

DOI 10.31558/2307-2318.2018.3.5

UDC 656:502/504(477)

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## **INFLUENCE OF ECOLOGIZATION TENDENCIES IN THE WORLD ON RENEWAL AND DEVELOPMENT OF MOTOR CAR INDUSTRY IN UKRAINE**

In the article the process of ecologization motor car industry in the world is considered. It is defined, that extrass of exhaust-gass of cars are principal reason of exceeding maximum of possible concentrations of toxic substances and carcinogens in the atmosphere of large cities, formation of smogs that are frequent reason of poisoning. Ecological standards that operate in the countries of EU for adjusting of content of harmful substances in exhaust gass are analysed. Motor car industry is an eventual step of productive pyramid and determines the level of technological development of country. Therefore the construction of the developed motor car industry requires the self-weighted public policy. It is well-proven that it is expedient to change the existent format of motor car industry Ukraine and take a reference-point on development of electric vehicles, stimulating not only a market but also input of own production. It will help in the nearest prospect to result in the speed-up bringing in of front-rank technologies and increase of economy.

**Keywords:** pollution of the environment, motor car industry, electric car, environmental standards, electric vehicles technology.

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## **ВПЛИВ СВІТОВИХ ТЕНДЕНЦІЙ ЕКОЛОГІЗАЦІЇ НА ВІДНОВЛЕННЯ ТА РОЗВИТОК АВТОМОБІЛЬНОЇ ІНДУСТРІЇ В УКРАЇНІ**

У статті розглянутий процес екологізації автомобільної промисловості в світі. Визначено, що викиди вихлопних газів автомобілів являються основною причиною перевищення гранично допустимих концентрацій токсичних речовин і канцерогенів в атмосфері великих міст, утворення смогів, які є частою причиною отруєння. Проаналізовані екологічні стандарти, які діють в країнах ЄС для регулювання вмісту шкідливих речовин у вихлопних газах. Автомобілебудування являється кінцевою сходинкою виробничої піраміди і визначає рівень технологічного розвитку країни. Тому побудова розвиненої автомобільної галузі потребує виваженої державної політики. Доведено, що Україні доцільно змінювати існуючий формат автомобільної галузі та брати орієнтир на розвиток електричного транспорту, стимулюючи не тільки ринок, а й запровадження власного виробництва. Це допоможе в найближчій перспективі привести до прискороного залучення передових технологій та зростання економіки.

**Ключові слова:** забруднення навколишнього середовища, автомобільна індустрія, електромобіль, екологічні стандарти, електромобільні технології.

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## ВЛИЯНИЕ МИРОВЫХ ТЕНДЕНЦИЙ ЭКОЛОГИЗАЦИИ НА ВОССТАНОВЛЕНИЕ И РАЗВИТИЕ АВТОМОБИЛЬНОЙ ИНДУСТРИИ В УКРАИНЕ

В статье рассмотрен процесс экологизации автомобильной промышленности в мире. Определено, что выбросы выхлопных газов автомобилей являются основной причиной превышения предельно допустимых концентраций токсичных веществ и канцерогенов в атмосфере крупных городов, образования смогов, которые являются частой причиной отравления. Проанализированы экологические стандарты, действующие в странах ЕС для регулирования содержания вредных веществ в выхлопных газах. Автомобилестроение появится конечной ступенью производственной пирамиды и определяет уровень технологического развития страны. Поэтому построение развитой автомобильной отрасли требует взвешенной государственной политики. Доказано, что Украине целесообразно менять существующий формат автомобильной отрасли и выбрать ориентир на развитие электрического транспорта, стимулируя не только рынок, но и внедрение собственного производства. Это поможет в перспективе привести к ускоренному привлечению передовых технологий и роста экономики.

**Ключевые слова:** загрязнение окружающей среды, автомобильная индустрия, электромобиль, экологические стандарты, электромобильные технологии.

**Introduction.** According to the annual report of World Health Organization in the world through contamination of atmospheric air prematurely 7 million people die on the average. Close 92% of such cases took place in countries with the low and middle level of GDP per capita. Especially serious consequences for the health of man contamination of air has by industrial or motor car gases [1]. Thus, the modern tendencies of forming of ecological consciousness in society induce industrial enterprises to adhere to the environmental standards.

**The aim of the article is** to educe influence of ecologization tendency in the world on the improvement of motor car industry in Ukraine.

**Problem definition.** The world tendency of passing to environmentally clean cars was discussed by the Scottish scientists Victor Timmers and Peter A.J. Achten, British researcher from the University of Hertfordshire Ranjeet Sokhi, Ozzi Zenera, Petrov S., Umryhina L., Klimchuk M. But a few questions remained indefinite, one of that there is this theme.

**Research results.** Electric car is an auto that is operated by one or a few electric motors with a feed from batteries or accumulators. Today it is the most popular type of motor vehicles. But one should not to think that it takes place first. Electric cars are not acquisition of the last decades, in fact in history enough facts that lead to opposite. Popularity and confession were already characteristic for them over a century ago. So, if initial development did not cease self on itself with the offensive era of internal combustion engine, maybe, to today electric vehicles technologies would move up where farther than now.

In the period of origin of electric car industry (that was on the end of 19th - beginning of 20th of century) nobody appreciated ecofriendliness in electric carriges. Question of influence of motor vehicles (then, however, he was yet named «by a horseless carrige») on an environment and health of people nobody was worried yet. Another thing is absence of noise, vibration, cinder and strong smell, peculiar to the petrol cars of 1900th. A quite and «tidiness» could forgive even the slowness of the first electric vehicles. In addition, the driver of such carrige was confined necessity of transmissions switching that was in those years the most

difficult part of driving. The same goes for the start of engine - it was difficult with a starting handle. Driving lightness gave an opportunity to position electric cars as carriages for women and elderly people. The main disadvantages as small speed and necessity of the frequent recharging - as well as before allowed to use of cars in city, where on small distances were not so substantial. However, a situation with every year slowly changed to the best [10].

One of the first electric carriages, history of that counts over 100 years, created by William Morrison in 1891. Equipped by the tram-car 4-Horsepower engine Siemens (1hp = 735,5 watts), electric car was intended for transportation 6-12 passengers. Maximum speed arrived at 20 miles per hour (32 km/h), and batteries needed to be recharged every 50 miles (80 kilometres). Probably, it was the first ground vehicle, which was controlled by the steering wheel. It was a patented rake gear mechanism. All this construction weighed about two tons. During existence a company Morrison's Company produced 11 such electric cars [10].

It is passed many years. Cars with the internal combustion engines and diesel engines caused catastrophic harm to ecology in a world scale. Especially it is affected industrial and populous regions.

Table 1

## Composition of exhaust gas from the internal combustion engine

Name	Petrol engines (%)	Diesel engines (%)
Nitrogen	74-77	76-78
Oxygen	0,3-8,0	2,0-18,0
Water vapor	3,0-5,5	0,5-4,0
Carbon dioxide	0,0-16,0	1,0-10,0
Carbon monoxide	0,1-5,0	0,01-0,5
Nitrogen oxides	0,0-0,8	0,0002-0,5
Hydrocarbons	0,2-3,0	0,09-0,5
Aldehydes	0,0-0,2	0,001-0,009

*Source: authoring.*

According to the European Environment Agency, air pollution is the main factor of premature deaths in Europe. The high levels of dust, gases and aerosols in midair provoke pathologies of breathing organs. Excess of exhaust gas are principal reason of exceeding maximum of possible concentrations of toxic substances and carcinogens in the atmosphere of large cities, formation of smogs, that are frequent reason of poisoning in the reserved space [2]. The composition of exhaust gas from internal combustion engines is given in a table 1.

From 2015 in EU operates the environmental standard Euro 6, that regulates content of harmful substances in exhaust gas. On the requirements of Euro 6 close to the ecostandard of EPA10 (the USA) and Post NLT (Japan). The main difference of standards Euro 5 and 6 concerns requirements to the excess of nitrogen oxide from a diesel engine [2]. Standard difference represented in table 2.

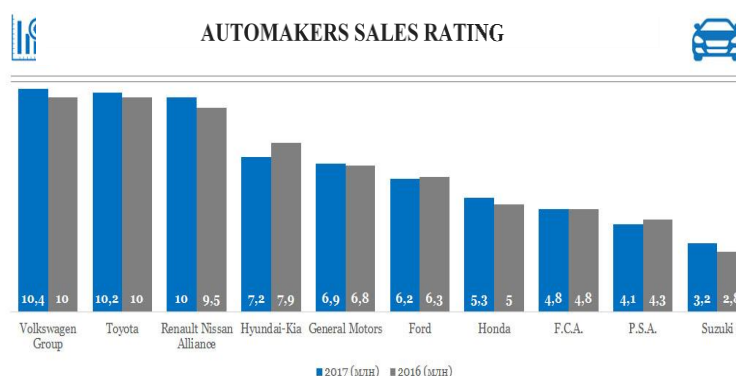
Automakers name this standard as «anti-diesel». Together with applying of new technologies in electric vehicles industry and they search the sales market for diesel produced. Just to beginning of Euro 6 action the German company Volkswagen in 2015 produced a lot of cars with diesel engines. Ukraine, other countries of post-soviet space, country with the low level of profit such as South America or Asia are optimal markets for a diesel [2].

Sales volumes of such brands as Volkswagen, BMW and other automotive companies in Germany are growing not only in the domestic market, but also around the world. According to the results of 2017, it is the German concern Volkswagen Group ranked first in

the ranking of the most successful car manufacturers with sales of 10.4 million cars (Fig.1) [3].

Table 2

Environmental standards						
Ecological standard	Carbon oxide	Hydrocarbons	Easy organic substances	Nitrogen oxide	Soot + nitrogen oxide	Suspension
For a diesel engine						
Euro - 1	2,72 (3,16)	-	-	-	0,97 (1,13)	0,14 (0,18)
Euro - 2	1,0	-	-	-	0,7	0,08
Euro - 3	0,64	-	-	0,50	0,56	0,05
Euro - 4	0,50	-	-	0,25	0,30	0,025
Euro - 5	0,500	-	-	0,180	0,230	0,005
Euro - 6	0,500	-	-	0,080	0,170	0,005
For a petrol engine						
Euro - 1	2,72 (3,16)	-	-	-	0,97 (0,13)	-
Euro - 2	2,2	-	-	-	0,5	-
Euro - 3	2,3	0,20	-	0,15	-	-
Euro - 4	1,0	0,10	-	0,08	-	-
Euro - 5	1,000	0,100	0,068	0,060	-	0,005
Euro - 6	1,000	0,100	0,068	0,060	-	0,005



Source: focus2move

Fig. 1 Rating of sale of cars 2017-2016

Pollution of the land surface by vehicle and road emissions is gradually accumulating, depending on the amount of vehicles passing through the track, road, highway and is stored for a very long time even after the elimination of the roadway (closing the road, track, highways or complete elimination of roads and asphalt cover). For the future generation, which is most likely will give up cars in their present form, transport pollution of the soil will be the most difficult consequence of the past. It is possible that even during the elimination of roads built by our generation, polluted with non-oxidising metals and carcinogens, the soil will have to be cleaned from the surface.

Despite the negative effects, motor car industry is the closing element of the production pyramid and determines the level of technological progress in the country, because the construction of a developed motor car industry requires a well-balanced state policy. In

Europe, Germany is the largest producer of cars, and therefore it is an example for the use of experience [4]. The main political forces of Germany supported the Germany's Bundesrat votes to ban the internal combustion engine by 2030. The Bundesrat resolution proposes that the European Commission «evaluate the impact of recent practices of taxes and contributions of community members on their effectiveness in promoting of mobility the emission-free vehicles (Mobility is the transition of an individual, a social object or value created or modified through human activity from one social position to another. The concept was introduced by P. Sorokin in 1927). This applies to low diesel fuel taxes operating in Europe. The document itself points out a few moments. Since by 2050 it is impossible to bring the entire industry and agriculture to emissions-free, the EU must by this time achieve mobility without emissions. This should be done together with efforts to reduce noise pollution. One of the points is the application of new tax and financial incentives for all registered emission-free vehicles by 2030. In order to achieve the goal, a good tax strategy and financial incentives should be used [5].

In a table 3 presented countries and cities that decided to prohibit or already banned vehicles with the internal combustion engine [6].

So, to get ready before that, automakers want to start executing new vehicles and reorienting to the so-called «green» vehicles - electric car or plug-in hybrid. For example, the Japanese company Nissan plans for the development of new diesel engines and stop sales of diesel models on the European market. Volvo and Porsche refused to release diesel cars [6]. At German the state support system (EUR 7000 for the purchase of such car) did not yet help stimulate of the citizens for the environmental protection of vehicles. Instead of the expected million, German citizens bought only 7K such vehicles [7].

By joint efforts, the number of electric cars in Europe in the first half of 2018 exceeded a million, and by the end of the year, the roads of the European continent will travel 1.35 million of its. In general, electric vehicles currently account for only 2% of all purchases of cars in Europe [7]. The leaders in the sale of electric vehicles were Norway, Germany, the United Kingdom, France and Sweden. In Norway, sales of electric cars and plug-in hybrid cars amounted to more than half of all new cars sold last year [7].

Table 3

First countries and cities that supported the ecologization tendency

Year	Country / City
2008	Berlin, Cologne, Hannover (Germany). Appearance of «Green Zone», where only cars that had ecological standards and environmental badge on glass.
2018	Germany. The court allowed local governments to prohibit the use of diesel cars.
2018	Ukraine. A removal of tax excise on the import of electric vehicles.
2018	Hamburg (Germany). Prohibition of driving on two central streets for cars with a diesel engine.
2020	UK. The introduction of taxes on a car with an internal combustion engine to reduce emissions of pollutants.
2022	Sweden. The use of Euro-5 vehicles in city centers will be prohibited.
2025	Norway. A total ban on the sale of new diesel-powered cars is planned.
2025	Lviv (Ukraine). 20% of all transport will be electric vehicles. This is still the only city ready for such transformations.
2030	Paris. Only cars with free exhaust emissions will be permitted.
2030	Izrael. A complete ban on the sale of petrol and diesel vehicles and complete elimination of taxes on electric car.
2030	Germany. A complete ban on the sale of petrol and diesel vehicles.
2030	India. A complete ban on the sale of petrol and diesel vehicles.
2040	UK and France. Complete ban on the sales of new diesel cars.

Source: authoring

The sale of electric cars in Ukraine in January-April 2018 compared to the same period in 2017 increased by 1.5 times to 1044 units. The growth was due to the import of used cars, the share of which in Ukraine increased to 85%.

The most popular electric car in Ukraine is the Nissan Leaf, which has reached 69% of the primary market of electric vehicles. From January to April, 723 cars of this model were registered. However, only 52 cars were new from this number. The second in the ranking was the car BMW I3. 58 cars of this model were registered, 19 of which are new. Third place in the Ukrainian rating of electric cars belongs to Tesla Model S. 52 cars have been registered. And only 18 of them are new cars Tesla Model S. Also, the rating of this period included electric cars: Mercedes-Benz B - 36 cars (8 new and 28 used) and Smart Fortwo Electric Drive - 32 units (all used).

The sale of electric vehicles in Ukraine in 2017 compared to 2016 increased in 2.3 times to 2697 units. The Ministry of Infrastructure of Ukraine, within the framework of the Program for stimulating the development of the market for electric vehicles, intends to increase the share of electric vehicles sales in the domestic automobile market by 15% by 2020 (Fig.2) [8].

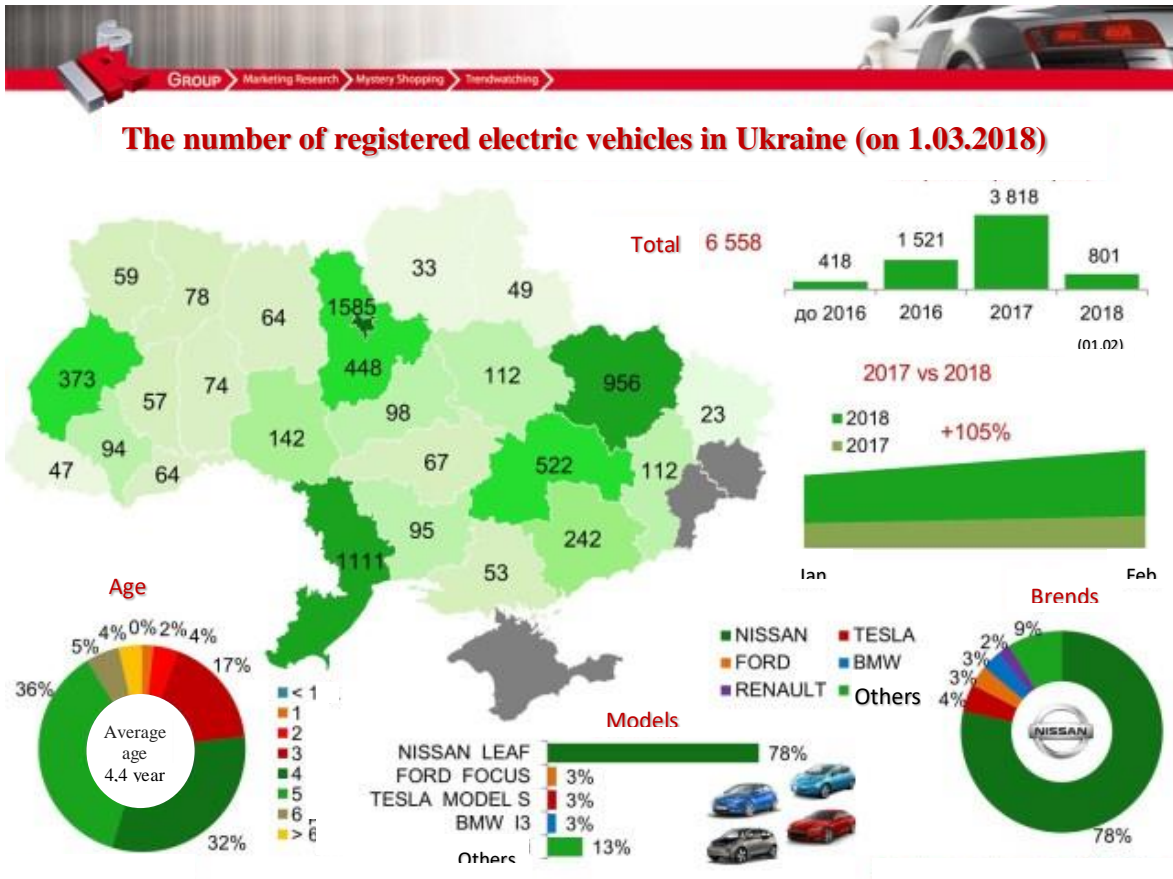
It should be noted that the success of Germany and other EU countries. Automotive is the final link in the production pyramid and determines the level of technological progress in the country. But the construction of a developed motor car industry requires a well-balanced state policy. In what conditions, such a recognized leader in the motor car industry, as Germany, has reached such heights. And most importantly - what should be done to enable Ukraine to repeat such success. In such a powerful development, a well-considered state policy is important.

Realizing that motor car industry is one of the key export industries, Germany has introduced a number of initiatives to protect it. In 2008, when the whole world suffered an economic crisis, major automakers Opel, BMW and Volkswagen received direct grants from the Federal Government. In 2012, within the framework of regional assistance, Porsche received EUR 43.67 million for the expansion of the plant in Leipzig to produce the new Porsche Macan model, with BMW in 2011 - EUR 17 million for the development of two models of electric cars [9].

In addition, the German government has implemented one of the most successful anti-crisis measures to support demand for domestic cars - a program for the disposal of old cars. The government has spent a total of EUR 5 billion on a subsidy of EUR 2,500 for each car owner, who will replace the old car (more than 9 years old) to the new one (with the Euro 4 standard for exhaust emissions). As a result, in the first half of 2009, sales of passenger cars increased by 25% [9]. In general, the implementation of anti-crisis packages of 2008-2010 has cost the country 4.1% of the annual GDP: 1.4% - tax cuts and fiscal stimulus; 2.7% - loans and guarantees. Economic measures were aimed at financial stabilization, increase of state investments, protection of employment, stimulation of demand, guaranteeing credits and loans, reducing tax burden, saving public expenditures, etc. [9].

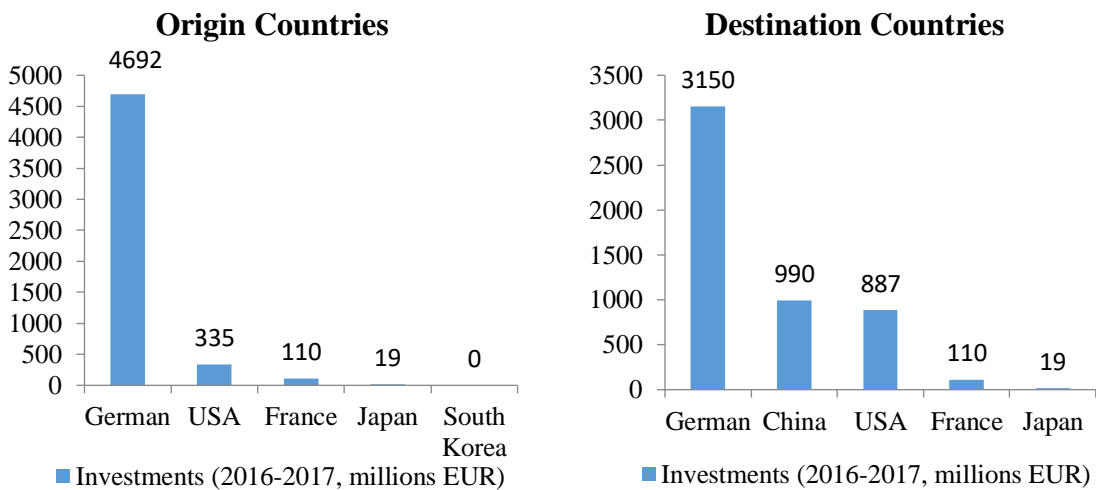
To measure the results of the German approach you can by analyzing the facts and figures that describe the motor car industry in East Germany:

- 68,700 working places;
- EUR 25 billion;
- 836,6 thousand vehicles are produced per year;
- EUR 1 billion for investment only in 2014.



Source: Ministry of Interior of Ukraine  
 Analytics and infographics: © IRS Group

Fig. 2 Registered electric cars in Ukraine as of 01.03.2018.



Source: Ernst & Young

Fig. 3 Investments in electric vehicles technology in 2016-2017

So, German motor car industry is one of the locomotives of the global mobility industry. In order to ensure their competitiveness, automakers invest billions of dollars in innovative development. Germany has invested EUR 4,692 billions in the electric car industry only in the last two years. Investments of German corporations are much larger than investments of the American (EUR 335 millions) and Japanese (EUR 19 millions) firms (Fig.3) [9].

In Ukraine, the production of light passenger vehicles reached peak in 2008 and amounted to 402 thousand units. At the same time, a record rate of new car sales was fixed, while the Ukrainian car market ranked 7th in Europe with an estimated 623 thousand new cars [8].

Already in 2009, the production of light passenger vehicles decreased by 5 times, to 65.7 thousand units, or 1.4 cars per capita. The fall in volumes of production is due to the crisis in the world economy, as well as the depleted demand for the population by car and the lack of cheap credit resources. Also, due to the reduction of the import duty from 25% to 10%, after the accession of Ukraine to the WTO, a change in the structure of filling the domestic market and a significant imbalance in the direction of imports occurred [8].

Given the electric car boom in Europe, Ukraine has a unique chance to show itself and become one of the leaders in the production of electric vehicles. The strategy of success can be based on the ability to create conditions for European experience to attract world automakers that are in need of expansion of production capacity.

**Conclusions.** Therefore, it is advisable for Ukraine to change the existing format of the motor car industry and to take the roadmap for the development of electric vehicles, stimulating not only the market but also starting its own production. The Ministry of Infrastructure is already active in this direction - the 15-year strategy for the development of electric vehicles in Ukraine was developed and the relevant bills were registered: No. 8160 «Project Law on Amendments to the Customs Code of Ukraine on Stimulating the Development of the Electric Car Industry in Ukraine» and No. 8159 «Project Law on Amendments to the Tax Code of Ukraine» and certain legislative acts of Ukraine on stimulating the development of the electric transport sector in Ukraine. They offer the row of privileges for production development and electric vehicles market. And already from this year advantageous terms operate for the import of ecological transport, that in totality will allow to bring down the electric car cost on 25%.

But this will not be enough if the investment climate will remain unfavorable for the entry of global companies. Therefore, it is necessary to create conditions for the development of industrial parks, introducing fiscal and customs incentives for their participants. In addition, it is important to develop and implement mechanisms to compensate the investor for the creation of infrastructure.

Another necessary step for the restoration and development of the motor car industry is the liberalization of the process of industrial assembly, in particular, through the abolition of the excise tax on bodies for the industrial assembly of cars, as well as the accelerated liberalization of import duties on cars produced in Ukraine.

However, all these steps may be in vain if the market continues to dominate the mess and inactivity with regard to the situation with cars on a foreign registration. It's been more than a year since the situation went out of control and reached a dangerous level.

With the creation of a favorable business environment, Ukraine can turn into a powerful production center for world automakers. This, in turn, will lead to accelerated growth of the economy and the attraction of advanced technologies in the near future. After all, the electric car industry for Ukraine is a portal that allows you to jump in a new era of the



motor car industry, and, even without having its own innovation, take its place among the leading countries in the automotive market. Ukraine has the potential and capabilities, the government must find methods to secure its highly developed future.

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