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Peculiarities of Implementation of the Environmental Management System of Motor Transport Enterprises on the Urban Territories

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Abstract:

It has been found out that the environment management system (EMS) in accordance with the standards of ISO 14001: 2015 is a universal instrument for ensuring the sustainable development of the transport system, the activity of transport enterprises, and reducing their environmental impact on the territory of modern cities. It has been determined that transport in cities is the main source of environmental and physical hazards. The realization of a full-scale experiment for a typical automobile enterprise allowed conducting a preliminary environmental analysis of the activity. For the implementation of environmental management for the transport company, a process model is proposed that defines the sequence of actions and includes the main processes that ensure the implementation of the Deming-Shuhart cycle. Based on the model, elements of the ecological management system and the typical procedures of the EMS implementation processes have been developed. The defining procedure is the proposed environmental policy of the motor transport company, which is the basis for its further activities. A register of essential environmental aspects has been developed, an action plan has been developed, which sets out the goals and objectives for the gradual maintenance of an effective system of environmental management.

Keywords: environmental pollution; technogenic territories; sustainable development; Deming-Shuhart cycle; transport systems.

JEL Classification: M11; K32; O13; O44; Q52.

Introduction

Adopted by the UN General Assembly (2015), the activity program "Transforming our world: a sustainable development agenda for the period up to 2030" is aimed at fulfilling the basic goals of developing a modern society, taking into account economic, social and environmental aspects (Transforming our world: the 2030 Agenda for Sustainable Development 2015). In this regard, the Government's National Report "Sustainable Development Goals: Ukraine" (2017), developed by the Government, covers the basic indicators for the achievement of 17 strategic goals, taking into account the specifics of the state's development. The goal "Sustainable Development of Cities and Communities", which provides for the provision of openness, security, vitality and environmental sustainability of cities and towns, is the leading place among them (Natsionalna dopovid "Tsili staloho rozvytku: Ukraina" 2017). Consequently, the important task of the countries of the world is the creation of safe and sustainable transport systems in cities, based on increasing road safety, increasing the use of public transport and paying special attention to the needs of children, the disabled and the elderly.

The constant growth of passenger and cargo flows in the world is causing the aggravation of problems related to the rational organization of traffic, the placement of parking spaces, the provision of road quality and the protection of the environment (Osietrin *et al.* 2015). It is known that in urban areas transport is the main pollutant of air, reservoirs, soils, and so on. In particular, harmful substances (SF) during operation of motor vehicles with exhaust gases (EG) fall into the air. For example, the amount of carbon monoxide emissions (carbon dioxide and carbon monoxide) is influenced by road relief, mode and speed of the car, road condition, road situation, etc. The problem of utilization and recycling of wastes arising during the operation of vehicles (OV), including after the expiration of service life, remains acute. In addition, transport is the main source of noise in cities, as well as a source of heat pollution. Petroleum products, residues from worn tire and brake pads, bulkheads, dust, chlorides, used to spill roads in the winter, pollute roadside strips and water bodies, causing degradation of urban ecosystems (Zaporozhets *et al.* 2017).

Ecologization and safety of the transport sector development, minimizing the pressure of road transport on the environment are an important condition for improving the ecological condition of urbanized areas. The modern approach assumes the systematicity of all necessary actions: ecologization of the running gear of the TP, engines, fuel, salons, resolving issues of environmentalizing the passenger and freight (especially the transport of dangerous goods), improving quality and repairing roads. The universal instrument to provide the Sustainable Development of Transport in the World is the Environmental Management System (EMS) in accordance with the standards of the ISO 14000 series. Its implementation allows minimizing the negative impact of business activities on the environment, increasing the environmental safety of production processes and reducing the cost of natural resources. The experience of implementing these tasks for TK manufacturers is described in the research (Gaudillat *et al.* 2017). For example, the BMW Group (Germany) uses EMS based on ISO 14001 and an Environmental Management System (EMS) for all production – both in the planning of the production network and in factories located around the world. Since 1995 company groups Volkswagen (Germany) and General Motors (USA) have been working on the introduction of CEM certification procedures. The system also joined Fiat Chrysler Automobiles (USA, Italy), with 146 of its factories certificated by 2015 in accordance with ISO 14001.

Sustainable development and environmental protection is a priority task for LKW WALTER (Austria), which aims to organize entrepreneurial activities with minimal environmental impact (LKW WALTER). Companies such as Fiximer Logistics and Raben Group (Germany), Rapid (Turkey), Baltic transline (Lithuania) and some of the companies that carry out their activities in accordance with the requirements of international environmental management standards are an example. The Boryspil International Airport and the Southern Sea Port (Ukraine) also have the certificates of compliance with the requirements of ISO 14001. At the same time, the implementation of environmental objectives is consistent with other priority tasks of enterprises that provide for the provision of current and long-term competitiveness. The purpose of the research is to develop elements of the environmental management system of the motor transport company within the urbanized territories.

To achieve this goal, the following tasks have been set:

- to analyze the main problems of transport activity in highly urbanized territories;
- to identify the environmental aspects (EA) of the motor transport company on the example of a typical carrier company;
- to form a process model for the introduction of EMS;
- to develop separate elements of the system of ecological management of the motor transport enterprise.

Consequently, the introduction of EMS in the activities of transport enterprises (TE) allows to reduce environmental pressures and thus increase the competitiveness of the enterprise. This is an important prerequisite for the sustainable development of cities and communities. However, the issue of systematic environmentalization of urban road transport to improve the quality of the environment requires additional research.

1. Theoretical Overview

Urbanization is one of the main trends in human development. By 2050, according to the UNO forecasts, over 85% of the Earth's population will live and work in cities. The development of a modern city is provided by an efficient and developed transport system, and, in most cities, traffic growth is at an alarming speed. The solution to this problem depends on the development and capabilities of the metropolis itself, the construction of its transport system, the system of roads, passenger traffic and traffic flows etc. The main metropolises in the modern world are New York, Tokyo, London, Bangkok, Singapore, Hong Kong, Paris, Moscow, Mexico City and others. According to the results of the complex research of transport systems in 24 cities of the world (Krupfer *et al.* 2017) five groups of indicators have been defined that have a direct impact on the lives of millions of people. These are accessibility, efficiency and convenience – the basic indicators of transport activity. However, the most important issues of the present are the indicators of physical and environmental safety of urban transport systems.

Hong Kong, Paris and Singapore, which have the lowest mortality rate as a result of traffic accidents, are at the forefront of transport safety in the world. These cities are also leaders in the effectiveness of meeting the road safety requirements. For example, Singapore has developed a comprehensive traffic safety policy. An intelligent transport video surveillance system has been introduced in the city, due to which the total number of fatal accidents decreased by 21%. However, the impact of transport on the environment can not be underestimated. All over the world, transport is considered one of the main factors that affects the deterioration of the environmental situation in cities. In assessing the impact of transport on the environmental situation in cities, the impact of cars on such criteria as the total number of machine hours, the level of their environmental performance, and compliance with the requirements of existing fuel standards are considered.

Comparative analysis of levels of physical and environmental safety is shown in Figure 1. Leading cities – Singapore, Hong Kong, London, Toronto, Beijing – provide environmental safety by imposing restrictions, for example, on the use of the fuel standard Euro 6 or the regulation of the time of entry of freight transport to the city center. However, in the issues of ensuring the ecological safety of the city transport system, the actions of city administrations vary. For example, the Hong Kong authorities are actively promoting the use of electric vehicles. This city is one of the leaders in this area. London's transport strategy provides for active promotion of public transport, bicycles and pedestrian infrastructure development. In Beijing, the problem is solved radically: environmentally harmful transport is transferred under the ground, as well as regulate its amount on the roads of the city. Now there are more than ten million cars in Beijing, and in the city there is a network of 26 giant tunnels.

The capital of Ukraine, Kyiv, has an extensive and well-developed transport infrastructure. Passengers in the city are provided with various types of transport – buses, trams, trolleybuses, city trains, taxis. Passenger transportations are carried out on 114 bus routes (General information about KP "Kyivpastrans" 2019), and about 1.7 million citizens and guests of the capital use daily ground transportation services. According to the Department of Ecology and Natural Resources of the Kyiv City State Administration (Prikhodko 2017), the main sources of air pollution in the capital are mobile sources. Only in 2015 the amount of harmful emissions into air amounted to 171 thousand tons, 84% of which – from the operation of transport engines and mobile working equipment. Quantitative and qualitative content of pollutants from the activity of motor transport in Kyiv for the period of 2013-2015 is shown in the Table 1. According to the results of the table data analysis, the main toxic compound in this case is Carbon (II) oxide. The working cars emit with exhaust and kerosene gases, the evaporation of fuel and oil about 200 harmful substances, which make toxic, mutagenic, carcinogenic and other kinds of influences on living organisms and the environment.

Figure 1. Comparative analysis of levels of physical and environmental safety of transport of some cities: row 1 – level of physical security; row 2 – level of environmental safety



Table 1. Quantative and qualitative content of polluting substances from the motor transport operation in Kyiv (2013–2015)

No	Polluting substance	Volume of emissions, t		
		2013	2014	2015
1	Sulfurous oxide (IV)	796.2	633.7	704.1
2	Nitrogen oxide (IV)	6223.3	4951.0	5562.6
3	Carbon oxide (II)	27979.1	21589.2	25355.2
4	Methane	119.6	98.8	114.9
5	Non-methane volatile organic compounds	4087.3	3180.1	3737.4
6	Carbon oxide (IV)	682.1	552.6	622.1
7	Soot	1190.3	950.7	1047.0

Consequently, achieving the goals of sustainable development of cities and communities involves making decisions that take into account and minimize the possible negative consequences of transport activity, prevent ecologically conditioned diseases of the population and create a comfortable environment for citizens and guests of cities. First of all, this can be ensured through the introduction of environmental management system procedures (ISO 14000) for individual economic entities, which will improve the system of environmental management of the city transport system. However, in order to fulfill these tasks, a mechanism for the introduction of the EMS for a separate entity should be developed for the TE. Such a mechanism is based on the results of the previous environmental analysis of the enterprise.

2. Literature Review

The problem of reducing the pressure of road transport on the urban environment involves conducting research in three main directions. In particular, the first direction is connected with the provision of sustainable development of cities and communities; the second – aimed at studying ways to reduce the impact of TE on the environment. As for the third direction, the study of the application of environmental management and environmental management methods enables to establish mechanisms for the effective implementation of EMSs on TE, carrying out passenger and cargo transportation in urban areas. The practical implementation of the approaches to sustainable urban and community development in the municipalities of Switzerland is presented in the research (Schneider *et al.* 2018). The authors cite examples of measures, achievements and obstacles that have emerged in 200 municipalities of Western Switzerland in the application of two different approaches – the development of local action programs and a transversal (horizontal) approach to sustainable development. However, there is a need to integrate strategic and operational management.

Therefore, it is advisable to develop standardized approaches, as well as criteria and indicators for monitoring and evaluating the implementation of a sustainable development strategy (Villa *et al.* 2017). The study of green infrastructure policy for sustainable urban development in Malaysia was conducted in (Danjaji and Ariffin 2017). Green infrastructure includes a network of natural and technogenic areas and spaces in rural, urban, coastal and marine areas. The policy of urban planning while aimed at achieving sustainable urban development, the protection of natural areas, preservation of the country's environment. The issue of environmental sustainability of urban road transport is considered in the study (Rahman *et al.* 2014). The authors identify the role of motor transport in the global economy and the development of modern society. It is shown that transport is one of the most powerful sources of local and global emissions of pollutants.

The work proposes a mechanism for determining sources of emissions throughout the life cycle of vehicles. The assessment of the strategies for reducing emissions of harmful substances for the stability of the vehicle system is considered in the research (Bisen *et al.* 2014). The authors state that the sustainable development of the urban transport system requires a compromise between economic, social, demographic, geographic and political objectives. The simulation of the system dynamics is presented; the simulation model is developed that integrates the dynamics of the trip with the behavior of transport users. The authors assess the impact of various events (individual pedestrian lanes, changes in traffic, transport patterns, land use models with minimizing emissions of the harmful substances etc.), and an analysis has been made that makes it possible to assess the policy of transport ecologization. The priority of sustainable transport development for urban transport planning and policy is defined in (Sorensen and Gudmundsson 2010).

The study analyzed the impact of public administration reform in the British transport sector to attract passengers to use public transport. Best Practices for the Implementation of Sustainable Transport Development are also considered in (Reis *et al.* 2018). The author studies the organization of public transport in the United States, Europe, South America, Africa and Asia. It has been determined that effective EMS-based public transport can reduce the impact of global warming and reduce environmental pollution. An entity can manage the environmental impacts to ensure accountability and the implementation of sustainable development initiatives. The ISO 14001 standard is the world's most recognized environmental management practice. Reliable and efficient operation of the city transport system allows reducing emissions of greenhouse gases, other toxic substances etc., by reducing the use of transport means, contributing to the prevention of environmental pollution, energy saving, and the reduction of the use of fossil fuels. Consequently, the introduction of EMS in transport management is an effective way to combat climate change, a means of improving air quality and an important tool for implementing the sustainable urban development strategy.

The study (Abdallah 2017) states that an enterprise certified according to ISO 14001 has a developed EMS structure. This means continuous improvement of the business environment and production processes, monitoring and control of environmental impacts. Certified companies are more resilient in the market, actively attract new clients, investors, and improve their image. The study (Ferrón Vilchez 2017) analyzes the relationship between the state of the environment and the adoption of the standard ISO 14001. The authors use the method of regression analysis for the study of environmental indicators of production processes of transport enterprises. The obtained results show that the higher the ecological efficiency of the company, the greater is the likelihood of adoption of ISO 14001. On the basis of the analysis of theoretical approaches to the development of environmental management in Ukraine (Karaim and Lavryniuk 2015), it was concluded that this is a qualitatively new ideology of environmental management, which contributes to the achievement of efficient and environmentally sound management decisions. An analysis of the classical approaches to the environmental management system and the application of management approaches for the effective implementation of EMS (in accordance with the requirements of ISO 14001: 2015) was carried out in (Kupalova and Ulianova 2011; Barabash 2018).

Conceptual principles of providing economic and environmental management as an instrument for the sustainable development of rail transport enterprises are studies in (Dvulit 2018). Scientific and methodical approaches to improving the organizational and economic tools for managing ecologically-balanced development of the motor transport complex are discussed in (Liamtsev 2012). The analysis of the features of the introduction of EMS at motor transport enterprises was carried out in (Khrutba *et al.* 2014). Mechanisms for increasing the environmental friendliness of domestic motor vehicles by ensuring its sustainable development are justified in the study (Kofanova and Kofanov 2015). In such a way, the analysis of literary sources suggests a constant scientific search for systemic ways and methods for solving the problem of sustainable urban and community development, reducing the human impact of transport activities on the environment. Numerous studies are devoted to the methods of implementing EMS in the management of transport activities in urban areas. However, the analysis

also showed a lack of certainty of the methods, techniques and procedures of the EMS, which should take into account the characteristics of the activities of the transport enterprises, which carry out their activities in a modern city. Consequently, the definition of the features of the introduction of EMS at transport enterprises, which carry out passenger and cargo transportation in highly urbanized territories, is an actual scientific and practical task.

3. Materials and Methods

The research uses a systematic analysis and synthesis to analyze the anthropogenic impact of transport on the environment. Structural analysis, modeling, including graphic, is used for the formalization of environmental management processes, the development of system and process models. Natural modeling was used for preliminary environmental analysis, testing of developed models and their use in the implementation of EMS on the current transport enterprise. From the management methods, software and project management has been introduced to assess the situation, identify the main areas of environmental impact and set the objectives of environmental management. An ecological analysis and an expert evaluation method are used to determine the essential EA. To determine the preconditions for the introduction of EMS requires a primary environmental analysis of the typical TE. KP "Kyivpastrans" (Kyiv, Ukraine) is the object of a field experiment – one of the largest TEs in Ukraine, which has almost 10 thousand employees (General information about KP "Kyivpastrans" 2019).

Its main functions are the provision of services for the carriage of passengers by land vehicle and electric transport; organization of efficient management of urban land transport of general use, creation of favorable conditions for its development. The company combines 4 trolleybus and 3 tram depots, as well as 6 bus fleets (AP). Every day, the park employs about 300 buses of various classes, brands and models on a route for 72 routes. TE activity has a negative impact on the environment due to the emission of harmful substances into the atmosphere, thermal, noise, electromagnetic pollution of the environment. The technological processes of the enterprise are accompanied by the consumption of natural resources, the formation of waste of different classes of hazard, emissions and discharges of pollutants. A fragment of the impact of technological operations on the environment is presented in Table 2.

Table 2. The influence of the separate TE's technological operations on the environment

No	Division name	Technological operation/equipment	Qualitative content of the pollutants emissions
1.	Department of Chief Mechanics	Grinding machine, turning, milling machine, arc welding point, gas cutting point	Abrasive-metal dust, aerosol coolant – emulsol, metal oxides: Ferum, Manganese; Carbon monoxide and Nitrogen oxides.
2.	In-line repair workshop	Washing of parts, units in a washing machine, baths	Kerosene vapours, sodium carbonate
3.	Aggregate department	Repair point of fuel equipment, a grinding machine, regulation of engines	Kerosene vapours, abrasive metal dust, products of incomplete combustion of fuel.
4.	Bodywork section	Electric arc and gas cutting	Metal oxides: Ferum, Manganese; Carbon monoxide and Nitrogen oxides.
5.	Plastic section	Molding under pressure from products of nylon, polystyrene	Products of thermo-destructive plastics – ammonia, CO, styrolene
6.	Welding department	Arc welding in argon environment	Oxides of Ferum, Mangan, Nitrogen, Argon, Carbon
7.	Electrosection	Soldering with tin-lead solder	Lead Aerosol and Oxides of Stanum
8.	Painting department	Application of paint and drying coatings, pouring paint and varnish materials	Vapours of volatile solvents consisting of paints, aerosol paint and varnish materials

According to the statistical data, the emissions of harmful substances from AP № 2 only in 2017 amounted to 2,248 tons. In order to determine the impact of the activity of the TE on the environment, a preliminary environmental analysis was carried out and EAs that are subject to control were determined. About twenty aspects have been identified that have a negative impact on the environment. Among them, consumption of fuel, electricity, gas and drinking water, the presence of harmful substances, unused waste and containers. The level of skills of workers, especially in the field of environmental protection, compliance with standards and environmental legislation refer to the positive impact on the environment. Thus, according to the results of the initial environmental analysis, significant EA activity of the TE was found in the accumulator, welding, motor, tire-

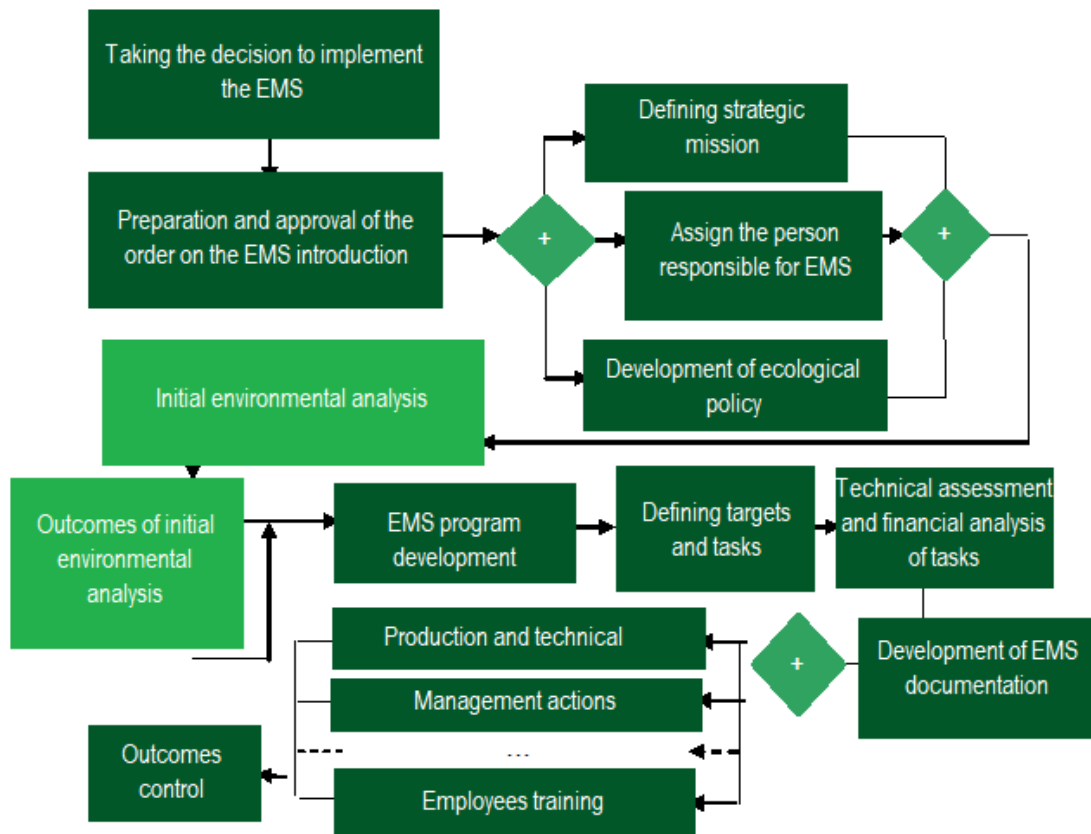
mounting, turning-mechanical, painting and washing departments. It has been established that the most significant impact of TE on the environment is carried with processes of fuel consumption and waste generation.

4. Results and Discussion

4.1. Process model for implementation of environmental management system

The basis for the implementation of EMS is the Deming-Shuhart's Continuous Improvement Process (Plan-Do-Check-Act, (PDCA), which enables you to effectively manage any system, implement changes in the TE, translate it from the existing state to the desired, target (ISO 14001: 2015). The process model for implementing the EMS is presented in Figure 2, according to which the introduction of the system begins with the decision of the head, who by appointment assigns the person responsible for the introduction of the EMS; the strategic mission is then determined and the environmental policy of the enterprise is being developed. The management cycle begins with conducting a primary environmental analysis, which involves determining the EA of the entity. On the basis of indicators of sustainable development, a strategic mission of the TE, its environmental policy etc, is formed. The planning process involves the development of the EMS program. The goals and objectives are defined that are necessary to achieve the goal; their technical and financial assessments are carried out. The best way of action is determined and agreed on the basis of the identified qualitative indicators of sustainable development and the requirements of environmental management. Typical tasks of EMS implementation are provided by the realisation of certain measures (actions), including documentation development, implementation of management measures to improve organizational performance of TE, production and implementation of technical measures for reducing pressure on the environment and training of workers. EMS is implemented in all structural subdivisions of the enterprise without stopping the main production activity.

Figure 2. Process model for implementation of EMS



The structure of tasks is determined by decomposition of the program by types of tasks – production (technical or technological), material, financial, organizational, regulatory, informational, educational, motivational, personnel, etc. The process involves planning the structure of work, evaluation of labor resources, analysis of cost structure of resources and risks, distribution of responsibility. The next process is to carry out the planned work. The verification process involves carrying out an environmental audit of the enterprise. After collecting

information, the results are monitored based on previously defined key indicators of TE efficiency. Deviations from the planned indicators are detected and analyzed, the causes of these deviations are established. The cycle ends with the correction processes, that is, the implementation of measures to eliminate the causes of deviations from the planned result, changes in planning and distribution of resources. The results obtained form the changes to the current EMS implementation program, and the PDCA cycle begins from the very beginning. The developed process model involves a sequence of actions for the implementation of EMS at the enterprise and includes all the major processes that ensure the implementation of the PDCA cycle. However, the immediate tasks of implementing EMS depend on the specific situation in a particular enterprise. Consequently, the process model of the EMS implementation allows implementing PDCA cycle groups for a single entity.

4.2. Development of elements of the environmental management system at the motor transport enterprise

Let's consider some processes of development and introduction of EMS at a certain motor transport enterprise. Definition of environmental policy. The environmental policy of a motor transport company is based on four principles: sustainable development; prevention better than remedy; the overall effect of the impact on the environment is important; open contacts with the authorities. Consequently, a typical environmental policy implies:

- realisation of production processes in accordance with the principles of prevention and avoiding of environmental pollution;
- adherence to the norms and prescriptions established for the emission of harmful substances into the atmosphere, discharges into water objects, the formation and placement of waste;
 - ensuring maximum full processing and reuse of waste;
 - planning actions to reduce environmental risks, minimize the probability of emergencies;
 - identification of priority tasks of energy and resource saving, rational use of natural resources, raw materials and materials.

The procedure of primary environmental analysis involves the realisation of environmental aspects identification processes, their quantitative assessment, planning of changes in the EA, the provision of the required level, monitoring and control of environmental aspects. Table 3 shows the characteristics of individual processes of the primary environmental analysis procedure.

Table 3. Characteristics of the separate processes of the primary environmental analysis procedure

No	Process	Characteristics of the process	Initial data	Methods and means	Results
1	EA identification	Defining production factors that may influence the environment and its characteristics	Characteristics of the TE activity. Description of processes, products and services. Information sources.	TE activity analysis. Evaluation of the environmental condition. Material energy balance.	Sources of EA appearing. Processes of environmental pollution. EA list.
2	Quantitative assessment of EA	Assessment of the EA influence rate on the environment to define the most important	EA list. Assessment criteria (ecological, household, economical).	Accepted methods of EA assessment. Expert assessments.	Registries of essential EA. Proposals for improvement of environmental state.

On the basis of initial environmental analysis and determination of essential EAs, the Register of Essential EAs is developed, the fragment of which is given in the Table 4. Thereafter, an environmental management program is developed, which specifies the goals and objectives for the gradual achievement of effective environmental management of the TE. A fragment of the program of production and technical measures of the program of environmental management of the AP is given in the Table 5. In such a way, the further introduction of EMS involves the implementation of program tasks. At the same time, the necessary documentation for monitoring and control procedures, internal audit, communication, operations management etc. are developed. Structure, responsibilities, experience, technical rules, methods, processes and resources are coordinated with the processes of management in the production processes of the AP (in the management of production, finance, quality assurance, labor protection, etc.). An essential element for the awareness of all employees of the TP of the importance of the EMS implementation is the realisation of a program for raising the level of knowledge and competencies of employees. This process is cyclic and constant. The introduction of the EMS of a motor

transport enterprise within the urbanized territories allows organizing activity in such a way as to reduce the impact on the environment. EMS integrates into the general control system of the AP and provides a balance of objectives of all systems, taking into account environmental, economic, social and technical capabilities.

Table 4. A fragment of the register of essential ecological aspects.

No	Localisation	Activity, process, service	Appearing conditions	Influence on the environment
1	Battery department	Change of the battery packs	Leakage of sulfate acid, its vapor	Soil pollution, water and air pollution
2	Engine department	Current repair of engines, cutting, grinding, honing of cylinders etc.	Emitting of the harmful substances into the atmosphere, waste formation	Pollution of air and soil
3	Tire-mounting department	Works on replacement of buses' wheels, installation / dismantling of tires	Accumulation of waste tires	Soil pollution with depleted tires
4	Bodywork department	Repair of the buses' bodyworks	Formation of solid waste, metal dust, use of water resources	Pollution of soils, including metals, accumulation of scrap metal

Table 5. A fragment of the program of production and technical measures of the EMS AP Program

Policy	Target	Task
Minimizing emissions of pollutants into the atmosphere.	Obligation to reduce the concentration of volatile organic compounds (in this case sulfate acid) by 20% over 3 years.	1. To conduct a control measurement of the air pollution. 2. To analyze existing equipment based on reliability, cost and quality. 3. To purchase equipment based on the analysis. 4. To ensure installation of new equipment. 5. To conduct training of workers on the operation of new equipment 6. To conduct constant monitoring of the operation of new equipment.

Thus, a certain mechanism for the introduction of EMS in a motor transport enterprise enables the development of process models for the implementation of the system itself and its individual procedures. This allows the TE to reasonably approach the environmental management of the activity. At the same time, the quality of the environment in the cities improves and the road transport pressure on the environment components is minimized.

Conclusion

The main result of the research is the development of the EMS elements of a motor transport enterprise that carries out passenger and cargo transportation within highly urbanized territories. This process is an important prerequisite for the sustainable development of cities and communities. The main achievement is the formation of methods, models and procedures for the introduction of the EMS of the transport enterprise as a universal instrument for the sustainable development of transport, reducing its impact on the environment of modern cities. However, the processes of monitoring and control during the implementation of the EMS of transport enterprises remained out of focus, and the peculiarities of conducting internal and certification audits have not been defined. There are no conditions and procedures for certification under the standard ISO 14001. Therefore, there was done the following during the study:

1. The preconditions of ecologization and safety of transport systems development in urbanized territories, minimization of pressure of motor transport on the environment as an important condition for improvement of the ecological condition of cities have been analyzed. It has been found out that transport is one of the main factors influencing the deterioration of the ecological situation in cities. It has been determined that the introduction of EMS in the management of TP is a universal instrument for ensuring the sustainable development of the urban transport system.

2. According to the results of the initial environmental analysis of the typical TP, about twenty aspects that have a negative impact on the environment have been identified. Among them, the consumption of fuel, electricity, gas and drinking water, the presence of harmful substances, waste etc. Positive influences include the level of skills of workers (especially in the field of environmental protection), the level of compliance with norms and current environmental legislation. A quantitative assessment revealed significant EA in the accumulator, welding, motor, tire mounting, turning-mechanical, paint and washing departments. It has been found out that the

significant influence of TP on the environment is carried out by processes of fuel consumption and the generation of waste of various hazard classes.

3. The offered process model for implementing EMS defines the entire management cycle for continuous improvement of the Deming-Shuhart's processes (Plan-Do-Check-Act, PDCA). The model allows you to effectively manage any system and implement changes in the activities of the company, translate them from the existing state to the desired, target. The process model has allowed the development of separate organizational and production procedures for the introduction of CEM, relevant documentation etc.

4. The elements of the EMS of the motor transport enterprise, the procedure for determining the environmental policy and the formation of the environmental management program of the TP have been developed. Implementation of ecologically responsible management will allow, with the help of the defined and identified significant EAs, to form a portfolio of projects aimed at reducing anthropogenic impact of the enterprise on the environment.

5. Implementation of the measures of the environmental management program in the activity of a typical TP (on the example of TP No. 2 of "Kyivpastrans", Kyiv, Ukraine) has allowed to reduce the environmental impact, thus reducing the payment for emissions into the air, discharges into water bodies and for the waste of the enterprise at 5 ... 7%. Total amount of mass emissions of AP decreased by 8 ... 12%; the quality of liquid motor fuels increased by 5 ... 7%; the amount of waste has decreased by 12 ... 18%. Contamination of soil and water by transport infrastructure decreased by 7 ... 8%, fines decreased by 5-10%. The profit of the company has increased by 5 ... 10%.

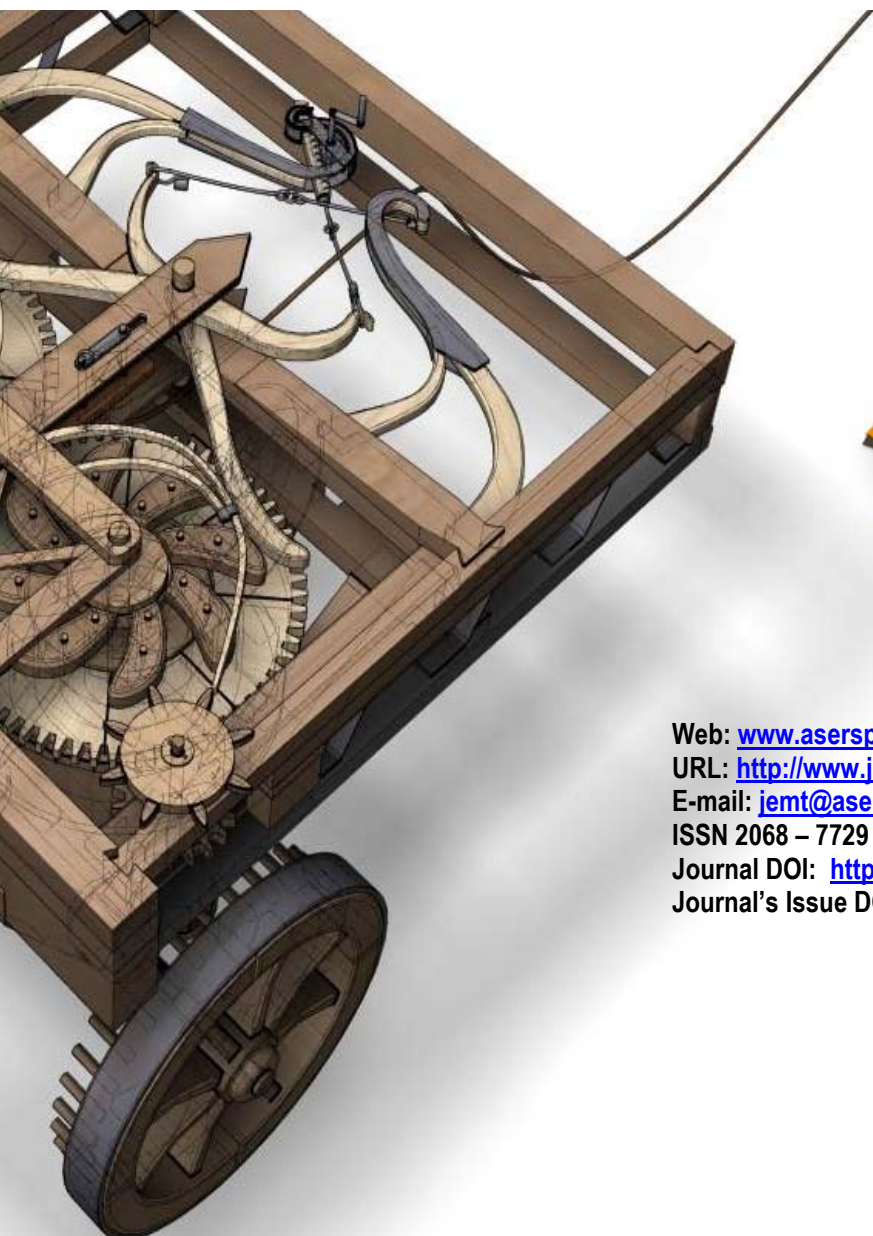
From the practical point of view, the mechanism found can be implemented into the activity of the TP, which operate in a modern city. Implementation of ecologically responsible enterprise management allows, with the help of defined and identified significant environmental aspects, to form a portfolio of projects aimed at reducing environmental pressures. Thus, the applied aspect of using the obtained scientific result is the possibility of improving the procedures of a typical technological process for the implementation of the ecological management system. Further research is planned to continue in two main directions. The first of them involves the development of the production procedures of the EMS of the motor transport enterprise, and the second task is the introduction of developed models, methods and mechanisms into the activities of carriers.

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