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The operational performance on Rail Freight Corridors as key factor in fostering the attractiveness of the rail transport: focus on the Baltic-Adriatic Rail Freight Corridor

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1 Freight transport in the EU

Freight transport is a key factor in the EU market, as it contributes substantially to the economic growth and to the creation of new job positions. Freight import and export among the territory of the EU had a strong development in the last 20 years, reaching in the 2016 over 3000 billion tons-kilometres[1]. This strong development of the EU market did not concern all the transport modes, causing a modal split heavily in favour of road: in the 2017, 77% of the freight transport was on road, the 17% on rail and the 6% on inland waterways[2]. This modal share is a concern for the EU institutions, as it prevents the achievement of the goals they established on sustainable mobility: according to the European Environment Agency, a third of the CO_2 global emissions is due to the transport sector, the 77% of which is up to the road transport. Because of, for a given load, the road transport emits the triple of CO_2 compared to the rail transport; the EU strategies in these last years were focused on fostering the international rail freight transport.

In this context, the main EU targets regard the transfer of the 30% of the international freight transport from road to the rail, for distance greater than 300 kilometres, by the 2030, and the 50% by the 2050[3]. In order to enhance the rail transport, many financial resources were allocated and many legislative measures were taken, including the so-called "four rail packages", the Regulation n. 913/2010 about Rail Freight Corridors set up and the Regulation n. 1315/2013 about the TEN-T European network. However, despite the European Commission's efforts, these measures did not return the expected results yet: the rail freight traffic remained stable, while the road one continued his growth[4].

This lack of development could be justified by the several limitations that characterize the rail transport, these limitations and constraints regarding both the pre-transport and the actual transport phase: infrastructure access, high intermodal competition, administrative constraints, freight loading and unloading, missing of a centralized traffic management and all the problems concerning the border crossings. All these features mean that the road transport might be preferable for the freight forwarders in terms of cost, travel time, frequency, flexibility and reliability, and especially this last feature has a great impact on the modal choice, because the punctuality of the final product delivery from the company to the costumer depends on punctuality of goods transportation.

2 International rail freight punctuality: focus on the Baltic-Adriatic Rail Freight Corridor

Since punctuality is one of the most important criteria on which freight forwarders base their transport modal choice, a study was made about the reliability of the international transport along the Baltic-Adriatic Rail Freight Corridor.

Punctuality was analysed along the six Corridor's borders with a three months observation and all the information needed was collected through the Italian IT System (PIC) and the RNE[5] IT Systems (TIS and OBI). These IT platforms allow punctuality measurement in four different moments along the train

[1] CE (2018), EU Transport in Figures – statistical pocketbook 2018
[2] ec.europa.eu
[3] COM(2011), 144 *final*, Brussels 28.03.2011, White Paper: Roadmap to a Single European Transport Area – Towards a competitive resource efficient transport system
[4] eca.europa.eu
[5] RailNetEurope (RNE) is a non-profit making association founded in January 2004 on the initiative of a number of European railway Infrastructure Managers and Allocation Bodies, who wished to establish a common Europe-wide organisation to facilitate their international business. Website: www.rne.eu

path: departure from the first station on the Infrastructure Manager's network, arrival at the border station, departure from the border station and arrival at the final destination.

The results highlighted that the transport reliability along the Corridor is not yet sufficient for the fostering of the rail freight competition over the road transport: with a 60 minutes threshold, punctuality percentage turns out to be of 37%, way far from the medium target that the most Corridor's Infrastructure Managers established for their freight transport. It is important to notice how these low punctuality values remain basically constant along the train travel, this means that the delays are caused mostly at the beginning of the journey and therefore, that the most frequent causes of delays are not those that normally occur along the journey (for example, traffic management issues) but at the beginning of it (for example, lack of structured communication exchange between the Terminals and the Railway Undertakings at the origin of the train journey).

Another element that suggests that the international level of punctuality does not reflect a bad national traffic management is that the national punctuality levels, for each Corridor's Country, are about 90%, and so compliant with the targets. An explanation for this difference between the two types of traffic could be found in the role of the Performance Regime: while at national level, where applied, this tool appears to be well effective for the maintenance of a high transport quality, at international level it does not work in the same way, as all the delays due to "other networks", both for incoming and outgoing, are identified as "external cause" and so immune of charge.

3 IT tools for the traffic management

To ensure a high quality level for the international freight traffic, a key role is played by the IT tools used for the real time traffic monitoring and for the information exchange among the stakeholders. Many IT Systems currently used by Infrastructure Managers and sector organizations, in relation to the international rail business, are provided by Rail Net Europe and the one used for the international traffic monitoring is the Train Information System (TIS). This IT platform plays a key role in the real time international rail traffic management, since it is the only tool available for the Infrastructure Managers, Terminals and Railway Undertakings that allows the train mapping when the train is not on their national territory. Without this IT System, the parts involved would have information only about train scheduled timetable, but, as we saw in the previous paragraph, international train travels are used to being characterize by a certain uncertainty, that makes the planned timetable not enough reliable with a view to ensuring an appropriate use of resources, in terms of tracks, isolated locomotives and staff. In addition, this IT platform provides all the data to the Oracle Business Intelligence (OBI), a calculator system that, through the data processing, develops reports and statistics about the traffic along the Rail Freight Corridors.

Due to the strong link between international traffic timetable reliability and IT System data accuracy, a detailed analysis was carried out on TIS data quality. The study covered 12 terminals along the Baltic-Adriatic Rail Freight Corridor, in a three days observation. The number samples analysed was 1295 and only 72% presented completely correct information, while the remaining 28% showed problems related to the incorrect presence or absence of trains in the platform, isolated locomotives identified as freight trains and incorrect information about timetable (day or time) and number (wrong train identification number). In the end, an issue of great impact on international traffic monitoring was represented by the difficulty in linking trains at border crossing: it often happens that trains, at national borders, undergo a number changing. The TIS System should be programmed in a way that makes possible to keep record of the train number changing, so that each Infrastructure Manager is capable of the identification, but the study carried out highlighted how this does not often happen in the right way.

The issue about trains linking at border crossing influences the quality of OBI's reports and statistics: in order to discern the international traffic from the national one, a couple of measuring points is identified for each border, if the same train is registered in the both border points, this will be identified

as an international traffic and the train is considered belonging to the Freight Corridor. But, if the train is not correctly linked at the border, this will be registered at the two measuring stations with two different numerations, and so instead of one international traffic, OBI will understand two different national paths which will not be counted correctly in the final reports and statistics.

In order to understand how this linking problem influences OBI's statistics precisely, a data quality analysis was carried out. The study covered 12 border stations along the Baltic-Adriatic Rail Freight Corridor for a three-day observation period. The results obtained show a certain heterogeneity among the stations: some borders presented full consistency in international trains identification through the two IT platforms, TIS and OBI, meaning of a correct linking trains at border crossing, while other borders presented a percentage of trains consistency between the two platforms too low to be considered as correct (about 10-15%). The borders characterized by this low consistency were studied with much attention: as international train identification depends strongly by the position of the couples of measuring points, IT simulations were carried out in order to identify the couples that lead to an adequate data consistency between the two platforms. These simulations consisted of changing the measurement points near the borders and the data-reprocessing trough the OBI calculator, so that the right measuring couple could be found for each border. Where the low consistency was due to linking trains issues, adequate trains sharing percentages were obtained using two different couple of measuring points for every border, and so a couple for every Country. As an example, it is possible to analyse the border between Italy and Slovenia: at the beginning, the measuring points were the stations of Villa Opicina in Italy and Divaca in Slovenia, but, with these points, the percentage of international trains linked at the border by the IT platforms was only 12% for the Italian station and 10% for the Slovenian one, while the remaining trains were considered as "national" as no linking was identified. To understand where exactly the problem was, several simulations were carried out and the one which returned the best result involved the use of a couple of measuring points for each national territory: Aurisina - Villa Opicina for the Italian territory and Sežana – Divaca for the Slovenian one. With this double couple, the percentage of consistency between the two IT platforms grew up to 96% for the Italian station and 83% for the Slovenian one. This kind of approach allows to distinguish the international traffic from the national one in a more reliable way, but it has a problem: using a couple of measuring points for every Country means that the same train will be counted twice by the IT System, both before and after the border crossing. If the train does not undergo a changing number at the border, the double couple does not interfere with OBI's statistics; otherwise, the train will be counted as two different international trains in OBI's statistics about the traffic intensity along the Corridor, making it difficult the correct identification of the actual number of trains that cross the border.

At the end, the last problem found during the TIS data quality analysis is related to the connection of the Terminals to this platform: no Terminals along the Baltic-Adriatic Rail Freight Corridor are currently connected to this IT System, and that causes problems to the Infrastructure Managers and Railway Undertakings in gathering real time information about the state of the train when it is not yet located in the national network. This lack of connection represents a critical issue because, as we saw, most of the delays are generated in the first part of the train path, between the Terminal and the first station on the national network ("last mile"). The missing of information about this first part of the path makes difficult the identification of the real cause that provokes the given delays.

The issues concerning the real time traffic management and information exchange have a great impact on the satisfaction of the Rail Freight Corridor users. In fact, the annual Corridor's Satisfaction Survey showed that users complain mostly about logistic chain fragmentation, IT System data reliability and poor reliability of the traffic along the Baltic-Adriatic Rail Freight Corridor.

4 Pilot proposal in operational field

In order to solve the issues concerning real time traffic management and meet the user demands, the International Traffic Management section of the Italian Infrastructure Manager (Rete Ferroviaria Italiana) proposes a pilot in operational field. The main aim of the pilot is a concrete individuation and solution of IT Systems issues, the strengthening of the real time traffic monitoring and information exchange between all the actors of the logistic chain, in order to eventually obtain an adequate level of international freight traffic punctuality.

The pilot proposal basically involves two temporal phases with two different goals. The first phase is oriented towards the improvement of real time traffic monitoring, information exchange and logistic chain simplification, through the fostering of an even more transparent freight transport, where users and stakeholders have access to real time information. The second phase, instead, in oriented toward the final aim, which is the achievement of a minimum punctuality level, at least for the parts involved in the pilot, through the voluntary subscription of a "Railway International Performance Act" (RIPA), an act that states the commitment to a minimum level of punctuality.

In the first phase, in order to achieve the goals established, a "traffic focal point" (TFP) for the whole Corridor would be set up, in order to develop an organic traffic monitoring that allows an overall view over the whole Corridor traffic in real time. The "traffic focal point" is thought as a tool that supports the traffic management, but without decision-making power, which will remain a task of the IM's Control Centres.

The TFP position will be occupied by a Corridor's Traffic Management expert. Its tasks regard the monitoring of the real time traffic information available in the IT Systems and the fostering in gathering these data where missing. In the event of a traffic disruption that compromises transport regularity, the TFP would act like an "early warning system" ensuring that all needed information is shared in due time among all the parts involved, instead, in event of minor disruption, it will be a support tool for the normal traffic management. In addition, the TFP will have to spot all the issues that prevent the obtainment of high punctuality standards and to propose corrective actions, with a special focus on trains linking at border crossing.

For its tasks performance, the TFC will have access to the Infrastructure Manager's national traffic management tools, to the TIS platform and to all the platforms used in case of international disruptions, in addition, it will have the opportunity to contact the Traffic Control Centres of IMs and Terminals, the Incident Managers, the Communication Managers and other experts by phone calls or e-mails.

At the beginning of the pilot, the TFP's monitoring will not concern all the traffic along the Corridor, but only some train samples identified in advance with the cooperation of the Infrastructure Managers, Railway Undertakings and Terminals who would join the first phase of the pilot. For each train sample, the TFP day by day will monitor and control the train travel development, checking the match of the information available in the different IT platforms, the presence of such information almost 30 minutes in advance on the train departure and that all information is available during the whole train route. If the TFP detects some inconsistencies among the IT platforms or lack of data, it will contact the Control Centre involved, in order to obtain adequate information about the train route or the cause of the delay, allowing forecasting the development of the train run. Relying on the information obtained, the TFP will give feedback to all the parts involved, in order to facilitate the adoption of mitigating measures and ensuring the best use of the available resources.

For the purpose of monitoring the work during the first pilot phase, the TFP will draw up reports about the punctuality sample's trains and the IT systems data quality, which will be sent to all the experts involved in the pilot. The content of the reports will be discussed through conference calls, with the aim of identifying mitigating measures to apply to solve the issues found.

Carrying out this pilot and the TFP's introduction would bring several benefits that regard not only the data quality and the train punctuality improvement, but also the acquiring of new information related

to rail international traffic: the opportunity to forecast the train route with a certain advance and to gather information about the cancellations of trains made by the national managers or Railway Undertakings. Finally, this pilot would facilitate the solution of the issue related to the Terminals connection to TIS, ensuring an overall view over the whole freight travel, from the fist Terminal to the destination, using only one digital platform.