



BROCHURE FOR TRAINING OF PROFESSIONALS IN TRANSPORT OF DANGEROUS GOODS

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October, 2024.



PREFACE

Transport of dangerous goods is a very challenging area with a high degree of risk that requires a high level of responsibility and expertise to ensure all direct and indirect actors, but also the wider environment in which it is carried out. Transport of hazardous materials is a complex process that requires coordination and cooperation of different sectors in order to guarantee safety at every stage.

This brochure was created as an auxiliary information tool that provides basic information regarding the training of professionals in the field of transportation of dangerous goods. The brochure is also a companion document to the Manual, in which all important current issues in the field of transportation of dangerous goods are treated in more detail. The goal of the Manual is to create an adequate resource for the training of professionals in the field of transporting dangerous goods, that is, providing the necessary knowledge and skills to improve the level of safety, protect people, property and the environment in the process of transporting dangerous goods.

The brochure was created as a result and necessity in the implementation of the Erasmus+ project DGTRANS (Transport of Dangerous Goods - Modernization of Curricula and Development of Trainings for Professionals in the Western Balkans HEIs, 101082187-DGTRANS-ERASMUS-EDU-2022-CBHE) - Transport of dangerous goods - Modernization of curricula and development of training for professionals in higher education institutions of the Western Balkans.

Authors



Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project number: 101082187



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LIST OF PICTURES

Picture 1. ADR bag	28
Figure 2. Danger board with variable labels	30
Figure 3. Thermal camera	30
Figure 4. Device for measuring vapors from the tank	31
Figure 5. Smart device for tachograph analysis	32
Figure 6. Real-time air quality meter and recorder	33
Figure 7. Device for testing static electricity	34
Figure 8. Arduino equipment	34
Figure 9. GPS receiver	35
Figure 10. Ultrasonic device for measuring material thickness	36
Figure 11. Mobile gas and toxic gas detector	36
Figure 12. Device for measuring carbon monoxide	37

LIST OF TABLES

Table 1. Overview of ADR content	7
----------------------------------	---



INTRODUCTION

Hazardous substances are substances that can endanger human health, cause environmental pollution or cause material damage. Hazardous substances based on their nature, properties and condition, and in connection with transport, can be dangerous for public safety, and which have proven toxic, corrosive, irritating, flammable, explosive or radioactive effects. Raw materials from which dangerous goods and waste are produced are also considered dangerous substances if they have the properties of dangerous substances.

The transport of hazardous materials by means of road transport carries with it significant risks, both due to the prevalence of this form of transport and the characteristics of hazardous materials. These types of cargo represent a potential threat to human health and the environment if they do not comply with prescribed procedures and guidelines defined within legal regulations.

This brochure presents the basic training guidelines according to ADR, with a focus on the conditions, program and structure of the training. Special attention is paid to the role of drivers and other personnel in the entire transport process, with an emphasis on safety measures and procedures in case of accidents. This brochure presents and introduces the concept of training and training of professionals, which was created based on the project activities of the Erasmus+ DGTRANS project. The goal is to improve the training of personnel in the field of transportation of dangerous goods. Through a detailed overview of thematic units, the goal is to create a consistent framework of education that will combine theoretical knowledge with practical examples, improving overall safety in the transportation chain of dangerous goods.

Training of personnel in the transport of dangerous goods plays a key role in minimizing risks and ensuring a safe transport chain. Through adequate education, drivers, escorts and other personnel acquire the necessary knowledge about the specifics of dangerous substances, the application of safety measures and procedures in case of accidents. This training not only increases awareness of risks, but also ensures proper handling in critical situations, which protects not only human health but also the environment. In this context, the implementation of training and education under the Erasmus+ DGTRANS program becomes a key tool for improving safety in the transport of dangerous goods, ensuring that trained personnel are able to respond to the challenges in the processes of transporting dangerous goods.



1. REGULATION ON TRAINING AND QUALIFICATION IN THE FIELD OF TRANSPORTATION OF DANGEROUS SUBSTANCES

The transport of dangerous goods by means of road transport carries the greatest risks due to the high prevalence of this type of transport, but also the very dangerous characteristics of these types of goods, which represent a potential danger to human health and the environment, if they are not handled in accordance with procedures and instructions defined within legal regulations.

The basic regulation governing the transport of dangerous goods in road transport is the European Agreement concerning the International Carriage of Dangerous Goods (ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road), as well as Directives that define in more detail certain specific requirements that must be met. compliance during the transport of dangerous goods (requirements related to the construction of the vehicle, requirements for training of persons participating in the transport process, etc.). The European Agreement on the International Road Transport of Dangerous Goods - ADR was adopted on September 30, 1957. year in Geneva by the European Commission of the United Nations for Europe - UNECE, and the Agreement entered into force on January 29, 1968. years. After that, the Agreement underwent numerous amendments

The main objectives of the restructuring are to make the requirements acceptable and easier for users, in order to facilitate their application, not only for international transport activities according to ADR, but also in the national transport of all European countries, through national legislation or legislation of the European Community, with the aim of finally provision of a consistent framework of standards at the European level.

The signatory countries of this Agreement have the obligation to adapt their national regulations to the Agreement and must not contradict it with their legal regulations. It is possible that the state, the signatory, requests an exemption from the application or postponement of the application of certain requirements that are given in the ADR. This Agreement is mandatory for new members who subsequently joined the EU and thus undertook to respect the said Agreement. For countries that are not members of the EU, the Agreement is also binding in the road transport of dangerous goods across the territory of EU member states.



The content of the ADR itself can be divided into two parts (Annex A and Annex B): Annex A consists of 7 chapters (a whole) and refers to dangerous substances and objects, while Annex B refers to transport equipment and transport operations (Table 1).

Table1. Overview of ADR content

ANNEX A - GENERAL AND SPECIAL REGARDING THE TRANSPORT OF HAZARDOUS MATERIALS	
Chapter 1:	General regulations
Chapter 2:	Classification.
Chapter 3:	List of dangerous substances (according to UN numbers and alphabetical order), special regulations and free quantities of dangerous substances, limit quantities.
Chapter 4:	Packaging and regulations for tanks.
Chapter 5:	Signatures for delivery of goods.
Chapter 6:	Requirements for the production and printing of packaging, means of packaging (IBC), large packages and tanks.
Chapter 7:	Signatures related to conditions for transport, loading, unloading and manipulation.
ANNEX B -REGULATIONS REGARDING TRANSPORT EQUIPMENT AND OPERATIONS	
Chapter 8:	Regulations for vehicle crew, equipment, procedures and documentation.
Chapter 9:	Requirements related to the construction and type approval of the vehicle.

1.1. Basics of training according to ADR

According to ADR (ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road) (the last amendment entered into force on January 1, 2023, and is valid until June 30, 2025. year), drivers who transport substances that are defined as such by ADR, as well as personnel accompanying them and persons participating in loading, unloading, storage and related tasks in the process of transporting dangerous substances, are required to be trained for such tasks.

The basics for training according to ADR are defined in Annex B, Chapter 8: Regulations for vehicle crew, equipment, procedures and documentation, i.e. in Chapter 8.2, which refers to conditions for vehicle



crew training, general and special training conditions driver, training structure and programs, training approval, training evaluation exams, proofs and certificates of training, as well as training elements of other persons in the process, who are not drivers.



2. SYSTEM OF STAFF TRAINING ACCORDING TO ADR

2.1. Training requirements

Drivers of vehicles in which dangerous substances are transported must have a certificate issued by the competent authority, which confirms that they have attended training and passed an exam on the special conditions that must be met in the transport of dangerous substances.

Drivers of vehicles transporting dangerous goods must attend basic training. The training is conducted in the form of a course approved by the competent authority. The main objectives of the course must be the following:

- to familiarize drivers with the dangers arising from the transport of dangerous goods and to provide the necessary information to minimize the likelihood of an accident occurring,
- if this happens, enable them to take the appropriate measures that are necessary for their safety and the safety of the public and the environment, to limit the effect of the accident.

Basic training, which includes practical exercises, is conducted on the basis of training for all categories of drivers. The competent authority may approve basic training limited to a particular class or classes. However, this limitation of basic training must not apply to the part of training for drivers of vehicles transporting dangerous goods of class 1 (subclass 1.4) and class 7, for which specialist training is mandatory.

All types of training, including basic training and specialist training, as well as accompanying practical exercises, exams and the role of competent bodies must be at a high level of organization and in accordance with previously defined provisions. All training certificates in accordance with the set conditions issued by the competent authority of the contracting party for the duration of their validity must be accepted by the competent authorities of the other contracting parties.

The necessary knowledge and skills are transferred through training, which includes theoretical lectures and practical exercises. Knowledge must be tested in an exam. The training organizer must ensure that the instructors are well informed and take into account the latest changes in



regulations and training conditions related to the transport of dangerous goods. Training must be related to practice.

2.2. Training program

The training program must be in accordance with the approval issued by the competent authority. Approval is issued on the basis of a request that should include:

- the training program, specifying the topics to be taught, and specifying the schedule and planned teaching procedures,
- qualifications and areas of activity of the teaching staff,
- information about the premises where the training takes place and information about the teaching material, as well as about the facilities for practical exercises,
- conditions for participation in the training, such as the expected number of participants.

The competent authority must organize the supervision of training and examinations and has the right to send authorized persons to attend training and examinations. The competent body must be informed about the places where certain trainings are held. The approval can be withdrawn if the conditions for issuing the approval are not respected.

2.3. Training structure

Initial and additional training must be in the form of a basic course and, depending on the case, specialist courses. Additional training is attended at regular intervals, and helps drivers refresh their knowledge and acquire new technical and legal knowledge. Initial training and additional training must include individual practical exercises. Practical exercises must be linked to theoretical training and must cover at least:

- first aid,
- fire protection and
- handling in the event of an accident or accident.



The basic course, which is conducted for all categories of drivers, should last at least 18 teaching units (the teaching unit lasts 45 minutes), and the topics must be at least the following:

1. general conditions for managing the transport of dangerous goods,
2. basic types of hazards,
3. information on environmental protection in the control of waste transport,
4. protective and safety measures appropriate to various types of hazards,
5. what to do after an accident (first aid, road safety, basic knowledge of the use of protective equipment, written instructions, etc.),
6. marking, marking with danger sheets and marking with orange plates,
7. what the driver must and must not do when transporting dangerous goods,
8. purpose and mode of operation of technical equipment on vehicles,
9. prohibition of joint loading on the same vehicle or in a container,
10. protective measures for loading and unloading hazardous materials,
11. general information regarding civil liability,
12. information on various modes of transport,
13. handling and storage of packaging,
14. traffic restrictions in tunnels and instructions on behavior in tunnels (prevention and safety, accident prevention, safety, procedure in case of fire or other accidents, etc.),
15. the importance of security.

The specialist course for tank transport should last at least 12 teaching units (the teaching unit lasts 45 minutes), and the topics must be at least the following:

1. the behavior of the vehicle on the road, including the movement of matter,
2. special conditions for vehicles,
3. general theoretical knowledge of various and different charging and discharging systems,



4. special additional provisions related to the use of these vehicles (approvals, marking of approvals, marking with danger sheets and marking with an orange plate, etc.).

The specialist course for the transport of dangerous goods of class 1 should last at least 8 teaching units (the teaching unit lasts 45 minutes), and the topics must be at least the following:

1. specific dangers related to explosives and pyrotechnic substances and objects,
2. specific conditions related to mixed loading of substances and objects of class 1

The specialist course for the transport of radioactive materials of class 7 should last at least 8 teaching units (the teaching unit lasts 45 minutes), and the topics must be at least the following:

1. specific dangers related to ionizing radiation,
2. specific conditions related to packaging, handling, joint loading and storage of radioactive material,
3. specific measures to be taken in the event of an accident caused by radioactive material.



3. BASICS OF TRAINING ACCORDING TO THE DGTRANS PROGRAM

Taking into account the defined procedures according to ADR in the field of education and training of personnel in the transport of dangerous goods, and the adopted knowledge about examples of good practices in EU countries through the implementation of training within the Erasmus+ project DGTRANS, a framework training program for professionals in the field of transportation of dangerous goods was created.

The stated framework training program according to DGTRANS guidelines mostly focused on problem areas and identified priority needs for improving the situation.

The implementation of the framework training program according to the DGTRANS guidelines should enable adequate training of personnel in the field of dangerous goods transport, combining clearly defined regulations and theoretical knowledge with real examples and practices, technologies and procedures, in order to achieve maximum safety in the complete transport chain in which dangerous goods participate matter.

The framework training program for personnel in the field of transportation of dangerous goods according to the DGTRANS guidelines should consist of the following thematic units:

1. General conditions for managing the transport of dangerous goods.
2. Basic types of hazards.
3. Environmental protection in controlling the transport of hazardous waste.
4. Protective and safety measures appropriate to various types of hazards.
5. Procedure after an accident.
6. First aid.
7. Fire protection.
8. Marking of dangerous substances.
9. Obligations and prohibitions for the driver when transporting dangerous goods.
10. Purpose and mode of operation of technical equipment on vehicles.



11. Protective measures for loading and unloading dangerous goods.
12. Joint loading on the same vehicle or in a container.
13. General information regarding civil liability.
14. Handling, packaging and storage.
15. Transport of hazardous materials in tunnels.
16. Safety and adequate measures for the use of tanks in the transport of dangerous goods.
17. Safety and protective measures during the transport of explosive and pyrotechnic substances and objects.
18. Specific conditions and dangers related to ionizing radiation and radioactive substances.
19. Protection against static electricity.
20. Handling of flammable liquids and gases in traffic.
21. Institutional-management and organizational capacities in the field of transportation of dangerous goods.
22. Traffic safety when transporting dangerous goods.
23. Personnel and technical-technological capacities in the field of transportation of hazardous materials.
24. Technical correctness of vehicles in the transport of dangerous goods.
25. Inspection supervision and control in the transport of dangerous goods.
26. Emergency, medical and rescue services in the transport of dangerous goods.
27. The impact of the transport of hazardous materials on the environment.
28. The impact of transporting hazardous materials on health.
29. Risk management in the transport of dangerous goods.



4. OVERVIEW OF THE THEMATIC UNITS OF THE DGTRANS PROGRAM

4.1. General conditions for managing the transport of dangerous goods

Understanding the seriousness of the problems and risks in the transport of dangerous goods. Directing resources to build a management system in the field of transportation of dangerous goods. Knowledge and application of international and national regulations.



4.2. Basic types of hazards

Knowledge and understanding of the classification system and types of hazardous materials. Marking of dangerous substances. Knowledge and understanding of the characteristics of hazardous materials. Risks, negative impacts and consequences of hazardous materials during transport.





4.3. Environmental protection in the control of hazardous waste transport

Effective sustainable waste management and preservation of environmental balance. Cooperation between authorities, waste transporters and the population. Minimizing the risk of pollution and preserving the environment during the transportation of hazardous waste. Adequate labeling, packaging and handling of hazardous waste. Creation and implementation of Environmental Protection Plans. Measures to prevent the impact of hazardous waste on the environment and incident response plan. Selection of safe routes for transporting hazardous waste.



4.4. Protective and safety measures appropriate to various types of hazards

Protective and safety measures in the complete transport chain. Protective and safety measures in cargo handling processes (dangerous substances). Protective and safety measures in loading, transport and unloading processes. Protective and safety measures related to the preparation and handling of the vehicle for transporting dangerous goods.



4.5. Procedure after an accident

Written instructions and training for the actions of personnel in the event of accidents during the transport of dangerous goods. Accident notification. Use of appropriate protective equipment. Treatment of other participants and injured persons. Providing first aid. Treatment of the vehicle and cargo. Prevention of major consequences.



4.6. First aid

Adequate handling of injured persons depending on the type and cause of the injury. Adequate staff training and periodic trainings. Informing the competent emergency medical services and cooperating with them.



4.7. Fire protection

Adequate staff training, and periodic trainings and exercises. Permitted and prohibited actions of personnel during the transport of dangerous flammable and explosive substances. Knowledge of the correct classification of dangerous substances in order to apply adequate fire protection measures and adequate approaches in case of fire. Adequate packaging and fire-resistant containers. Fire protection systems on vehicles. Firefighting equipment in vehicles for transporting dangerous goods. Cooperation with local fire services. Fire emergency plans. Evacuation plans.



4.8. Marking of dangerous substances

Knowledge of the hazardous materials classification system. Marking and marking of dangerous substances with danger sheets and marking with orange plates.



4.9. Obligations and prohibitions for the driver when transporting dangerous goods

Basic duties and responsibilities of the driver in the process of transporting dangerous goods. Procedures related to vehicle inspection and preparation. Obligations and responsibilities while driving, parking and resting while driving. Prohibitions and restrictions for drivers in order to eliminate potential dangers that may contribute to the occurrence of incidents and accidents. Obligations to comply with traffic instructions and regulations. Adequate planning and compliance with the planned route, while respecting the impact of potential risks and dangers on the planned route.

4.10. Purpose and mode of operation of technical equipment on vehicles

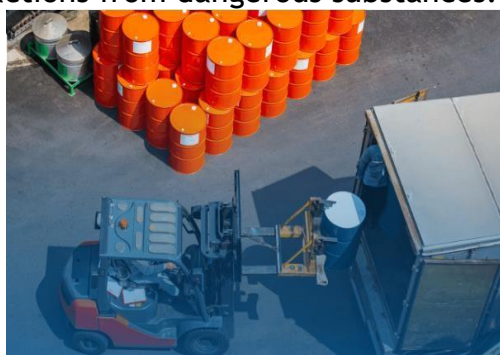
Categorization and types of vehicles for transporting dangerous goods. Requirements for the construction and manufacture of vehicles, type approval, ADR approval. Requirements for technical correctness. Procedures for issuing a certificate of compliance with conditions for



vehicles transporting dangerous goods. Technical characteristics of the vehicle and technical equipment. Safety conditions for tanks. Safety conditions for the production of bodywork.

4.11. Protective measures for loading and unloading dangerous goods

Precautions against electrostatic charge. Provisions for temperature regulation. Transport with temperature regulation. Restrictions for mixing goods during loading, transport and unloading. Preventive and protective measures for possible reactions from dangerous substances.



4.12. Joint loading on the same vehicle or in a container

Conditions for the vehicle and vehicle crew, as well as containers and tanks, viewed from the aspect of safety, cleanliness and correct operation. Conditions in container terminals. Documentation control. Visual inspection of vehicles and cargo. Loading, handling and unloading procedures. Limits on the quantities of goods. Prohibitions on joint loading.

4.13. General information regarding civil liability

Responsibility of competent institutions and stakeholders (police, inspection bodies, emergency and medical services). Responsibilities of the company ordering the transportation of dangerous goods. Responsibilities of the company providing the service of transportation of dangerous goods. Responsibilities of individuals. Risk assessment



when choosing a route for the transport of dangerous goods. Insurance system.

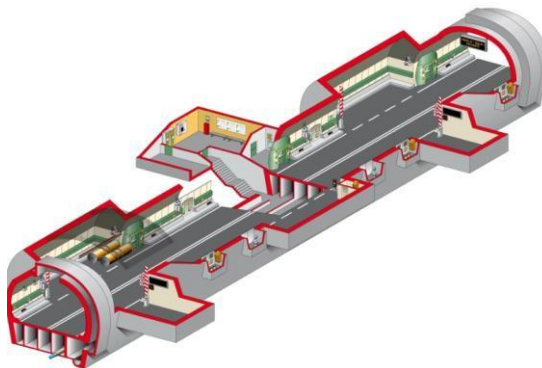
4.14. Handling, packaging and storage

Means and devices for the manipulation of dangerous substances. Procedures of manipulation and storage of dangerous substances. Conditions and limitations for packaging materials. Conditions for storage areas.



4.15. Transport of hazardous materials in tunnels

Traffic restrictions in tunnels and instructions on behavior in tunnels. Preventive and security procedures and measures. Accident prevention. Procedures in case of fire or other accidents. Traffic monitoring and control system in the tunnel. Traffic infrastructure of the tunnel. Evacuation plan.





4.16. Safety and protective measures for the use of tanks in the transport of dangerous goods

Handling and safety aspects of tank driving, including movement of substances. Special conditions for tank vehicles. General theoretical knowledge about different systems for filling and emptying tanks. Special additional provisions related to the use of tank vehicles (approvals, marking of approvals, marking with danger sheets and marking with an orange plate, etc.).



4.17. Safety and protective measures during the transport of explosive and pyrotechnic substances and objects

Specific hazards related to explosives and pyrotechnic substances and objects Specific conditions related to mixed loading of explosive and pyrotechnic substances and objects.



4.18. Specific conditions and dangers related to ionizing radiation and radioactive substances

Specific hazards related to ionizing radiation. Specific conditions related to packaging, handling, joint loading and storage of radioactive materials. Specific measures that must be taken in the event of an accident caused by radioactive substances.



4.19. Protection against static electricity

Establishing a system of protection against static electricity. Measures for protection against static electricity. Testing static electricity. Devices for measuring static electricity. Risks and unintended consequences.



4.20. Handling of flammable liquids and gases in traffic

Conditions for handling explosive substances. Facilities for the accommodation of explosive materials. Approval for the transport of explosive substances. Security measures. Storage and work in warehouses of explosive materials.



4.21. Institutional-management and organizational capacities in the field of transportation of dangerous goods

Establishing a strong and responsible institutional framework in the transport of dangerous goods. Adoption of a set of regulations and compliance with international regulations in the field of transportation of dangerous goods. Adoption and application of examples of good practices.



4.22. Traffic safety when transporting dangerous goods

Improving the knowledge and skills of personnel participating in the control of the technical correctness of vehicles for the transport of dangerous goods. Establishing a system of risk management and safety management in the transport of dangerous goods. Preventive measures for drivers and vehicles. Creation of safe routes for the transport of dangerous goods. Procedures and measures for the vehicle. The role and importance of traffic signals and equipment. The role and importance of the information and information exchange system during the transportation of dangerous goods. Establishing a system for recording data on traffic accidents with vehicles for the transport of dangerous goods for the purpose of preventive action.



4.23. Personnel and technical-technological capacities in the field of transportation of hazardous materials

Improvement of the system of training and qualification of personnel in the field of transportation of dangerous goods. Innovation and modernization of technical and technological capacities. Application of new technological solutions for more efficient and safer transport of hazardous materials. A system for monitoring and recording the driver's driving behavior when transporting dangerous goods.





4.24. Technical correctness of vehicles in the transport of dangerous goods

The role and importance of the technical correctness of vehicles for the transport of dangerous goods. Modernization of vehicle fleets. Tightening of the conditions for the technical correctness of vehicles in the transport of dangerous goods. Training of personnel to control the technical correctness of vehicles in the transport of dangerous goods. Daily vehicle inspections.



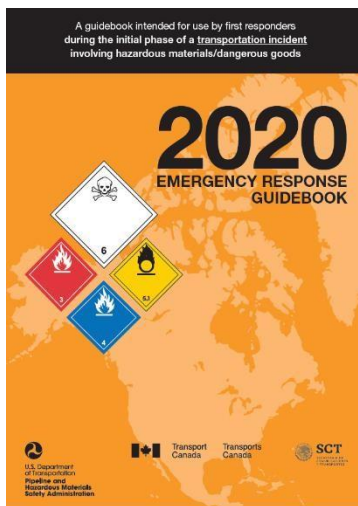
4.25. Inspection supervision and control in the transport of dangerous goods

Institutional framework of inspection bodies for the control and supervision of the transport of dangerous goods. Regulations, obligations, responsibilities and procedures of inspection bodies. Equipment and devices for inspection field control of vehicles for the transport of dangerous goods.



4.26. Emergency, medical and rescue services in the transport of dangerous goods

The role and importance of emergency medical and rescue services in the event of accidents in the transport of dangerous goods. Devices and equipment for protection and rescue. Emergency action plan.





4.27. The impact of the transport of hazardous materials on the environment

Assessment of the risk of unwanted consequences during the transport of dangerous goods. Consequences of the impact on the environment after the occurrence of accidents in the transport of dangerous goods. Preventive measures and procedures. Proceedings in the event of accidents in the transport of dangerous goods and protective measures with a focus on environmental protection.



4.28. The impact of transporting hazardous materials on health

More significant involvement of the health sector in the process of transport of dangerous goods. Improving training. Improving the performance of emergency medical services. Risk management. Route planning with a focus on the level of risk when passing through populated areas. Preventive and protective measures for personnel participating in the loading, unloading and manipulation of cargo with dangerous substances.



4.29. Risk management in the transport of dangerous goods

Establishing and implementing a risk management system in the transport of dangerous goods. The importance and role of the security advisor. Report on accidents, incidents and extraordinary events during the transportation of dangerous goods. Training and education. Application of GIS in risk management processes in the transport of dangerous goods.





Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project number: 101082187



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5. DGTRANS LABORATORY EQUIPMENT AND DEVICES

5.1. Laboratory equipment DGTRANS

During the implementation of the project activities, equipment was acquired that should be used for the purpose of practical testing problems and training of all actors in the process of transporting hazardous materials. The description of the equipment and its basic capabilities are given in the following chapters of this document.

5.1.1. Complete ADR bag

ADR equipment (bag) is mandatory when transporting dangerous goods. The bag meets all the standards required by the law on the transport of dangerous goods. The equipment of the bag located in the established laboratory contains the following components:

- Gloves.
- Transparent glasses.
- Boots.
- Disposable overalls.
- Marking cone.
- Marking tape.
- Respirator with valve.
- Signaling lamp.
- Lamp battery.
- Half mask.
- Half mask filter.
- Signaling vest.
- Flushing liquid.
- Broom and trowel.
- Hand lamp.
- Battery for flashlight.
- Bag.
- Instructions.



Figure1. ADR bag

5.1.2. Danger board

The rectangular warning signs indicate the transport of dangerous goods, while the numbers on the hazard board provide information about the transported goods. The carrier of the information is a change



warning board with change numbers. Danger signs on road vehicles indicate that the vehicle is transporting hazardous materials. The hazard number plate is orange in color with a variable set of GGVSEB/ADR numbers. According to GGVSEB/ADR, smaller warning signs can be used if the available area is not sufficient due to the shape or construction of the vehicle. Marking of the danger sign is precisely regulated. The number in the lower part indicates the UN number of the goods.

The top 2 or 3 numbers are called hazard numbers. The first number corresponds to the hazard class, and if the risk can be additionally indicated by a number, a zero is added to that number. The upper number is the so-called danger number (also known as the Kemler number) - it consists of two to three digits. The first number indicates some kind of basic danger posed by the cargo. For example, 3 indicates flammable liquids, 4 indicates flammable solids, or 7 indicates a radioactive hazard. If the substance poses no further danger, the second number is zero, which serves only as a placeholder. If a second, non-zero number appears along with the first number, 33, for example - this means an increase in the corresponding danger (in this case, for gasoline). The triple number 333 would indicate a self-igniting liquid. For example, the number 80 in the upper field indicates corrosive substances. The numbers can also vary: 236, for example, would be a gas (2), which is flammable (3) and poisonous (6). The number in the lower part indicates the UN number of the goods. The Figure below on the left shows a typical warning sign. Based on it, you can see that according to the ADR (European Agreement on the International Carriage of Dangerous Goods by Road), gasoline has the number 1203, and heating oil and diesel fuel have the UN number 1202. The basic components of the danger panel are:

- Orange plate with variable numbers
- Material: stainless steel V2A
- Dimensions: min. 300 x 400 mm
- Design: rigid, with edge protection
- The board necessarily comes with: 4 empty fields, 1 set of numbers, 1 cover and 1 fastening clip





Figure 2. Danger board with changeable labels

5.1.3. Thermal camera

UNI-T UTi165A is a professional thermal camera ideal for use in inspection, machine industry, plants, laboratories, colleges, finding sources of fire, moisture, etc. Detailed analysis of the thermal Figure via a large LCD screen and PC program, possible recording on a micro SD card and mounting on a stand. The camera features are:

- Temperature measurement range: -10°C up to 400°C.
- Heat sensitivity: $\leq 150 \text{ mk}$ (0.15°C).
- FOV (Field of View): min. $56^\circ \times 42^\circ$.
- IFOV (Instantaneous Field of View): 11m work.
- Camera resolution: min. 160x120px.
- Screen: min. 2.8-inch LCD.
- Battery: Li-ion 3.7V 5000mAh.
- Dimensions: 236x75.5x86mm.
- Weight: min. 455



Figure 3. Thermal camera

5.1.4. Device for measuring vapors from the tank

With an ergonomic design and innovative infrared sensor technology, the Dräger X-am® 5600 is the smallest gas detection instrument for measuring up to 6 gases. Ideal for personal monitoring applications, this rugged and waterproof detector provides accurate and reliable measurements of explosive, flammable and toxic gases and vapors, as well as oxygen. The basic characteristics of the sensor are:

- Concentration measurement min. 6 types of gases: Combustible Explo gases (IR), Amines, Cl₂, ClO₂, CO, CO₂ (IR), H₂, H₂S, HCN, NH₃, NO, NO₂, O₂, O₃, PH₃, SO₂.
- Alarms: min. 360 ° ultra-bright, audible (90 dB at 30 cm) and vibrating indicators
- Dimensions: min. 48 x 130 x 44 mm
- Weight: min. 250 g
- Ambient operating conditions: min. -20 to +50 ° C / 10 to 95% RH
- Protection: min. IP 67
- Autonomy: min. 9 days with NiMH battery / Charging time < 4 h
- Data logger: min. 1000 hours
- Operation with sampling pump:
- Automatic pump start
- Maximum hose length: max. 30 m
- Certification: min. ATEX, CSA (USA), CE & MEDvante



Figure 4. Device for measuring vapors from the tank

5.1.5. Smart tachograph analysis device and tachograph card reader with software

Device for downloading data from the driver card and tachograph. The possibility of transferring data to a computer via USB. Reminder function to ensure legal download periods. It can be used for 12 volt and 24 volt digital tachographs. It is compatible with all digital tachographs, and it is possible to download data from the tachograph as well as from the driver's digital card. It also supports downloading from the new smart tachographs of the second generation. Data is downloaded directly from the driver's card via the integrated chip card reader. TFT touch screen to monitor vehicle activity, download status, battery level and memory capacity. An additional LED shows the download status and an audible signal informs when the data download is complete. Reminder when data download is required. Checking digital signatures of downloaded files. Data export for other PC applications. The device enables fast data transfer from the digital tachograph to the computer thanks to the USB connection. The basic characteristics of the set components are: The device is compatible with all digital tachographs, and it is possible to download data from the tachograph as well as from the driver's digital card.

- Touch screen



- USB cable
- Instructions

The software is used to collect all data, from digital tachographs and driver cards. This data is processed and evaluated so that the results are immediately available to all involved parties when needed. The kit includes:

- License for a minimum of 3 users
- Import and management with no limit on the number of drivers and vehicles
- Data protection guarantee by logging in with a username and password
- Reading and archiving of driver card data and vehicle files
- Evaluation and display of driver card and vehicle data
- Assessment of violations of driving time, rest periods and working hours
- Supported: min. Windows 7,8,10,11



Figure 5. A smart device for tachograph analysis

5.1.6. Real-time air quality meter and recorder

Air pollutant source monitoring device from dust, petrochemical industry, steel plant, thermal power plant, restaurant, smoke, burning plants, car driving. The device is a real-time air quality monitoring instrument used to monitor the concentration of PM2.5, humidity and temperature in the indoor environment.



- Measuring functions: min. PM2.5: 0 to 250 $\mu\text{g}/\text{m}^3$
- Humidity: 5 to 95 % RH
- Temperature: 0 to 50 $^{\circ}\text{C}$
- CO₂: 0 to 10,000 ppm
- Air pressure: 10 to 1100 hPa, mmHg, inHg.
- PM2.5 time average
- Record Retention: YES
- Option: Recording to SD card
- Power supply: min. battery and via line power supply



Figure 6. Real-time air quality meter and recorder

5.1.7. Device for testing static electricity

Static electricity is a problem in many industrial areas. It slows production, reduces product quality, attracts contaminants and shocks operators. This is a well-known problem in the plastics, packaging, paper, medical, electronics, textile and pharmaceutical industries. In industries that use solvents, explosives, or other low-flammability materials, static can create additional fire and explosion hazards. The static electricity meter F-EX715 can show where and how static interference is generated, its magnitude and polarity. This hazard locator gives engineers a scientific basis for analysis. The basic features of the device are:

- Possibility of testing static electricity in hazardous industrial areas
- Measurement level: min. from 10 V to 200,000 V on the surface of the material
- Measurement possibilities: Identification of the origin of static electricity, size and polarity
- The screen for the ability to load test data
- Internal battery
- Certification: ATEX and IECEx, EN-500081-1 (EMC) and BS7506-2 (Construction)





Figure 7. Device for testing static electricity

5.1.8. Arduino kit

The Arduino kit consists of:

- Arduino Explore IoT Kit
- Arduino CTC 101 Kit - Full
 - CTC 101 Box: 26 playable projects, boards, shields and components for a class of up to 30 students.
 - 6 Arduino 101 boards
 - 6 Arduino educational shields
 - 10 mini motherboards
 - a set of electronic components
 - a set of plug and play modules with a set of sensors and actuators
 - a set of batteries
 - media and storage
 - cable set
 - boxes for storage and sorting



Figure 8. Arduino equipment

5.1.9. GPS receiver

Robust and waterproof design with control buttons and a 2.6" sunlight-readable color screen. The device is equipped with a high-sensitivity receiver with a quadrilateral spiral antenna and multiple GNSS support (GPS, GLONASS and Galileo) and a 3-axis compass with barometric altimeter available on GPSMAP 64sx devices. Whether you're cycling, geocaching or climbing, you can explore even more with superior handheld navigation. The series is now also equipped with multiple GNSS support. With its square helix antenna, high-sensitivity receiver and multiple support for global navigation systems (GPS, GLONASS and Galileo), the GPSMAP 64x series quickly and precisely locates your position and maintains it in more demanding environments than GPS itself.



- Screen size: min diagonal 7.6 cm (3")
- Screen resolution: 240 x 400 pixels
- Display type: Transflective TFT color display
- Battery: Rechargeable NiMH battery
- Battery life: Up to 16 hours
- Waterproof: Yes (IPX7)
- Built-in memory 4 GB
- Memory and power capacity of microSD™ cards up to 32 GB (supplied)
- Waypoints/favorites/locations 10,000
- Routes: 250
- Track log: 20,000 points, 250 stored tracks
- Barometric altimeter: Yes
- Electronic compass: Yes (3 axes with tilt adjustment)
- Automatic route creation: Yes
- Adapted for geocaching: Yes
- Camera: Yes (8 megapixels with autofocus and digital zoom)
- Compatibility with wireless technologies: Yes (Wi-Fi, Bluetooth and ANT+)
- Map segments: 15,000
- Active weather forecast: Yes
- Connect IQ compatibility: Yes (widgets, apps and data fields)
- Flashlight: Yes



Figure 9. GPS receiver

5.1.10. Ultrasonic device for measuring material thickness

TB 200-0.1 is an ultrasonic device for measuring material thickness and is characterized by its precision and equipment. Features of the device are:



- Measurement method: Ultrasonic.
- Calibration: Yes.
- Measuring range: 1.5 mm - 200 mm.
- Type of material to be measured: iron, cast iron, copper, aluminum, zinc, quartz glass, polyethylene and PVC.
- Power supply: Set of batteries.



Figure 10. Ultrasonic device for measuring material thickness

5.1.11. Mobile gas and toxic gas detector

BH-4S portable multiple gas detector can detect flammable gas, O₂ and other two types of toxic gases continuously and simultaneously. It is widely used in areas where protection against explosion or leakage of toxic gases is required, such as underground channels or mining industry, in order to protect the lives of workers and avoid damage to relevant equipment. Features of the device are:

- Types of measurement parameters: oxygen (O₂), carbon monoxide (CO), hydrogen sulfide (H₂S) and flammable substances (Ex)
- Calibration: Yes
- Data recording and the possibility of transferring it to a computer
- Screen: color
- Sound alarm for detection of exceeding values of measurement parameters
- Dust and water resistance
- Power supply: Battery set or charger



Figure 11. Mobile gas and toxic gas detector

5.1.12. Carbon monoxide (CO) measuring device

Measuring device for checking the amount of carbon monoxide in your environment. Adjustable alarm limits alert you to different areas of application via acoustic means. Features of the device are:



- Types of measurement parameters: carbon monoxide (CO)
- Calibration: yes
- Measurement range: 0 - 1000 ppm.
- Color screen
- Sound alarm for detection of exceeding values of measurement parameters
- Power supply: Battery set or charger



Figure 12. Device for measuring carbon monoxide



6. ACADEMIC STAFF INVOLVED IN THE TRAINING OF PROFESSIONALS

In order to carry out the training of professionals, it is necessary to include adequate academic staff. This refers to the teachers who, in the course of the DGTRANS project, underwent the necessary training in different countries and in this way were additionally educated for such a complex job. The Faculty of Mechanical Engineering actively participated in the development and implementation in the field of transportation of hazardous materials and in this way invested in its personnel in order to contribute to the practical improvement of processes in the transportation of hazardous materials.

The following academic staff from the International Business College Mitrovica will be included in the training of professionals in the field of transportation of dangerous goods:

- Assoc. Ph.D. Milan Veselinovic
- Assoc Ph.D. Afete Musliu.
- Lecturer Damir Gashi



Milan Veselinovic (m.veselinovic@ibcmittrovia.eu)

Milan Veselinovic, Ph.D. is a Lecturer/Trainer in Logistics and Supply Chain Management at IBC-M. He holds a PhD in Economics (Commercial Industry and Economics). In this regards, Mr. Milan Veselinovic published research papers and review articles in the field of with supply chain operations, logistics, procurement and risk diversification issues concerned with import dependence. All papers/articles were published in international scientific journals and has been a featured speaker at numerous conferences. Mr. Milan Veselinovic is professional in Economics and Management, with a specific focus on logistics, supply chain operations and procurement. Besides this, Mr. Milan Veselinovic has participated in projects, a project an advisor and consultant, concerning capacity building in HE (infrastructure and portfolio building in HE).

EDUCATION BACKGROUND (Ph.D.)

-Title of doctoral dissertation: The Market Position and the Efficiency of Oil Companies in Therms of Oligopoly;

-Field: Commercial Industry;

-Scientific and research work in Ph.D. is engaging in business management, international politics, politics of use of alternative and renewable energy sources, logistics, supply chain operations, marketing, entrepreneurship, and environmental policy;

-About the scientific fields of interest, you may see the list of published scientific papers in professional university journals and books.

Field(s) of study according to CERIF classification: S185, Commercial and Industrial Economics according to Erasmus+ 04.5 and 04.0/04.7/14.3

WORK EXPERIENCE IN HEI INSTITUTIONS

IBCM/PEP/APSKM/HSET/USAID (2013-2024)

- Participating in the planning, lesson preparation, and teaching/training according to the curriculum objectives and standards (marketing, organizational management, entrepreneurship, logistics, supply chain operations, macroeconomics);

- Participating in panel exams, curriculum developments, promotion activities, meetings, ERASMUS+(sub)projects, grade exams, final exams, etc.;

- Working with the staff and with the students in the workshops/T2P, training delivering and project participation;



- Participating in the planning, lesson preparation, and delivery classes according to the curriculum objectives and standards in Marketing, Organizational Management, and Entrepreneurship (US Embassy English Class);
- Identifying and conducting extra-curricular activities in different fields of economics;
- The recommendation(s) can be attached, posted, or shown for inspection.

Afete Musliu (a.musliu@ibcmitrovica.eu)

Afete Musliu is an accomplished academic and environmental scientist with a PhD in Environmental Sciences from the Agricultural University of Tirana. She currently serves as an Assistant Professor at the International Business College Mitrovica (IBCM), teaching courses in environmental sciences, chemistry, and management. Dr. Musliu's extensive background includes previous teaching roles at UBT College, where she also managed the college library, and her role as a project manager at the NGO Environmental Education in Mitrovica, where she led initiatives focused on environmental awareness and preservation.

Dr. Musliu's research interests center around pollution assessment, with numerous publications addressing issues such as heavy metal contamination and sustainable environmental practices. She has contributed to multiple international conferences and projects, including Erasmus+ staff mobility programs. Her work highlights a dedication to advancing environmental education and sustainable practices, making a notable impact in academia and her community.



Damir Gashi (d.gashi@ibcmitrovica.eu)

Damir Gashi is an environmental management professional with extensive experience in sustainable development and ecosystem protection. Currently, he serves as the Director of an NGO at the International Business College Mitrovica, where he leads projects focused on enhancing environmental practices in collaboration with NGOs, businesses, and communities in Kosovo. A PhD candidate at the University of Zagreb, Damir's research investigates sustainable environmental practices, water pollution parameters, and the application of horizon scanning to anticipate and address emerging environmental challenges. He holds a Master's degree in Environmental and Agricultural Management and has over two decades of experience in environmental project coordination, quality assurance, and strategic development. His work emphasizes the integration of environmental sensing and IoT technologies to support effective, data-driven solutions for sustainable resource management. Through his leadership and research, Damir is committed to advancing innovative approaches to environmental protection and sustainability across the region.



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Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project number: 101082187



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