

PAPER • OPEN ACCESS

GLONASS technologies as innovative development of road transport: social and economic impact

To cite this article: O V Grivanova *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **632** 012050

View the [article online](#) for updates and enhancements.

GLONASS technologies as innovative development of road transport: social and economic impact

O V Grivanova, R I Grivanov and R A Reshetnikov

Vladivostok state university of economics and service, 41, Gogolya Street, 690014, Vladivostok, Russia

E-mail: Reshrobert@icloud.com

Abstract. This article describes the current state of navigation technology within the motor transport sphere based on the GLONASS system. In this article, the example of the “ERA-GLONASS” emergency alert system is used. Consideration is given to both the systems operation and technical solutions. Further consideration is also given to the experience of the implementation of the “ERA-GLONASS” system within the automotive industry. It also considers the impact of the state rules and regulation required to equip cars with this system on the market of used imported cars operating within Russia. The author further researches issues related to the organization of a system of authorized centers for the installation and maintenance for “ERA-GLONASS” equipment within the Primorsky Kray region and the associated social and economic consequences. Recommendations are made for further development of the application of technologies of global navigation systems in road transport, taking into account the positive and negative experiences of implementation to date.

1. Introduction

The role of telecommunication technologies is becoming increasingly important within the transport and logistics spheres. In the future, this trend will be further strengthened not only for commercial transport, but also for individual transport. Relevance of this research is determined by the important role of automobile transport in the social and economic development of society and also by the current state policy required to implement GLONASS technologies. The impact of this policy could potentially be a determining factor concerning its operation within commercial and personal vehicles. Therefore, a comprehensive study of the subject becomes one of the main tasks of the entire research into the economy, organization, current planning activities and innovative development within the automobile transport sphere.

This research article relates to the application of a syncretic approach and analysis of the object of study not only in terms of technical and technological components of the implementation of the GLONASS technologies process within Russia and Primorsky Kray, but also in the analysis of social and economic factors related to these processes. This allows consideration for not only the dynamics of the innovative development within the navigational technologies sphere, but also the impacts and risks of the economy of this key sector.

The aim of this research paper is to assess the value of the “ERA-GLONASS” system to date and the level of success of its implementation within the Russian Federation and in Primorsky administrative division of the Russian Far East.

The following research objectives based on this aim are:



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

- i. to assess the impact of technical regulations and standards associated with this system on the road transport sector;
- ii. to analyze the experience of Primorsky Kray and identify systemic deficiencies in the implementation of this system in the region;
- iii. to make recommendations for optimizing the use of “ERA-GLONASS” in road transport in the region and the country as a whole.

2. Methodology and results

From the latest publications on this topic, it is necessary to mention the work by D V Dyachenko [1], V V Terentyev [2], A V Stepchenkov [3] and D M Yusupova [4]. Although their combined research provides much relevant and valuable information on the investigated problem, it does not cover the situation in detail within the Primorsky Kray region, where the role of the importation of road transport into the economy is of very high importance for both businesses and individuals. Further to this, it has become apparent during our research that has been minimal focus on the relationship between the regional economy and the technical level of the implementation and use of the “ERA-GLONASS” system.

Federal Law No. 395-FZ dated December 28, 2013 describes “ERA-GLONASS” as a geographically distributed automated information and accident emergency response system that provides for the receiving of operative information in an unchangeable form based on the use of signals for the global navigation satellite system of the Russian Federation, information of traffic accidents and other accidents on the roads of the Russian Federation. This includes also the processing of this information, its storage and transfer in emergency operating services [5].

A key indicator in the successful application of the “ERA-GLONASS” system can be seen in the high proportion of cars equipped with this system and emergency call devices in cars within Russia. These data are presented in table 1 [6].

Table 1. Data cars park in Russia.

Indicator	2016	2017	2018
Registered cars in the country (thousands)	45 163	46 887	-
Cars equipped with “ERA-GLONASS” (thousands)	215	1 202	3 392
Percentage of vehicles equipped with “ERA-GLONASS”	0,52	2,73	-

According to table 1, it can be concluded that the public uptake of the “ERA-GLONASS” system has not been, to this date, completely adequate. This would indicate that more effective measures are required to convince Russian car users to implement the “ERA-GLONASS” system. In this connection, the analysis is the determination of the direction of infrastructure improvements.

According to the developers, this should have a positive impact on mortality statistics for accidents in the country. Let us consider the statistics of traffic accidents in the country for the period from 2013 to 2018, which are presented in Figure 1 [7]. According to JSC “GLONASS” till 13.03.2019, 2 659 583 system calls were received and processed, of which 31 786 were demanded emergency responses [8].

Figure 1 shows that over the past six years there has been a reduction in the number of victims per thousand traffic accidents for the whole period, including the number of those wounded and deceased, with the average annual rate of reduction being 0.2%. This trend formed as a result of reducing the number of deaths per thousand traffic accidents – an average of 3.9% per year. Therefore, considering the positive trend of decrease in the number of victims, as well as the number of deaths per thousand traffic accidents, there has been a dynamic growth in the number of wounded, which in this context is a positive factor. For greater visibility, consider in table 2 the dynamics of the mortality in traffic accidents at 100 thousand per population by country and Primorsky Kray, in particular [9].

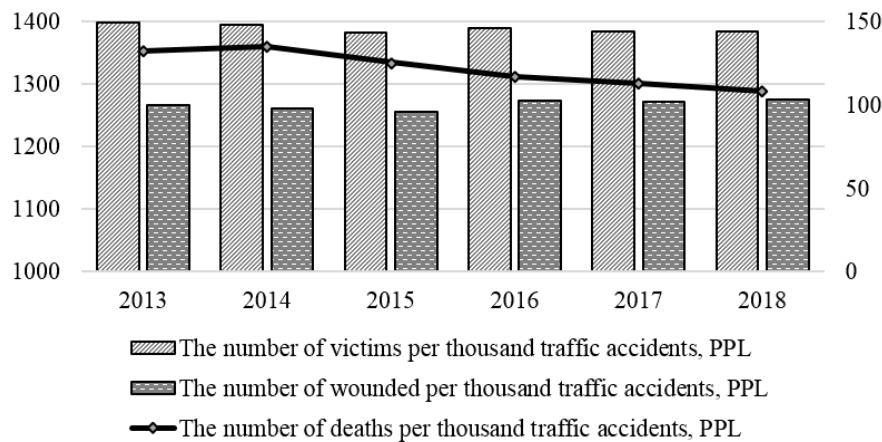


Figure 1. Statistics of road traffic accidents in the country.

Table 2. Deaths in traffic accidents per 100 thousand population.

Indicator	2013	2014	2015	2016	2017	2018
Russia	18.85	18.77	15.80	13.86	13.00	12.40
Primorsky Kray	21.98	20.17	15.62	12.65	13.73	16.25

The data presented in table 2 show a trend of reducing mortality in traffic accidents both in Russia and in Primorsky Kray, however, there has been ahead of the curve in the average annual rate of reduction of the country (8%) over at an average annual rate of decline for the Primorsky Kray (6%). In addition, the negative is that the value of mortality in Primorsky Kray during the reporting period exceeds the averages of country. This statistic confirms the need for the implementation of the “ERA-GLONASS” system, which will reduce both the time of response and the provision of necessary assistance to victims. Consequently, this will reduce mortality on country roads. Moreover, it is indicative that in Primorsky Kray the implementation and the successful operation of this system is essential.

Of particular note is the fact that vehicle imports within the Primorsky Kray region are of a high level. Based on the example of Primorsky Kray it is therefore important to assess the impact of the introduction of the “ERA-GLONASS” system to consumers of used cars. Subsequently since January 1 2017, the technical regulations of the customs union “On Safety of Wheeled Vehicles” [10], came into force, requiring imported cars to install the Emergency Call Device.

In 2017, the two organizations were engaged in the sale and installation of the Emergency Call Device, offering their services for the same price. In 2018, the number of accredited implementation agents and policy centers had risen to 12, the list of which is published on the official website of JSC «GLONASS». As a result, the market situation has become more favorable for consumers [11]. The survey companies calculated an average price of the Emergency Call Device and an average price for services at the end of 2018. The results are presented in table 3.

Table 3. The cost of equipping the used car in the period of 2017-2018.

Indicator (rubles)	2017	2018	2018-2017	2018/2017 (%)
Emergency Call Device's price	22 361	17 000	-5 361	76.0
Emergency Call Device activation and identification in AIS "ERA-GLONASS"	1 950	2 000	+50	102.6
The cost of installation services	2 800	1 500	-1 300	53.6
Total	27 111	20 500	-6 611	75.6

According to table 3, the total cost of the complete installation procedure of Emergency Call Device on the used cars has decreased by 24% largely due to lower prices for the device. However, it is worth noting, this decrease is due to the advent within the Primorsky Krai region of new agents to implement, rather than a decline in the cost of this equipment.

The calculation of the proportion of costs for equipping the car device in relation to the price of the cars prices is of important value. As a result of this fact, it is worth considering the data of import used cars in table 4 [12].

Table 4. Data of import in Primorsky Krai of used vehicles from countries outside the Customs Union.

Indicator	2015	2016	2017	2018
Number of vehicles	9 244	18 452	23 929	13 309
Customs value, thousand rubles	1 940 213	4 179 531	5 441 277	3 626 600
Average customs value of one vehicle, rubles	209 889	226 508	227 393	272 492

According to table 4, imports reached maximum values in 2017 and in 2018 import values decreased sharply, both in natural and cost value. However, the estimated average customs value of one vehicle in 2018 increased by 20% due to the change of commodity structure of imports and an increase in the average annual United States dollar. In other words, certain documentary difficulties, as well as additional time and the financial cost of the importation of used vehicle on the territory of Russia negatively influenced imports.

As mentioned previously, the cost of equipping an Emergency Call Device has been added to car import costs since the beginning of 2017. These costs, in the year 2017, accounted for 12% of the calculated average of the customs value of the imported vehicle, while in 2018 this was reduced to 8%. It is worth noting, that the vehicle import costs included customs duties, international transportation costs, insurance costs, temporary storage costs, etc. Therefore, consumers need to consider such claims as additional financial expenses rather than an opportunity to improve the efficiency of the transfer of the necessary emergency services data.

The development of such technologies is a worldwide trend. Along with the development and implementation of the "ERA-GLONASS" system, the European counterpart "eCall" was launched simultaneously. Introductory work was commenced on the European system in 2013 with the system being successfully completed in 2015 and cars being fully equipped by the end of 2018 [13]. Presently the "ERA -GLONASS" and «eCall» systems are synchronized. This will enable Russian motorists within the territory of the European Union to obtain guaranteed assistance in the case of an emergency. This will also apply to European motorists who are in the territory of the Russian Federation.

However, the Russian market is not ready for the mass commercialization of the system, in spite of the technical importance of such systems and the availability of their own "GLONASS" satellite network, which are able to compete in the long term with foreign systems. It is significant that in the organizational and technical terms with similar problems faced by the introduction of a "Platon" system for trucks [14]. For the further effective development of the two systems, which are undoubtedly

important for the transport and logistics infrastructure of the Russian Federation, both negative and positive experience already available in their implementation need to be taken into account.

The main negative factor in relation to the implementation of the “ERA-GLONASS” system is the adoption of restrictive measures to equip the car device. This results in much discontent and resistance on the part of consumers, as well as an expression of distrust regarding the system. This adversely affects the number of equipped vehicles in the country and the importation of used cars in Primorsky Krai. However, this was eased by the adoption of a temporary order [15] that provided support for citizens, who chose to purchase a car outside the Customs Union because of lower prices and high quality. This document permitted the consumer to import one vehicle category M1 or N1, imported over 1 year without installing the Emergency Call Device. This development is beneficial for those interested in financial savings when purchasing a car, taking into account a general reduction in purchasing power. It is worth noting that the order reduced the burden on the agents responsible for the implementation of the Emergency Call Device, customs processing time and also reduced the load on the warehouses of temporary storage. The drawback, however, is that this order does not aim at further development of the system. Moreover, it reduces the growth rate of the equipment devices on used cars. As a consequence this reduces the effective functioning of the “ERA-GLONASS” system, which proved to be a necessary measure in reducing the mortality in traffic accidents.

3. Conclusion

Thus, improving the efficiency of the “ERA-GLONASS” system is of the highest priority when ensuring a high rate of installation of Emergency Call Device on used cars and reducing the burden on citizens. To achieve this, it is recommended that action needs to be taken in the following areas:

1. Production capacity for Emergency Call Devices needs to increase by attracting enterprises within the territory of the Far East. This will reduce the self-cost of equipment and also reduce the production time for release to the final consumer. It is also necessary to extend the sales and service network of equipment based on “ERA-GLONASS” system. This will create increased workplaces for technical specialists and, in the process, solve staffing problems while at the same time encourage the development of education and professional retraining of specialists of this profile at the State level.

2. The introduction of a rewards system for citizens that voluntarily install the equipment. An example of such measures would be to enable citizens in the cost-effective acquisition and installation of equipment. For example, the purchase of equipment at production cost and free activation will significantly reduce costs and encourage citizens to equip their cars. In addition, it is possible to decrease the value of insurance or registration at the time of a traffic accident. Such measures have been implemented in the central part of Russia. European Protocol is being used to register traffic accident in the territories of Moscow, St. Petersburg, Moscow and Leningrad regions from January 1, 2018. It is an experimental way, which provides insurance indemnity within the limits of sum insured 400 thousand rubles in case of the submission of data recorded with the help of technical means of control to the insurer about the circumstances of the injury of vehicle because of the traffic accident.

3. It is possible to involve private businesses through public-private partnership to provide the “ERA-GLONASS” system infrastructure. For example, services of private hospitals for citizens who agreed to the service at his own request and with surcharge. This would give a 100 percent guarantee that an emergency team would respond in the shortest possible time, or, in the event of the accident in a remote place, an airborne rescue operation would be undertaken. Such services would also reduce the load and optimize the work of general ambulance departments.

References

- [1] Dyachenko D V and Efimov I A 2017 Urgent issues in implementation of the project “ERA-GLONASS” *Navigation News* chapter 1 pp 38–40
- [2] Terentiev V V, Andreev K P and Shemyakin A V 2017 Increasing the effectiveness of the system of “ERA-GLONASS” *Modern Materials, Equipment and Technologies* **5(13)** 86–91

- [3] Stepchenkov A V 2017 “Era-glonass” and “black boxes” in cars. A far future or today's reality *Science without Borders* **4(9)** 20–23
- [4] Yusupova D M and Vyguzova M A 2017 Application of alarm button on automobile transport *Proc. 4th Int. Conf. (Penza) Innovative Development of Modern Science: Problems, Perspective and Patterns* **1** 40–42
- [5] *Federal Law On State Automated Information System “ERA-GLONASS”*, Law No. 395-FZ December 28, 2013
- [6] Rosstat 2018 *Transport in Russia. 2018* (Moscow: Federal State Statistic Service) p 101
- [7] Statistics on road traffic accidents *Official website of the State inspection of road traffic safety* URL: <http://stat.gibdd.ru>
- [8] The State automated information system “ERA GLONASS” *Official website of JSC “GLONASS”* URL: <http://aoglonass.ru/gais-ehra-glonass/>
- [9] Mortality in traffic accidents *Unified interdepartmental information and statistical system* URL: <https://www.fedstat.ru/indicator/43780/>
- [10] Decision of the Board of the Eurasian Economic Commission of 13.12.2016 N 164.
- [11] Information on installing the device with the function call to emergency services *Official website of JSC “GLONASS”* URL: <https://aoglonass.ru/ao-glonass/doku-menty/informaciya-po-ustanovke-ustrojstv-s-funkcij-vyzova-ekstrennyh-operativnyh-sluzhb/>
- [12] Customs statistic of foreign trade *Federal Customs Service* URL: <https://stat.customs.ru/>
- [13] Alekseev V 2015 Comparative Characteristics of Emergency Response “eCall” and “ERA-GLONASS” Systems *Wireless Technology* **4(41)** 16–22
- [14] Patsuk E B and Banova V S 2016 Differences and Problems of the New System “Platon”, Based on GLONASS, and the Old System “ERA-GLONASS” *Actual Problems of Aviation and Cosmonautics* **2(2)** 81–83
- [15] *Temporary order of import to the territory of the Russian Federation of used right-hand drive cars by residents of the Far Eastern Federal district for their own needs* approved by the Government of the Russian Federation 21.11.2018