EUROPEAN UNION AGENCY FOR RAILWAYS

Moving Europe towards a sustainable and safe railway system without frontiers.

Full Impact Assessment[1]

JNS Normal Procedure "Crosswind"

Implementation of outcome of the SG 1 "AMOC"

[1] A **full impact assessment** (FIA) provides a qualitative and quantitative analysis of the impacts of a change; other IA outputs are: an **impact note** is a concise analysis that is added to a Recommendation or Opinion in case the expected impacts are negligible or previously adequately assessed, and a **light impact assessment** (LIA) provides a mostly qualitative analysis of the main impacts of a change. For details on the Agency IA procedure and template see: DECISION n°290 of the Management Board of the European Union Agency for Railways amending annex 1 of MB Decision n° 195 adopting the amended Agency's Impact Assessment Methodology | European Union Agency for Railways (europa.eu); DECISION n° 257 of the Management Board of the European Union Agency for Railways adopting the annex 2 template for the impact assessment methodology | European Union Agency for Railways (europa.eu).

Contents

1. Context and problem definition

1.1. Problem and problem drivers

On January 2024, the JNS Normal Procedure "Crosswind – containing the Subgroup 1 'AMOC'[2] and 2 "RISK" was launched as a follow-up activity of previous procedures[3]:

1. *JNS Urgent Procedure "Great Belt Bridge Accident" (03/2019 – 04/2019),*
2. *JNS Normal Procedure "Great Belt Bridge Accident/incident" (06/2019 – 04/2022),*
3. *JNS Urgent Procedure "Incident of 13.01.2021" (02/2021 – 04/2021).*

The JNS Normal Procedure on the Great Belt Bridge – GBB (point 2 of the previous list), for which semi-trailers transported on pocket wagons over the recalled bridge were moved outside of the gauge, caused by cross-wind, showed the general need to regain trust among the actors and from National Safety Authorities (NSAs) due to unability of the actors to demonstrate that they control the related risk, related to:

A. *The procedure of loading and securing of semi-trailers on pocket wagons,*
B. *The functioning and maintenance of hitches, and*
C. *An unclear split of responsibilities between RUs and IMs regarding cross-wind safety.*

Subsequently, NSA DK imposed restrictive national rules which:

- *Applied initially only to GBB,*
- *Apply since the beginning of 2024 to the entire railway network in Denmark.*

After the accident of 02.01.2019 and the incident of 13.01.2021, NSA DK introduced bans for the use of semi-trailers on pocket wagons[4]. Based on a previous impact assessment, these rescrictive measures generated traffic and profit losses for the sector along with adverse societal impacts (notably additional external costs from the transport system).

Based on this, in the current JNS procedure two subgroups are created to deal with the beforementioned problems as follow:

- *Subgroup 1 "AMOC": issuing problems recalled in A. and B.,*
- *Subgroup 2 "RISK": issuing problems recalled in C.*

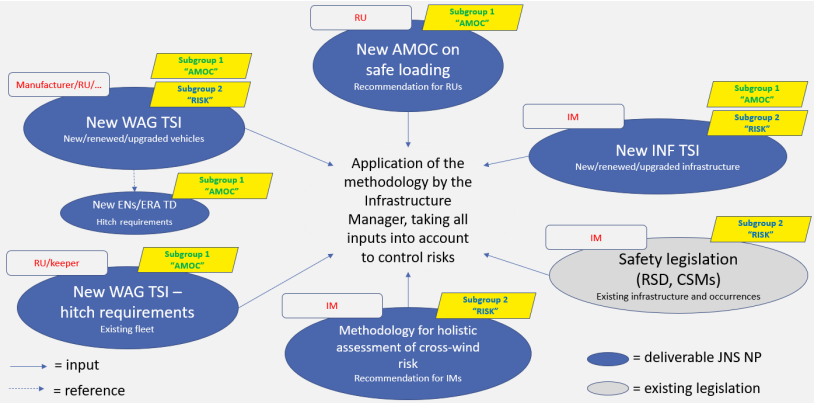
[2] Acceptable Means of Compliance (AMOC).

[3] At the following link, there are all the recalled JNS procedures available: Joint Network Secretariat (JNS) | European Union Agency for Railways (europa.eu).

[4] Following the incident on the Great Belt west Bridge on 13/01/21 where a semi-trailer moved out of the loading gauge on its way across the Great Belt, the ban for the use of semi-trailers on pocket wagons on the entire Danish network (including the GBB) was introduced by NSA DK. This ban was lifted on the 5 February 2021 for the entire Danish network with the exception of the Great Belt Bridge subject to additional safety measures being introduced. The ban on the use of semitrailers on pocket wagons on the Great Belt Bridge was lifted on the 20/04/21 and instead a series of safety measures were introduced, notably: 1) The type of hitch used must have a vertical locking force ≥ 85kN; 2) A third-party assessment stating that the type of hitch used is suitable as a secure and sufficient lock (vertical locking force ≥ 85kN); 3) Documentation of the competencies of the third-party; 4) Semi-trailers loaded on pocket wagons must have a gross weight of at least 14 tons; 5) A procedure that ensures a semi-trailer gross weight of at least 14 t must be described; 6) Documentation of how the above conditions have been incorporated into the Railway Undertaking's Safety Management System; 7) The action plan from the JNS Urgent Procedure of April 2019 on recommendations for procedures and control when loading semi-trailers on pocket wagons must be applied by terminals, regardless of hitch type; 8) If loading and checking is conducted by a terminal, there must be an agreement with the terminal operator regarding requirements of loading procedure and check of this as well as competence requirements for staff; 9) Cooperation with relevant terminals must be documented and incorporated into the Railway Undertaking's Safety Management System.

Considering the complex context, it is worth to provide an overview of the subgroups, related expected outputs (delibverables), stakeholders involved and the legislative framework (Figure 1).

Figure 1 – Structure of the JNS Crosswind ormal Procedure (2024-2026)



The current Full Impact Assessment (FIA) is focused only on the output of Subgroup 1 "AMOC".

According to Article 2(33) of the Directive on the interoperability of the rail system within the European Union (Directive (EU) 2016/797, as amended), Acceptable Means of Compliance (AMOCs) are "*non-binding opinions issued by the Agency to define ways of establishing compliance with the essential requirements*". Therefore, AMOCs define good practices to cover operational risks also by referring to available standards, which the actors of the railway sector can use in their safety management system as evidence that their operational procedures comply with high-level requirements set out in EU legislation.

The FIA covers only the outcome of the Subgroup 1 "AMOC", in particular:

- *Annex 1 "Loading and securing of semi-trailers on pocket wagons" to the existing AMOC "safety of load",*
- *Recommended WAG TSI requirements on "device to secure semi-trailers" and the related ERA Technical Document containing the conformity assessment,*
- *Retroactive application of certain of the WAG TSI requirements to the existing European (pocket wagon) fleet.*

All these elements are prerequisite for the NSA DK to withdraw its national rules. In particular, the new WAG TSI requirements on hitches (from now on, *devices to secure semi-trailers*) refer to:

- *strength,*
- *vertical locking force,*
- *indication for correct loading and securing of semi-trailers, and*
- *marking of information regarding these devices on the sides of the unit.*

The selected identified requirements for devices to secure semi-trailers to be applied to new, renewed upgraded and existing pocket wagons will be integrated in the WAG TSI. The demonstration of conformity of devices to secure semi-trailers with the mentioned requirements shall be done in accordance with the conformity assessment procedure described in the ERA Technical Document - "*Assessment of the conformity with the requirements in point 4.2.2.4 of the WAG TSI on securing of semi-trailers*"[5].

[5] The elements are described in sections 2.1, 2.2, 2.3 and 2.4 of the ERA TD referenced in Appendix D.2, Index [D.1].

1.2. Evidence of the problem

In addition to the two Danish occurrences (Great Belt) mentioned above, several JNS TF experts mentioned that further occurrences happened over time in other Member States (MSs): Norway (Ingedal) in 2006 and Germany (Hamburg) in 2014. These events may suggest that crosswind may be a local phenomenon but can occur in different MSs. Furthermore, RISC[6] #102 meeting has shown that also MSs other than Denmark question whether the railway actors are capable to sufficiently control the risk of the transport of semi-trailers on crosswind-exposed infrastructure (especially in the context of ongoing climate change in the coming decades).

Analysing the trend of the rail freight traffic volume passing the GBB for the 2018-2024 time period[7], it emerged the following:

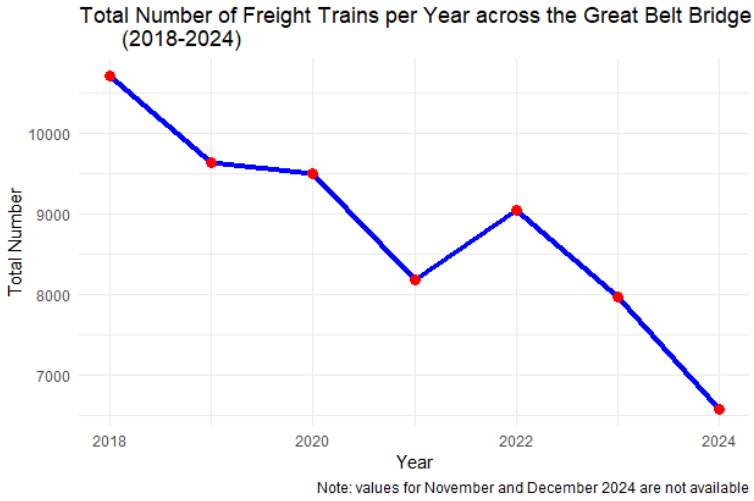
- *Progressive decline for the entire period which saw a drop of around 27% (only between 2020 and 2021 the number of freight trains increased slightly),*
- *Considering that the traffic figures are aggregated for all freight trains with all types of freight wagons, it cannot be excluded that with this important traffic loss, the number of pocket wagons are at a significantly lower level compared to the period before the restrictions for use of pocket wagons were introduced,*
- *From further investigation, it has emerged that the loss of traffic related to pocket wagons alone is significantly higher than the percentage indicated above, which pertains to the general 'freight' sector, and is approximately 50%.*

Additional statistics related to the trends in traffic volume are included in Annex 1.

Comparing the freight traffic volume for 2018-2023 between rail and road (2024 not available yet for road), it emerged that:

- *Rail traffic = -26%*
- *Road traffic (trucks) = +12%.*

Figure 2



[6] Committee on the Interoperability and Safety of the European Rail System.

[7] For the year 2024, data available until end October; for November and December, it was assumed that the traffic levels would be the same as in October (source for all traffic data: BaneDanmark and DTU). While the traffic volume refers to the 2018-2024 time period (Figure 2), the percentage of progressive decline is calculated between 2018 and 2023 due to the unavailability of road traffic data for the year 2024.

Given the nature of pocket wagons with semi-trailers, it is very likely that a significant portion of the traffic that shifted to road transport originally came from rail. Moreover, from a geographical point of view, it cannot be excluded that the traffic loss had impacted neighbouring countries (e.g. Germany, Sweden).

The concern about significant traffic loss and the modal shift towards road transport also emerged during bilateral exchanges with various stakeholders, such as terminals and companies providing services like leasing rail freight wagons, rail logistics solutions, and tank container logistics.

Among the restrictive measures put in place by the NSA DK after the incident on the GBB on 13/01/2021, particular concerns have been expressed from the sector re. the requirement that semi-trailers loaded on pocket wagons must have a gross weight of at least 14 tons. The need to organise the transport movement accordingly significantly complicates the practical logistics, implying a potential cost impact.

On this regard, in 2022 an assessment of the cost impact for the sector was carried out and aimed to evaluate:

1. *Impacts associated with the ban in place from 13 January to 20 April 2021 of the use of pocket wagons, and*
2. *Impacts associated with 14 tons minimum gross weight requirement and related requirements imposed after 20 April 2021.*

Aggregated cost estimates are summarized for both items in Table 1 and Table 2, respectively.

Table 1 – Aggregated cost impact for ban of semi-trailers on pocket wagons

Step	Methodology and results
1	Number of freight trains crossing the Great Belt Bridge per day in both directions (pre-2021 incident): 26 (or approximately 800 per month)
2	On the basis of information from BaneDanmark about monthly freight trains on the Great Belt Bridge during the period in which the ban was in place, there were approximately 6 freight trains less than in the previous period.
3	EU average revenue per train kilometre / net-tonnes kilometre[8] combined with information about cost per train kilometre / tonnes kilometre[9]: the average revenue per train kilometre (in 2018) is equal to 21.23 EUR, while the average revenue per net-tonne kilometre is equal to 0.0376 EUR.
4	Eurostat information about average tonnes per train / average distance travelled in Denmark.
5	Two measures for cost to the sector is provided either expressed as lost revenue per week or as lost profits per week.
6	The estimated revenue loss per week is in the range from 0.25 to 0.35 mln EUR. The estimated profit loss per week is in the range **from 0.07 to 0.19 mln** EUR. Interestingly, the reported loss mentioned by the sector in February 2021 was in excess of 1 mln EUR per week[10] (the difference may be due to more detailed information about impact incl. consideration to trains using alternative routes, e.g. directly from Sweden to Germany without transiting through Denmark). It should be noted that with the above cost estimates this would translate into a total cost for the sector covering the **14 weeks** in which the ban was in place would be in the range **from 1.0 to 2.6 mln EUR**.

[8] https://www.irg-rail.eu/download/5/853/IRG9thMMReport-WorkingDocument.pdf

[9] Information included in a document found in the website of Netherlands Institute for Transport Policy Analysis (KiM).

[10] Denmark's pocket wagon ban: one million extra weekly costs for operators | RailFreight.com.

Table 2 – Aggregated cost impact associated with 14 tonnes minimum gross weight requirement and related requirements

Step	Methodology and results
1	On the basis of available information (at the time – Q1 2022) about monthly freight trains on the Great Belt Bridge since the lifting of the ban it was realistic to assume a recovery of 50% of the cancelled trains over the Great Belt Bridge (although subsequent data indicated a lower level of recovery, see Figure 2).
2	This would imply that instead of 6 trains cancelled it would be 3 cancelled trains. It would then follow, that the situation with the 14 tonnes restriction in place (along with other additional measures) could translate into a profit loss of **0.04 mln EUR and 0.09 mln EUR per week**. These values are taken as 50% of the values given for the estimated weekly profit loss with the ban. With these values the total loss incurred by the sector since the new requirements were introduced would amount to **between 1.7 and 4.4 mln EUR** (over a 47-week period, from 21/04/21 until mid-March 2022). It should also be noted that had the complete ban stayed in place since January 2021 the total cost in terms of lost profit would be in the range **from 4.3 to 11.5 mln EUR** (corresponding to the full 61-week period).
3	Given the assumptions involved these findings should be interpreted with care and are indicative only. It was noted in an article from July 2021 that 'Since 20 April, volumes are gradually returning back to normal'[11]. However, the cancellation of 3 trains per day since the ban would seem realistic given the available data for the Great Belt Bridge link on number of freight trains covering the period January 2018 to February 2022.

Always on the JNS NP "Great Belt bridge accident/incident" (2019-2022), it is important to recall that also an AMOC on Safety of load – safety requirements was produced, covering Fundamental Operational Principles 3 (FOP3) in the TSI OPE: "*Before a train begins or continues its journey, it shall be ensured that passengers, staff and goods are carried safely*". In particular, in the existing AMOC weaknesses caused by Human & Organizational factors were not easily identified.

The AMOC designed within the current JNS procedure: *i)* considers the safe loading and securing of semi-trailers on pocket wagons, *ii)* recommends one way for RUs to comply with FOP3 and the responsibilities as assigned to them by the RSD, *iii)* provides guidance to RUs for contracts in case involvement of third parties are planned, and *iv)* identifies remaining weaknesses caused by Human & Organizational factors, mitigating them, by the new requirements for the devices to secure semi-trailers in WAG TSI and *v)* the EC conformity assessment in the ERA Technical Document.

1.3. Baseline scenario

After the accidents/incidents (Great Belt Bridge – GBB -, 2019 & 2021) immediate and restrictive measures were adopted by the NSA DK, introducing a ban for the use of semi-trailers on pocket wagons. Following the incident on the Great Belt West Bridge on 13/01/21 where a semi-trailer moved out of the loading gauge on its way across the Great Belt, a ban for the use of semi-trailers on pocket wagons was introduced by NSA DK in Denmark with particular focus on the GBB. This ban was lifted on the 5 February 2021 for the entire Danish network with the exception of the Great Belt Bridge subject to additional safety measures being introduced. The ban on the use of semitrailers on pocket wagons on the GBB was lifted on the 20/04/21 and instead a series of safety measures were introduced (some of them also to the entire national system), notably:

- *The type of devices to secure semi-trailers used must have a vertical locking force ≥ 85kN;*

[11] Pocket wagons return to Great Belt Bridge on the way to Sweden | RailFreight.com.

- *A third-party assessment stating that the type of hitch used is suitable as a secure and sufficient lock (vertical locking force ≥ 85kN);*
- *Documentation of the competencies of the third-party;*
- *Semi-trailers loaded on pocket wagons must have a gross weight of at least 14 tons;*
- *A procedure that ensures a semi-trailer gross weight of at least 14 tons must be described;*
- *Documentation of how the above conditions have been incorporated into the Railway Undertaking's Safety Management System;*
- *The action plan from JNS Urgent Procedure of April 2019 on recommendations for procedures and control when loading semi-trailers on terminals must be applied by terminals, regardless of hitch type;*
- *If loading and checking is conducted by a terminal, there must be an agreement with the terminal operator regarding requirements of loading procedure and check of this as well as competence requirements for staff;*
- *Cooperation with relevant terminals must be documented and incorporated into the Railway Undertaking's Safety Management System.*

Today, many of these measures are still in place. As a result, the aggregated cost impact associated with those measures given in Section 1.2 remain valid (for further details see Tables 1 and 2). From today's perspective it is likely that actual costs imposed on the sector are significantly higher.

It is worth recalling that rail pocket wagon traffic on the GBB declined by around 50% from 2018 to 2023, while road traffic increased by 12% over the same period. In addition to important traffic lost, that could have impacted – also here – neighbouring countries, it leads to an increase in negative environmental externalities.

1.4. Main assumptions

This impact assessment is focused on the outcome of subgroup 1 "AMOC" of the JNS Procedure "Crosswind" and it is based on information provided during JNS TF exchanges (including subgroup meetings) regarding the problem statement, as well as follow-up analyses and discussions with individual TF members and external experts representing various stakeholders.

Within the JNS TF activities, a range of solutions has been discussed and assessed in-depth. Additional data were collected through bilateral interviews with experts to conduct simplified quantitative evaluations, contextualizing the potential impact of the new WAG TSI requirements.

To regaining the trust among the actors and from NSAs (not only for DK), the current JNS Procedure "Crosswind" was launched. Its Subgroup 1 "AMOC" has developed the following two key elements:

- *Updated AMOC "safety of load",*
- *New WAG TSI requirements for devices to secure semi-trailers (strength, locking force, indications- and marking of the unit) and a related ERA Technical Document with the respective conformity assessment,*
- *Retroactive application of certain of the WAG TSI requirements to the existing European (pocket wagon) fleet.*

On the basis of the available evidence and knowledge it is concluded that these technical requirements are feasible from a technical perspective, also because they are exhaustively discussed and agreed among European JNS experts of Subgroup 1 "AMOC".

1.5. Stakeholders affected

The stakeholders affected by the issue are indicated in Table 2. The current requirements affect many stakeholders. In particular, the complexity of the problem is likely to impact mainly RUs, vehicle keepers, manufacturers and other entities involved in the design, logistics, operations and maintenance of pocket wagons. As such, it should be noted that the geographical and organisational heterogeneity amongst stakeholder groups would influence the extent to which individual companies are affected.

Table 2 – Stakeholders affected in the current JNS "Crosswind" NP subgroup AMOC

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

1.6. Subsidiarity and proportionality

The problem and proposed options fall within the scope of the Railway Safety and Interoperability directives including the TSIs. In section 1.2 are recalled some occurrences related to crosswind that happened from 2006 in Denmark, Norway and Germany. These events suggest that crosswind could be a local phenomenon but may occur in different MSs. Furthermore, RISC #102 meeting has shown clearly that also MSs other than Denmark question whether the railway actors are capable to sufficiently control the risk of the transport of semi-trailers on crosswind-exposed infrastructure. Due to a variety of resources / expertises or priorities, MSs may implement varying standards, leading to inconsistencies that could hinder cross-border operations significantly, so ensuring a coordinated action across multiple MSs can be complex and inefficient without a centralized approach.

As concluded within several previous JNS procedures, European action is needed to ensure a coordinated and harmonised solution regarding the loading and securing of semi-trailers on pocket wagons.

Proportionality is an integral part of the impact assessment performed for the JNS Crosswind normal procedure in order to ensure that the proposed solutions are not excessive (in line with the EU Better Regulation Guidelines).

2. Objectives

2.1. Specific objectives

The objectives concern the development of mid and long-term measures, to sustainably:

- *Restore / increase the safety level (supporting the transport companies to sufficiently control risks),*
- *Ensure interoperability, and*
- *Return to the previous cost base or lower.*

Furthermore, an additional objective related to this specific case needs to be added:

- *Rebuild trust among stakeholders and for NSAs in general (not only NSA DK),*
- *Remove DK National Rules,*
- *Provide legal certainty in case of future accidents / incidents.*

3. Options

3.1. List of options

In order to assess and compare the impact of the implementation of the new AMOC for safety of load and the new WAG TSI requirements on devices to secure semi-trailers, **two scenarios** have been developed. One of these scenarios is further detailed in **four options.**

Scenario 0: new AMOC "Safety of Load" implemented, DK national rules continue to apply.

Scenario 1: WAG TSI requirements on devices to secure semi-trailers apply to new/renewed/upgraded pocket wagons, new AMOC "Safety of Load" implemented and DK national rules continue to apply.

Scenario 1 is further detailed with one of the following options[12] for retroactive application of the new WAG TSI requirements to the existing fleet. In all these options, **the DK national rules are withdrawn after the transition period of 1 year**:

- *Option 1: application of following new WAG TSI requirements to the existing fleet used on the Danish network :*
  - *on locking force (4.2.2.4.2)*
  - *and marking on unit (4.2.2.4.4)*
- *Option 2: application of following new WAG TSI requirements to the existing fleet used on the Danish network :*
  - *locking force (4.2.2.4.2)*
  - *marking on unit (4.2.2.4.4)*
  - *indications (4.2.2.4.3)*
- *Option 3: application of following new WAG TSI requirements to the entire existing fleet in Europe:*
  - *locking force (4.2.2.4.2)*
  - *marking on unit (4.2.2.4.4)*
- *Option 4: application of following new WAG TSI requirements to the entire existing fleet in Europe:*
  - *locking force (4.2.2.4.2)*
  - *marking on unit (4.2.2.4.4)*
  - *indications (4.2.2.4.3)*

All the options were discussed and agreed with JNS TF members.

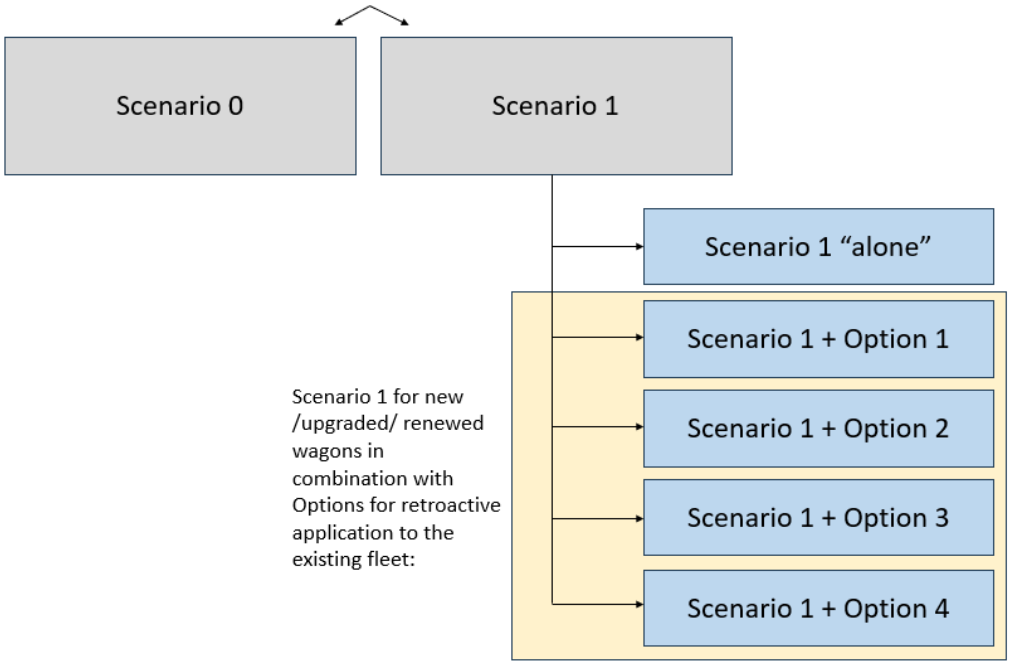
Overviews of scenarios / options are provided in Figure 3 and Figure 4.

[12] For all Options 1 to 4 (for retroactive application of the new TSI WAG requirements) contain also the application of Scenario 1 (i.e. the full application of the new TSI WAG requirements to new/renewed/upgraded wagons).

Figure 3 – Overview of Scenarios and Options'structure for the impact evaluation

Elements	Scenario 0 Baseline scenario	Scenario 1 New/renewed/ upgraded	Option 1 DK existing fleet	Option 2 DK existing fleet	Option 3 EU existing fleet	Option 4 EU existing fleet
Application of NR DK	X	X				
Application of new AMOC	X	X	X	X	X	X
New WAG TSI requirements - point 4.2.2.4.1 "strength"		X				
New WAG TSI requirements - point 4.2.2.4.2 "locking force"		X	X	X	X	X
New WAG TSI requirements - point 4.2.2.4.3 "indications"		X		X		X
New WAG TSI requirements - point 4.2.2.4.4 "marking of units"		X	X	X	X	X

Figure 3 – Overview of Scenarios and Options' linkages for the impact evaluation



4. Impacts of the options

4.1. Qualitative analysis

Stakeholder assessment

A high-level overview on the expected impacts for clusters of stakeholders and aggregated results are provided in the following Tables.

Scenario 0 (Baseline, Option 0) [DK National Rules and AMOC]			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector (RU, manufacturer, ECM etc.)	Positive	/	Very negative
	Negative	Decline in pocket wagon traffic and potential for traffic growth lost along with increased costs. The national and European legal framework does not facilitate the regaining of traffic and trust among stakeholders. Modal shift from rail to road. Negative external costs due to DK national rules.	
National Authorities and Assessment bodies (MS, NSA, NoBo etc.)	Positive	/	Very negative
	Negative	Persistence of the DK national rules might result in limited or no traffic recovery. Contribute to the non-achievement of the modal shift target for rail freight. Persistence of lack of trust among stakeholders and from the NSAs. Difficulty to support the transport companies to sufficiently control the risks.	
European Authorities (EC, ERA)	Positive	/	Very negative
	Negative	Persistence of the DK national rules. Possibility of spread of the strict DK national rules to other MSs which imply a non-harmonised approach, as well as the lack of trust among stakeholders and from the NSAs (not only the DK one). Difficulty to support the transport companies to sufficiently control the risks. Contribute to the non-achievement of the modal shift target for rail freight.	

Only Scenario 1 (alone) [DK National Rules, AMOC and all new WAG TSI requirements are applied to new / renewed / upgraded) pocket wagons using the European railway network]			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector (RU, manufacturer etc.)	Positive	Implementation of new requirements ensures alignment across Member States and stakeholders, improving the safety, interoperability and competitiveness of the European railway sector for only the new, upgraded and renewed pocket wagon.	Very negative
	Negative	Knowledge gap and potential costs to comply with new WAG TSI requirements implemented only for new, renewed and upgraded vehicles. Decline in pocket wagon traffic and potential for traffic growth lost. The national and European legal framework does not facilitate the regaining of traffic and trust among stakeholders. Modal shift from rail to road. Negative external costs due to DK national rules.	
National Authorities and Assessment bodies (MS, NSA, NoBo etc.)	Positive	Limited harmonization of the legal framework (WAG TSI and AMOC) for the European pocket wagon fleet with regard to devices to secure semi-trailers.	Very negative
	Negative	Changes to the TSI requirements and AMOC require an update of knowledge and procedures within the different national authorities. Persistence of the DK national rules might result in limited or no traffic recovery.	
European Authorities (EC, ERA)	Positive	Amending the current WAG TSI would improve the harmonization of the legal context regarding devices to secure semi-trailers for only new, renewed and upgraded pocket wagons in Europe.	Very negative

	Negative	Persistence of the DK national rules. Possibility of spread of the strict DK national rules to other MSs which imply a non-harmonised approach across the EU, as well as the lack of trust among stakeholders and from the NSAs (not only the DK one). Fine tuning changes to the legislative framework requires a marginal update of knowledge and procedures. Harmonised approach for devices to secure semi-trailer concerning WAG TSI requirements does not cover all EU rolling stock. Contribute to the non-achievement of the modal shift target for rail freight.	

Scenario 1 + Option 1 *[this option includes Scenario 1 + Option 1; for the particular impact of Scenario 1 alone see the second table of this section; Option 1 includes the AMOC and new WAG TSI requirements related to locking force, strength (vertical upwards directed forces) and marking on the unit are applied to existing pocket wagons using the DK network]*			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector (RU, manufacturer etc.)	Positive	Implementation of new WAG TSI requirements (point 4.2.2.4.2. for locking force and point 4.2.2.4.4 for marking of unit of WAG TSI) ensures alignment to the existing fleet, improving the safety, interoperability and competitiveness for the (only) Danish railway network.	Rather positive
	Negative	Knowledge gap and potential costs to comply with new WAG TSI requirements implemented in the existing pocket wagon fleet that is using the Danish network. Potential costs could include administrative work to ensure that only wagons enter into the Danish network which comply with point 4.2.2.4.2. (for locking force) and point 4.2.2.4.4 (for marking of unit) of WAG TSI.	
National Authorities and Assessment bodies (MS, NSA, NoBo etc.)	Positive	Progress on harmonization of the legal framework (WAG TSI and AMOC) at European level for devices to secure semi-trailers.	Very positive
	Negative	Changes to the TSI requirements and AMOC require an update of knowledge and procedures within the different national authorities. Different approach for pocket wagons using the DK network and those not using the DK network may result in lack of clarity which could be difficult to manage and more resource intensive for authorities.	
European Authorities (EC, ERA)	Positive	Amending the current WAG TSI would improve the harmonization of the legal context regarding devices to secure semi-trailers for only the existing pocket wagon fleet of Denmark.	Very positive
	Negative	Fine tuning changes to the legislative framework requires a marginal update of knowledge and procedures.	

Scenario 1 + Option 2 *[this option includes Scenario 1 + Option 2; for the particular impact of Scenario 1 alone see the second table of this section; Option 2 includes the AMOC, WAG TSI requirements related to locking force, strength (vertical upwards directed force), indications and marking on the unit only for the railway network of Denmark]*			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector (RU, manufacturer etc.)	Positive	Implementation of new WAG TSI requirements ensures alignment to the existing fleet, improving the safety, interoperability and competitiveness for the rolling stock using only the Danish railway network, including the compliance to the Indications' requirements.	Rather positive
	Negative	Knowledge gap and potential costs to comply with new WAG TSI requirements implemented in the existing national pocket wagon fleet. Potential costs could include administrative work to ensure that only wagons enter into the Danish network which comply with point 4.2.2.4.2. (for locking force) and point 4.2.2.4.4 (for marking of unit) of WAG TSI.	
	Positive	Strong harmonization of the legal framework (WAG TSI and AMOC) at Danish level for devices to secure semi-trailers (also retroactively).	Rather positive

National Authorities and Assessment bodies (MS, NSA, NoBo etc.)	Negative	Different approach for pocket wagons using the DK network and those not using the DK network may result in lack of clarity which could be difficult to manage and more resource intensive for authorities.	
European Authorities (EC, ERA)	Positive	Amending the current WAG TSI would improve the harmonization of the legal context regarding devices to secure semi-trailers for only the existing pocket wagon fleet used on the DK network (also retroactively).	Rather positive
	Negative	Fine tuning changes to the Danish legislative framework requires a marginal update of knowledge and procedures.	

Scenario 1 + Option 3 *[this option includes Scenario 1 + Option 3; for the particular impact of Scenario 1 alone see the second table of this section; Option 1's requirements applied to the European pocket wagon fleet]*			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector (RU, manufacturer etc.)	Positive	Implementation of new WAG TSI requirements ensures alignment to the existing European fleet, improving the safety, interoperability and competitiveness for the entire European railway sector (excluding the compliance to the Indications' requirements).	Very positive
	Negative	Knowledge gap and potential costs to comply with new WAG TSI requirements implemented for the entire existing European pocket wagon fleet.	
National Authorities and Assessment bodies (MS, NSA, NoBo etc.)	Positive	Very good level of harmonization of the legal framework (WAG TSI and AMOC) at European level for devices to secure semi-trailers.	Very positive
	Negative	European harmonisation concerning WAG TSI requirements for the entire existing European pocket wagon fleet resulting in potential additional resources required.	
European Authorities (EC, ERA)	Positive	Amending the current WAG TSI would improve the harmonization of the legal context regarding devices to secure semi-trailers for the entire European pocket wagon fleet.	Very positive
	Negative	Fine tuning changes to the legislative framework requires a marginal update of knowledge and procedures.	

Scenario 1+ Option 4 *[this option includes Scenario 1 + Option 4; for the particular impact of Scenario 1 alone see the second table of this section; Option 2's requirements applied to the European pocket wagon fleet]*			
Category of stakeholder	*Impact type*	*Description*	*Overall Impact*
Sector (RU, manufacturer etc.)	Positive	Implementation of new WAG TSI requirements ensures alignment to the existing European fleet, improving the safety, interoperability and competitiveness for the entire European railway sector (including the compliance to the Indications' requirements).	Rather positive
	Negative	Knowledge gap and potential costs to comply with new WAG TSI requirements implemented in the entire existing European pocket wagon fleet.	
National Authorities and Assessment bodies (MS, NSA, NoBo etc.)	Positive	Very good level of harmonization of the legal framework (all requirements of WAG TSI and AMOC) at European level for devices to secure semi-trailers (also retroactively).	Rather positive
	Negative	European harmonisation concerning all requirements (except requirement in point 4.2.2.4.1, strength) of the WAG TSI for the entire existing European pocket wagon fleet resulting in potential additional resources required.	
European Authorities (EC, ERA)	Positive	The new WAG TSI amendments would improve the harmonization of the legal context regarding devices to secure semi-trailers for the entire European pocket wagon fleet (also retroactively).	Rather positive
	Negative	Fine tuning changes to the legislative framework requires a marginal update of knowledge and procedures.	

Railway system assessment

Options	*Safety*	*Interoperability*	*Competitiveness*	*Trust among the actors and from NSAs*	***Effectiveness***
Scenario 0 (baseline, Option 0)	Current provisions do not ensure further improvements of safety regarding the identified problem / Non-harmonised implementation of safety actions regarding the identified problem.	Under this option, there is no further change to the interoperability of the EU rail system / Risk of diverging implementations of measures	Freight traffic reduction (GBB) / Decrease in the competitive situation of railway / No improvements in the competitive situation of the railway system	Lack of trust	Very low
Scenario 1 "alone" (new/renewed/ upgraded pocket wagons in Europe)	Moderate improvement of harmonisation of safety actions	Moderate improvement	Lower administrative burdens, changes to facilitate pocket wagons and harmonisation efforts contribute to increased competitiveness	Moderate trust improvement	Very low
Scenario 1 + Option 1 (existing pocket wagon in DK)	Significant improvement of harmonisation of safety actions	Significant improvement limited only for the DK railway system	Significant improvement limited only for the DK railway system	Significant trust improvement between DK authorities and industry	Very high
Scenario 1 + Option 2 (existing pocket wagon in DK)	Significant improvement of harmonisation of safety actions	Significant improvement limited only for the DK railway system	Significant improvement limited only for the DK railway system	Significant trust improvement between DK authorities and industry	Rather high
Scenario 1 + Option 3 (existing pocket wagon in Europe)	Very significant harmonisation of safety actions	Very significant improvement for the European fleet as a whole	Very significant improvement for the European fleet as a whole	Dramatic trust improvement for EU, national authorities and industry	Very high
Scenario 1 + Option 4 (existing pocket wagon in Europe)	Very significant harmonisation of safety actions	Very significant improvement for the European fleet as a whole	Very significant improvement for the European fleet as a whole	Dramatic trust improvement for EU, national authorities and industry	Rather high

Coherency assessment

Options	*Policy analysis*	***Coherence***
Scenario 0 (baseline, Option 0)	DK national rules in place, WAG TSI, AMOC "safety of loading" and EN standards have been assessed. DK national rules retained and its unharmonized nature negatively impacts the coherence with the TSI	Very low
Scenario 1 "alone" (new/renewed/ upgraded pocket wagons in Europe)	AMOC and technical requirements have been updated in the WAG TSI, full application limited to new, upgraded and renewed pocket wagons in Europe	Rather low

Scenario 1 + Option 1 (existing pocket wagon in DK)	AMOC and technical requirements have been updated in the WAG TSI, full application only for new, upgraded and renewed pocket wagons in Europe as well as certain requirements for the existing rolling stock using the Danish railway system	Rather high
Scenario 1 + Option 2 (existing pocket wagon in DK)	AMOC and technical requirements have been updated in the WAG TSI, full application only for new, upgraded and renewed pocket wagons in Europe as well as all requirements for the existing rolling stock using the Danish railway system	Rather high
Scenario 1 + Option 3 (existing pocket wagon in Europe)	AMOC and technical requirements have been updated in the WAG TSI, full application only for new, upgraded and renewed pocket wagons in Europe as well as certain requirements for the existing rolling stock in Europe. This guarantees a coherent European legal framework	Very high
Scenario 1 + Option 4 (existing pocket wagon in Europe)	AMOC and technical requirements have been updated in the WAG TSI, full application only for new, upgraded and renewed pocket wagons in Europe as well as all requirements for the existing rolling stock in Europe. This guarantees a coherent European legal framework	Very high

4.2. Quantitative analysis

Pocket wagons, used for transporting semi-trailers by rail, are equipped with devices that secure the semi-trailers during transit. These devices are crucial for ensuring the stability and safety of the transported semi-trailers. They hold and lock semi-trailers in a safe position by using the H50-type king-pin complying with ECE Regulation 55 (ERA TD, section 1.3 “Definition”). In Figure 4 is shown an example of such a device.

Figure 4 – Example of device to secure semi-trailer (from Innotrans 2024)

In the current European fleet, based on information provided by JNS TF experts, there are around 15 types of devices to secure semi-trailers, with the vast majority of hitches produced by the same company. Railway operators may have pocket wagons with different types of these devices. In the market, there are several types of devices available, reflecting a certain degree of heterogeneity. This variety can be attributed to different manufacturers and the specific requirements of various rail operators. The devices can range from relatively simple mechanical systems to more complex designs that incorporate advanced locking mechanisms, materials to enhance durability and safety and some of them are equipped also with sensor systems.

An overview of the unit costs to comply with the proposed WAG TSI requirements and updated AMOC is available in Annex 2 based on inputs received from JNS TF members and external stakeholders. The ‘orders of magnitude’ are provided for each Scenario / Option (as defined in section 3.1) and expressed in ranges of values, as follows:

- *AMOC: being the current (best) practice, no new costs are identified,*

- *Strength requirements (point 4.2.2.4.1 of WAG TSI): these apply only to new, renewed and upgraded pocket wagons (Scenario 1 "alone" and in all options); the collected values range between 4.000 € and €8.000 € per vehicle-type; this cost is considered for Scenario 1 "alone" and in the combinations with Options from 1 to 4; this requirement only applies to new / upgraded / renewed devices to secure semi-trailers,*
- *Locking force and strength requirement – vertical upwards directed forces: the values collected are between 4.000 € to 10.000 € vehicle-type for Options from 1 to 4, while for Scenario 1 "alone" the upper bound decrease to 8.000 € vehicle-type (and same lower bound, 4.000 €)[13],*
- *Indications (king pin in the funnel and king pin locked): for new, renewed and upgraded pocket wagons the mechanical implementation of the functionalities would cost in a range between 800 € to 2.000 € per wagon[14], while the electronic implementation is more expensive (from 2.500 € to 3.000 € per wagon). Moreover, for the existing fleet, the implementation of the mechanical system is very difficult because it would require retrofitting the device to secure semi-trailers. Therefore for Option 2 and 4 only the electronic system was considered with a cost between 3.000 € to 5.000 € per wagon[15],*
- *Marking on the unit: for new, renewed and upgraded pocket wagons (Scenario 1) the cost is considered to be around 100 € per wagon, while for the other Options it depends on the way it is realised:*
    - *During operation: there is a one-off cost when the marking is applied (e.g. 300 € per wagon)[16], and this cost is not further increased during operation,*
    - *In a maintenance shop: the cost may vary depending on the distance from the maintenance workshop. Indeed, the range of values is considerably larger e.g. from 400 € to 4.000 € per wagon.*

It is important to highlight the potential need to redesign devices securing semi-trailers to comply with the proposed WAG TSI requirements (in particular if the redesign is related to the locking force requirements - vertical down force). This may involve modifying the mechanical structure of the existing devices e.g. modification of the locking bar, and in extreme cases, replacing it with a new one. Based on the inputs collected from JNS TF members, the summary is as follows:

- *Each company may have more than one type of devices to secure semi-trailers,*
- *In case modification of the actual configuration of the device is required it may impose a new authorisation process; it can happen that some pocket wagons authorised with the old regulations (not TSI) cannot fulfil the actual authorisations requirements, with the consequence of scrapping of wagons,*
- *Not all investigated companies are foreseeing the need to redesign the devices to secure semi-trailers and no concrete information was received about the need to replace devices with new ones,*
- *A rough estimation of the cost of redesigning the device is between 2.000 € and 3.000 € per wagon applied conservatively to 16% of the European pocket wagon fleet (relevant specifically for Options 3 and 4).*

Regarding the estimation of the number of hitches in the EU fleet that do not comply with the 85 kN locking force requirement (e.g., approximately 20%, as mentioned above), the summary is as follows. Out of the total number of hitches in the current European pocket wagon fleet (around 26,000 units, rounded figures), excluding those related to MAZ (including hitches produced under license), SAF, PVF, Lohr (for which there has been a consolidated agreement among the JNS TF experts that they comply with the

[13] For the quantifications of Options reported below, 7.000€ and 6.000€, respectively were used.
[14] It was used 2.000€ for the quantification of the related Options.
[15] It was used 4.000€ for the quantification of the related Options.
[16] It was used 300€ for the quantification of the related Options.

locking force requirement and therefore do not need retrofitting) and Stützbock TWIN, it is unknown whether a range of 3,900 to 6,900 hitches comply with the 85 kN locking force requirements. These devices correspond, on average, to about 16% of the total number of devices currently in use, amounting to 2,174 pocket wagons in Europe[17]. However, it cannot be excluded that this number includes hitches that already comply with the requirement and therefore do not need to be redesigned.

The estimated cost of redesigning the device includes the quantification of the following items: 1) the purchase cost of the hitch modification kit and related installation activities (including staff); 2) shunting movements; 3) the cost of lost commercial revenue due to rolling stock being out of service; and 4) parking costs. When there are no maintenance tracks within the terminal and the wagons must be transported to the nearest workshop, additional travel costs are incurred for transporting the wagons to and from the maintenance facility.

Based on the above evidences, the total (one-off) cost of retrofitting the devices to secure semi-trailers to comply with new WAG TSI requirements is in the range between 2,8 M€ and 8,8 M€ (rounded values), with an average value of around 5,4 M€ for the European fleet (while for the fleet using the DK network a rough estimate is around 1,4 M€).

Being negligible in the bigger picture, maintenance costs have not been included in the Table in Annex 2, but are summarised as follows:

- *The devices to secure semi-trailers must be checked regularly,*
- *Maintenance is required for the 'electronic' system (see 'indications' requirement), although this system is not mandatory in the WAG TSI and also not for retrofitting,*
- *The 'marking on the unit' requires an update (renewed) every six months.*

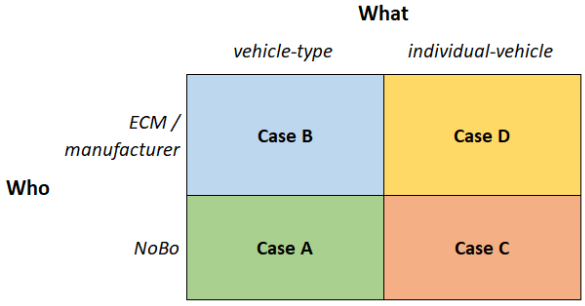
An additional cost category relates to the conformity assessment within the vehicle authorisation costs. On this, 2 main aspects were analysed: 'who' is carrying out the conformity assessment and 'what' is to be the type of conformity assessment process. Figure 4 shows the 2 dimensions considered and quantified in terms of conformity assessment costs. For the calculation, the following main input data and assumptions were used:

- *Number of pocket wagon in Europe[18]:*
  - *High estimate: 13.600*
  - *Low estimate: 7.000*
- *Number of vehicle-type (authorisation): 25,*
- *Time requested to perform the conformity assessment (including train travel to the site / accredited laboratory): 3 days in case of high availability / proximity and 4 days in case of low availability / proximity,*
- *The NoBo's activities include the inspection of each vehicle / vehicle type, the drafting of an inspection report for each vehicle (paperwork) and the combination the related vehicles (one or several ones) into a NoBo file and issuing the related EC verification certificate,*
- *Cost figures include also the tests performed in an accredited laboratory; it was found that Finite Element Analysis and bumping tests are standard tests.*

[17] The total number of pocket wagons in Europe was extracted from EVR as well as collected from JNS experts; the type and number of hitches were provided by JNS TF experts along with a table from a UIRR Report (2020) and from an external stakeholder.

[18] The number of pocket wagon in Europe (13.600) was extracted from EVR, while a more conservative value was estimated also based on experts' opinion.

Figure 5 – Overvire of the cases considered for the conformity assessment



Based on the results of this analysis, it is possible to summarise as follow:

- *All the calculated cost figures are 'one-off' type of costs,*
- *The preferred choice is Case B which implies a vehicle-type authorisation carried out by the ECM or manufacturer,*
- *Case C (full scope in term of number of pocket wagons in Europe = 13.600, individual-based authorisation, NoBo assessment) is around 176 times more costly than Case A (vehicle-type authorisation, NoBo assessment).*

These elements were taken forward in the specific analysis of the Scenarios / Options (section 4.2), whereby important consideration was given to proportionality such that application of the new requirements retroactively optimises the balance between conformity assessment at vehicle type level and at individual vehicle level.

Negative externalities – air pollution, climate change and Well To Tank (WTT) emissions – are considered in the analysis[19]. A calculation for the GBB is performed and summarised below.

Updating in December 2024, the previous analysis carried out for the previous JNS TF procedure (see section 1.2 – Table 1 and 2 – for details) it was possible to quantify the following impacts:

- *Estimated annual loss for traffic reduction with ban of semi-trailers on pocket wagons (assuming a total of 7 cancelled trains per day)[20]:*
  - *3.7 M€ per annum (based on train-km and in lost profit) or*
  - *16.5 M€ per annum (based on train-km and in lost revenue).*
- *Additional external costs from shifting 7 trains to road of approximately 1.3 M€ per annum which includes air pollution, climate change and WTT emissions, and 6.5 M€ per annum which includes accidents[21].*
- *Additional cost due to missed opportunities for growing rail freight as a result of the prolonged restrictions for using pocket-wagons in Denmark with semi-trailers of around 1.1 M€ per annum (assuming there could have been 2 additional trains / around 10% of the current number of trains per day).*

The total costs linked to the above elements amount to 12.6 M€ per annum. In case the DK National Rules would be lifted this estimate provides a conservative indication of the resulting benefits (as avoided costs).

[19] https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1.
[20] https://www.bane.dk/da/Borger/Publikationer/Analyse-af-vindrestriktioner-paa-Storebaeltsforbindelsen.
[21] Impact on road congestion was not considered.

Furthermore, two additional issues have been investigated with selected JNS experts with the intent to estimate their magnitude and costs:

1. *Cost due to the administrative work performed by RUs and vehicle keepers to ensure within a dynamic market that only wagons compliant with locking force and marking on units requirements enter the Danish network (it only affects "Scenario 1 + Option 1" and "Scenario 1 + Option 2"),*
2. *Legal uncertainty in case further accidents / incidents occur which may lead to a renewed loss of trust from NSAs and subsequently very restrictive national rules threatening the European railway freight business for an unpredictable time period (it only affects "Scenario 1 + Option 1" and "Scenario 1 + Option 2").*

Concerning point (1), the results of the bilateral meetings with selected JNS experts show responses ranging from minimal administrative costs (most of the replies) to more significant expenses. In the former case, operators are flexible to change their fleet management system by considering an additional parameter. So, no major issues are foreseen to adjust their fleet management systems to identify the pocket wagons compliant with locking force and marking requirements running on the DK network from the rest of the fleet. In the latter case, the following main types of one-off costs were mentioned and quantified: adaption of Enterprise Data Management systems by creating a new character which defines the "geographic area of use" for operations (estimated around 20.000 €[22]), data administration for each single wagon forcreating subdivisions within vehicle types (estimated around 5.000 €/wagon), and staff training (estimated around 50.000 €).

Regarding point (2), it was confirmed by the majority of JNS TF members the legal uncertainty and negative consequences in case a further occurrences (accident or incident) occur without providing an economic quantification (e.g. reputational damage for the RU / vehicle keeper, commercial damage, damages related to the infrastructure and rolling stock, environmental damage, closure of the line, and fatalities). However, the analyses of the consequences for traffic in DK offer an insight about the order of magnitude of costs for the sector. Considering that there are more heavily used corridors in Europe compared to the Great Belt Bridge in DK, the figure of 12.6 mln EUR of traffic loss and additional external costs would be a lower value with the actual costs significantly higher for connections with higher traffic volumes.

Based on the summarised evidence, no additional cost elements were added to the below calculation related to the Net Present Values (NPVs) and the Benefit/Cost (B/C) ratios of Scenarions / Options.

Moreover, several additional benefits should also be considered:

- *Reducing the environmental impact of transport services by favoring rail over road transport,*
- *Addressing the emerging issues of climate change and extreme weather events (e.g., cross-winds. stronger winds / storms) and their impact on the resilience of the railway system.*

On the basis of the quantitative elements above on costs and benefits the following table outlines the Net Present Value (NPV) and the Benefit/Cost (B/C) ratio for the relevant forecast years (20 years) for all the do-something Scenarios / Options (1-4). NPVs and B/C ratios have been estimated using a discount factor of 4%.

Category of stakeholder	*Stats*	*Scenario 1 "alone"*	*Scenario 1 + Option 1 **	*Scenario 1 + Option 2 **	*Scenario 1 + Option 3*	*Scenario 1 + Option 4*
Overall	NPV	-3.8 mEUR	156 mEUR	135 mEUR	150 mEUR	95 mEUR
	B/C ratio	-	17	6	10	2

[22] This cost estimate is only indicative and likely to vary significantly between companies. This also applies to the other estimated costs mentioned in the paragraph.

It should be noted that in practice "Scenario 1 + Option 1" and Scenario 1 + Option 2" could be complicated to implement and may result in additional costs as mentioned above considering also the 4th Railway Package context introducing the 'Area of Use' concept.

The estimates of NPVs and B/C ratio represent order of magnitude. In order to consider the robustness of the estimates of NPV and B/C ratios sensitivity testing has been carried out for key parameters. In particular, the following parameters have been examined:

- *Number of trains cancelled (examining the implication of 6 rather than 7 trains cancelled as well as missed growth opportunities concerning 1 additional train instead of 2 additional trains);*
- *The doubling of the number of pocket wagons that need to be retrofitted to comply with the 85 kN locking force requirement for the analysed scenarios concerned.*

The results shows that for cancelled trains and missed growth opportunities the annual figure would be 10.4 mln EUR (as benefits with the DK national rules lifted).

With the doubling of the pocket wagon fleet that need to be retrofitted to comply with the 85 kN, the updated NPVs and B/C ratios are the following:

Category of stakeholder	*Stats*	*Scenario 1 "alone"*	*Scenario 1 + Option 1 **	*Scenario 1 + Option 2 **	*Scenario 1 + Option 3*	*Scenario 1 + Option 4*
Overall	NPV	-3.8 mEUR	154 mEUR	134 mEUR	145 mEUR	91 mEUR
	B/C ratio	-	14	5	8	2

5. Comparison of scenarios / options and preferred option

5.1. Comparison of scenarios and options

Considering the qualitative and quantitative analysis of the impacts linked to each option the table below provides a summary of how the different compare. It should be noted that it is foreseen that Scenario 1 would not be implemented on its own but rather in combination with another of the Do-Something Options (1-4).

	Option 0 (baseline)			*Scenario 1 "alone"*			*Scenario 1 + Option 1*			*Scenario 1 + Option 2*			*Scenario 1 + Option 3*			*Scenario 1 + Option 4*		
Stakeholder impact	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Effectiveness	Very low/neg.			Very low/neg.			Very high/pos.			Rather high/pos.			Very high/pos.			Rather high/pos.		
Coherence	Very low/neg.			Rather low/neg.			Rather high/pos.			Rather high/pos.			Very high/pos.			Very high/pos.		
NPV	-			-3.8 mEUR			156 mEUR			135 mEUR			150 mEUR			95 mEUR		
B/C ratio	-			-			17			6			10			2		

Colour legend	Very low/neg.	Rather low/neg.	Neutral	Rather high/pos.	Very high/pos.
Stakeholder legend:	A – Sector organisation	B – National Authorities & AsBo	C – EU Authorities		

5.2. Preferred scenario / option

Based on the assessment above provided, the choice is between the following options: "Scenario 1 + Options 1" and "Scenario 1 + Option 3" present a positive overall balance for the Danish and European railway system respectively, with "Scenario 1 + Options 1" converging towards "Scenario 1 + Option 3". In particular, while the "Scenario 1 + Options 1" option may show a positive NPV, several risks need to be considered:

- *Non-harmonization of TSI provisions: if the new WAG TSI requirements are adopted only for the pocket wagon fleet running in Denmark, other MSs might follow suit in the event of a future accident or incident. These MSs could either adopt Denmark's requirements or even propose and adopt modifications. Additionally, other MSs may independently choose to adopt similar requirements, leading to potential non-harmonization even without an accident or incident,*
- *Geographical limitation of potential benefits: the benefits of harmonisation would be restricted to Denmark (and neighbouring territories[23]), thereby limiting its overall impact. This approach misses the opportunity to achieve the full potential benefits of an EU-wide implementation, such as enhanced cross-border railway operations and improved network efficiency,*
- *Operational inefficiencies: implementing different standards for only the pocket wagons circulating in Denmark, as opposed to the rest of the European fleet, can result in operational inefficiencies and increased complexity in managing cross-border railway operations. This inconsistency may lead to interoperability issues, causing delays and disruptions in railway freight services.*

These risks have not been fully included in the cost estimates of the options mentioned above.

However, considering also broader strategic, economic, and environmental goals, "**Scenario 1 and Option 3**" should be regarded as the **preferred choice** due to its EU-wide geographical scope, level of effectiveness and efficiency (including also the possibility for economies of scale), and the substantial number of net benefits it offers over the other options:

- *As it pertains to all EU member states, "Scenario 1 + Option 3" ensures:*
  - *legal certainty in the unlikely case of an incident or accident with semi-trailers caused by crosswind (sector will be able to demonstrate the control of the risks), and*
  - *better alignment with EU-wide regulations (e.g., WAG TSI), maintaining consistency and standardization across Europe.*

  This approach promotes the harmonization of railway operations and standards across the continent, leading to more efficient and integrated railway networks. Consequently, it increases the likelihood of ensuring long-term sustainability,
- *Implementing a solution that applies to all EU MSs can achieve economies of scale, thereby reducing overall costs and enhancing the efficiency of the railway system,*
- *The marking on the units ensures that all the devices to secure semi-trailers are within the maintenance intervals which ensures their correct functioning,*
- *The EU-wide solution mitigates the risk of regulatory non-compliance and potential penalties associated with not meeting WAG TSI requirements and may open up opportunities for market expansion and cross-border operations, which can enhance economic growth and competitiveness.*

[23] The geographical reference does not necessarily correspond to the administrative reference.

5.3. Risk assessment

The updated AMOC and the new WAG TSI requirements for devices to secure semi-trailers have been drafted in close cooperation with industry experts, representative bodies and national and European authorities over the course of 12 months within Subgroup 1 "AMOC" as part of the JNS "Crosswind" Normal Procedure. This process also benefits from previous JNS procedures as described in section 1. Despite the detailed analyses and discussions carried out for each change during the elaborated and iterative discussions of the JNS Subgroup AMOC, there are certain risks associated with the implementation of the new requirements that should be highlighted:

- *Cost due to the administrative work performed by RUs and vehicle keepers to ensure within a dynamic market that only wagons compliant with locking force and marking on units requirements enter the Danish network vary among operators,*
- *Legal uncertainty in case further accidents / incidents occur which may lead to a renewed loss of trust from NSAs and subsequently very restrictive national rules threatening the European railway freight business for an unpredictable duration of time,*
- *The number of devices to secure semi-trailers that need to be retrofitted estimated above is considerably overestimated (on the basis of the available evidence),*
- *Geographical coverage of accredited laboratories to perform tests: preliminary checks found that the tests (as foreseen in the ERA TD) are rather standard, making it easy for rail operators to find a laboratory in close proximity. However, this may differ for some actors,*
- *Cost of sensors (#2 Indications) when a redesign is needed: in specific cases of existing devices to secure semi-trailers, retrofitting with sensor systems may require a redesign of the device due to for instance lack of mounting space. As mentioned and quantified above, it is difficult to estimate these very individual costs and use them as a European reference, so these costs were not considered in the estimated cost impacts in section 4.2.*

5.4. Further considerations

It is noted that a rather high share of device to secure semi-trailers used by EU rail freight stakeholders are produced by one company. This aspect would be relevant to follow in the future monitoring trends that could have implications for customers.

6. Monitoring and evaluation

6.1. Monitoring indicators

Considering the complexity and importance of the topic under analysis, it would be appropriate to carry out monitoring analysis on:

- *The number of devices to secure semi-trailer in the EU fleet that do not comply with the 85 kN locking force requirement,*
- *The number of pocket wagons circulating on the Danish network,*
- *Effectiveness and efficiency of new WAG TSI requirements,*

- *Positive safety culture[24] and mutual trust between actors:*
  - EU Railway Safety Directive 2016/798, recital 10: MS should promote a culture of mutual trust, confidence and learning with focus on IMs and RUs.
  - CSM on SMS for IMs and RUs 2018/762, recital 7: promotion of safety culture through SMS; and Annex I and II – Section 2.1.1 (j): "involvement of top management promoting a positive safety culture […]."
- *Elements mentioned in section 5.3 related to the risk assessment.*

6.2. Future evaluations

According to the Agency regulation, ERA can undertake ex-post evaluation (Article 8.3). In the future, it could be relevant to undertake ex-post evaluation linked to the new WAS TSI requirements for devices to secure semi-trailers, aimed at analysing the implementation status of the adopted risk control measures.

7. Sources and methodology

7.1. Sources

This impact assessment was informed by inputs from meetings with ERA colleagues involved in JNS TF investigations, JNS collegial meetings, bilateral meetings with JNS TF experts and external stakeholders, and exchanges via email. Additionally, qualitative and quantitative inputs were gathered from the industry (vehicle keepers, railway undertakings) and associations (industry and assessment bodies) through email and bilateral meetings.The desk research was aimed to collect relevant documentation produced by both participants in the JNS TF and external actors (e.g. for traffic data).

The ERA database used refer to EVR, ERAIL and ERATV.

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

[24] Safety culture "*refers to the interaction between the requirements of the safety management system, how people make sense of them, based on their attitudes, values and beliefs and what they actually do, as seen in decisions and behaviours*" (The European Railway Safety Culture Declaration_1.pdf).

Annexes

Annex 1 – Additional statistics on the traffic lost in the Great Belt Bridge

Figure 4

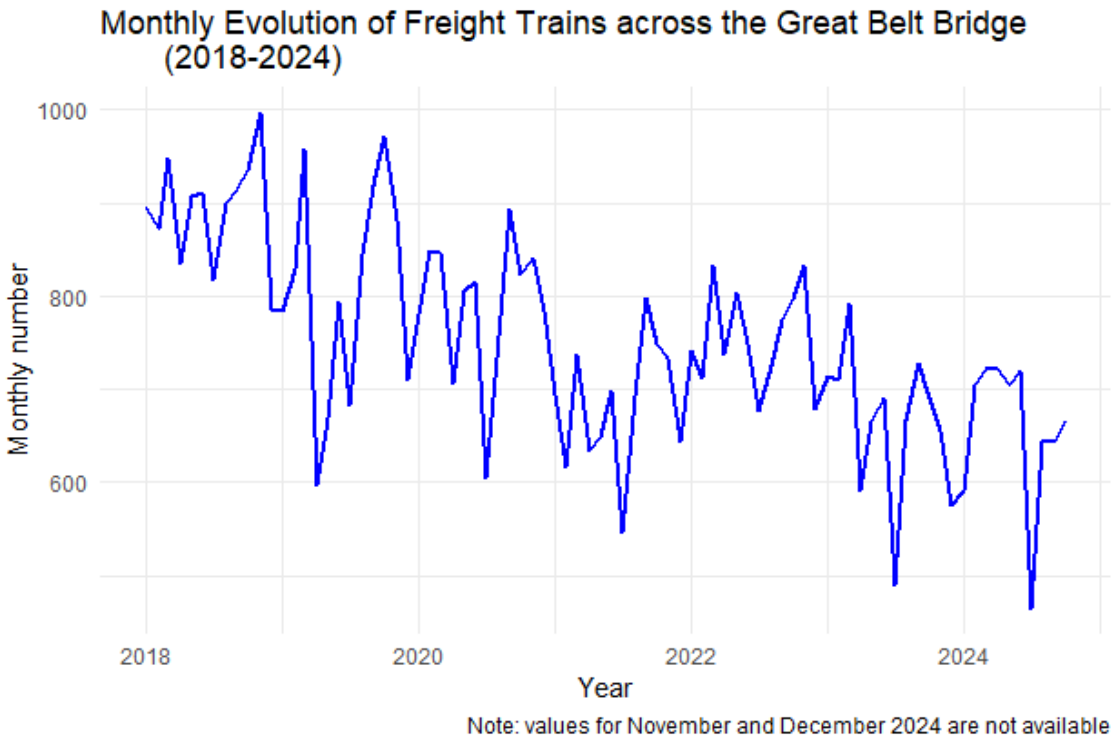
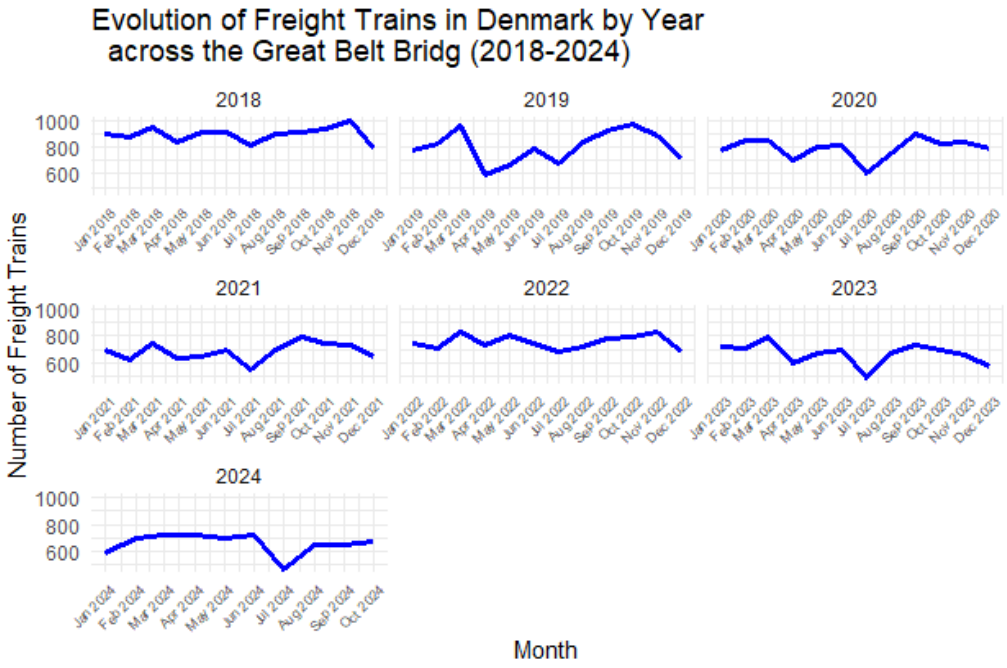


Figure 5



Moving Europe towards a sustainable and safe railway system without frontiers.

Annex 2 – Main unit costs to comply with new WAG TSI requirements and updated AMOC

Elements	Scenario 0, Option 0 Baseline scenario	Scenario 1 New/upgraded	Option 1 DK existing fleet	Option 2 DK existing fleet	Option 3 EU existing fleet	Option 4 EU existing fleet
Application of NR DK	**X**	**X**				
Application of new AMOC	**X**	**0 euro** (best / current practice, nothing new so not additional costs)	**0 euro** (best / current practice, nothing new so not additional costs)	**0 euro** (best / current practice, nothing new so not additional costs)	**0 euro** (best / current practice, nothing new so not additional costs)	**0 euro** (best / current practice, nothing new so not additional costs)
New WAG TSI requirements - point 4.2.2.4.1 "strength"		**4.000 - 8.000 euro/veh-type / hitch-type combination** (because an additional bumping test is needed for each setting)				
New WAG TSI requirements - point 4.2.2.4.2 "locking force"		**4.000 - 8.000 euro veh-type / hitch-type combination**	**4.000 - 10.000 euro veh-type / hitch-type combination**	**4.000 - 10.000 euro veh-type / hitch-type combination**	**4.000 - 10.000 euro veh-type / hitch-type combination**	**4.000 - 10.000 euro veh-type / hitch-type combination**
New WAG TSI requirements - point 4.2.2.4.3 "indications"		**800 - 2.000 euro per wagon (mech)** **2.500 - 3.000 euro per wagon (electronic)**	**3.000 - 5.000 euro per wagon (electronic)** Very difficult with mechanical indications (need to retrofit the hitch), therefore only electronic indications	**3.000 - 5.000 euro per wagon (electronic)** Very difficult with mechanical indications (need to retrofit the hitch), therefore only electronic indications		**3.000 - 5.000 euro per wagon (electronic)** Very difficult with mechanical indications (need to retrofit the hitch), therefore only electronic indications
New WAG TSI requirements - point 4.2.2.4.4 "marking of units"		**100 euro/wagon**	**300 euro/wagon in operation** or **400 - 4.000 euro/wagon in maintenance shop**	**300 euro/wagon in operation** or **400 - 4.000 euro/wagon in maintenance shop**	**300 euro/wagon in operation** or **400 - 4.000 euro/wagon in maintenance shop**	**300 euro/wagon in operation** or **400 - 4.000 euro/wagon in maintenance shop**