

Study of the risk analysis associated with multimodal maritime transport

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Abstract:

According to the International Maritime Organization, risk is defined as "a combination of the frequency and severity of the consequence", thus articulating two components of the likelihood of occurrence and the probability of severity of the foreseeable/unpredictable consequences. Risk is a measure of the significance of the hazard that involves a simultaneous examination of its consequences and likelihood of occurrence, using a combination and practical experience, as well as relevant information about the system and its operating environment.

Keywords: risk analysis, multimodal, maritime transport, study

1.Introduction

Terje Aven, a professor at the University of Stavanger and president of the Society for Risk Analysis (SRA), based on a historical analysis of the concept of risk, presents the following conceptual classes used as a basis for gaining insight into how risk is defined in the area application, as follows:

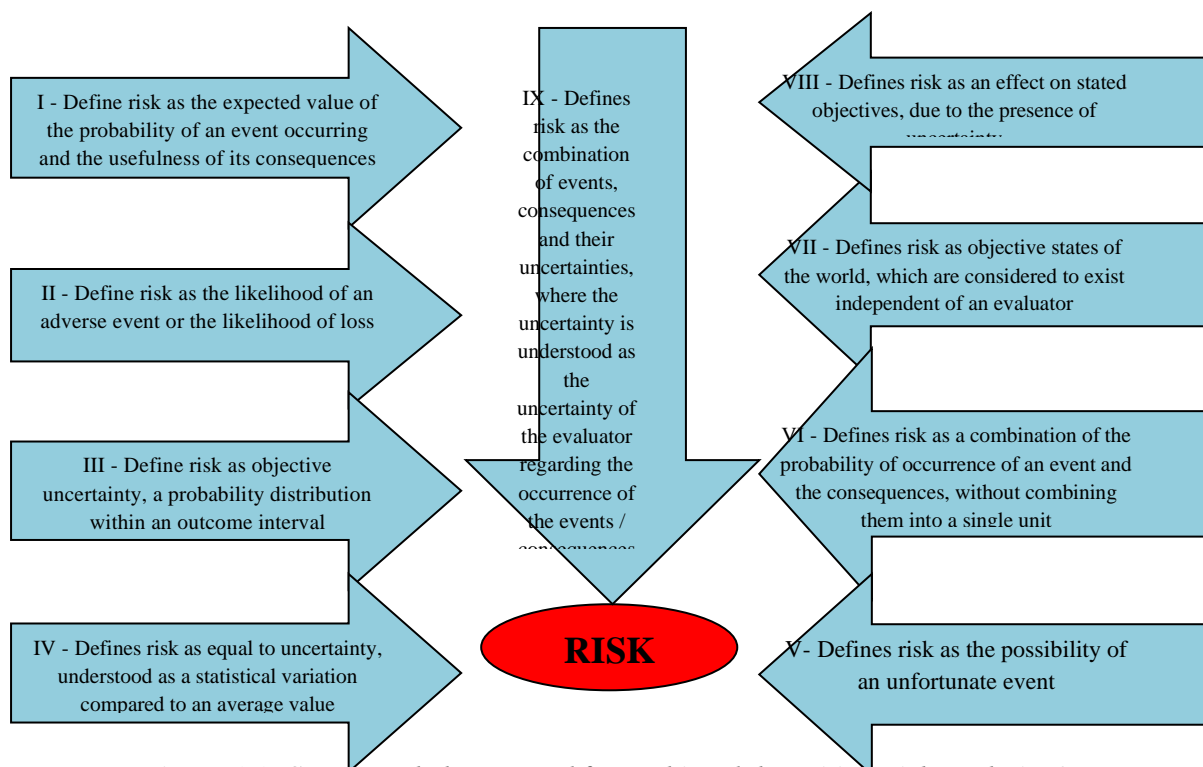


Figure 1.1. Conceptual classes used for multimodal maritime risk analysis [2]

2. Risk analysis associated with multimodal maritime transport

The essential role of risk analysis in multimodal maritime transport is to measure and assess the level of individual risks to justify prioritizing the mitigation of certain risks. A considerable amount of financial / human resources is required to minimize the risks in multimodal transport. Only when the benefit of reducing the risk outweighs the cost can the implementation be justified. In this case, the risk assessment aims to prioritize the use of risk management resources.

Fundamentally, risk assessment refers to the objective assessment of the risk it raises and the question of whether the risk is objective. Researchers who support the subjective nature of risk prefer to use the term “risk perception” to highlight the subjective significance of risks. In this case, the risk is assessed by individual perception, even if it is the numerical result of a statistic. Out of the objective or subjective nature, the nature of the risk assessment may also be "formal - informal" or "quantitative - qualitative".

At the methodological level, several risk assessment methods were identified. In any case, the identification of the risk must be preceded, at least, by the risk analysis to provide the risk to be assessed, but the assessment unit can be treated as an individual risk event, or by risk categories. In terms of risk management in the freight chain, the assessment consists of the probability (or probability / frequency) represented on one axis and the impact (or consequence / magnitude) on the other, as shown in the figure below. Scaling differs from case to case, but 3 to 5 point scales are normally used to assess probability and impact. In essence, the level of risk is calculated by multiplying the probability and the impact. [1]

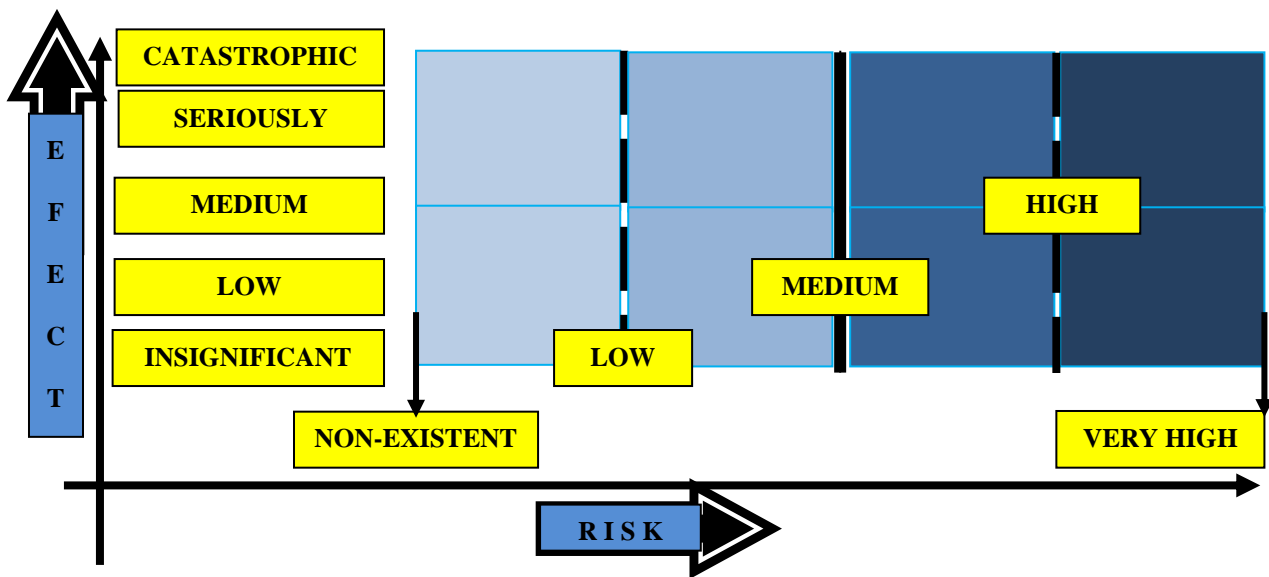


Figure 1.2. Graph of risk assessment using probability of occurrence or frequency and impact / consequences [2]

The risk analysis method requires the use of advanced tools in order to be able to carry out the risk management analysis in case of a certain project. The tools and methods used make it possible to determine the factors that triggered a particular dangerous situation and help to identify the consequences.

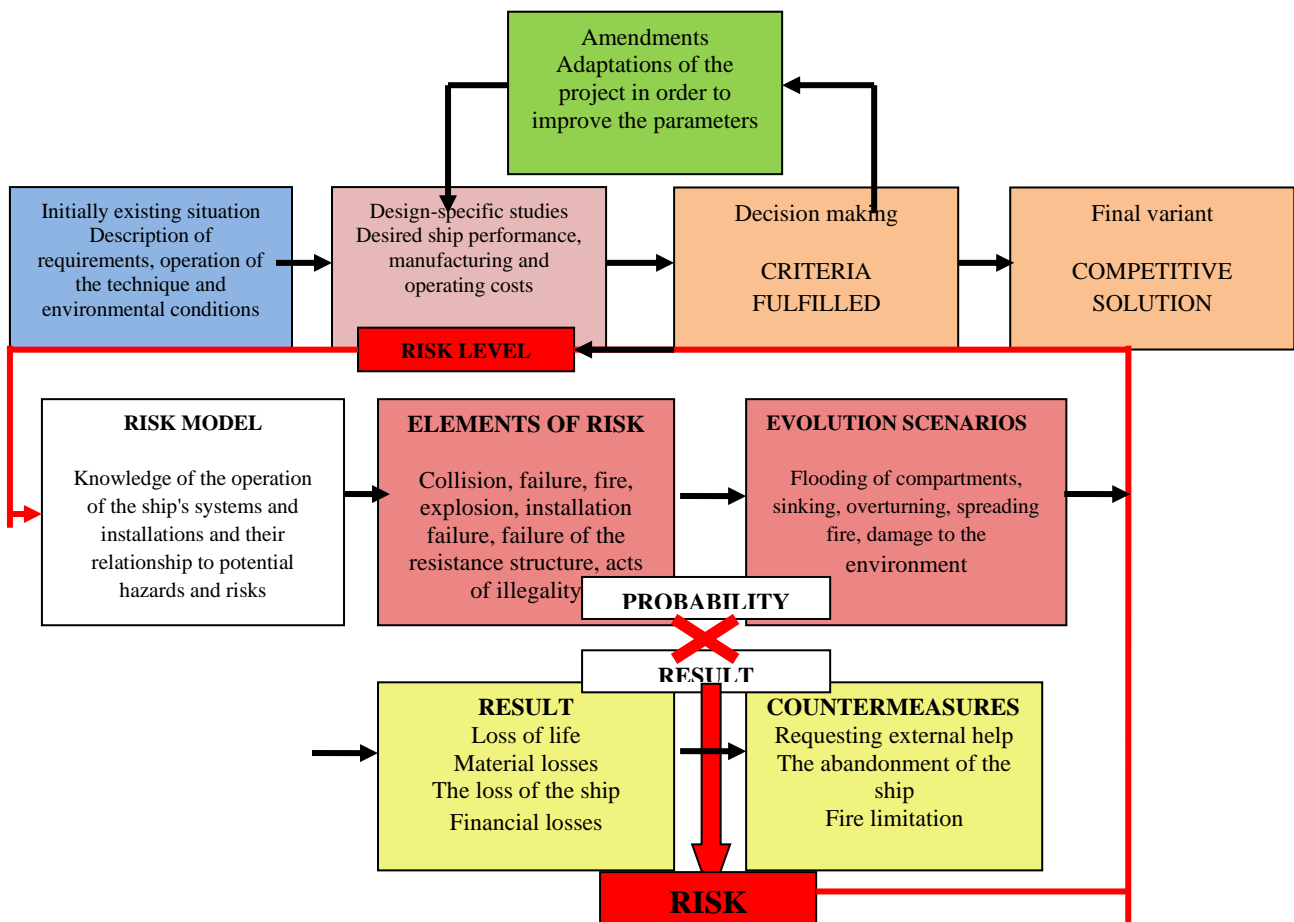


Figure 1.3. Algorithm for applying the concept of risk analysis [4]

The use of risk analysis techniques in high-risk industrial areas has gained ground. Risk analysis today is a proven technology used by operators who want to analyze major hazards in a structured way, but also to ensure that there are methods to reduce risks to acceptable levels, involving low costs. This also applies to maritime operators and the security measures imposed on them. However, the Offshore Safety Division (OSD) noted that very few maritime operators were checked on this line.

Multimodal transport can be affected by a number of factors that can have disastrous consequences for the cargo carried, the ship or its crew. These include:

- Loss of ship stability;
- Loss of structural integrity of the hull;
- Damage to the ballast installation, damage to cargo warehouses;
- Damages / failures of the installations (propulsion installation, power installation, hydraulic systems);
- Collision;
- Failure.

The Health and Safety Executive's (HSE) views on how to make decisions about safety have been explained in a study called "Risk Reduction, Protecting People". [3]

The approach used by the Health and Safety Executive (HSE) is based on the level of risk tolerability (TOR). This concept applies to large-scale risk and includes not only the risk of injury (seen as individual and social risks), but also the perception of the associated dangers for ethical and social reasons, leading to the approach of accidents that can result in multiple casualties. The standard divides risk into three broad areas:

- Unacceptable - risks considered inadmissible except in very special circumstances, regardless of their benefits. Activities that create such risks are generally prohibited, or consideration can be given to reducing the level of risk, regardless of the costs involved;
- Tolerable - risks that are tolerated to ensure certain benefits. This category includes those risks that are maintained at a low, reasonable and practical level of impact, this being achieved by adopting measures to reduce the impact, regardless of the implications (in terms of costs, level of effort and time dedicated), this being somewhat disproportionate compared to the level of reduction with its actual achievements;
- Widely accepted - risks that are perceived as insignificant by most of those involved in the activity. Normally, no additional measures are required in this case to reduce the level of risk. [3]

In order to apply this approach, the person in charge must first ensure that the risks on the spot are not unacceptable, so that the risks must fall into the category of tolerable risks or widely accepted risks.

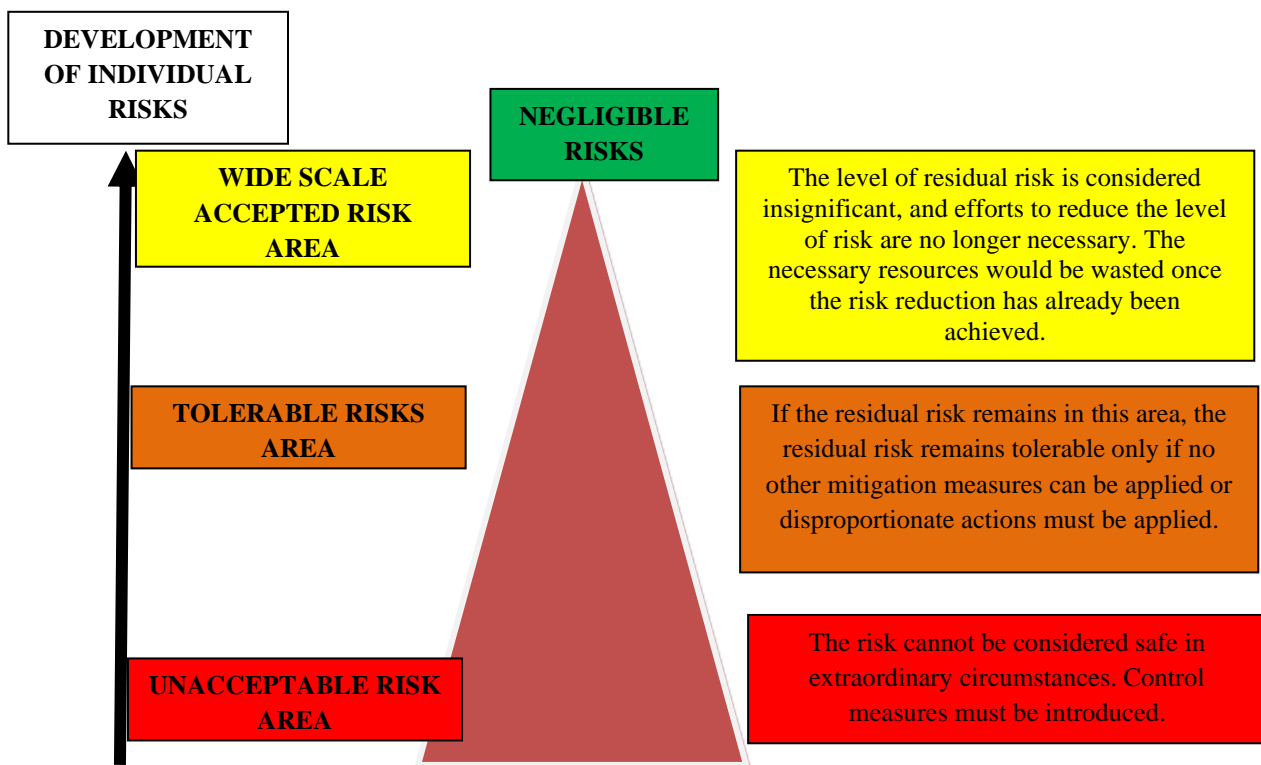


Figure 1.4. Risk tolerability framework [4]

The UK oil and gas industry has developed a framework that can assist the risk-based decision-making process to help decision-makers choose an appropriate basis for their subsequent decisions.

The framework presented in the figure below takes the form of a series of fundamental decisions, from those dominated by purely technical ones to those in which corporate and social values are the most relevant factors. Typical general context features that indicate the need for a decision are displayed at the bottom right of the frame; they can be used to help users of the chart easily determine the context of a particular decision. Once the level of risk is determined, the graph is read sideways to determine the balance of the fundamental decisions to be made. Some methods for calibrating or validating basic decisions are shown on the left side of the work diagram. According to this diagram, risk analysis can be thought of as consisting of technically structured thinking based on basic risk analysis. This approach shows that risk analysis has a key B-entry value, which also implies a degree of uncertainty that is seen as a deviation from standard practice. In the case of type A and type C decisions, the risk analysis is still relevant, but may be much less affected when the final decision is made. The rules and regulations developed by the IMO classification society are representative of

"codes and standards" and represent the main A-values for decision-making, while B and C are much less influential.

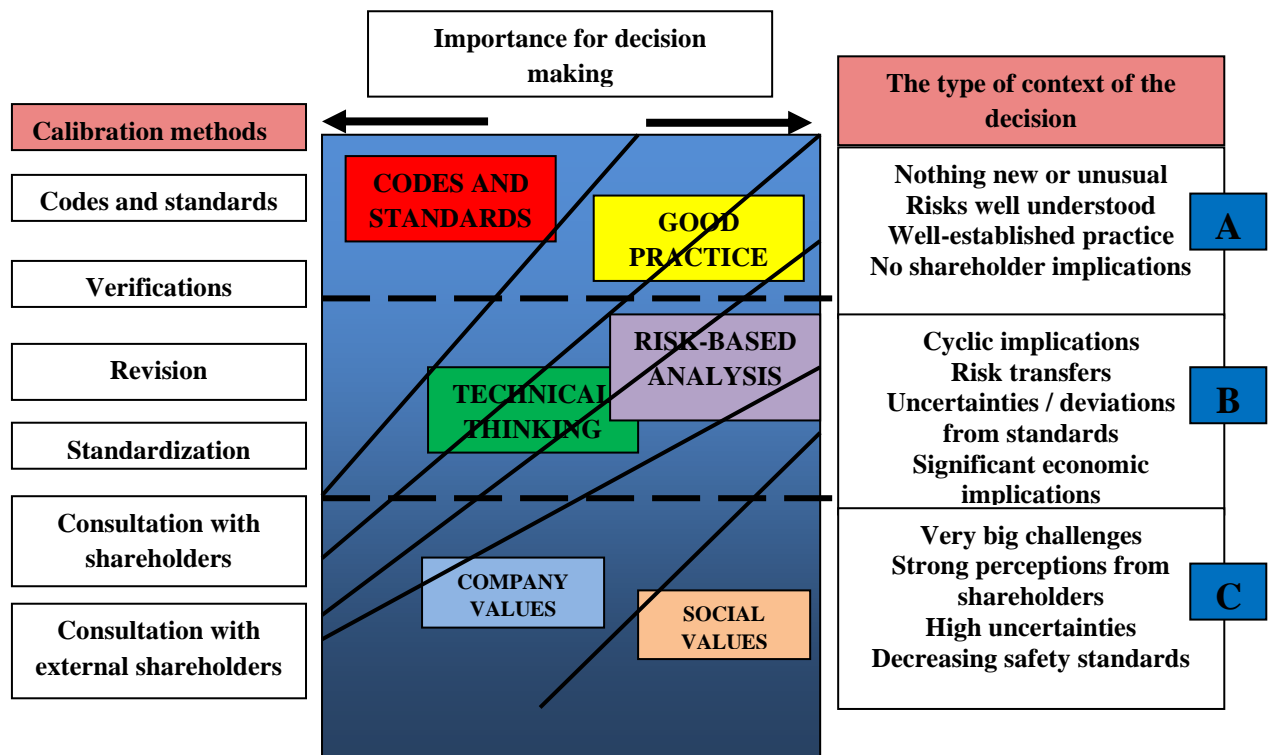


Figure 1.5. Graphic diagram of the decision-making process according to the associated risk [4]

3. Conclusions

Modern approaches to risk analysis clearly demonstrate that risk analysis plays an important role in decision-making based on multiple risk analysis, particularly for decisions involving uncertainties, deviations from standards and common practice, and the possibility of transferring the risks during the activity, and for these situations the maritime legislative regulations are not enough. The framework that supports the decision-making process provides an appropriate basis for reliable decision-making.

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