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COR Final Report

COMMON OCCURRENCE REPORTING PROJECT

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2.1. Reference Documents

Table 1 Table of Reference Documents

[Ref. N°] Title	Reference	Version
[1] Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (recast)	2016/798	OJ: L138/102 of 26/05/2016
[2] Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) N° 881/2004	2016/796	OJ: L138 of 26/05/2016
[3] Commission Regulation (EU) No 1078/2012 of 16 November 2012 on the common safety method for monitoring to be applied by railway undertakings, infrastructure managers after receiving a safety certificate or safety authorisation and entities in charge of maintenance	1078/2012	OJ: L320/8 of 17/11/2012
[4] Commission Regulation (EU) No 376/2014 of the European Parliament and of the Council on the reporting, analysis and follow-up of occurrences in civil aviation	376/2014	OJ L 122, 24.4.2014, p. 18–43
[5] COR project plan	ERA-PRG--004	V2.0
[6] Review of data quality and approach of the Agency Annual Report on Safety:	-	-
[6.1] Assessment of Existing National Occurrence Reporting Regimes and Systems	1LDI90Z-12	Task 1, Rev. 2
[6.2] Assessment of the Impact of Rail Suicides on EU Railways	1LDI90Z-13	Task 2, Rev. 2
[6.3] Impact Assessment on the introduction of reporting regime at EU level	1LDI90Z-9	Task 3, Rev. 2
[6.4] Proposal for Common Occurrence Reporting Regimes and Systems Including Taxonomy	1LDI90Z-10	Task 4, Rev. 2
[7] Designing the common occurrences and taxonomy for COR	ERA-PRG-004-TD-002	V2.0
[8] Phasing the COR Safety Management Data system	ERA-PRG-004-TD-004	V2.0
[9] Review of EU legislation related to occurrence reporting	ERA-PRG-004-TD-001	V2.0
[10] Roles, use of data, governance and confidentiality for COR Safety Management Data	ERA-PRG-004-TD-006	V2.0
[11] Big data in railways	ERA-PRG-004-TD-003	V1.0
[12] COR paper on Risk Profiling	ERA-PRG-004-9	V1.4
[13] COR paper on Just Culture and Liability	ERA-PRG-004-5	V1.0
[14] System Proposal for COR Safety Management Data	ERA-PRG-004-TD-008	V2.0
[15] Full Impact Assessment for the COR System Proposal	FIA COR 1.1	V1.1
[16] Commission Implementing Decision of 7.1.2019 on a mandate to the European Union Agency for Railways to draft common safety methods for assessing the safety level and the safety performance of railway operators at national and Union level.	C(2018) 8887 final	-

2.2.   Definitions and Abbreviations

2.2.1.   Standard Terms and Abbreviations

The general terms and abbreviations used in the present document can be found in a standard dictionary. Furthermore, a glossary of railway terms that focuses primarily on safety and interoperability terminology, but also on other areas that the Agency can use in its day-to-day activities as well as in its Workgroups for the development of future publications, is available on the Agency website.

2.2.2.   Specific Terms and Abbreviations

Table 2 Table of Terms

Term	Definition
Agency	The European Union Agency for Railways such as established by the Regulation (EU) No 2016/796 of the European Parliament and of the Council of 11 May 2016 [2]
Interested party	any natural or legal person or any official body, whether or not having its own legal personality, that is in a position to participate in the improvement of railway safety by having access to information on occurrences exchanged by the Member States and which falls within one of the categories of interested parties set out in Annex IV;
Just culture	A culture in which front-line operators or other persons are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but in which gross negligence, wilful violations and destructive acts are not tolerated;
Occurrence	Occurrence means any safety-related event which endangers or which, if not corrected or addressed, could endanger a train or any rolling stock, its passengers, staff or any other person, and includes in particular an accident and incident.
Risk	The frequency of occurrence of accidents and incidents resulting in harm (caused by a hazard) and the degree of severity of that harm. (Art.3.(1) of Regulation (EU) 402/2013 – CSM for risk assessment)
TDG Occurrence	An occurrence as defined in section 1.8.5 of the 'RID' annex of Directive (EU) 2008/68

Table 3 Table of Abbreviations

Abbreviation	Meaning
COR	Common Occurrence Reporting
CSM	Common safety methods
ECM	Entity in Charge of Maintenance
ERA	European Union Agency for Railways
ERAIL	European railway accident information links
IM	Infrastructure Manager
MS	Member state
NIB	National investigation body
NSA	National Safety Authority
NOR	National occurrence reporting
RISC	Railway Interoperability and Safety Committee
RSD	Railway Safety Directive
RU	Railway Undertaking
System proposal	System Proposal for COR Safety Management Data
SMD	Safety management data
TDG CAs	TDG Competent Authorities referred to in section 1.8.5.1 of 'RID' annex to Directive (EU) 2008/68 collecting information on TDG occurrences
TDG	Transport of Dangerous Goods
WP	Working party

3. Purpose and background of the report

The purpose of this document is to summarize the work done in the frame of the Common Occurrence Reporting (COR) project by the European Union Agency for Railways and other parties involved. This activity run by the Agency since 2015 was aimed at establishing an EU-wide system for collecting and sharing data on safety occurrences on the European railway network.

The Agency chose a working method that foresaw a number of preparatory activities before designing the reporting system itself. This included studying the existing solutions for managing safety related data on the Member State level, developing working papers on different aspects of the future COR regime that were consulted with the European railway sector, organizing stakeholder workshops, as well as having bilateral meetings with representatives of different transport organizations but also with other European Agencies and the European Commission. All the gathered information allowed to prepare a proposal for COR accompanied by the impact assessment.

The following document outlines the results of the above mentioned activities. It brings clarity about the work done and information gathered by the Agency in the project, which will be finalised with the publication of this report.

In 2018, the European Commission prepared a mandate for a new CSM that would support the assessment of safety performance of EU railways [16]. A mandate to draft common safety methods for assessing the safety level and the safety performance of railway operators at national and Union level, based on point (d) of Article 6(1) of the RSD [1] was presented during the Railway Interoperability and Safety Committee meeting in June 2018 and received support from the RISC members on the following meeting in November 2018. According the mandate, the Agency is to prepare a recommendation to the Commission on method for assessing safety level and safety performance should be based on all available data (incl. those on SMS and on occurrences).

To allow data comparability, the CSM should provide a methodology for harmonizing and enhancing the data management process, including the data collection, analysis, reporting and sharing.

The currently defined CSIs are a basis to start from but additional data relating to occurrence causes are necessary in order to have a view on risks, causes and accidents. The responsibility for collecting and reporting information on occurrences will stay with RUs and IMs, as defined in CSM on Monitoring [3] – new CSM is to bring added value to those processes, especially by providing means for sharing safety related data and occurrence information on the EU level, beyond MS borders.

Because the mandate covers the issue of collecting and sharing occurrences data and because it explicitly requests to use the analysis done so far in the COR project, the Agency has decided to finalise the Common Occurrence Reporting as a standalone activity. With the last two reports on risk profiling and on just culture and liability, the consultation phase foreseen in the project plan will be concluded. The results of the work described in the working papers and other relevant documents will be used as one of the inputs into the design of the methods and processes required by the mandate for the new CSM. Decisions on the next steps defined for Common Occurrence Reporting – designing the data sharing regime and developing the supporting IT tool – will be made at the later stage, after the recommendation for the CSM ASLP is sent to the Commission.

4. Preparatory studies

A risk-based safety management depends greatly on:

- undertaking a proper system definition, business requirements and related hazards and risk calculation;
- identifying and implementing relevant risk control measures;
- monitoring safety performance, and;

- learning from past events, sharing and collecting safety relating information.

Taking this into account, an analysis of accident data reporting in the railway and other transport modes was conducted. Only serious accidents were required to be investigated by the EU law, with a large variation of approaches by National Investigation Bodies towards all the other accidents and incidents. As for reporting safety related data, the horizontal Common Safety Indicators (CSI) regime allowed for a reliable monitoring of harmonized horizontal data on railway safety performance at Member States level, but only provided aggregated numbers without links to root causes and consequences. This allowed the monitoring of performance only via a number of reactive (lagging) indicators with a small amount of leading indicators (precursors). A number of studies suggested that there is a need for extended safety data collection at EU level.
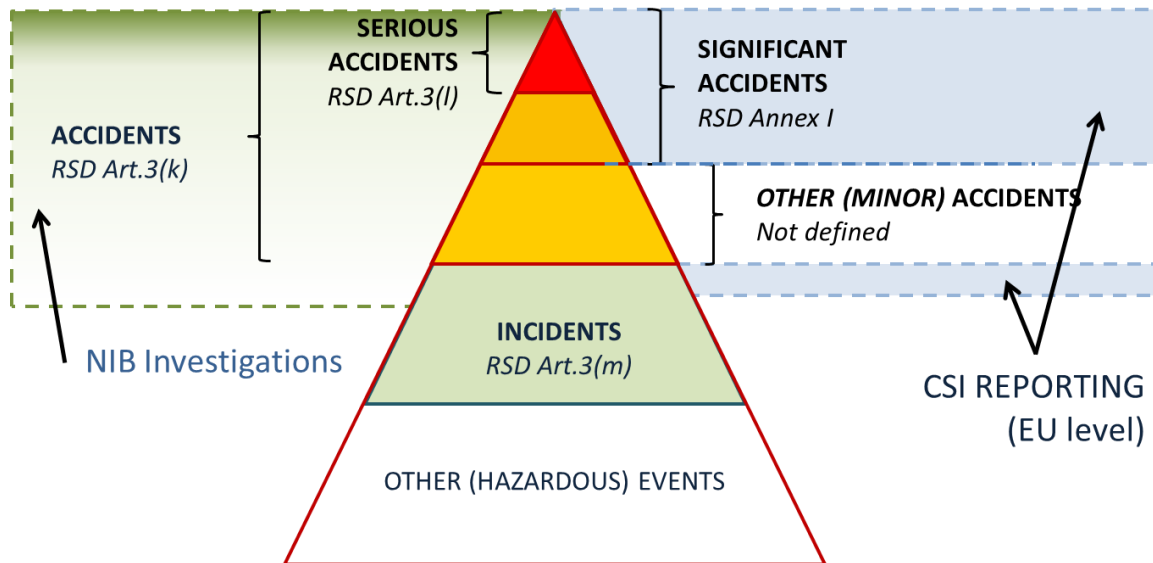

Figure 1 *Overview of the current common accident reporting in the EU*

In 2014, the Agency awarded DNV consultants to carry out a study into occurrence reporting systems in Europe. The purpose of the study was to review the existing practices in reporting (safety) occurrences in Europe, assess the need and feasibility to migrate towards a common regime and make a proposal for such arrangements.

Answering to two different calls for tender, the consultant delivered four reports in early 2015:

1. **Task 1: Assessment of Existing National Occurrence Reporting Regimes and Systems [6.1]**
   The objectives were to assess whether is it feasible to establish a European-wide reporting, what would be the benefits and what would be the optimal scope and arrangements for such reporting. In addition, it aimed at determining a most sensitive common taxonomy for occurrence reporting. The study found that a harmonized European-wide reporting of occurrences is feasible. All Member States operate some form of occurrence reporting albeit with a wide variety of approaches. As such agreeing the detail of what should be reported using such a system is quite feasible. Selecting the most frequently reported occurrences captured by the existing regimes would allow this to be done at as low a cost as possible in the immediate term. In the longer term it will be possible to extend the Common Occurrence Reporting system on an incremental basis as it is agreed that further occurrences should be added to it, or alternatively by extending the reporting scope from significant accidents to all accidents resulting in harm or potentially to near miss incidents.

2. **Task 2: Assessment of the Impact of Rail Suicides on EU Railways [6.2]**
   The objectives of this task were to determine the means by which railway suicides are reported, what is the real impact of suicide events on railways in the EU and whether there is a need for any action

at the EU level. Specifically the Agency wished to understand what the cost impact of suicide was at an EU and national level and, in order to facilitate comparison between differing Member States, understand what a suitable normaliser for railway suicide might be.

The study concluded that reporting on suicides is a complex activity involving numerous actors, highly dependent on national practices of law enforcement entities. Harmonization of data collection based on the cooperation between RUs, IMs and national police was seen as an opportunity, with the proportion of all suicides that occur on railways normalised by train-km identified as a suitable normalizer supporting suicide prevention activities and investments.

3. **Task 3: Impact assessment on the proposal for a common occurrence reporting system [6.3]**

   The objective was to develop a standard impact assessment for the proposal of an EU occurrence reporting developed previously.

   A light impact assessment was delivered, providing economic justification for an EU-wide occurrence reporting regime on the basis of expected reduction of occurrences thanks to learning from other incidents and accidents. A series of options were considered, whereas the option providing for a common reporting system in addition to a harmonized occurrence regime was recommended for implementation.

4. **Task 4: Proposal for Common Occurrence Reporting Regimes and Systems Including Taxonomy [6.4]**

   The objective was to determine objectives for a common occurrence reporting regime a system and propose a suitable occurrence taxonomy to be used.

   The consultant recommended that all Member States' National Occurrence Reporting regimes are brought up to a minimum standard matching the definition of a comprehensive occurrence reporting system. These National Occurrence Reporting systems, respecting the principle of subsidiarity, might have been of varying scope but should have included the ability to record a core set of information relating to the accident categories characterised as Potentially High-Risk Train Accidents. These were as defined in the existing Common Safety Indicator (CSIs) and should be recorded for significant accidents and for all other accidents resulting in harm (major injuries and minor injuries). Benefit would also derive from reports of near miss incidents that cause no harm but which under other circumstances would have caused a significant accident and it is recommended that these too are recorded in the same occurrence reporting system. A subset of the information on Potentially High-Risk Train Accidents should be provided in a common format to an EU level Common Occurrence Reporting regime as meta data. A recommended implementation plan was drafted.

In parallel to the previous study another research activity was contracted in order to detect the use of methodologies to create and manage risk profiles:

Review of research on risk models at European level

The objective was to review relevant risk models used in the railway domain and in the oil/gas and aviation sectors. The focus of this screening exercise was on quantitative risk models although information on qualitative approaches has been collected as well where possible.

The consultant identified eight Member States that reported using a quantitative risk model and a further five using a qualitative risk model. Details of these quantitative models and publically available qualitative models were then captured in a standard template agreed with the Agency, where possible, noting that all the models were confidential and not available for public examination. Five Member States reported having neither a qualitative nor a quantitative risk model. A review of the risk modelling used in the oil and gas and in the aviation sectors was additionally made to explore if these sectors used any different techniques that might form a technique relevant for railway risk modelling.

The results of the study were discussed with the stakeholders during two dedicated workshops organized at the time of the availability of intermediate and final reports respectively.

5. COR project definition and planning

According to the Project Plan [5], the following problems have been identified:

- Small datasets that are less robust: relying on data from single companies or countries;
- Poor sharing of safety information between the multiplicity of sector actors: within Member States, but also across national boundaries and at a European level;
- Availability of consistent, harmonized data that provides real and proactive information about risks;
- Insufficient use of data to support decision-making by operational actors, national and European regulators and legislators;
- Poor transparency and lack of a positive culture that supports reporting, learning and improving, including between competitors.

The main goal of the project was to establish a Common Occurrence Reporting regime that would preserve or improve, when reasonable, the safety level of the Single European Railway Area. Objectives set out for the project included:

1. Giving early warnings of any deviation from the expected outcome, or assurance that the expected outcome is achieved as planned;
2. Giving information about unwanted outcomes;
3. Supporting decision making at both regulatory and operational level, by all the relevant actors.

The objectives were to be achieved by:

1. Building awareness and support for safety information sharing at a European level;
2. Gathering and disseminating intelligence on state of the art methods;
3. Setting out clearly the cost, benefits and requirements (including legislative, resource and competence, and cultural);
4. Selecting and proposing well supported methods and plans;
5. Describing a long term plan for evolution of risk profiling information about the adequacy and improvement of risk management measures, to support risk based supervision and decision-making.

It was decided that reaching the goals can be done with two different areas which constituted the specific purposes for the project:

- Safety alerts – designed to share unknown or poorly understood information about hazards and their consequences urgently;
- Safety management – collection of data as an output of continual monitoring, capable of providing information about the adequacy and improvement of risk management measures, to support risk based supervision and decision-making.

For the first of the purposes, the work focused on designing and implementing an IT solution that was later introduced as Safety Alerts IT Tool (SAIT). The second purpose was defined and analysed as Safety Management Data (COR SMD) work stream.

The project was to deliver a fully functional system for reporting and sharing safety occurrences on the European level. This included the proposal for the system itself, with the supporting changes to the legal framework and an IT system with guidance documentation. A number of working papers were foreseen discussing the main aspects of the project, as well as an agreed taxonomy for occurrences, their causes and consequences. The impact of the system itself was to be assessed and the whole project was to be communicated according to communication plan. Separately, an IT solution was to be established to support sharing of safety alerts for newly found or poorly understood risk.

The Common Occurrence Reporting project started on the 1st of January 2015. According to the planning, main milestones included: a series of working papers, bilateral meetings and stakeholder workshops that

would allow to draft a system proposal accompanied by an impact assessment; establishment of a working party that would prepare the required legal text supporting the system, functional and technical (IT) specifications and definitions as well as accompanying guidance; building phase for the IT tool; target system implementation with the required governance structures, roles and responsibilities.

Project work focused on reporting of Safety Management Data – Safety Alerts IT Tool was later developed separately. At the moment SAIT is a functioning IT tool allowing the relevant stakeholders to share information on new or poorly understood hazards that might be important to sector organisations. Access to the system is possible via the [SAIT web platform](1). The IT solution for SMD was to be decided at a later stage of the project, with the IT System build planned as the last phase of COR implementation.

6.   Main project activities

Because of the nature and the complexity of the topic, working method for the project included an open collaboration on documents and plans, participation in key stakeholder meetings (EIM, CER, UIP, PRIME, UIC working groups as well as Agency network meetings), bilateral meetings with key partners as well as representation and communication at Agency conferences and key events. No formal working party had been set up. In order to provide an open and transparent form of cooperation with various stakeholders, dedicated workshops with defined and planned outputs were foreseen on the key topics. In order to provide state-of-the-art solutions in terms of safety data collection, reporting and sharing, planning assumed an analysis of existing reporting practices on the national and EU level both in railways and in other transport sectors. A structured collaboration with the other transport agencies was setup and recurrent interagency meetings were organised.

The working method chosen for the delivery of the project foresaw the identification of key issues to be considered before a decision on the solution was made. This included topics like occurrence definitions and taxonomy, legal aspect of occurrence reporting, phasing options for the project implementation, roles and responsibilities in the sharing of information, use and governance of data, just culture, risk profiling. Each of the topics was discussed internally and the results of the discussions was presented in a form of a working (technical) document. These reports where not biding proposal, but rather a basis for discussion, an overview of the given topic, identifying the opportunities and the challenges for the design and introduction of the system.

The working papers were then sent out to the stakeholders (NSAs, NIBs, RUs, IMs, representative bodies and other experts), allowing them to provide comments and opinions. In order to facilitate a more open way of exchanging views, the Agency also organised workshops, where participants representing the railway sector could share their views, experience and remarks to the project team – as well as share observations and best practices among each other. The comments were included in the second version of the document and a summary of the discussions and opinion presented was added in the text. All of the feedback provided by the sector was later used to design the COR system proposal that was described in a separate working document.

In addition, the Agency held meetings with a number of organisations to better understand how they collect, share and analyse occurrence data and how a Common Occurrence Reporting system can provide added value to their activities in safety management. This included meeting with national authorities, operating companies as well as other EU agencies involved in safety data management in other modes of transport. The project team also cooperated with organisations representing different parts of the railway sector by meeting with them and including their positions in project work.

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[1] For more information on the Safety Alerts IT Tool, please refer to the [Terms of Use](#) and the [Guidelines](#).

6.1.   Designing the common occurrences and taxonomy for COR

In order to create a harmonized regime for reporting and sharing occurrence data, the project included work on a common taxonomy that would allow the collected data to be analysed and incorporated in the safety management beyond the limits of one company and/or Member State. The purpose of the activity was to propose a structure and content for a set of common rail occurrences and taxonomy. At an early stage, this was to provide an idea for discussion with the stakeholders, especially those organizations that already established occurrence taxonomies for their own purposes of monitoring and supervising safety performance. It was also to help determine the scale, phasing and cost to benefit ratio of such a European occurrence reporting system.

The reasons for developing an occurrence taxonomy were based on the needs of:

- identifying all relevant information and possible data attributes for each event, creating a kind of accident model for each case;
- enhance the data interoperability, by harmonising definitions of occurrences.

This would allow to:

- define the requirements for the reporting system
- identify all the possible profits of data analysis done within this harmonized reporting regime;
- have a common wording and terminology.

The following parts of a common taxonomy were considered in the work: reference number and reporting entity, notification status, occurrence identification and description, information relating to elements of subsystems involved, consequences and causes.

It was also assumed that the taxonomy must capture the aspect of human performance in order to fully show the nature of the occurrence and its causes and provide a taxonomy that would in line with existing solutions and procedures in order to avoid double reporting and overburdening the sector with additional task of translating collected data into a different structure.

The first step in the work on a common taxonomy for COR was elaborating a paper "Designing the common occurrences and taxonomy for COR". It was drafted by the Agency and provided for comments to various stakeholders (railway operational actors and authorities) from 23th of May 2016 till 15th of July 2016. In addition, dedicated workshop was organized by the Agency in Valenciennes on 2nd and 3rd of June 2016. During consultation period 18 different organisations (NSAs, NIBs, Ministry, Railway sector organisations (CER, UNIFE, UIC, RSSB, ATOC) and University (Huddersfield)) provided comments for above mentioned paper.

During the consultation period, the stakeholders supported the value of harmonized occurrence definitions and taxonomy, underlining the need to consider differences between technical subsystems and operational practices in different MS. It was also noted that there are already well established and robust reporting regimes available in some countries or organisations and the COR project needs to take that into consideration in order to avoid double reporting of occurrences. Consultation participants agreed on the added value of sharing safety information, arguing for a bottom up approach to the development of the COR system.

The final version of the paper dated 30th of November 2016 [7] was published on the Agency web page and is available in the Common Occurrence Reporting area. The documents from the workshop are available in the COR Extranet space.

6.2.   Phasing the COR Safety Management Data system

Taking into account the scale of the project as well as the multitude of existing procedures and solutions that needed to be considered in the implementation of the system, phasing of the new occurrence reporting

regime was an important issue for consideration and discussions. For this reason, a paper was drafted on possible phasing strategies for COR SMD [8]. Two main topics included in the document were a short summary of the existing CSI based reporting regime and a high-level description of the main building blocks of the COR SMD that could be considered as phasing options for the target system. The purpose of the consultation and the workshop was to discuss the most appropriate phasing structure and timing that would bring most benefits to the sector without causing unnecessary burden to the reporting entities.

The following COR SMD building blocks were identified:

- Operational scope (passenger and/or freight operations, shunting);
- Geographical scope (all or selected Member States);
- Data use (how will the reported data be used and by whom, i.e. measuring safety performance, supervision, risk management);
- Event classification and taxonomy (basic and/or full sets of consequences, causes, metadata; alternatively reporting on only one type of event);
- Legal obligations and reference documentation (voluntary or mandatory reporting of different types of events);
- Reporting tools and IT system (national databases, EU centralized access point or centralized EU data repository).

For each of the building blocks, a number of phasing options was proposed to be analysed. The description of different strategies took into consideration factors like resources required to implement the steps, amount of data generated by the implementing step, impact on the sector and the Agency, actual contribution to the achievement of the target reporting system. Sector representatives could provide other factors to be considered both in the consultation period and during the workshop.

The first version of the paper was provided to the stakeholders with a proposal of methodology to phase the implementation of the COR SMD system. All parties were invited to provide comments and suggestions on the preferred strategy of phasing COR. The paper was approved on 27th of September 2016 and published on the Agency's extranet on the 28th of September 2016. The last set of comments was sent to the Agency on 21st of December 2016. Additionally, a workshop on the topic of phasing was organized by the Agency in Valenciennes on the 25th and the 26th of October 2016, with representatives from 39 stakeholder organizations participating.

In the discussions and paper comments stakeholders supported the view that phasing of the project is important for its implementation, although none of the phasing options was favoured on top of others. The participants agreed that existing national solutions for reporting occurrences should be considered in the phasing of COR, as well as possible applications of the system in the areas of activities of different stakeholders (RUs, IMs, NSAs etc.)

The final version of the paper dated 28th of July 2017 was published on the Agency web page and is available in the Common Occurrence Reporting area. The documents from the workshop are available in the COR Extranet space.

6.3. Review of EU legislation related to occurrence reporting

The ERA project team drafted an overview of all relevant EU legislation that was linked to occurrence reporting in European transport [9]. The aim of this analysis was to identify both existing legal requirements for the collection and sharing of occurrence related data as well as the potential for new legislation that would support a COR SMD system.

The analysis of existing legal provision identified the requirements for reporting data on safety related occurrences both for operational actors as well as national authorities. In the former case, the document considered obligations stemming from railway legislation, product liability legislation and product safety and

market surveillance legislation. In the latter case, applicable legal provisions were identified for reporting on European and Member States level.

In addition, the document included a reflection on legal requirements for reporting safety occurrence data from other modes of transport. An analysis was made for legislation established for maritime, road and aviation transport sectors. Aviation was described as the most advanced as the EU legislative framework[2] defines the whole process of collecting, reporting and following up of occurrences, including the roles and responsibilities, functioning of an EU Repository and an IT tool, rules on data protection and confidentiality, and the establishment of a network of safety analyst. In the maritime sector, EU law[3] provides the process of reporting occurrences and the establishment of an EU database by European Maritime Safety Agency, although the main responsibility for analysis and follow-up remains with the national investigation bodies, which are legally required to cooperate and share information. Additionally, it was identified that both of the transport sectors have a long tradition of harmonizing approaches in data sharing and occurrence investigation based on international cooperation and organizations like ICAO and IMO. In the road sector, Member States are required to communicate on road accidents resulting in death or injury to an EU database (Community database on Accidents on the Roads in Europe – "CARE") as defined in Council Decision 1993/704/EC. The data is to be used for identifying road safety problems, supporting the decisions on new preventive actions and exchange of experience in the field.

Finally, after identifying the existing legal provisions for reporting occurrence data, the authors of the paper reflected on the need for establishing new legal requirements for COR, either by amending existing EU legislation or by introducing new legislative acts to the European railway legal framework. It was also underlined that the legal background of the Common Occurrence Reporting system should be decided basing on further considerations, especially depending on the phasing strategy chosen for the project.

The first version of the paper on legislation elaborated by the Agency was provided for comments to railway stakeholders (including railway operational actors and authorities) from 15th of September 2016 to 16th of November 2016. A dedicated workshop was organized by the Agency on 25th and 26th October 2016 in its Valenciennes premises to support the consultation (together with the discussions on project phasing strategies).

Participants of the consultation and the workshop focused on the legal basis of COR, discussing both the existing legislative framework and possible new acts of EU law. It was underlined that the legal provisions introducing COR must clearly identify the roles of all parties involved, taking into considerations the responsibilities already placed on organisation by current EU railway law.

A final version of the document including both the replies from the consultation process as well as remarks and comments made during the workshop, dated 17th of July 2017, was published on the Agency web page and is available in the Common Occurrence Reporting area. The documents from the workshop are available in the COR Extranet space.

6.4.   Roles, use of data, governance and confidentiality for COR Safety Management Data

The following paper [10] drafted by the Agency focused on a number of topics linked with the implementation of a Common Occurrence Reporting system: roles of different organizations involved in the occurrence data collection and sharing, use of collected data, governance of the reporting system as well as confidentiality issues. The objective of the document was to identify all the actors of the COR, their input into the system and possible contribution to the general aim of improving safety performance of the railways in Europe. The outcome of this part of work was found to be crucial for assessing the impact of the whole project.

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[2] Two most important legal acts in this area include Regulation (EC) 216/2008 and Regulation (EU) 376/2014.
[3] Directive 2009/18/EC.

Common Occurrence Reporting was aimed at improving safety performance by supporting a risk-based safety management with occurrence related data that would allow a better understanding of causes of accidents, more focus on proactive and predictive precursors, better risk-based decision making and enhanced sharing of information at EU level. The achievement of these objectives and future benefits was analysed with regard to different actors bearing responsibility for railway safety that would be involved in collecting, sharing and using of occurrence data.

Among entities identified as involved in the occurrence reporting were the operating companies – mainly RUs and IMs, but also ECMs – as well as national administrative bodies (NSAs, NIBs, ECM Certification bodies). Other stakeholders included the Agency, policy makers on national and EU level (Member States and the European Commission) and TDG competent authorities. For each of the organizations the authors of the paper described the current role in managing safety related data within the existing legal framework and defined a possible future role in the COR process with potential benefits from an improved reporting system. It was identified that COR could contribute to – among other things – risk management and safety monitoring done by RUs and IMs, certification and supervisory activities conducted by the NSA and the Agency, NIB investigation activities, policy making and performance monitoring by the Member States, European Commission and the Agency.

The paper also attempted to draft a process of transforming occurrences into information supporting the improvement of railway safety performance. It was established that the use of data would include an analysis of the collected data according to a methodology appropriate to each actor's responsibility, defining and implementing actions need to tackle the shortcomings identified in the analysis and, finally, a communication of the undertaken activities. This was to guarantee a systemic and risk-based approach to occurrence related information.

In order to assure an adequate level of confidentiality of the collected data, the paper provided an analysis of access principals for different actors, foreseeing three levels of sharing: within an operating company (RU, IM, ECM for the purpose of monitoring and improvement), at the national level (with the national authorities for purposes of supervision, assessment and investigations) and on the EU level. Specific access rights of different stakeholders as well as data protection issues were discussed, but detailed solutions were left for future work on the target system.

Main topics raised during the consultation period as critical to the proper design of the system included the possible application of the COR system and the collected information by different stakeholders (i.e. in risk assessment, decision making), rules of access to the database and security of the gathered data.

The first version of the paper on roles, use of data and governance was elaborated by the Agency and provided for comments to railway stakeholders (including railway operational actors and authorities) from 8th of February 2017 to 4th of April 2017. A dedicated workshop was organized by the Agency on 22nd and 23rd February 2017 in Lille to support the consultation. Second version of the document including both the comments from consultation period and the results of the discussion in the workshop, was published on the Agency web page on 26th of July 2017.

6.5. Big data in railways

A separate working paper has been devoted to possible applications of big-data analysis in railways [11]. The purpose of this work was to establish whether the big-data methodology can bring added value to the data collected and managed in railway safety, especially in the perspective of establishing a Common Occurrence Reporting system.

The report discussed current state of play in big-data techniques, including existing implementation in other transport modes. It also reviewed the role of data analysis in monitoring and improvement of railway safety, including the availability, volume and structure of the data. The analysis considered possible benefits for safety monitoring, risk modelling or understanding human factor as well as challenges linked to lack of

sufficient amounts of data and varied approach to data collection by different actors. Introduction of the Common Occurrence Reporting was perceived as an opportunity to overcome those shortcomings.

Following the report – which was accepted by ERA in October 2016 and is available on the Agency webpage – a study "Use of data and analytics techniques in railways to support better management of the risk of accidents" was contracted by the Agency to an outside consultant. The company Bearing Point was tasked with evaluating the benefits and feasibility of leveraging big data and analytics techniques to support occurrence reporting and accident analysis, prediction and prevention. For this purpose the capability of big-data to support occurrence reporting and analysis of accident risk was assessed. The project included collaboration with a number of stakeholder organizations (RUs and IMs) that could provide their experience as well as data to be incorporated into the analysis. The study was conducted between May 2017 and March 2018 and the documents from this activity can be found in the COR Space of the Agency Extranet. The main observation was that although some early adapters of big data analysis can be identified among railway operators, the EU rail sector as a whole is not yet mature enough for the analytic techniques to be implemented for safety data management on the European level.

6.6.   COR paper on Risk Profiling

The document [12] was aimed at presenting the Agency approach on Risk Profiling. Seen as one of the tools used to manage safety related risk in railway transport, risk profiles were identified as important contribution to rail safety performance that could be supported by a Common Occurrence Reporting system. According to the report, common and harmonized usage of risk profiling, based on an EU wide set of data would help develop a risk profile for the whole Single European Railway Area.

The paper analysed the concept of risk profiling, its prerequisites and possible applications, based on the occurrence data available in the existing reporting regime as well as information gather via the COR system. It also discussed the links between risk profiling and benchmarking, safety levels and safety performance assessment. The presented use cases for specific stakeholders were shown to be in line with objectives defined in the COR project. And while development of risk profiling and attempts at building a Sector Risk Profile for European railways could be done before COR is fully implemented, a system of sharing occurrence data among all the stakeholders would be beneficial to the approach based on risk profiles.

The first version of the report on risk profiling was provided for comments to railway stakeholders from 27th of November 2018 to 27th of February 2019. A dedicated workshop was organized by the Agency on 6th and 7th of December 2018 in its Lille premises to support the consultation (together with the discussions on just culture and liability). The final version of the paper including comments from the sector is due to be published in September 2019. Materials from the workshop are available in the COR Space in the Agency Extranet.

6.7.   COR paper on Just Culture and Liability

The following working paper [13] had two main topics: the impact of just culture on sharing of occurrence related data by different stakeholders and possible issues of liability that might be caused by the introduction of COR. Objectives of this document included the understanding the cultural background of organizations' approach to safety and reporting, identifying the possible concerns of stakeholders about sharing sensitive occurrence related data and considering all the possible conflicts between just culture, national law and judiciary practice with regards to unsafe events in the railways.

Just culture was described as an element of an organizational safety culture that supports reporting and sharing of safety related information both within and outside of the organization. It was noted that common occurrence reporting and an appropriate organizational culture depend on each other – a harmonized legal framework with an accessible and transparent system provided by COR would reinforce a culture of openness and sharing, but at the same time the success of COR itself depends on the maturity of all the stakeholders

involved. Basing on an analysis of just culture on the level of operational actors as well as authorities, the document identified a number of potential threats to COR stemming from varied level of maturity in the railway sector as well as cultural and legal differences between Member States.

The first draft of the just culture and liability working paper was made available for comments to the stakeholders from 27th of November 2018 to 27th of February 2019. On 6th and 7th of December 2018 the Agency organized a workshop in Lille to discuss to content of the document (together with the discussions on risk profiling). The final version of the paper including comments from the sector will be published in September 2019. Materials from the workshop are available in the COR Space in the Agency Extranet.

7. COR System Proposal and Impact Assessment

Following the consultation phase based on working papers, stakeholder workshop and bilateral meetings, the Agency drafted a System Proposal for COR, which was accompanied by an impact assessment, which provided the cost-benefit analysis of different options established in the discussions with the sector. This proposal was not seen as definite as it foresaw additional work to be done by the working party supporting the Agency in developing the required legislation (following a mandate issued by the Commission) – it rather aimed at analysing different possibilities for COR identified in the consultation period.

The main objective of COR was defined as contributing towards better risk-based decision making to improve railway safety performance, with the following specific objectives to support its achievement:

- Improve risk profiling and modelling techniques regarding accidents and incidents;
- Ensure broader visibility of safety performance in Member States;
- Enable identifying and monitoring low frequency high consequence risks;
- Improve learning, exchange and sharing of accident / incident data between all EU actors.

To fulfil these objectives, the Agency proposed an EU Common Occurrence Reporting scheme allowing to report, collect, share and analyse information on accidents and incidents. Such an exchange of information was to help ensure that roles and responsibilities in railway safety are fulfilled by all parties involved, safety actions are taken in an appropriate manner based on the analysis of the collected data and railway safety risks are considered and dealt with on national and EU level.

Options considered in the impact assessment were based on different scope of reporting in the COR system, with aggregated CSIs as baseline that could be expanded by adding a taxonomy as well as additional incident to be reported either on voluntary or mandatory basis. The benefit was qualitatively assessed for all identified stakeholders and the cost estimations were made for each of the options, basing on the estimated cost per reported occurrence, including the cost of IT and the employee workload.

The baseline reference was the existing reporting regime, where RUs and IMs provide their Common Safety Indicators (described in Annex I of the Railway Safety Directive [1]) in the annual safety reports to the NSAs, which are responsible for aggregating the data and publishing their own Annual reports. These documents are received by the Agency, which has the tasks of assessing the national CSIs against the Common Safety Targets set out for the Member States and sending the results of the assessment to the European Commission. EC acts if a possible or probable deterioration of safety performance is identified.

The overall impact assessment showed that the preferred option is building the COR on the scope of current CSI regime which would be expanded from aggregated yearly reporting into individual occurrence reporting structured by the taxonomy. This meant that instead of annual reporting of aggregated indicators, RUs and IMs would be required to collect information on single occurrences with the supporting taxonomy data and share it in the national occurrence reporting system put in place by the Member States. In each MS an entity (National Reporting Authority – NRA) should be established with the responsibility of managing the national regime and transmitting the collected occurrence data to an EU wide common occurrence reporting system run by the Agency.

Apart from describing the preferred option, the system proposal contained a number of other consideration about the COR regime. It described the definitions and the taxonomy (following the previous paper on this topic), proposed reporting scheme and timing, data management including analysis and quality assurance. In order to provide transparent and manageable interfaces between different levels of reporting, the document introduced the role of National Reporting Authority – a body on the Member State level that would be responsible for collecting the data from the national railway sector and sharing it with the Agency. System governance as well as data protection and confidentiality were also discussed in the paper.

First draft of both the system proposal [14] and the impact assessment [15] were provided to the EU railway sector for consultations from 24th of November 2017 to 23rd of February 2018. A dedicated workshop was held by the Agency on the 10th and 11th of January 2018 to support the consultation process. Second version of the two documents that included the comments and remarks from the stakeholders was elaborated at the end of May 2018 and published on the Agency web page.

8. Summary

Following the preparatory study by a consultant, the Agency organised a number of activities under the COR project that were aimed at drafting a proposal for the system that would be a widely accepted solution, taking into account experience of organisations from railway and other transport modes. The objective was to design a system that would bring added value to safety management and improve safety of the railways in Europe while being in line with systems and procedures for reporting already in place on national and operational level.

During this preparatory phase, the Agency received multiple comments and remarks from sector organisations, both supporting the introduction of a common reporting regime as well as expressing concern. Main challenges that were brought to the attention of the project team included the scope of the reporting system, the timings and responsibilities for feeding the data into the system, avoidance of double reporting (in an EU and national system), harmonizing definitions and taxonomies in order to avoid additional work. Legal aspects and issues of confidentiality and system access were also topics for discussion.

Participants of the consultation phase underlined the size and robustness of some data reporting and analysis systems, which are deeply embedded in the Safety Management Systems, technical and operational practice and national safety performance monitoring. At the same time, stakeholders agreed that a more harmonized system for reporting and sharing safety data would be beneficial for the European railways and could help develop a mature reporting culture among the organisations. The comments and remarks were taken into consideration by the Agency project team in the development of the COR system proposal.

Annex I Project timeline

Table 4 Table of key milestones and deliverables

Project topic / milestone	Type	Date	Remarks
Assessment of Existing National Occurrence Reporting Regimes and Systems	**Report**	**09/12/2015**	
Assessment of the Impact of Rail Suicides on EU Railways	**Report**	**09/12/2015**	
Impact Assessment on the introduction of reporting regime at EU level	**Report**	**09/12/2015**	
Proposal for Common Occurrence Reporting Regimes and Systems Including Taxonomy	**Report**	**09/12/2015**	
Common Occurrence Reporting Project Plan	**Project Plan**	**31/03/2016**	**First version**
Designing the common occurrences and taxonomy for COR	Working paper	23/05/2016	First version
Designing the common occurrences and taxonomy for COR	*Consultation*	*23/05/2016 – 15/07/2016*	
Designing the common occurrences and taxonomy for COR	*Workshop*	*2-3/06/2016*	*Venue: Valenciennes*
Review of EU legislation related to occurrence reporting	Working paper	27/09/2016	First version
Review of EU legislation related to occurrence reporting	*Consultation*	*15/09/2016 – 16/11/2016*	
Phasing the COR Safety Management Data system	Working paper	27/09/2016	First version
Phasing the COR Safety Management Data system	*Consultation*	*28/09/2016 – 21/12/2016*	
Big Data in railways	**Report**	**12/10/2016**	
Review of EU legislation related to occurrence reporting	*Workshop*	*25-26/10/2016*	*Venue: Valenciennes*
Phasing the COR Safety Management Data system	*Workshop*	*25-26/10/2016*	*Venue: Valenciennes*
Designing the common occurrences and taxonomy for COR	**Working paper**	**30/11/2016**	**Second version**
Roles, use of data, governance and confidentiality for COR Safety Management Data	Working paper	07/02/2017	First version
Roles, use of data, governance and confidentiality for COR Safety Management Data	*Consultation*	*08/02/2017 – 04/04/2017*	
Roles, use of data, governance and confidentiality for COR Safety Management Data	*Workshop*	*22-23/02/2017*	*Venue: Lille*
Common Occurrence Reporting Project Plan	**Project Plan**	**06/03/2017**	**Second version**
Review of EU legislation related to occurrence reporting	**Working paper**	**17/07/2017**	**Second version**
Roles, use of data, governance and confidentiality for COR Safety Management Data	**Working paper**	**26/07/2017**	**Second version**
Phasing the COR Safety Management Data system	**Working paper**	**28/07/2017**	**Second version**

Project topic / milestone	Type	Date	Remarks
System Proposal for COR Safety Management Data	Working paper	23/11/2017	First version
Full Impact Assessment for the COR System Proposal	Working paper	23/11/2017	First version
System Proposal for COR Safety Management Data	*Consultation*	*24/11/2017 – 23/02/2018*	
Full Impact Assessment for the COR System Proposal	*Consultation*	*24/11/2017 – 23/02/2018*	
System Proposal for COR Safety Management Data	*Workshop*	*10-11/01/2018*	*Venue: Valenciennes*
Full Impact Assessment for the COR System Proposal	*Workshop*	*10-11/01/2018*	*Venue: Valenciennes*
System Proposal for COR Safety Management Data	**Working paper**	**16/05/2018**	**Second version**
Full Impact Assessment for the COR System Proposal	**Working paper**	**31/05/2018**	**Second version**
Just Culture and Liability	Working paper	20/11/2018	First version
Risk Profiling	Working paper	26/11/2018	First version
Just Culture and Liability	*Consultation*	*27/11/2018 – 27/02/2019*	
Risk Profiling	*Consultation*	*27/11/2018 – 27/02/2019*	
Just Culture and Liability	*Workshop*	*6-7/12/2018*	*Venue: Lille*
Risk Profiling	*Workshop*	*6-7/12/2018*	*Venue: Lille*
Just Culture and Liability	**Working paper**	**29/08/2019**	**Second version**
Risk Profiling	**Working paper**	**03/09/2019**	**Second version**