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Title:	Risk assessment model for the implementation of rail freight
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Keywords: rail freight, risk management, risk assessment model, risk matrix.

The dissertation is devoted to risk assessment issues for the transport process in rail transport. The safety of rail freight transport affects the stability of the functioning of entities providing services on the rail market. The research issues focus on the analysis of the causes of direct railway accidents in the rail transport system and the effects of adverse events. This makes it possible to identify the areas of undesirable events occurring during the carriage of goods by rail and their consequences.

Based on the review of literature sources and the analysis of adverse events in the rail transport system, it was found that the risk assessment for the performance of rail freight is a management challenge for entities operating on the rail transport market. As part of the dissertation, a risk assessment model was developed for the distinguished categories of causes of direct accidents and incidents in rail freight based on a 5x5 risk matrix.

The first part of the dissertation presents theoretical and research considerations relating to rail freight implementation risk assessment. The first chapter of the dissertation aims to introduce the undertaken research issues, with particular emphasis on the specificity of the railway transport process. The research areas identified through a literature review were discussed: risk and its types, multi-faceted risk assessment, reliability and safety of the railway system, legal acts related to the safety of the railway system, risk areas based on disturbances, and the methodology of risk assessment in rail transport. The second chapter presents the methods and tools of the risk management process in rail transport, including the risk matrix method. The third chapter formulates the work's aim, thesis, and scope. The subject of the fourth chapter is the analysis of adverse events in the rail transport system. The starting point for consideration is the characteristics of rail freight in Poland. Serious accidents, accidents, incidents, and potentially dangerous events on railway lines and railway sidings in the entire railway transport system were analyzed based on the data of the Office of Rail Transport and the National Railway Accident Investigation Committee. Chapter five presents the formalization of the provision of the risk assessment model for the implementation of rail freight (*MORKPT*). This model contains information about the railway network elements, structure, and basic parameters. Identification of direct causes and effects of adverse events during the implementation of rail freight transport was made.

The second part of the dissertation is of a utilitarian and application character. Chapter six presents an approach to determining risk values for accident and incident categories in the area of railway lines and railway sidings. The assignment of adverse event levels (slight, low, medium, high, very high) to a 5x5 risk matrix is presented. The applications supporting the visualization of data on adverse events, which can be used during the risk assessment study of rail freight, are discussed. The risk was assessed for each category of adverse events associated with consequences (killed, seriously injured, injured, a road vehicle collides with a train, a train collides with a road vehicle, freight train delays, and financial consequences). The seventh chapter includes the verification of the model on actual data. It also indicates which railway lines in Poland and between which railway sidings are located in individual provinces, the probability of an accident or incident is the highest. The last chapter of the dissertation presents a summary, conclusions, and further directions of scientific research in improving solutions related to the risk assessment of rail freight.