Sustainable Transport in the "Green Economy" System

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Abstract: The actualization of global ecological problems necessitates transformational reformations in the transport sector. The strengthening of global trends in decarbonization is leading to some deformations in the transport sector. Greening the transport sector is due to the ecologization of global development and will be long-term, what is due to its cost reduction and the achievement of appropriate energy efficiency indicators. The features of the development of the transport sector are characterized by a decrease in the level of energy intensity, as well as the active development of the "green" sector of electric cars. The intensive growth of the green transport sector is largely supported by state financial backing as part of the implementation of sustainable development strategies. Further development of the "green" transport sector will take place in the context of expanding the use of market-based support instruments, that ensure the introduction of energy-efficient technologies for vehicles; development of logistics technologies, that reduce the frequency and distance of transportation; increasing the availability and sustainability of low-carbon fuel types.

1 INTRODUCTION

Climate change issues are a key trend, predetermining global economic development over the coming decade (Anseretal, 2020; Barrett, 2020; Carattinietal, 2019).

The ecological trend involves meeting the current needs of people without affecting future generations and the ecosystem of the planet and is supported by the need to implement the Sustainable Development Goals for the period up to 2030, as well as the Paris Agreement on Climate (Sustainable development goals, 2015; The Paris Agreement, 2015). The need to implement these targets is due to the need to reduce the level of inequality in the global economy and in the transition to socio-economic development, taking into account environmental restrictions (Brechetetal, 2016; Chanetal, 2019). The transformation of the global transport sector plays a special role in achieving these goals (Lorenteetal, 2020; Ravettietal, 2020; Sepehretal, 2019).

Long-term development strategies of countries are based on the concept of a humane environment, ecological compatibility, and safety, and transport infrastructure plays an important role in this aspect. The need for a transition to sustainable development predetermines the actualization of mobility issues when the transport infrastructure acts as a field shaper of the country's united area. In the world, transport is developing within the framework of achieving the required level of comfort, ecological compatibility, and safety, which determines the future of sustainable development (Anderssonetal, 2020; Zenghelis, 2019; Vitaetal, 2019).

At the beginning of the 21st century, a breakthrough was outlined in the transport infrastructure, associated with a change in the socio-economic landscape. The deteriorating ecological situation, the low level of safety, and the lack of equal availability of space for the entire population redetermined the vector of development of mobility. The existing transport system is being reformed towards progressive forms of movement - electric cars and electric buses, which in the near future will form the basis for a humane environment (Barbier, 2020; Kapustin and Grushevenko, 2020; Anastasiadou and Vougias, 2019; Habich-Sobiegallaetal, 2019).

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The emergence of the term “green” or sustainable transport is considered, as a logical extension of the concept of “sustainable development”, describing types of transport and transport planning systems, that are consistent with broader sustainability issues. "Green" transport has a positive impact on the ecological, social and economic sustainability of society and ensures the mobility of both socio-economic tides and the population as a whole. The actualization of the problems of ecological compatibility of transport is due to the very significant volumes of energy consumption and carbon dioxide emissions, leading to negative ecological changes. The ecological footprint of transport is due to not only air pollution and the depletion of non-renewable resources, but also by the presence of problems with its disposal and hazardous waste (batteries, etc.) (Herberz et al., 2020; Hansson, 2020; Wang et al., 2020; Jin et al. al., 2020; Sun et al., 2020).

The article studies the features of the development of the global transport sector. The research is based on extensive scientific literature, that allows comparisons, giving corresponding examples, and extrapolation of ideas and results. The purpose of the research is to study the features and identify opportunities for the development of global transport in the context of an eco-friendly trend.

2 MATERIALS AND METHODS

The research methodology was based on methods of calculating the dynamics of indicators, characterizing data on the development of the global transport sector, as well as on a comparative analysis. To achieve the purposes in hand and assess the results, specific data from the International Energy Agency (IEA) were used on CO2 emissions in the transport sector, on the energy intensity of the transport sector; the share of electric cars in global transport; their technological and territorial distribution; market share of electric cars by country.

3 RESULTS

Sustainable ("green") transport is considered as an affordable, cheap and efficient type of transportation, that minimizes environmental damage and contributes to reducing the ecological and social impact of its use. The types of such transport are: pedestrian and bicycle traffic, eco-friendly cars, transit-oriented development, vehicle rental, economical urban transport systems, etc. Through the development of sustainable transport, the needs of people, companies, and society for reliable and affordable means of transportation, without harm to human health and the ecosystem as a whole, are met. Ideally, it uses energy from renewable ("green") resources (hydropower, solar energy, etc.).

Expanding the use of such transport contributes to: reducing greenhouse gas emissions; reducing the use of energy-consuming types of transport; the transition to low-carbon fuel types; expanding electrification in the transport sector; stimulating research for affordable storage batteries, etc.

Sustainable transport is meant to improve the ecological situation, providing consumers with a decrease in exhaust gas toxicity, an affordable cost, and a high level of its technical performance.

The development of sustainable transport can ensure the ecological, social, and economic sustainability of society as a whole, as well as an increase in the number of socio-economic tides and increased mobility of people. The increase in mobility indicators cannot be considered in isolation from the ecological, social, and economic costs of transport systems. Social costs of transportation include accidents, air pollution, reduced physical activity, vulnerability to fuel price increase, and others. In the economic context, traffic jams and blocks, resulting in serious temporary losses in all sectors. Ecological costs are associated, first of all, with significant volumes of greenhouse emissions (lead, sulfur, solid aldehydes, carcinogens, etc.), leading to oxygen starvation, as well as significant energy intensity and ecological imbalance in connection with the production and use of transport means and infrastructure.

The scaling of research in the development and creation of "green" transport indicates a high level of interest of the authorities at different levels in the development of the ecological aspect. Ecological humanism, which predetermines the world agenda, implies a high level of culture of consumption, careful attitude to natural resources, and is of a long-term nature.

It is difficult to overestimate the degree of the environmental impact of transport. The share of transport in CO2 emissions from fuel combustion is about 25%. It is important to note, that positive dynamics of such emissions has been observed over a long period. So, in 2019 their increase was by around 0.5%, suggesting a decrease of positive dynamics, which is caused by improved energy efficiency, increased electrification (over 7 million electric cars

in 2019 in the world), and increased use of renewable energy sources in the global transport sector. The largest share in the structure of emissions (about 75%) is accounted for by motor vehicles. Along with this, there is a positive trend in CO2 emissions in the aviation and shipping sectors. (Transport, 2020)

According to the sustainable development scenario, measures to improve efficiency and reduce energy demand are highly relevant in achieving the global climate goals in the transport sector. At the same time, there is an increase in emissions from the motor vehicles sector, which is due to a number of reasons. Most of the vehicle markets are characterized by increased purchases of larger and heavier vehicles. So, in a number of regions, the share of cross-country vehicles was about 50%. (Tracking-Transport-2020, 2020) In addition, there is a high level of demand for road transportation due to the expansion of the e-commerce and delivery services sector.

The global slowdown in economic development was reflected in a decrease in the energy intensity of the global transport sector (by 2.3% in 2019). However, the expected rate of decrease in accordance with the goals of the sustainable development scenario was not achieved. (Tracking-Transport-2020, 2020) In this regard, the degree of importance of measures to improve energy efficiency with an increase in demand for mobility and freight transportation with reducing CO2 emissions is being updated. Improving energy efficiency in the global transport sector can be achieved by: introducing energy-efficient technologies for vehicles and fuel types; developing of logistics technologies to reduce the frequency and distance of transportation; improving the energy efficiency of vehicles; increasing the availability and sustainability of low-carbon fuel types, etc. In addition, meeting the sustainable development scenario targets for improving air quality requires stricter emission control standards for vehicles, as well as increased availability of low-carbon fuel types.

Fiscal policy, that stimulates development in the field of reducing emissions and improving air quality, can be an effective regulatory tool. The mechanism of adoption of taxes, reflecting social costs and the cost of ecological damage, is an effective regulatory tool for the mobility of passenger and freight transportation. The features of making transport decisions are influenced by taxation, associated with the purchase and turnover of vehicles, which can stimulate consumer activity in the sector of "green" transport.

The active development of "green" transport is observed in the electric car sector. So, in 2019, their sales exceeded 2.1 million units (+6% compared to 2018) against a backdrop of a global contraction of the car market. In addition, there is an increase in the share of electric cars in the global structure of the car market to 2.6% in 2019, which indicates the consolidated sustainable development of this sector. (Electric-Vehicles, 2020) The sustainable development scenario implies the expansion of the share of the electric car park in the world to 13% by 2030.

In 2019, the leaders in electric car sales were China (1.06 million vehicles); Europe (560 thousand cars); the USA (326 thousand cars). Their share in the overall market structure exceeded 90% of all sales. Against a backdrop of increased decarbonization requirements for the economy, there was an increase in sales of battery electric cars (including battery-electric cars and plug-in hybrid electric cars). So, in 2019, their share in the total sales structure was about 75%.

In the second half of 2019 there was a slowdown in global demand for electric ars due to the deformation of direct subsidy policy in key markets. However, the total amount of electric cars in the world reached 7.2 million in 2019. At the same time, about 47% of all cars are used in China. (Electric-Vehicles, 2020)

The most popular in the global market are battery electric cars. In 2019 there was a drop in hybrid vehicle sales of 11%. Along with this, it is important to note, that the share of such cars in the overall structure of the electric car market is about 30%. The most active sales of these cars are observed in China (40% of the world market) and Europe (36%).

The development of "green" technologies is becoming a characteristic trend for other types of transport as well. The two-wheeled car sector (scooters and bicycles) is actively developing, 25% of which are electric and the most developed in China (over 95% of the market). The market of electric buses in the world as of 2019 exceeds 513,000 units (+17% by 2018). China is the leader in this sector too. The active expansion of the electric bus park is also typical for Europe, India, and Latin America. The segment of medium and heavy electric trucks is expanding, especially in China, where sales grew by more than 6,000 units in 2019. There is an improvement in electrification processes in shipping and aviation, especially in Europe and China. (Electric-Vehicles, 2020)

4 DISCUSSION

Achievement of the required indicators of sustainable development in the "green" transport sector must be accompanied by the implementation of appropriate state policy. Among the key mechanisms for stimulating the development of the electric transport market are the tools of subsidizing and tax incentives.

In 2019, in Europe, a new fuel economy standard for passenger cars and vans and a CO2 emission standard for heavy vehicles was adopted, reflecting the requirements or preferences for the electric transport segment, that have a stimulating effect on the sector. In 2020, in China, its fuel economy standard for light vehicles was updated, also aimed at stimulating the development of this sector. India conducts a policy of stimulating the development of electric transport, mainly in the two-wheeled car sector. The development of this sector is actively supported in Canada, Chile, New Zealand, Costa Rica.

According to research in 2019, over 50 countries, participating in the global car market, which share is about 90%, provided direct stimulating regulation of the development of the electric car sector. However, there is a gradual elimination of the implementation of direct stimulating measures at the national level in leading markets (China, USA, etc.) and a transition to indirect regulatory measures (for example, building norms for the installation of charging infrastructure, etc.).

The stimulating mechanisms, that provide the development of battery technology in the electric car sector forms a progressive battery cost reduction (-13% in 2019). Since the basis of the cost of electric cars is namely the car battery, an investment policy is being actively implemented at the national levels, aimed at developing innovative activity in the field of battery technologies (increasing the size of the battery pack, changing the chemical composition of batteries, reducing costs due to the expansion of production facilities, etc.).

In the early stages of the electric car market (introduction and distribution), procurement subsidizing policy was implemented at national levels to demonstrate such technologies and intensive growth of production, providing cost reduction. Indirect regulation through tax incentives to increase purchasing power in this sector, as well as additional measures, that increase the value of daily driving of electric cars (for example, discount parking rates, discounts on toll roads and low-emission zones) play a key role in attracting consumers and enterprises to electric cars in an early market stage.

The next stage of the development of the electric car sector implies increased requirements for both CO2 emissions in relation to consumers and a minimum share of cars with zero or low emissions in relation to manufacturers. An important condition for enhancing electrification of the transport sector is the sustainable scaling of the battery industry, which must be supported by appropriate policy at the national levels (reducing investment risks, fuel economy standards, zero or low emission mandates, maintaining battery production value chains, developing innovative technologies in this area, etc.).

5 CONCLUSIONS

Sustainable transport afflicts minimum damage to the environment and helps to reduce the ecological and social consequences of its use. Its use provides: reduction of greenhouse gas emissions; transition to low-carbon fuel types; expansion of electrification in the transport sector, etc. Sustainable transport is meant to improve the ecological situation, providing consumers with an affordable cost and a high level of its technical performance.

In the current period, the scale of the negative impact of transport on the environment is very impressive and is constantly increasing. The share of transport in CO2 emissions from fuel combustion is about 25%. In the current period, there is a decrease in the level of energy intensity of the global transport sector, the pace of which is not sufficient to achieve the goals of sustainable development. In this regard, there is an active development of "green" transport, especially in the electric car sector. The most popular in the global market are battery electric cars.

Achievement of the required indicators of sustainable development in the "green" transport sector must be accompanied by the implementation of appropriate state policy. In the early stages of the electric car market, a procurement subsidizing policy was implemented at national levels to demonstrate such technologies and intensive growth of production, providing cost reduction.

The next stage of the development of the electric car sector implies increased requirements for both CO2 emissions in relation to consumers and the minimum share of cars with zero or low emissions in relation to manufacturers, and implies the implementation of appropriate state policy as part of the expansion of the use of market support tools, that ensure the introduction of energy-efficient technologies for vehicles; development of logistics technologies, that reduce the frequency and distance

of transportation; increasing the availability and sustainability of low-carbon fuel types.

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