June 2022.

1.5. Stakeholders affected

The stakeholders affected most by the issue are indicated in the table below.

Railway undertakings (RU)	☐	Member States (MS)	☒
Infrastructure managers (IM)	☒	Third Countries	☐
Manufacturers	☐	National safety authorities (NSA)	☒
Keepers	☐	European Commission (EC)	☒
Entity Managing the Change (EMC)	☐	European Union Agency for Railways (ERA)	☐
Notified Bodies (NoBo)	☐	Citizens living nearby railway tracks	☐
Associations	☐	Persons with reduced mobility (PRM)	☐
Shippers	☐	Passengers	☐
Ticket vendors	☐	Other (Please specify) …	☐

There are strong differences noted within stakeholder groups as well. The magnitude of the impacts on IMs and countries depends for instance on existing practices regarding TSI compliance after upgrading and renewal. These variations should be acknowledged when interpreting the findings.

1.6. Subsidiarity and proportionality

The problem and proposed option fall into the scope of the interoperability directive and the TSIs.
Proportionality is assessed under section 4.1.

2. Objectives

2.1. Specific objectives

In the TWG RST:FI meeting the following objectives have been set for defining the options:

- Improve interoperability of the EU rail network
- Limit disproportionate costs for upgrading and renewal

3. Options

3.1. List of options

Baseline (Option 0)**:**

No change to the existing legal provision on upgrading and renewal. This implies the following.

Specification

The IOD defines upgrading and renewal. TSI INF and TSI ENE add specifications on upgrading and renewal that are particular for those subsystems. Appendix 1 provides an overview of the current provisions.

Implementation

Under the baseline, TSI INF and TSI ENE specify that in case of a new authorisation for placing into service, the parts that fall under the scope of the upgrading or renewal shall comply with this TSI.

Scope

Only the parameters affected by the change shall be made TSI compliant. Exemptions apply for existing subsystems. An overview of such exemptions for TSI INF is provided in Appendix 2.

Option 1:

The proposal forwards new elements in terms of specification, APIS and scope.

Specification

The IOD defines upgrading and renewal. The revised TSI INF and TSI ENE add specifications on upgrading and renewal that are particular for those subsystems. Appendix 1 provides an overview of the proposed provisions. It is highlighted that:

- Both in the baseline and in option 1, upgrading under TSI INF is understood to be linked to the traffic codes.
- Both in the baseline and in option 1, the (a) realignment of part of an existing route, (b) the creation of a bypass, and (c) the addition of one or more tracks on an existing route, can or shall be understood as an upgrade, instead of a new subsystem. This applies both to TSI ENE and TSI INF.

Implementation

Option 1 proposes to apply the TSI in every case of upgrading or renewal, regardless of whether an APIS is needed or not.

Scope

Under option 1 the entire subsystem shall be made TSI compliant after upgrading, instead of only the parameters affected by the change. For renewal, the scope remains those parameters that are affected by the change.

The scope of parameters that apply to upgrading projects is limited by means of exemptions as defined within some TSI clauses of chapters 4 and 7. Specific cases also can limit the requirements on compliance with some TSI clauses. For TSI INF an overview is provided in Appendix 2.

Option 1 is to maintain the existing provisions and add exemptions on:

TSI INF

- 4.2.4.2 Cant
- 4.2.4.3 Cant deficiency
- 4.2.9.2 Platform height
- 4.2.9.3 Platform offset

TSI ENE

- 4.2.9.2 Maximum lateral deviation

4. Impacts of the options

4.1. Qualitative analysis

The following questions are asked to assess option 1 versus the baseline:

a) **Will the specification of upgrading imply that projects will be labelled as upgrades under option 1 but not under the baseline scenario?**
b) **Will the full application of the TSI after upgrade increase project costs?**
c) **Will the full application of the TSI after upgrade improve interoperability?**
d) **Are the improvements in interoperability proportional to the additional costs?**
e) **Will the options lead to additional requests for the non-application of TSIs?**

The answers to these questions are primarily derived from sector inputs from ten different countries, and feedback received during the TWG FI:RST meetings. More information on the sources is provided in section 7.1

a) Will the specification of upgrading imply that projects will be labelled as upgrades under option 1 but not under the baseline scenario?

It should be emphasized that the existing national practices on upgrading and renewal differ substantially. The main sources of variation are:

- The large divergence in national specifications that are used to distinguish upgrading from renewal
- The point that some countries do not distinguish between upgrading and renewal in practice.
- The share of the respective national networks that is being upgraded / renewed annually
- The level to which APIS are being filed for upgrading and renewal works
- The extent to which TSIs are fully applied to upgrading and renewal works on a voluntary basis

These points make it impossible to provide an answer to this question that holds true for the entire EU.

Having said this, the received feedback suggests that generally both INF and ENE projects that were identified as an upgrade in the past would remain so under option 1. Mostly because the specifications under option 1 of what constitutes upgrading and renewal do not strongly divert from existing TSI specifications or national practices.

Some respondents did indicate however that several TSI ENE projects that were previously understood as upgrades may now in fact be labelled as renewals.

b) Will the full application of the TSI after upgrade increase project costs?

The costs related to option 1 relate to the following points:

- The number and type of projects
- The parameters that need to be made TSI compliant
- EC verification costs (versus benefits)

The feedback received from IMs highlighted that some countries perform very few to no upgrading projects. In such a situation the impact of option 1 is by default absent or limited. This does not preclude that these IMs may engage in more upgrading projects in the future, but it does point to the different application of upgrading per country and thus variations in impacts.

The major point of change under option 1 concerns the full TSI application after upgrading, rather than only those parameters affected by the change. The sector was asked how this will influence costs. Some respondents indicated that it was not possible to provide an in-depth analysis due to time and resource constraints. Only two respondents provided concrete examples that could be scrutinised by the Agency. Still, based on the inputs received and subsequent analysis the following can be derived:

TSI ENE:

- Minor additional cost impacts are expected from Option 1. The reason being that large parts of the network are already TSI compliant and the specification under option 1 sets a high bar for what would be understood as upgrading, thus limiting the impact of this provision.

TSI INF:

- Some respondents expected high-cost impacts related to upgrades of existing bridges. It was clarified during the 11/05/2022 TWG meeting that clause 4.2.7.4 and the updated Appendix E make that these concerns are often unsupported.

Both TSI ENE and TSI INF:

- Additional costs related to EC verification process. One respondent indicated that these are rather small compared to the overall project costs (i.e. a few 1 000 Euros). Several (financial) benefits of EC verification related to the early detection of errors are acknowledged as well.

In summation, the cost impacts may be more limited than initially anticipated based on the following factors:

1. The specification of upgrade under option 1 excludes many projects from fully applying the TSI.
2. There are multiple exemptions embedded in the TSI clauses for upgrading and renewal projects so to limit disproportionate cost impacts.
3. There are additional exemptions proposed under option 1.
4. A project promoter can define the scope of an upgrade project, excluding sections that are believed to not benefit from having the TSI applied fully.
5. Non-application can be requested for those cases where the economic viability of the project and/or the compatibility of the rail system would be compromised.

The costs related to the baseline are linked to the delayed or incomplete implementation of the TSIs and thus the non-achievement of a single European railway area. Those costs are multifaceted and large, as assessed in previous EC and ERA impact assessments.

c) Will the full application of the TSI after upgrade improve interoperability?

The benefits of the baseline scenario are that NSAs and IMs have greater discretionary power to decide whether the TSIs need to be applied for upgrading projects. This can reduce administrative and certification costs and provide more flexibility in terms of infrastructure works. The disadvantage is, as evidenced by the EC discussion paper on TSI implementation, that a TSI compliant European railway area is considerably delayed, which ultimately also has a cost for the railway sector.

The benefits of option 1 are that it promotes the transition towards an interoperable railway network in a faster and more coordinated way than would be the case under the baseline. As legacy systems are prevalent and several exemptions to apply the full TSI after upgrading for existing fixed installations exist, the interoperability benefits of option 1 are likely to materialise in a medium to long term.

d) Are the improvements in interoperability proportional to the additional costs?

The timing of this ex-ante evaluation did not allow for a complete quantitative analysis on the benefit-cost ratio of both options.

Still, the Agency and EC have performed several IAs over the course of the past years that quantified the benefits of improved interoperability (e.g. presentation provided during RISC94, February 2022). As the cost impact of Option 1 is mitigated by several exemptions for existing fixed installation, the benefits of higher TSI compliance and thus a swifter realisation of a harmonised EU rail network are deemed to be proportional to the costs.

One argument that was voiced during the TWG FI:RST was that some parameters are less important for interoperability. That argument is not acceptable, as if that were the case, the parameters should not have been in the TSI in the first place and change requests should have been introduced to secure the omission of the implied clauses.

Based on the points above, acknowledging the limitations of the current study, the proportionality of option 1 is positively evaluated.

e) Will the options lead to additional requests for the non-application of TSIs?

Based on the responses of sector organisations, no additional requests for the non-application of the TSIs are expected. This is grounded in the following reasons:

- No big cost impacts of the proposal are expected by the IM
- Projects in advanced stage of development can be notified to the EC and may not be impacted by option 1
- There are currently no upgrade projects ongoing in the respondent’s country

In summation, the finding is that limited additional costs regarding to non-application requests are expected.

The findings above are summarised in the tables below by category of stakeholder.

Stakeholder assessment

Option 0 (Baseline)			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
IM	Positive	Continuation of national practices regarding upgrading and renewal, providing more flexibility in deciding when to apply the TSIs and request an EC Verification, thus limiting costs for the IM.	Rather positive
	Negative	Unclarity on when to apply for upgrading and renewal lead to confusion and debates in several MS.	
NSA / MS	Positive	Existing practices can be continued, hence no revision of national specifications.	Neutral
	Negative	Unclarity on when upgrading should be applied and when renewal shall persist in some MS. Delay in achieving TSI compliant network.	
EC	Positive	/	Very negative
	Negative	The realisation of a TSI compliant EU rail network is slower than anticipated, causing several costs related to a lack of interoperability.	

Option 1			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
IM	Positive	Improves interoperability of the network on medium to long-term.	Rather negative
	Negative	Several IMs do not anticipate substantial cost increases and see the benefits in terms of increased European interoperability. Yet some IMs expect higher costs despite that those impacts are softened by exemption clauses for existing fixed installations.	
NSA / MS	Positive	For some countries there is the benefit that there is a better specification on when to apply renewal or upgrading. On the long term, the countries will benefit from greater European harmonisation of fixed installation.	Rather positive
	Negative	Cost increases for some projects, notably in terms of process costs for EC verification. This negative impact is likely more notable on the short to mid-term.	
EC	Positive	A more consistent and faster implementation of the TSIs across Europe.	Rather positive
	Negative	Several exemptions for existing fixed installations continue to exist, limiting the extend of full interoperability.	

Railway system assessment

	Option 0 (baseline)	*Option 1*
Safety	No impact on safety.	No impact on safety.
Interoperability	Slow and fragmented TSI implementation for the INF and ENE subsystems.	A faster and more consistent implementation of the TSIs across Europe.
Market access	*Manufacturers:* Fragmented market, due to the slow change to legacy infrastructure *RUs:* Lower access, due to non-TSI compliant network related limitations and national rules.	*Manufacturers:* Economies of scale, because of the harmonisation of the network. *RUs:* Greater access, because of the faster achievement of an EU interoperable network.
Competitiveness	Lower competition due to fragmented networks.	Higher competition because of harmonised networks.
Effectiveness	Rather low	Rather high

5. Comparison of options and preferred option

5.1. Comparison of options

	Option 0 (baseline)			*Option 1*		
Stakeholder impact	IM	MS	EC	IM	MS	EC
Effectiveness	Rather low			Rather high		

Colour legend	Very low/neg.	Rather low/neg.	Neutral	Rather high/pos.	Very high/pos.

5.2. Preferred option(s)

Based on the above analysis, Option 1 is preferred.

5.3. Risk assessment

There are several risks and limitations that should be considered when interpreting the results:

1) Inputs on the impacts of option 1 were provided by respondents from Western, Southern and Northern Europe. No responses were received from Eastern European countries, which complicates the assessment.

2) As indicated, there was relatively limited time for sector organisation to conduct analyses on the impacts of the proposal. This made that less (quantified) information could be provided as wished for.

3) The EC indicated during TWG FI:RST on 11/05/2022 that discussions on this topic will continue after the Agency sends its Recommendation to the EC. As such, changes to the provisions may occur prior to the adoption of the legal text. These changes fall out of the control of the Agency and out of the scope of this IA.

5.4. Further considerations

/

6. Monitoring and evaluation

6.1. Monitoring indicators

- Requests for non-application of the TSIs
- RINF data

6.2. Future evaluations

No evaluations are anticipated.

7. Sources and methodology

7.1. Sources

Desk research	☒	Interviews	☒
ERA database	☒	Meetings	☒
External database	☐	Survey	☒

The TWG RST:FI meetings were a key source of information as the above issues were discussed in detail.
A large numeral of bilateral meetings was held with sector organisations and the EC to reflect on the topic.
Additionally, the Agency requested the sector to provide additional information. Ten infrastructure managers (IMs) provided information.
Finally, insights were retrieved from the EC '*Discussion paper on the implementation of the TSIs (input for RISC 9-10 February 2022)*'

Countries that responded to the information request are highlighted in green below.

Appendix 1. Definitions and specifications of upgrading and renewal

<table>
<tr><th>Source</th><th>Renewal</th><th>Upgrading</th></tr>
<tr><td>IOD</td><td>‘renewal’ means any major substitution work on a subsystem or part of it which does not change the overall performance of the subsystem;</td><td>‘upgrading’ means any major modification work on a subsystem or part of it which results in a change in the technical file accompanying the ‘EC’ declaration of verification, if that technical file exists, and which improves the overall performance of the subsystem</td></tr>
<tr><td>TSI INF Baseline</td><td>7.3.1 (4)
For this purpose, major substitution should be interpreted as a project undertaken to systematically replace elements of a line or a section of a line. […] A renewal is the same case as upgrading, but without a change in performance parameters</td><td>7.2 (2)
The following situations, for example to increase speed or capacity, may be considered as an upgraded line rather than a new line: (a) the realignment of part of an existing route, (b) the creation of a bypass, (c) the addition of one or more tracks on an existing route, regardless of the distance between the original tracks and the additional tracks.
7.3.1 (2)
The infrastructure subsystem of a line is considered to be upgraded in the context of this TSI when at least the performance parameters axle load or gauge, as defined in point 4.2.1 are improved in order to meet the requirements of another traffic code.</td></tr>
<tr><td>TSI INF Option 1</td><td>7.3.2 (5)
‘Renewal’ differs from a substitution undertaken in the framework of maintenance, since it gives the opportunity to achieve a TSI compliant subsystem. For this purpose, ‘major substitution’ in the framework of ‘renewal’ should be interpreted as a project undertaken to systematically replace elements on a subsystem or part of it.</td><td>7.2 (3)
The following situations at least, but not restricted to, are not a “new” line (new infrastructure subsystem), but “upgrading” (a) the realignment of part of an existing route, (b) the creation of a bypass, (c) the addition of one or more tracks on an existing route, regardless of the distance between the original tracks and the additional tracks.
7.3.1
“Upgrading” is a major modification work of an existing infrastructure subsystem resulting in at least compliance with one additional traffic code or a change in the declared combination of traffic codes (Table 2 and Table 3 of 4.2.1) or fall in the cases that are included in 7.2 (3).</td></tr>
<tr><td>TSI ENE Baseline</td><td colspan="2">7.2.1 (2)
The following situations may be considered as an upgrade or renewal of existing lines: (a) the realignment of part of an existing route; (b) the creation of a bypass; (c) the addition of one or more tracks on an existing route, regardless of the distance between the original tracks and the additional tracks.</td></tr>
<tr><td>TSI ENE Option 1</td><td>7.3.2 (5)
‘Renewal’ differs from a substitution undertaken in the framework of maintenance, since it gives the opportunity to achieve a TSI compliant subsystem. For this purpose, ‘major substitution’ in the framework of ‘renewal’ should be interpreted as a project undertaken to systematically replace elements on a subsystem or part of it.</td><td>7.2 (3)
The following situations at least, but not restricted to, are not a “new” line (new energy subsystem), but “upgrading”: (a) the realignment of part of an existing route, (b) the creation of a bypass, (c) the addition of one or more tracks on an existing route, regardless of the distance between the original tracks and the additional tracks.
7.3.1
“Upgrading” is a major modification work of an existing energy subsystem resulting in an increase of the line speed of equal or more than 30km/h or fall in the cases that are included in 7.2 (3).</td></tr>
</table>

Appendix 2. TSI INF: Overview of existing exemptions for upgraded projects and specific cases per TSI clause

INF basic parameter groups	INF Clause	Title of TSI clause	Chapter 4 based exemptions for upgrade/renewal (clauses in brackets)	Chapter 7 exemptions for upgrade/renewal (article in brackets)	Comments	Specific cases																
						AT	BE	BG	DE	DK	EE	EL	ES	FI	FR	IE	IT	LV	PL	PT	SE	SK
Line layout	4.2.3.1	Structure gauge											X	X		X				X		
	4.2.3.2	Distance between track centres	yes (2,5)										X	X		X			X	X		
	4.2.3.3	Maximum gradients	yes (1,3)																			
	4.2.3.4	Minimum radius of horizontal curve	yes (1,2)											X					X			X
	4.2.3.5	Minimum radius of vertical curve																	X			X
Track parameters	4.2.4.1	Nominal track gauge									X			X								
	4.2.4.2	Cant	yes (3,7)																			
	4.2.4.3	Cant deficiency																	X			X
	4.2.4.4	Abrupt change of cant deficiency																	X			
	4.2.4.5	Equivalent conicity															X					
	4.2.4.6	Rail head profile for plain line																				
	4.2.4.7	Rail inclination																				
Switches and crossings	4.2.5.1	Design geometry of switches and crossings																				
	4.2.5.2	Use of swing nose crossings																				
	4.2.5.3	Maximum unguided length of fixed obtuse crossings												X								
Track resistance to applied loads	4.2.6.1	Track resistance to vertical loads																				
	4.2.6.2	Longitudinal track resistance																				
	4.2.6.3	Lateral track resistance																				
Structures resistence to traffic loads	4.2.7.1	Resistance of new bridges to traffic loads	yes								X		X					X				
	4.2.7.2	Equivalent vertical loading for new earthworks and earth pressu	yes																			
	4.2.7.3	Resistance of new structures over or adjacent to tracks	yes																			
	4.2.7.4	Resistance of existing bridges and earthworks to traffic loads			*4.2.7.4 applies t*																	
Immediate action limits on track geometry defects	4.2.8.1	The immediate action limit for alignment																				
	4.2.8.2	The immediate action limit for longitudinal level																				
	4.2.8.3	The immediate action limit for track twist																	X			X
	4.2.8.4	The immediate action limit of track gauge as isolated defect											X	X					X	X		X
	4.2.8.5	The immediate action limit for cant												X								X
	4.2.8.6	The immediate action limit for switches and crossings									X		X	X					X	X		X
Platforms	4.2.9.1	Usable length of platforms																				
	4.2.9.2	Platform height		yes (7.4)		X		X	X	X		X	X		X				X	X		X
	4.2.9.3	Platform offset	yes (2)		*interpretation c*		X	X					X	X			X			X	X	
	4.2.9.4	Track layout alongside platforms	yes (1)																			
Health, safety and environment	4.2.10.1	Maximum pressure variations in tunnels																				
	4.2.10.2	Effect of crosswinds																				
	4.2.10.3	Aerodynamic effect on ballasted track																				
Provision for operation	4.2.11.1	Location markers																				
	4.2.11.2	Equivalent conicity in service															X		X			X
Fixed installations for servicing trains	4.2.12.2	Toilet discharge																				
	4.2.12.3	Train external cleaning facilities												X								
	4.2.12.4	Water restocking																				
	4.2.12.5	Refuelling																				
	4.2.12.6	Electric shore supply																				