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# Evolution of the Regulation of the Transport of Dangerous Goods by Road

## Part 1

*The transport of various hazardous materials called "dangerous goods" in carriage is subject to strict international rules. The transport of dangerous goods by road has been governed by an international agreement since 1968, but its origins go back much further. Regulations of the transport of dangerous goods by road has paramount importance for several reasons. A road accident could result in a large contaminated area, and a serious economic damage is created by the loss of the goods. In this publication, the author examines the main stages in the history of the ADR Agreement, the process of the second amendment of the Agreement and reviews the experience gained since then.*

***Keywords:*** *ADR Agreement, history, protocol, amendment, European*

## Introduction

If a good is produced and used in different locations, it is necessary to move the goods, which necessarily entails the greatest risk of loss.

The discovery of new sources of energy in the 18th and 19th centuries, the technical revolution in Britain and the first use of steam power led to the emergence of industrial capitalism and the mass production of goods for sale.

In 1814, the English engineer George Stephenson designed a machine capable of transporting coal at 6 km/h, and in 1829 he presented an improved version, the Rocket, which could travel at 45 km/h on its own and 15–20 km/h towing freight wagons.[2]

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[2] Nagy Mézes 2007.

The Mississippi River was the primary natural factor in the development of the United States, and its ability to overcome vast distances and its triumphs in transportation and communications made it the world's leading economy. After the advent of the steam engine, before the age of railroads, water transportation boosted America. Fulton himself became part of the steamboat business, securing a twenty-year monopoly in 1807 on all waterways in New York State, and then New Orleans. Canals were built to connect the rivers and the first railroads were built to serve the state canal system. In addition to the railways, the stagecoach network and the telegraph were also in operation in the 1830s and 1860s, after Samuel Morse built his electric telegraph in 1837, which soon became an indispensable tool for government, commerce and general communication.[3]

The production of heavy machinery demanded increasing amounts of coal and iron ore, and revolutionised steel production and iron smelting. The spread of petroleum products led to the search for better raw materials for lighting. The first oil well was drilled in 1859 at Oil Creek in the U.S. state of Pennsylvania. Since the early 20th century, hydrocarbon energy sources gradually replaced coal. The widespread use of electricity began in the late 19th century, after the American Graham Bell patented the telephone in 1876 and Michael Faraday developed the dynamo by 1831. In 1894, the German Gottlieb Daimler created the first four-stroke petrol engine, which led Henry Ford in the United States to mass-produce the cars we know today. The Belgian chemist Ernest Solvay (1838–1922) produced sodium carbonate from salt, ammonia and calcium carbonate, which led to the production of soda ash, the basis for soap and the glass and photographic industries.[4]

My research objective is to assess the impact on safety of international recommendations and conventions on the transport of dangerous goods. As a research method, I use a review of authoritative international and national literature, an analysis of the relevant legal regulatory framework, and the analysis of continuously generated data and documented information.

## The birth of modern regulations

If a product is produced and used in different locations, it is necessary to move the goods, which necessarily entails the greatest risk of loss.

The more ways of moving goods became possible, the more "international" trade has become. The seller or the buyer often did not have his own means of transport, which led to the development of transport. In international trade, five types of freight transport are distinguished: rail, road, air, inland waterway and sea. International rail freight transport dates back to the International Convention concerning the Carriage of Goods by Rail of 1890

[3] Johnson 2016.
[4] Nagy Mézes 2007.

(Convention internationale concernant le transport des marchandises par chemins de fer, CIM). The development of international rail freight transport also includes the 1951 Agreement on International Railway Freight Communications (SMGS), established by the railway companies of the former socialist countries (Соглашение о международном железнодорожном грузовом сообщении, СМГС). After World War II, the development of motor vehicle production and the road network led to a boom in international road freight transport. In 1940, the International Road Transport Union (IRU), the international road freight transport lobby was founded. The International Air Transport Association (IATA) was established in 1919. The rules for international river transport are set on a river-by-river basis, unlike the uniform maritime rules. Freedom of navigation on the Danube was first proclaimed by the Congress of Vienna in 1815. There are two types of international maritime freight transport, liner service and charter. The most important document in maritime transport is the Bill of Lading (B/L), which is the title to the cargo, i.e. a document of value. The mandatory content of the ship's manifest was laid down in the 1924 Hague Rules. The first document on maritime transport laid down the rules for common carriage of goods by ship, the York Rules, revised in 1874 and 1994 (York–Antwerp Rules).[5]

Dangerous goods are carried in all types of freight transport. With the growing volume of dangerous goods, transport, transport safety and environmental sustainability are essential societal needs.[6]

Chemical safety is a system of activities, institutions and administrative requirements aimed at reducing and controlling the risks of chemicals. Industrial safety is the state of security of vital interests of individuals and society.[7]

Figure 1 shows the curves for the percentage evolution of the chemical consumption's volume developed by Eurostat. The volume of consumption is composed of manufactured and imported substances. The period under review (2004–2020) shows that the overall use of chemicals hazardous to human health and the environment is on a slight downward trend. In 2020, 230 million tonnes of chemicals dangerous to human health were used in the EU.[8]

We can see that the global financial and economic crisis of 2008–2009 interrupted the pace of growth, after which it did not return to the 2008 volume, but from 2016 onwards the trend is slightly upwards. The data series expected by the end of 2022 will include the period of the coronavirus epidemic, from which further conclusions can be drawn.

[5] Martonyi 2018.
[6] Horváth–Kátai-Urbán 2018.
[7] Nagy 2022.
[8] Eurostat 2022.

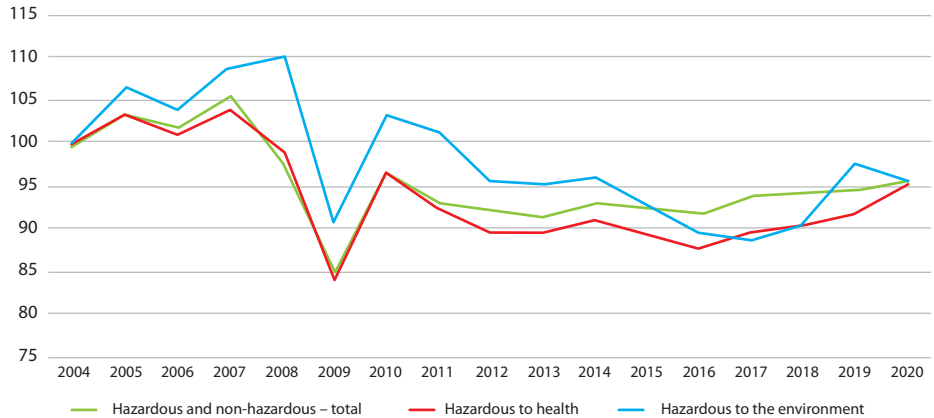


*Figure 1: Consumption of chemicals*
*Source: Eurostat 2022.*

The 230 million tonnes of the above-mentioned group of substances with hazardous properties for human health represent approximately 10 million road transport units consisting of tractors and their associated heavy trailers.

As shown in Figure 2, the greatest risk in terms of frequency of occurrence and consequence of occurrence is posed by flammable liquids, which account for more than half of all hazardous substances transported by road.

However, it is important to point out that the flammability property is a characteristic of several classes in addition to flammable liquids (ADR Class 3). Flammability is reflected in Class 1, explosive substances and articles, subclasses 1.3, 1.4 and 1.5, Class 2.1 for flammable gas, Class 4.1 for flammable solids, self-reactive substances, polymerizing substances and solid desensitized explosives. Class 4.2 is for substances liable to spontaneous combustion, Class 4.3 is for substances which, in contact with water, emit flammable gases, and Class 5.1 is for oxidising substances. Class 5.2 is for organic peroxides, and corrosive substances in Class 8 can also inflame objects. Class 9 includes the so-called different dangerous substances and articles, which cannot be classified elsewhere according to the classification principles, but this does not mean that they are less dangerous.[9] The latter includes, for example, lithium batteries.

It can therefore be seen that the fire risk goes well beyond the 51% of flammable liquids.

[9] Horváth et al. 2021: 110–125.

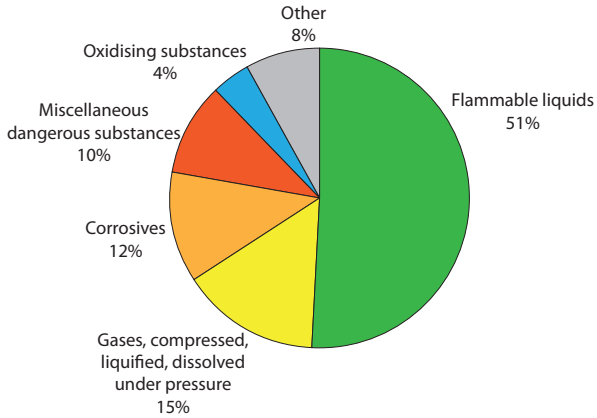


*Figure 2: Road freight transport by type of goods*
*Source: Eurostat 2022.*

The most serious accidents in the history of road transport of dangerous goods were caused by flammable liquids and gases.

In September 1976, a cargo of liquid ethylene overturned and caught fire in Aszód, Hungary. It took more than twenty hours to extinguish the fire and 2 people died.[10] Hungary joined the ADR Agreement after the incident.

In July 1978, a tanker carrying 23 tonnes of liquid propylene exploded in Tarragona, Spain, killing more than 200 people and seriously injuring 100 others.[11]

In July 1987, a vehicle carrying 35,000 litres of petrol overturned in Herborn, Germany, spilling its load, which later caught fire in the sewer system under the town. 6 people died in the incident.[12]

In Africa, fires involving fuel tankers are also frequent, with hundreds of people killed in recent years. The scenario is basically the same in all cases, with victims gathering at the vehicle in the hope of easily obtaining spilled fuel, which then catches fire. Such accidents occurred in western Uganda on 18 August 2019, where 23 people died, in Nigeria on 2 July 2019, where more than 50 people died, in Niger on 6 May 2019, where 80 people were burned to death, in Sudan on 16 September 2015, where 203 people died, in the Democratic Republic of Congo on 2 July 2010, where 292 people died, or in Kenya on 31 January 2009, where 111 people died in the accident and subsequent fire that trapped some of the victims while they were collecting fuel from the accident.[13]

Dealing with emergencies is an increasing challenge for the whole defence system, the rescue organisations, the different levels of defence administration, businesses and citizens.[14]

[10] Aszódi Tükör 2007.
[11] UNECE ITC WP TDG 2010.
[12] Höhle 2012.
[13] Conger 2019.
[14] Kátai-Urbán 2020.

The protection of the population is a complex process and can only work effectively if the serious accident event is detected and protection measures are implemented in time.[15]

## The road to the ADR Agreement

The United Nations was founded on 24 October 1945 to ensure international peace and security, humanitarian aid, the protection of human rights and international law. Today, UN activities have been complemented by efforts to solve problems that were not yet visible after World War II. This commitment is the 2030 Sustainable Development Goals and joint action against climate change. According to its Statute, the United Nations has six main bodies: the General Assembly (GA), the Security Council (SC), the Economic and Social Council (ECOSOC), the Trusteeship Council (TC), the International Court of Justice (ICJ) and the Secretariat (Secretariat). Among these main bodies, ECOSOC coordinates economic, social and environmental issues, the related policy dialogue, the implementation of the SDGs and the oversight of individual expert bodies.[16]

ECOSOC has several subordinate bodies, one of which is made up of governmental expert bodies.[17] Here is the Committee of Experts on the Transport of Dangerous Goods and the Globally Harmonised System of Classification and Labelling of Chemicals established in 1953. This committee was established based on a request made to the Secretary-General, which consisted of the need for the appointment of an expert body for the international transport of dangerous goods, which would draw up recommendations on the classification of dangerous goods in trade, on graphically identifiable markings without printed text and on transport documents. In 2001, two separate subcommittees were set up: the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG Sub-Committee) and the Sub-Committee of Experts on the Globally Harmonised System of Classification and Labelling of Chemicals (GHS Sub-Committee).[18] This meant, in essence, the independence of the latter field. ECOSOC's Sub-Committee of Experts on the Transport of Dangerous Goods (Model Regulations) is working on the "UN Recommendations on the Transport of Dangerous Goods (Model Regulations)", which provides a common basis for the structure of all transport sectors.[19]

It is important to include a brief presentation of the other GHS Sub-Committee, which was created in 2001 by the division of the Commission established in 1953. The new self-developed field deals with the classification of chemicals by type of hazard and harmonised hazard communication. It offers uniform labelling and safety data sheets. It aims to ensure global harmonisation and provides a single basis for the availability of information on the hazards of chemicals throughout the production, transport and use chain. The implementation

[15] Cimer et al. 2021.
[16] United Nations 2022.
[17] United Nations 2022.
[18] UNECE 2022a.
[19] UNECE 2022b.

plan of the World Summit on Sustainable Development (WSSD), held in Johannesburg on 4 September 2002, included the need for the GHS to be implemented as quickly and widely as possible. The first edition of the GHS was adopted in December 2002 and published in 2003. Since 2003, it has been reviewed every two years and adapted to emerging needs and implementation experience. The ninth revised edition of the GHS (GHS Rev.9), published in 2021, is the latest published revised edition.[20]

Another subordinate body of ECOSOC is the UN Economic Commission for Europe (UNECE), one of five regional commissions, which was one of the first to be set up in 1947 to help Europe recover from war.[21] This organisation is important because the first agreement on the international transport of dangerous goods was drafted and signed here, based on the recommendations mentioned above.

The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was signed in Geneva on 30 September 1957 and entered into force with its Annexes on 29 January 1968. It was first amended on 21 August 1975, affecting the main text of the Agreement, Article 14 (3). The short, most important part of the Agreement itself is Article 2, which states that substances the international transport of which is not prohibited by Annex A may be transported under the conditions set out in Annexes A and B. Annex A lays down conditions for the dangerous goods in question, in particular their packaging and labelling, and Annex B for the construction, equipment and running of the vehicle carrying the goods. The inseparable Annexes A and B of the ADR have been regularly reviewed and amended since their entry into force.[22]

Based on recommendations developed by the ECOSOC Sub-Committee of Experts on the Transport of Dangerous Goods, the UN Economic Commission for Europe's Inland Transport Committee (ITC) Working Party on the Transport of Dangerous Goods (WP.15) is developing harmonised provisions for all modes of transport.[23]

Representatives from the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) are also present at WP.15 Working Group meetings with full voting status.[24] PHMSA is the central administrative body at federal level for the safe handling of pipelines and hazardous substances, directly controlled by the U.S. Department of Transportation.[25] PHMSA edits and makes the collection of measures to be implemented in the event of accidents during the transport of dangerous goods, the Emergency Response Guidebook (ERG), available in electronic form throughout the world. The manual provides recommendations to the first intervening emergency services for the duration of the initial critical 30 minutes in relation to all commercial dangerous goods.[26]

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20 UNECE 2022c.
21 UNECE 2022d.
22 UNECE 2022e.
23 UNECE 2022f.
24 U.S. DOT PHMSA 2022a.
25 U.S. DOT 2022.
26 U.S. DOT PHMSA 2022b.

In 1957, nine signatory states were registered in the ADR Agreement; Austria, Belgium, the United Kingdom of Great Britain and Northern Ireland, France, Germany, Luxemburg, the Netherlands, Italy and Switzerland. The Agreement has 54 Member States in 2022.[27]

## Conclusions

The birth of the modern-day risky transport of dangerous goods can be seen in the technological revolutions of the 18th and 19th centuries, the development of machinery, the use of petroleum products and the advent of mass production. Therefore, although not on a scale comparable to today's, the transport of dangerous goods in large quantities across national borders has a history of about 200–300 years, in which I consider the establishment of the relevant international conventions and their amendments milestones.

In the first part of this two-part publication, I presented the main stages in the history of the transport of dangerous goods by road, up to the start of its most recent, second amendment. I described the relevant international organisations, their structure and functioning, current trends in the transport of dangerous goods, and the most serious accidents in the history of the transport of dangerous goods.

The ADR Agreement was concluded in Geneva on 30 September 1957 and entered into force on 29 January 1968, and has been amended twice so far. The first amendment was made to Article 14 (3) by the New York Protocol of 21 August 1975, which entered into force on 19 April 1985. The first amendment concerned the body of the Agreement. The second amendment is effective from 1 January 2021 and is particularly significant because it has been implemented in the title of the Agreement by removing the adjective "European", thus allowing the Agreement to be extended worldwide.

In the next part of this publication, I am going to describe the process of the second amendment to the Agreement and examine its impact.

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