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ScienceDirect

Procedia Engineering 192 (2017) 271 – 276

Procedia Engineering

www.elsevier.com/locate/procedia

TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport

# ADR safety system in efficiency conditioning

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**Abstract**

The paper presents theoretical approach for ensuring ADR safety. Whole spectrum of object constituting aspects is described in the light of the system methodology, with parallel identification of the system elements, relations between the elements as well as common aims and operational directions. Consequently, author's interpretation of ADR safety system is highlighted. Its implementation into relevant Polish determinants allows to analyze them in strictly practical dimensions and notice that main entities (institutions, services, entrepreneurs etc.) participating in ensuring ADR safety are connected by unique relations stated by law, trade and practical requirements. Such kind of research perspective is valuable especially from efficiency point of view. Accordingly to the Polish school of praxeology, the safety system can be analyzed by efficiency mechanisms, covering many different realms of safety-related operations (e.g. effectiveness, economy, rationality). In the paper a network methodology for identification of the crucial system efficiency determinants is used. Thus, practical development issues of ADR safety system are presented.



Peer-review under responsibility of the scientific committee of TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport

*Keywords:* ADR; transport safety; safety system; system efficiency

**Nomenclature**

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|---|---|
| HazMat | hazardous materials |
| ADR | L' Accord européen relatif au transport international des marchandises Dangereuses par Route; HazMat road transportation |
| ADR SaS | ADR Safety System |

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Peer-review under responsibility of the scientific committee of TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport
doi:10.1016/j.proeng.2017.06.047

## 1. Introduction

Production, distribution, usage and storage of hazardous materials (HazMat) play a crucial role in proper economy development at local, national and regional scales. Such kinds of goods support not only industrial and petrochemical processes, but are required also in communal, scientific, cultural and entertainment areas of activeness. Nevertheless, HazMat presence in so many dimensions of public and personal life generates common security threats. Owning to physical, chemical and biological attributes which correspond with assumptions of the ADR convention, combustible, explosive, oxidation, poisonous, infectious, radioactive and/or caustic influence for people, property and environment in case of emergency can be materialized [1]. There are many potential mechanisms that can result the threat occurrence [2].

High level of risk corresponds with HazMat road transportation (ADR). It is noticeable especially in Poland, accordingly to relatively big number of traffic accidents, including events participated by means transporting dangerous goods. Taking into account Police and State Fire Service statistics, above 32 000 traffic accidents occurred, more than 360 000 collisions were identified as well as 1065 rescue actions were proceeded in case of events with lorries, tanks, road engines and semitrailers on Polish roads in 2015 [3, 4]. Seriousness of potential causes is worth to highlighted in this context. Exemplifying, LPG leakage from tank in accident conditions can result fire and BLEVE explosion thermally and physically affecting area within a radius of 500 m or more [5]. Analogical and even much more serious situation can be observed contextually to other mechanisms and kinds of object harmful attributes [6, 7]. Thus, in spite of the fact that average number of HazMat traffic accidents is disproportionate lower that the total number (20 events in 2015 [8]), values of their current probabilities and causes stay permanently high, determining object level of risk.

"The problem of identifying potential risks and their consequences in (…) HazMat transportation has been a great concern and largely acknowledged by many researchers, government bodies and the public in general" [9]. This conclusion emphasizes the complexity of risks analysis and assessment as well as forces a necessity of high effective collaboration between many different services, guards, institutions and other entities related to ADR [10, 11, 12]. It is especially noticeable when direct and indirect rescue operations must be proceeded [13, 14, 15]. Practically, the collaboration is also complex and multi-aspect, contains wide-spectral management and executing safety operations, and has to respect many different formal, trade and practical requirements. Concluding, building of ADR safety requires a holistic and effective-related approach, proper to answer the question: *How to ensure efficiency of ADR safety operations referring to their complexity in holistic approach*? Theoretical foundations of system, praxeological and networking conceptions, respecting their successful implementation in similar areas of security, allows to solve this scientific and practical problem [16, 17, 18].

## 2. Methodology

The research methodology approach is comprised by three fundamental elements described as follows: 1. Description of safety with the use of system methodological assumptions, 2. Praxeological view into safety system efficiency and 3. Network determination of the efficiency.

The first research assumption bases on synthetic definition stating that system is a set of elements connected by relations to achieve common aim(s) which separate the system from its environment [19, 20]. It deals with necessity of taken into consideration possibly all entities collaborating for ADR safety. To gather them into one construct, identification of their general, particular aims and operational directions is required. As far as the object efficiency is concerned, one need to analyze coherency of the aims and directions constituting clear mission of ADR safety system (ADR SaS).

Praxeology is widely known as a science of efficient action, focusing on such basic issues as agents, materials, products, free impulses necessary to make actions, surrounding (environment of the actions), effects and aims [21, 22]. Hence, its output can be implemented into a realm of safety and security systems [23]. "Due to economic roots, efficacy is the most prominent criterion for the praxeological evaluation" [22]. As a synonym of efficiency, it might be characterized by positively interpreted factors called 'practical valuables of efficient action'. There are many of them, selected due to current contextual needs (e.g. effectiveness, ethics, economy, cleanliness, suitability) [24]. Relevant mechanisms can be formulated.