Reducing emissions during the formation of intelligent transport and logistics systems in the city

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Abstract. Nowadays transport is becoming one of the main sources of pollution in the city. In this area, the development of intelligent transport and logistics systems (TLS) and the use of advanced digital technologies makes it possible to reduce harmful emissions and improve the standard of living in modern megacities. The development of these systems is considered as an optimal approach to the use of investments and resource. Within the framework of Technical Committee 204, cross-country research cooperation is being implemented in the field of architecture, automatic vehicle identification, freight cart management, standards for cooperative intelligent transport systems and adaptive traffic management systems are being tested to increase the level of mobility and environmental friendliness in the city.

1 Introduction

Today, the world's largest economies, as well as developing countries, are increasing their efforts to implement the concept of a “smart” city, in which information and communication technologies (ICT) are maximally implemented in all areas of urban management. Their programs (national, regional and city) are aimed at improving economic, social and environmental performance. All this increases productivity, creates a comfortable environment for people, and creates conditions for creative, scientific and entrepreneurial initiatives.

The formation of an intelligent transport system is also focused on the use of modern ICT. These systems provide a reduction in travel time (by 10-15%), reduce the number of transport stops for passenger transport (by 20-40%), and reduce their fuel consumption (by 5-15%). For business enterprises, costs are reduced (by 5-25%), inventory turnover increases (by 15-45%). Safety is also increasing on certain sections of roads (up to 60%).

In addition, in the context of the scientific paradigm of sustainable development, in the formation of a smart city and intelligent transport and logistics systems, advanced environmental innovations are also being introduced, which leads to a reduction in harmful emissions into the atmosphere by 5-15%.

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2 Materials and Methods

Today, a trend has been formed in the world towards the development of "growth points" of the global economy, while the "smart" city [1] is one of the flagships of this direction, and the transport and logistics system is the basis for successful socio-economic functioning with the concentration of the population in the cities of the world.

In the area of improvements, there is interest in initiatives in any area that can affect sustainable development, reduce costs and improve the quality of life in the city. Basically, a few key ones dominate, to which local municipalities direct resources to solve current problems.

At the same time, studies are highlighted on the placement and operation of urban consolidation centers and delivery points, the use of drones [2] and autonomous transport [3-5], and optimization of the last mile [2.5-6]. Much attention is paid to reducing emissions and developing green logistics [7].

Bibliographic analysis of the city's TLS from the perspective of mobility [8-10] allows us to highlight the distinctive features of their formation, namely, they focus on the development of information processing centers with the aim of introducing services that improve the quality of life of citizens. At the same time, a comparative analysis of pollution in smart cities around the world allows us to judge the intensification of efforts by administrations to reduce water and air pollution [11].

3 Results

The analysis of the cities of the world has shown that the deployment of intelligent transport and logistics systems significantly allows you to change the environmental situation (fig. 1-3).

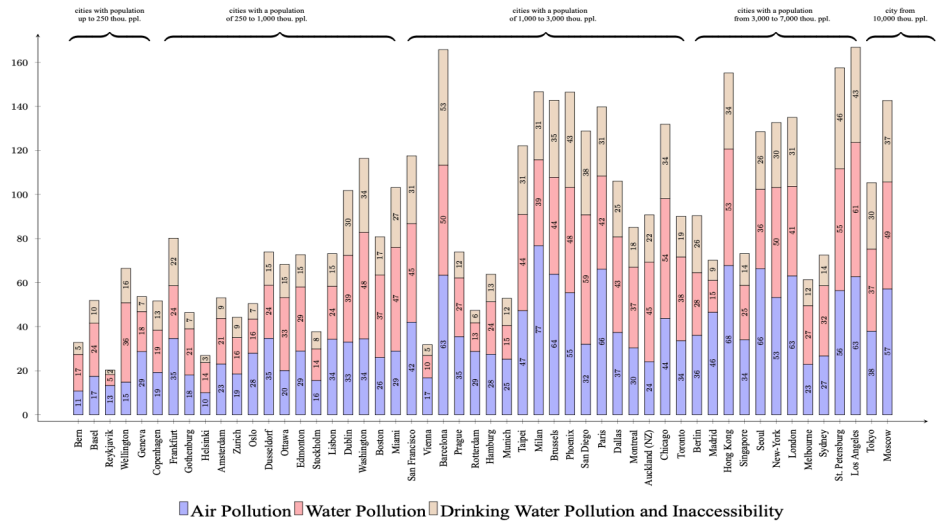

Fig. 1. City pollution indicators (water and air quality), 2023 year

It should be noted that air dissatisfaction is observed in many cities around the world, with high rates in Los Angeles, Miami, Dallas and San Francisco. In the area of environmental initiatives, positive efforts can be noted from Tokyo, London, Berlin and Vienna.

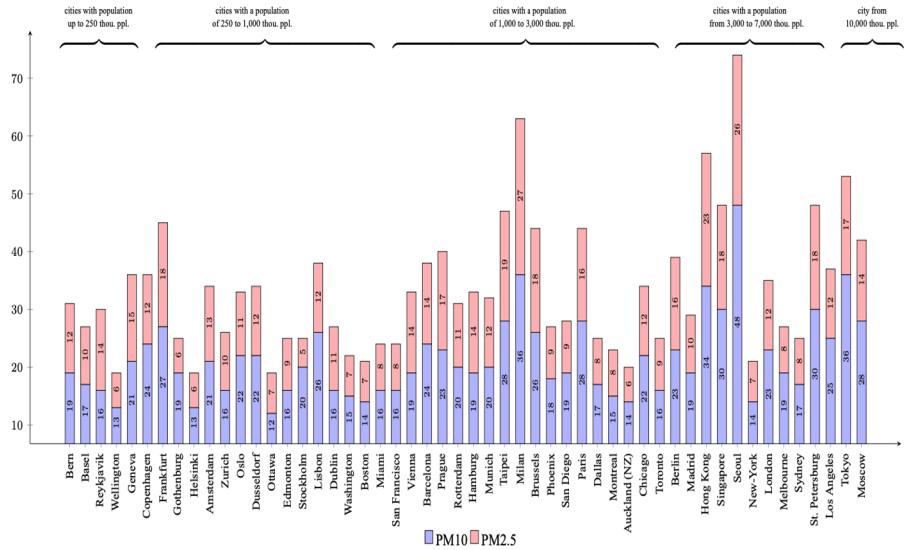

Fig. 2. Air quality in cities of the world, mkg/m³ (while the norm is 25 - for PM2.5 particles and 50 - for PM10 particles), 2023 year

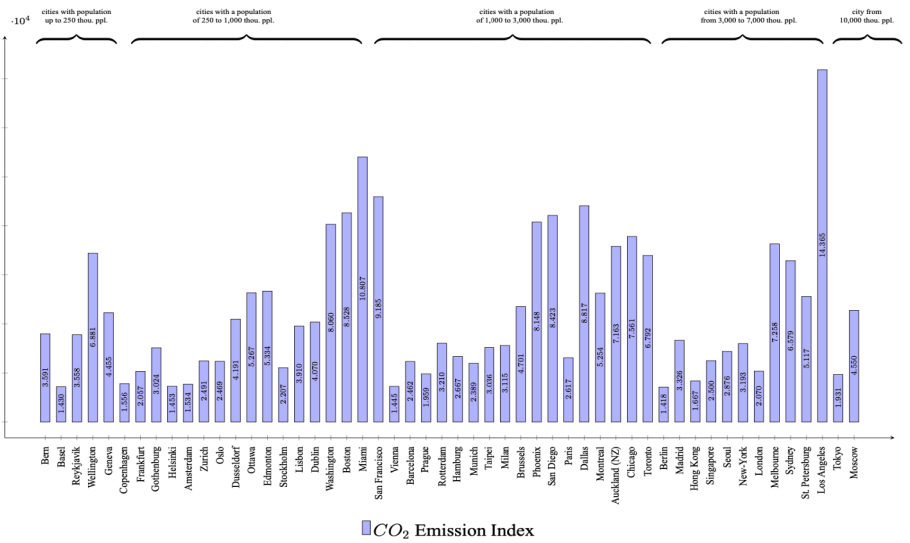

Fig. 3. Summary of CO_2 Emissions by City of the World, 2023 year

Water quality generally lags behind standard values for most large cities.

Digitalization and monitoring of key indicators has allowed many cities to reduce environmental harm and improve the quality of life.

4 Discussion

Today, one of the promising directions for the development of TLS is the introduction of the concept of a 15-minute city, in which the placement of infrastructure is subordinated to the planning of city life not only in the central part. In this situation, the new paradigm of "mobility as a service" and the use of the full tools of urban [12] and digital logistics [13]

can implement and complement an integrated and systematic approach. This approach will ensure effective management of flow processes in the city's TLS, as well as offer a full range of services in real time on demand for both business and citizens, as well as reduce environmental harm for the population in cities.

The formation of a unified integrated management system [14] for business, households and the state during the development of highly automated vehicles [15] will create uniform transparent rules for interactions between economic agents and its implementation based on the principle of decentralization will provide a lower threshold for investment in digital and "green" infrastructure, and will also contribute to its constant updating.

5 Conclusion

In the field of TLS development, sustainability and environmental friendliness of supplies today are of great importance in the context of the rapid development of e-commerce. In general, initiatives in the field of development of intelligent control systems can reduce environmental damage from transport, but the formation of a unified integrated management system will allow coordinating these initiatives and increasing the level of environmental friendliness in the city.

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