



Conversation on and presentation of opinions about safety management in railway traffic of the European Union

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1. The state of railway safety in Europe

- a) What factors currently determine the development of rail transport safety in Europe?

Rail transport safety is presently shaped by migrating (new) digital technologies into railway operations. This coincides with a societal demand towards rail to increase its transport capacities. While digital technologies enable a much higher productive output in rail operations, they create also new threats – mainly in relation to cybersecurity. Especially in the context of the aggressive war against Ukraine, it will be major consideration for European countries to prevent cyberattacks against critical infrastructures such as the railway system. We must bear in mind that not only can core safety processes can be targeted, but also weaker systems like passenger information or ticketing might be attacked and create enough damage to force the system to break down.

- b)** What is the impact of the requirements of the 4th Railway Package on safety, especially in the context of the functioning of the single railway market?

Our expectation is that unified standards and processes for homologation may speed up the migration of innovative solutions into the sector. Also, this provides an excellent commercial perspective to innovative companies to target the huge EU market with just one homologation process. This is a major step in the development of the industry.

- c)** How is knowledge transferred within the ERCI in the field of railway traffic safety?

The ERCI offers an international conference event at least twice a year as part of its Cybersecurity Taskforce. With representatives from industry, science and politics, current topics, challenges and solutions in the field of cybersecurity in railway technology are discussed. In addition, the ERCI webinar series is on twice a month. Here, institutions can present innovative products or services. The webinars are open to all topics and thus are also accessible to the field of railway security.

2. The development of innovations in rail transport and their levels of implementation in Europe

- a)** What is the status of innovation development and the degree of innovation implementation in Europe today?

In general, railway transport has more of a migration problem than an innovation problem. There are many innovative solutions on the market for many challenges that the sector faces. However, it generally takes too long to implement them into operations, especially when compared to other modes of transport such as automotive or aviation and the military sector.

- b)** What is the average implementation time for technical innovations in Europe?

This takes a comparatively long time, often 10–15 years or longer. The problem is inflexible and strict regulation, which used to be different in every country. Also, the long durability of the technical systems compared to other sectors leads to long implementation times for innovations.

- c)** What does the development of innovations in Europe's rail transport mainly concern?

All major areas of innovation should centre around the key challenge of the sector – to deliver more transport volumes at a better quality with enhanced capacity utilisation and a greener footprint. Thus, areas of innovation or digitalisation of operational and sales processes, interoperability of European railway systems, predictive maintenance of rolling stock and infrastructure, alternative propulsion technologies and lightweight concepts.

- d) How can the ERCI support railway companies in the context of implementing innovative solutions?

The ERCI connects 16 countries and over 2,000 institutions from industry and science across Europe. In the past funding period of Shift2Rail, 18 successful consortia were supported. In addition, the ERCI Innovation Awards take place annually, where innovative products and services are rewarded. So, in a nutshell – we bring together the right players from across the continent to develop solutions and products for the railways of tomorrow.

3. Problems of ecology in EU rail transport

- a) How are the principles of the Green Deal changing the development of rail transport in Europe?

The Green Deal is a major shift in strategy and will have a huge impact on transport in general. Don't forget – this is the major political framework in Europe on how to address climate change. The transport sector is a focus area, as it gives quite a lot of leverage for CO₂ reduction. The rail sector is expected to deliver a much higher share of the modal split over the next decade or so, as compared to today. That means more investments in infrastructure and rolling stock, but also better capacity utilisation and therefore solutions for safe and timely operation of more dense traffic on the network. Also, rail transport will need to be better aligned to logistical transport chains and personal trip planning. Intermodality and easy access to rail from other modes of transport will become increasingly important.

- b) How is the climate and energy transformation influencing the development of rail transport in Europe?

A major influence is seen in propulsion technology. The shift away from diesel to the use of alternative propulsion technologies such as hydrogen or batteries is evident throughout Europe. In addition, the topic of secure and reliable energy supply is coming into focus. But the key will probably be more electrification of the network. This will provide the best efficiency and provide the grounds for freight transport and high-speed connections in areas that do not have attractive connections today.

- c) What are the benefits and risks of striving for change to cause positive climate change in the rail transport sector?

The benefits for the rail sector are a) a greater relevance of rail in the modal split, b) the strengthening of the rail industry along the entire value chain, and c) the perception as the transport mode of the future and therefore a higher attractiveness as an employing industry.

The risks relate to the fact that rail could fail to deliver on expectations as overly ambitious planning will increase the unreliability of and possibility of errors in the overall system. Also, the high costs of creating the additional capacities in infrastructure and rolling stock might hinder achievement of the ambitious targets.

- d) How does the development of renewable energy sources, including hydrogen technologies, influence the development of rail transport in Europe, based on the experience of the ERCI?

Again, more electrification will be a good means to use renewable and sustainable energy sources, as it allows management of the grid and distribution of energy that would be centrally generated. In combining the high efficiency of power distribution with the high efficiency of electric drives and the possibility of energy recuperation from vehicles, no other mode of transport can deliver nearly as green a travel option.

Battery storage and hydrogen concepts will both provide the option to store sustainably generated energy for propulsion. Both concepts have limitations in terms of energy density, therefore their main use case will be in replacing passenger trains, currently powered by diesel in more rural areas. I expect that both propulsion concepts will be successful in the market. Which concept is to be chosen will depend on specific characteristics of the operational conditions and also on the infrastructural conditions for refuelling and recharging.

Finally, in markets like the USA, with large non-electrified networks and heavy-haul diesel traction, the most likely solution will be synthetic fuels. These markets will probably continue to operate on the basis of diesel for longer than we will in Europe, and shift to synthetic fuels once they are more broadly available at more commercially attractive price points.

Adam Jabłoński

Associate Professor PhD, President of the Board of the Southern Railway Cluster

Marek Jabłoński

Associate Professor PhD, Vice President of the Board of the Southern Railway Cluster

Referring to the words of Dirk-Ulrich Krüger and Veronica Elena Bocci, the ERCI Management Board, of key importance is to define the place and role of the functioning rail transport in Polish conditions against the backdrop of the applicable EU requirements.

It is important from the point of view of the requirements of the 4th Railway Package applicable throughout the EU, in particular with regard to rail safety, rail interoperability and shaping innovation in rail transport. With this adopted logic, it is worth asking the founders and creators as well as the current management board of the first railway cluster in Poland, founded in 2011. This cluster is also the only cluster from Poland, and at the same time a founding member of the ERCI network of railway clusters unique in Europe. The President of the board of the Southern Railway Cluster is an Associate Professor PhD Adam Jabłoński, the Vice President of the Management Board is an Associate Professor PhD Marek Jabłoński.

Adam Jabłoński says that in Poland, rail transport is safe compared to other EU countries. Nevertheless, it should be overlaid with an individual dimension of the local specificity of individual EU countries. This is due to the fact that each country has a different density of railway infrastructure, as well as average travel speed in the process of passenger and freight transport. In this context, we are faced with a situation of increasing speed in the Polish railway infrastructure, which may generate new threats to the safety of railway traffic in the context of both the replaced infrastructure and rolling stock.

Marek Jabłoński points out that an important element is also the implementation of investment processes, especially in Poland. Currently, the peak of the works being carried out can be observed, which significantly reduces railway traffic capacity. This generates changes in the organisation of railway traffic, which may result in a number of threats to the safety of railway traffic. Unfamiliarity with the operation of equipment, lack of the expected level of training and experience of the staff, and failure to ensure safe cooperation of new and old equipment are the key threats faced by experts in the railway industry. The widespread implementation of the new ETCS rail traffic control system, not yet used in Poland, is a key challenge for rail operators and infrastructure managers.

In the context of the safe operation of rail transport in Poland, **Adam Jabłoński** refers to the war between Russia and Ukraine taking place directly on our borders. This is of particular importance for the safety of the railway system in Poland. Threats can range from cybersecurity factors to physical terrorist attacks. In this dimension, it is important to understand the issues and distinguish two areas required for modern management: digital safety and cybersecurity. Activities in Poland should follow these two key directions in the development of rail transport in Poland.

According to **Marek Jabłoński**, the adaptation of operational processes in the context of the implementation of new technical solutions, such as ETCS Level 2 and GSM-R digital communication is a key task for rail traffic operators in Poland. Everyone is learning this, especially in the context of ensuring the safe operation of these systems. Therefore, the biggest challenge will be to ensure safe integration of new systems with solutions already in use. This is where the greatest risks can arise.

In conclusion, **Adam Jabłoński** points out that against the backdrop of the above-mentioned issues, the strength and potential for participation of the Southern Railway Cluster in the European Cluster Network is emerging. Thanks to it, we have access to the best innovative solutions in rail transport, which we can adapt, present and explore for individual domestic users of rail transport in Poland. This is also confirmed by the fact that both Adam and Marek Jabłoński have been members of the ERCI Innovation Award Jury for many years, a competition aimed at selecting entities that offer and deliver highly innovative products and services for rail transport to the market, both in the context of technological solutions and operational conditions.

Dirk-Ulrich Krüger is the President of the ERCI – European Railway Clusters Initiative ASBL, Brussels, Belgium. The ERCI is an association that unites 15 innovation-driven European railway clusters, that cover 16 countries and have a consolidated membership of over 2,000 businesses and research institutes. The ERCI’s mission is to bring customers, suppliers and supply chain opportunities together. Mr Krüger is also the Managing Director of Rail.S – the East German railway industry cluster that is a founding member of ERCI. Besides his long experience in that position, he has a strong background in strategic and financial advice for the transport and infrastructure sector. Former positions in that field include PwC (Price-waterhouseCoopers). Mr Krüger holds a degree in business studies from HTW – Dresden University of Applied Sciences. He is also a charterholder of CFA Institute, Charlottesville, Virginia, USA.

Veronica Elena Bocci is the Vice President of the ERCI – European Railway Clusters Initiative ASBL, Brussels, Belgium and Coordinator of DITECFER District for Rail Technologies, High Speed, Network’s Safety and Security Consortium. She is a graduate of the University of Pisa and several other faculties including the University of Fribourg, 24ORE Business School and DiploFoundation.

Adam Jabłoński, PhD is an Associate Professor at WSB University in Poznań, Poland, and Head of the Institute of Management and Quality. He is also President of the Board of a reputable management and technology consulting company “OTTIMA plus” Ltd. Katowice and President of the Association of the “Southern Railway Cluster” Katowice, which supports development in railway transport and innovation transfer, also working towards cooperation with the European Railway Clusters Initiative ASBL, Brussels, Belgium. For many years, he has also been a member of the jury for the ERCI Innovation Awards in railway transport. He holds a postdoctoral degree in economic sciences, specialising in management science.

Working as a management and technical consultant since 1997, his experience and expertise have grown through his contact with a number of leading companies in Poland and abroad. He is the author of a variety of studies and business analyses in the fields of business models, digital and sustainable business models, strategic management, safety and digital safety, railway transport, value-based management and risk management. Additionally, he has written and co-written several monographs and over 100 scientific articles in the fields of management and railway safety management, published both in Poland and abroad.

Marek Jabłoński, PhD is an Associate Professor at WSB University in Poznań, Poland. He is also Vice President of the Board of “OTTIMA plus” Ltd. Katowice, and Vice President of the Association “Southern Railway Cluster” Katowice. He holds a postdoctoral degree in economic sciences, specialising in management science.

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co-written several monographs and over 100 scientific articles in the fields of management, railway safety management, published both in Poland and abroad. Marek's scientific interests focus on the issues of modern and efficient business model design, including sustainable business models, innovative business models, value creation, railway safety management and the technical aspects of safety rules.

Adam Jabłoński and **Marek Jabłoński** are the co-authors of a series of books. In their monographs, they introduced, developed and promoted the concept of *mechanisms* of effective safety and maintenance management in rail transport, mechanisms for effective management of sidings in rail transport, mechanisms for shaping safety culture in rail transport, mechanisms for ensuring technical and safe compliance integration, and management mechanisms for the safe operation and maintenance of railway vehicles.

In 2022, they co-wrote a book *Digital Safety in Railway Transport – Aspects of Management and Technology* for the Springer Series in Reliability Engineering.

