

# Implementing Risk Management Principles in the Traffic and Transportation Processes

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The paper is based on the basic safety and security factors of the traffic and transportation systems. It identifies the main groups and types of risks in traffic based on the particularities of the traffic and transportation systems. In general it characterizes the scope of the individual risk management phases in traffic conditions. It specifies successive steps of risk management and forms of their outputs in transport enterprise.

**Keywords:** risk management, risks in transport, safety factors of transport, small and medium sized transportation companies (transportation SMEs), traffic, transportation processes.

## 1. INTRODUCTION

The real external as well as internal environment where people carry out their activities is a reflection of the objective reality they have to cope with. The interaction with this environment is affected by a great number of risks. Living with risk requires creating effective conditions for providing efficient help for those who are or can be in distress. For this it is necessary to create conditions and to realise processes which are effective in the framework of the risk management. Implementing comprehensive risk management processes is one of the procedures to cope with risk.

## 2. SAFETY AND RISKS OF THE TRANSPORTATION PROCESSES

The safety of the traffic is perceived as a state of the transportation system which enables fulfilling the planned objectives and concrete transportation requirements of the carriers in concrete internal and external conditions. [9] It is determined by a human factor, means of transport and environment. The overall traffic safety level is an intersection of these three factors and each of them affects it both positively and negatively. Increasing the safety is possible through making each of them better and at the same time optimising their mutual links. The safety level of

the traffic can be improved by improving the organisational measures including implementing information and communication technologies, staffing as well as investment activities in the area of traffic infrastructure and means of transport.

Increasing the safety level by public administration institutions as well as entrepreneurial subjects has managerial, economic and technical aspects. The managerial aspect is connected with stating the goals of this process and processing and realising the corresponding plans and their complex provisions. The economic aspect contains assessing costs for the activities realised in the framework of the risk management as well as the analysis of assumed benefits. The technical aspect contains technological procedures whose goal is to reduce the risk rate and realising measures for an effective intervention in the case a crisis phenomenon arises. [10]

The comprehensive risk assessment in the traffic and transport is a complicated process whose goal is to investigate the crisis phenomenon sources in the transportation organisation as well as in the operation of the traffic equipment and means of transport and last but not least during the process of relocating people and things. In practice there is no generally binding or internal legal standard which would state the types of the risks in traffic and would enable to analyse and assess them uniformly. The risks in the traffic can be classified

to four relatively independent areas which from the process point of view are very closely interconnected and mutually overlapping: [7]

- the risks of doing business in the area of transport
- the risks of the transportation technologies
- the risks of the traffic and transportation infrastructure
- the risks resulting from the character of transportation.

The traffic and relocating processes have become inevitable for people's development and the growth of their standard of living. They are exposed to the same risks as any other human activities. On the other hand a whole range of risks in the traffic and relocating processes are multiplied and the internal and external conditions limiting transport are much more complicated than the conditions in a lot of industrial processes. A range of special features testifies this fact – here belong:

- the transportation distance (range in kilometres up to thousands of kilometres):
  - the differences of the internal and external conditions in the location of the sender and receiver,
  - the changes of the transportation conditions (duration of the transport),
  - the weather influences on the transportation process.
- the character of the transportation:
  - passenger,
  - freight,
  - transporting dangerous goods.
- the transportation technology (which substantially differs according to the type of transport and its character).

People themselves, similarly as in a whole range of activities and processes, are the decisive source of risks. People can participate in the rise of emergencies and crisis phenomena in the traffic as follows:

- as the transport providers,
- as the participants of the traffic and transportation processes,
- as persons who intentionally threaten the traffic and transportation process,
- as persons outside the traffic and transportation process which threaten them due to an emergency or a crisis phenomenon which arose in the framework of processes they realise.

The risk analysis and its quantitative assessment is an inseparable part of the transportation firms' management as well as of the factually corresponding bodies of the state administration. This process cannot be successfully realised without perfect knowledge of the traffic and transportation processes and their technology, transportation requirements and environment where these processes are realised. The risk quantification requires concentrating on extensive data bases which comprehensively describe the traffic, enable carrying out a whole range of generalisations and stating the probabilities of developing the crisis phenomena. It is possible to say that currently there are only minimal assumptions for the rise of a military conflict in the EU area but the probability of the traffic accidents of various seriousness increases and also their seriousness is bigger and bigger. That is why it is inevitable to carry out preventive measures to prevent the crisis phenomena in traffic and at the same time to prepare conditions to minimise the consequences of the arising crisis phenomena. [2]

The basic risks threatening the operability of the traffic and transportation processes are as follows: [6]

- the risks of reliability and safety rate of the means of transport:
  - the risks resulting from design of the means of transport,
  - the risks resulting from the technical conditions of the means of transport,
  - the risks of exceeding the life span of the means of transport.
- the risks resulting from the state of the transport network:
  - the risks resulting from failing to keep the technical standards during the designing process and promotion,
  - the risks resulting from failing to keep the deadlines for periodical maintenance,
  - the risks resulting from failing to keep the quality of the maintenance and renewal operations,
  - the risks resulting from extreme climatic conditions,
  - the risks resulting from an obstacle on the traffic road created as a consequence of natural disaster.
- the risks resulting from the technology of the transportation processes:
  - the risks resulting from failing to keep the operational standards and generally valid

- principles during the process of loading and unloading the freight,
- the risks resulting from failing to keep the operational standards in the process of forming the trains and truck trailers,
- the risks resulting from failing to keep the operational directives during transport.
- the risks resulting from the type of the transported freight:
  - the transportation of dangerous freight,
  - the transportation of freight with a special transportation schedule,
  - the risks of failing the security devices and control systems,
  - the risks of failing the information and communication systems,
  - the risks of the terrorist activities,
  - the risks of a military conflict.

### 3. RISK MANAGEMENT IN TRAFFIC AND TRANSPORTATION

Risk assessment in traffic and transportation processes in the framework of risk management can be realised in the real natural, social, production, technical and technological conditions or models (logical, mathematical,...). Such a model is a virtual or material unit taking into account selected characteristic features of the original and created for studying and affecting a real system which due to its character, size and complicatedness cannot be investigated in real conditions. The real situation of investigating a risk in the traffic and transport processes is more complicated than assessing it through models. In the real world the mathematical and statistical assumptions are valid only partially and the probabilities of developing crisis phenomena are detected in a complicated way and are up to considerable level subjective and we can unveil here the individuality and professional knowledge of the evaluator. Also the extent of the potential negative impacts in the traffic and transport processes but also the society and economic activities cannot be determined unambiguously.

Risk management is gradually implemented in the public administration institutions, in entrepreneurial subjects but also in various design activities and in improving the complex safety of the society also in the area of realising the traffic processes and increasing their safety level. The process of a comprehensive and effective risk assessment is one of the assumptions for achieving good economic results of the SMEs including the

transportation companies. In the practice of the transportation companies it is necessary to implement general risk management procedure shown in figure 1 and also to respect a whole range of principles and sequential steps stated by the technical standard. [8]

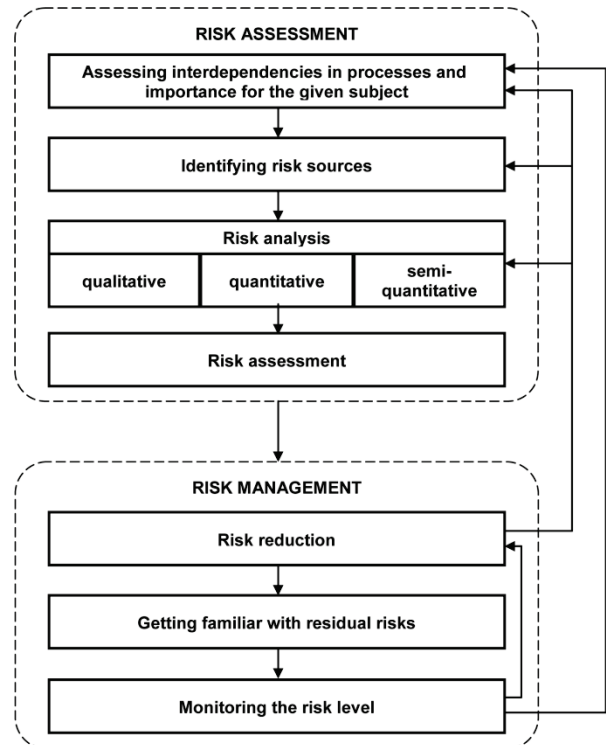


Fig.1. Risk management process in traffic and transport  
Source: adapted according to [5]

The risk management process in the area of transportation is created in several levels, from the multinational institutions through central bodies of the state administration in the section of transport up to individual freighters. The individual levels of management have to be mutually interconnected and to hand over as well as take over important information for their activity. The following activities are to be fulfilled at the individual management levels:

- to support the processes of implementing the risk management principles with an emphasis on increasing the transport safety and protection of the critical infrastructure element protection through EU bodies and institutions (especially through issuing the legal standards),
- to implement relevant EU documents into own legal standards respecting the specific conditions of the given country through the governments and the central bodies of the state administration,

- to work out philosophy for reducing the risks of disrupting operating processes in transport and improving their safety and security level through the transportation companies' top managements and operators of the transport infrastructure,
- to work out a compact conception of the risk management and to prepare a set of measures by the individual freighters and operators of the transport infrastructure and in this way to create assumptions for the risk management implementation in the whole transportation system and in all its activities.

The individual phases of the risk management in the transportation SMEs are to be adapted to the specifics of the transport and transportation processes. Risk management processes are to be aimed at:

- assessing the importance of transport from the society-wide point of view, its position in the environment or region evaluated as a part of a particular system,
- identifying the risk sources which can principally limit or make the transport and its security and safety completely non-functional,
- analysing the risks according to their specific categorisation which also includes the risk analysis from the external environment where the transportation processes are realised,
- stating the most important risks based on determining the probability of their rise and the intensity of the assumed harmful effects on the transportation processes and their security and safety and their classification to acceptable and non-acceptable ones,
- reducing the risks by an active anti-crisis company policy and concrete methods and procedures of a passive and active character with the goal to reduce the threat of the rise of emergencies, damages and losses in the transportation companies' operation, in the activities of the transport infrastructure operators and to minimise the possible economic consequences after the rise of a crisis phenomenon,
- informing all subjects participating in the transportation processes with residual risks and drawing their attention to the most probable crisis phenomena which can arise in the framework of the transportation processes,
- monitoring the state and development of the transportation processes' risk in the framework of the regulation area and affectivity of the set

of measures adopted whose basis is first of all to control the processes by the freighters and critical infrastructure operators.

The traffic and transport infrastructure has a whole range of specifics which are to be taken into account in the process of the risk assessment. These specifics reflect especially the extent and size of the traffic and transport infrastructure and the demandingness of its construction. As a rule, they are line constructions whose sizes cause a reduced possibility to monitor and protect them. Their construction and operation is connected with large investment and building demandingness especially when we build bridges and tunnels.

#### 4. RISK MANAGEMENT IN ROAD FREIGHT COMPANY

Similarly as the manufacturing and service providing enterprises also providers of the public freight services have to solve and implement risk management in their activities. However, besides the valid principles it is necessary to respect the specific conditions of the entrepreneurial activity in transport characterised especially by:

- the immaterial final product of the transportation process with the inseparable phases of production and consumption,
- the unique and unrepeatable characteristics of the transportation process as a specific production cycle,
- the fact it is not bound to a particular place only, but to moving to a determined space,
- performing a wide scale of external influences and their relatively difficult identification in the space and time,
- the integrating position in the logistic chains requiring narrow cooperation of many elements of these chains.

The specifics of a road freight company reflect practically in all process steps of the risk management system. In the risk assessment phase they are especially the phases of identifying risk sources and risk analysis. The company environment is affected either by the external elements through the framework conditions which are influenced in a limited extent only or by the internal controllable risk as shown in the figure 2.

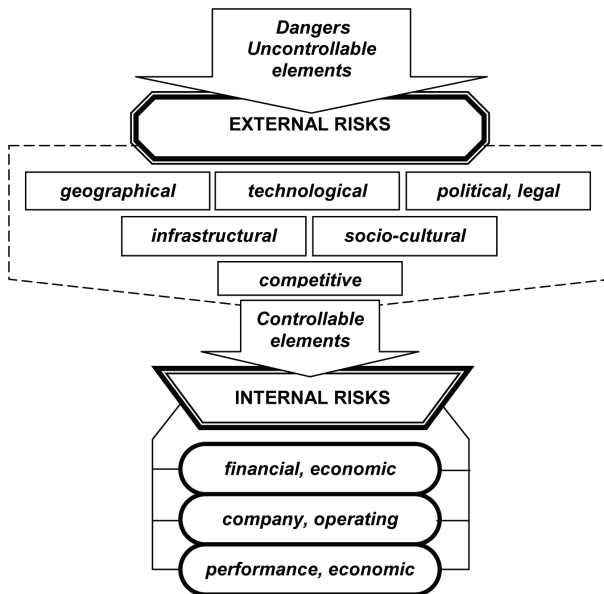


Fig. 2. Dangers, risks, uncontrollable and controllable elements

Source: adapted according to [4]

**Geographical and infrastructural conditions:**

- the geographical location of the country in relation to the other states in the region and the extent of the transition transport regarding to this fact,
- the need of developing and building the transport infrastructure from the point of view of the transition transport does not always correspond with the needs of the given country,
- the transfer of the investment means from the state budget for this building activity can result in reducing funds for the administrators of the transport infrastructure and an increased financial burden for the transport companies.

**Technological conditions:**

- the continuous development of the transport, reloading and warehousing tools with other revolutionary changes (e.g. extensive development of containerisation, network interconnection of the road communications, dramatic extension of utilising the information and communication technologies for planning and managing the material flows) enable increasing the transportation and logistics processes' effectiveness,
- on the other hand, the more and more intensive utilisation of the modern technique and technologies brings new uncertainties, dependences and problems.

**Socio-cultural conditions:**

- the societal development has particular impacts on the entrepreneurial activities of the freighters and providers of logistic services due to the development of the customers' and senders' demand,
- the continuously growing interest in the road transport in the national and European framework resulting also from the structure of the goods being transported,
- the specific properties of the road freight transport system (e.g. speed, flexibility, high network density) as well as the reduced number of the consignments mean a dramatic change of the economy-wide production structure,
- this development strengthens the logistic effect which are – the increased quality demands of the senders and demands on reliability of the transport performance in the modern logistic conceptions in industry and trade.

**Political and legal conditions:**

- the deregulation of the EU transport market and the resulting adaptations of the tariff activity, stating quotas, etc.,
- the gradual extension of the EU by the countries with different economic framework conditions,
- the influence of the measures adopted concerning the security and safety of transportation, customs regulations and directives for the foreign trade.

**Competitive conditions:**

- the external influence on the boom development,
- transferring the burden of the rise of the fuel prices on the freighters,
- the bad conditions and limitations for the entrance of new subjects to the road freight market arouses a high competitive pressure. [4]

As a rule, the organisational structure of the large transportation companies includes the crisis management components and especially the risk analysis belongs to an important part of their activity. However, it is not correct to reduce the problem of the risk management only to a narrow circle of the specialised risk management employees. It is obvious that it is necessary to involve all managers into the risk management processes especially in the SMEs which are

practically the dominant part of the road freight market players. The structure of the road freight companies in Slovakia (according to the criterion of the employee numbers) is in the table No. 1.

Table 1. The structure of the road freight companies in Slovakia

type of companies	employee numbers	percentage
the large freight companies	250 and more	26.12
the medium-sized freight companies	50 to 249	20.34
the small-sized freight companies	20 to 49	8.76
	0 to 19	16.41
the self-employed persons doing business in road freight transport		28.37

Source: adapted according to [3]

The figure 3 shows a framework procedure for the risk management process in a small-sized and medium-sized freight company

5. CONCLUSION

The security and safety of transport and transportation processes and the risk of their threats are often perceived only through some activities which can be a source of an emergency. Traffic accidents are such events in road traffic. However, it is necessary to perceive transportation risks from a much wider view without any underestimating the danger and consequences of traffic accidents. There is a whole range of risks which are specific just for transport technologies and processes and this fact requires taking into account the implementation of the general

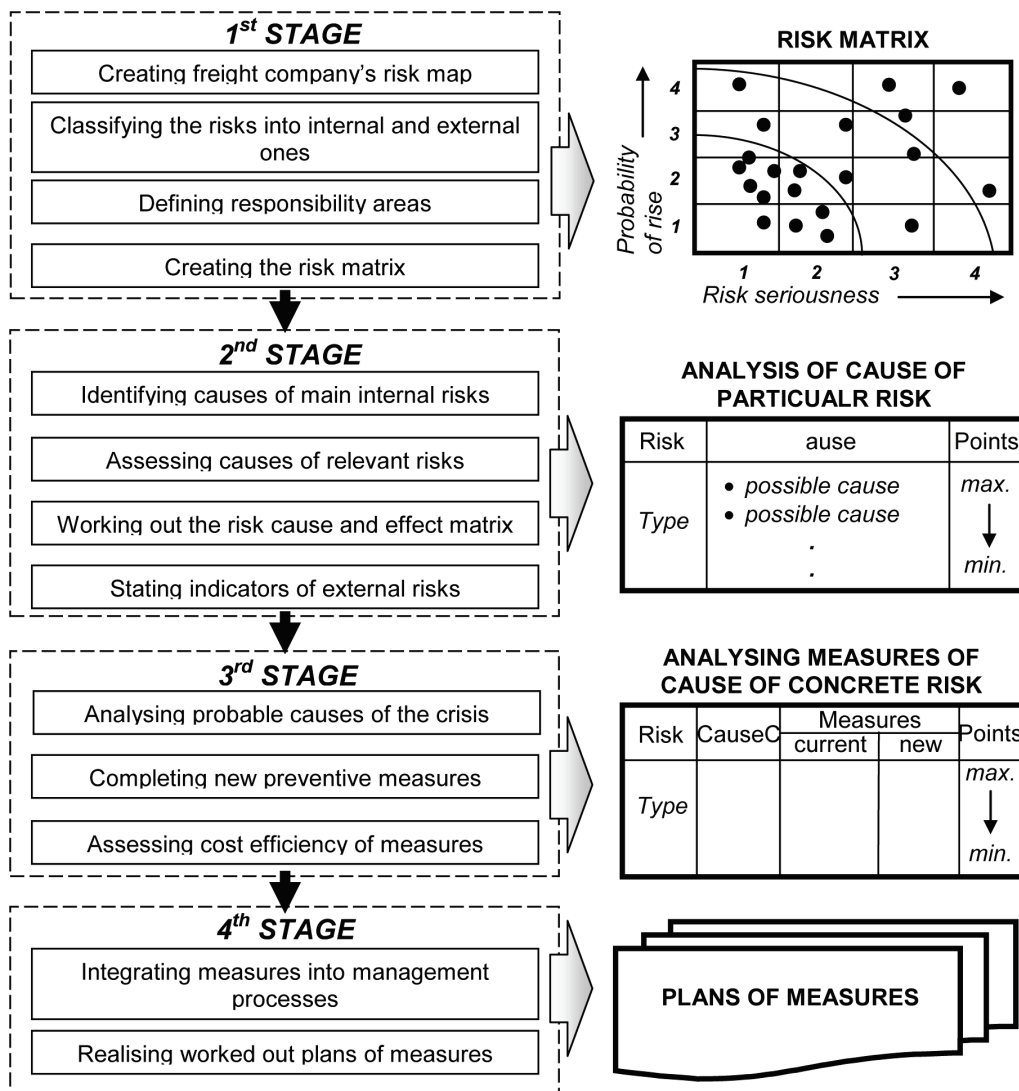


Fig. 3. Risk management process phases in a freight company  
Source: adapted according to [1]

procedures of the risk management process.

A lot of economic subjects specialised in certain partial areas of these processes participate in carrying out and ensuring traffic and transportation processes. Carrier companies and administrators of the traffic infrastructure are the decisive firms. The responsibility for the risk management in the traffic and transportation organisations is divided in the framework of the whole management. The owner, the statutory representative body and the company top management possess the highest responsibility. In small traffic and transportation enterprises the risk management is concentrated on the level of the statutory representative body. To employ the crisis managers – specialists is ineffective. In the framework of large traffic and transportation companies the responsibility for the risk management is distributed to individual managers. The large companies employ specialists – the risk managers.

The individual phases are to be kept in the risk management process. It is not only about the content fulfilment of these phases, but also their succession is to be held. E.g. it is ineffective to take measures for reducing the risk which was not exactly identified and assessed. These steps can also bring a synergic effect when the taken measure can be the means for coping with and managing several types of the risks at the same time.

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