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THE INFRASTRUCTURE OF ROAD TRANSPORT IN POLAND IN SHAPING THE STATE SECURITY

Abstract

The infrastructure of road transport, as one of the elements of the country's transport system, has a significant impact on the implementation of all kinds of transport taking place within the particular transport branch. Current quantitative and qualitative nature of individual infrastructural elements occurring in Poland, as well as the possibility of their further development are of great importance in shaping multidimensional security of the Republic of Poland.

Keywords: infrastructure, road transport, security, Poland

Introduction

One of the determinants of modern country security is a well-functioning transport system that allows people and cargo to move around during peace, crisis and war. Among its elements, transport infrastructure plays an important role, including the commonly used road transport infrastructure. How it shapes Poland's security is conditioned mainly by the condition of its individual elements, considered in terms of quantity and quality. The degree of implementation of emerging infrastructural innovations is also significant. The high level of infrastructure development of the country and innovation are identified with the readiness to respond to emerging needs, challenges and threats, as well as with the guarantee of the freedom to implement a number of processes directly or indirectly related to transport.

The purpose of this article is therefore to show the role of road transport infrastructure in shaping the security of the country, perceived through the prism of military security, ecological security and road traffic security. Thanks to the identification of problems in the area of road transport infrastructure and the indication

of priority actions, it is possible to develop the infrastructure of the transport branch described and, consequently, to improve the security of the Republic of Poland.

1. The role of road transport infrastructure in shaping the security of the country

When considering the transport infrastructure, it is worth emphasizing the role of the indicated transport branch. Thanks to many advantages, such as spatial availability, the possibility of transporting door to door or relative speed and flexibility, road transport has become widely used. It satisfies a number of needs related to the movement of persons and cargo during peace, crisis and war, as well as enabling efficient and effective functioning of the economy on a global and national scale. Proper implementation of transport tasks depends largely on the condition of the transport system. Its efficient operation is therefore influenced by all the elements that create it, i.e. means of transport, transport infrastructure, human capital, principles, rules as well as those taking place between individual components of dependencies and relations[1].

Although the literature provides different interpretations of the term infrastructure, for the purposes of this article it was assumed that transport infrastructure is made of buildings permanently associated with the area, forming the basis of transport lines and points, and also contribute to the social and economic development of a given country or region[2]. The integral elements of the transport infrastructure are now innovative tools that use information and communication technologies (ICT) to manage transport, including transport infrastructure management, the so-called intelligent transport systems (ITS)[3]. In accordance with the provisions of the Transport Development Strategy until 2020 (with a perspective until 2030), the following are mentioned among the directions of intervention in the framework of road transport: supporting the development of intelligent transport systems, contributing to increasing the efficiency of using existing road infrastructure and improving road safety[4]. It can therefore be concluded that "intelligent" roads, vehicles, parking lots and signs will develop intensively, and intelligent transport systems are the future in the field of transport[5]. At the same time, it should be emphasized that the development of individual infrastructural elements of road transport should not only consist in creating an integrated

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1 E. Dębicka, T. Jałowiec, *Zapewnienie ciągłości działania systemów transportowych*, Prace Naukowe Politechniki Warszawskiej. Transport 2016, 111, p. 36.

2 K. Wojewódzka, R. Rolbiecki, *Infrastruktura transportu. Europa, Polska – teoria i praktyka*, PWN, Warsaw 2018, p. 17.

3 *Ibidem*.

4 *Transport Development Strategy until 2020 (with prospects until 2030)*, Ministry of Transport, Construction and Maritime Economy, Warsaw 2013, p. 70, https://www.gov.pl/documents/905843/1047987/Strategia_Rozwoju_Transportu_do_2020_roku.pdf/ead3114a-aac7-3cdd-c71d-7f88267ce596 (access: 9.03.2018).

5 J. Mikulski, *Budowa i rozwój inteligentnych systemów transportowych*, Współczesne Systemy Transportowe 2015, 1, p. 12, http://www.wydawnictwo.wst.pl/uploads/files/5eac1f18e9f40547516076bdf52cc531.pdf (access: 9.03.2018).

transport network or increasing capacity, but also in striving to improve safety[6]. For example, the construction and modernization of the linear and point transport infrastructure in Poland should take into account the requirements of using electric cars (striving to improve the environmental safety of the country) or the latest global results in the elimination of technical and organizational causes of road accidents (striving to improve transport safety, road traffic safety).

The very concept of security is defined in many ways, including as a state of non-threat[7] or a state that gives a sense of confidence and guarantees its maintenance and a chance for improvement[8]. However, an in-depth analysis of the various interpretations of this term allows to conclude that in addition to reducing threats, security should be seen through the prism of the possibility of free development as well as ensuring prosperity. What is more, the contemporary dimension of security cannot be identified only with the assurance of internal order or territorial integrity, which is why in the literature there are different types (divisions, areas) of security, among others classification taking into account military, economic (energy, raw materials, food, economic), political, ideological, social, cultural, demographic, humanitarian, health, ecological, scientific and technical security[9]. It should be said that country security should be perceived as multidimensional – the ambiguity and even ambiguity of the concept considered from the point of view of researchers of security sciences, political science, international relations and others, on the one hand demonstrates its enormous content and subject-matter complexity and, on the other hand, about the constant need to conduct interdisciplinary research on this multifaceted and multidimensional research category[10]. When carrying out safety considerations with regard to road transport and its infrastructure, it should be noted that they can also cover many aspects. Because it is impossible to describe all of them, the following parts of the article will only present examples of connections between the infrastructure of road transport occurring in the territory of the Republic of Poland and safety in the military, ecological and road safety aspects. The presentation of the role of road transport infrastructure in shaping the security of the state will be possible by showing the current state of selected infrastructure elements and identifying problems related to their use and development. Due to the extensive scope of the problem, it was also considered appropriate to narrow the scientific considerations only to selected components of the infrastructure of the described transport branch.

Some of the problems in the area of road transport infrastructure arise from the very characteristics of the infrastructure. For example, a long period of its formation is associated with the freezing of expenditures that are spent on its construction. What's more, the effects of the works are not immediate – sometimes it is necessary to wait even a dozen or so years for the final commissioning of the facility.

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[6] M. Sitarz, *Zintegrowany system i środki transportu w Polsce*, Silesian Technical University, Katowice 2009, p. 36.

[7] https://sjp.pwn.pl/slowniki/bezpiecze%C5%84stwo.html (access: 9.03.2018).

[8] *Słownik terminów z zakresu bezpieczeństwa narodowego*, eds. J. Kaczmarek, W. Łepkowski, B. Zdrodowski, National Defence Academy, Warsaw 2008, p. 14.

[9] J. Gryz, *Bezpieczeństwo państwa. Zarys problematyki*, National Defence Academy, Warsaw 2016, s. 21.

[10] *Wielowymiarowość kategorii bezpieczeństwa: wymiar społeczny*, vol. 1 [in:] eds. K. Sygidus, P. Łubiński, Denys Svyrydenko, Bookmarket Publishing & Editing, Olsztyn–Warsaw–Kiev 2018, p. 5.

In addition, infrastructure investments are often unique, implemented in various conditions, related to the area, which causes that unforeseen technical problems occur in the course of implementation, resulting in economic problems and, as a result, the time of infrastructure projects often exceeds the previously planned[11].

Another issue that is a significant obstacle to the proper functioning and development of infrastructure may be its capital intensity, and, consequently, all issues related to its financing. Poland can use various sources of financing for the construction and modernization of roads, including the state budget or the National Road Fund (including also funds from the European Union). The "Public-Private Partnership" (PPP) also offers many opportunities, an example of which is a part of the A1 motorway, running from the Gdansk area to Toruń, 152 km long, which was implemented between the State Treasury and the company Gdansk Transport Company[12]. Nevertheless, despite the huge expenditures for the development and modernization of the Polish transport infrastructure, this area can still be considered as underinvested, primarily due to the large number of investments necessary to carry out and high costs of their implementation.

Many infrastructural difficulties occurring in Poland are also connected with the quantitative and qualitative status of the car transport infrastructure and the deployment of the road network. The new administrative system introduced in 1999 influenced the division of the national public road network, distinguishing the following categories: national roads, voivodship, county and commune roads[13]. At the end of 2015, the length of all roads in Poland was 419 636.4 km, of which 290 919.1 km were roads with a hard surface. Table 1 presents information on the managers of the aforementioned public roads category in Poland and their length at the end of 2015.

Table 1. List of public roads in Poland and their administrators

Category of public road	Length of roads – on 31st December 2015 [km]	Road administrators divided into categories
National roads	19 292.8	General Director of National Roads and Highways [excluding sections of national roads within cities with county rights and sections of toll motorways whose manager (after signing a concession agreement) becomes a concessionaire
Voivodship roads	29 108.6	voivodship board
County roads	125 092.3	county board
Commune roads	246 142.7	commune head (mayor, city president)

Source: study based on: https://www.gddkia.gov.pl/pl/a/6846/zarzadzanie-drogami-publicznymi (access: 3.03.2018); *Transport – results of operations in 2016*, Central Statistical Office, Warsaw 2017, p. 51, https://stat.gov.pl, 9/03/2018 (access: 9.01.2018)

[11] K. Wojewódzka-Król, *Problemy rozwoju infrastruktury transportu w Polsce w świetle tendencji unijnych*, Logistyka 2010, 3, p. 18, https://www.logistyka.net.pl/bank-wiedzy/logistyka/item/download/1389_57a-5f907aa03e4e932034fef81994504 (access: 16.02.2018).

[12] http://www.ndi.pl/ppp/autostrada-a1 (access: 17.02.2018).

[13] Annex to Resolution No. 105/2017 of the Council of Ministers of 12 July 2017 amending the resolution on establishing a long-term program under the name "National Road Construction Program for 2014–2023 (with a prospect until 2025)", http://mib.gov.pl/2-program_budowy_drog_krajowych.htm (access: 20.02.2018).

The distinction of administrators clearly defines who is responsible for a particular road, its maintenance, repairs and further development. It should also be noted that within the limits of cities with county rights (65 cities), the functions of the administrator of all public roads (except for motorways and expressways), i.e. national, provincial, county and municipal roads, are fulfilled by the management of the city[14].

In Poland, at the end of 2015, the average density of hard-surfaced roads was 93 km/100 km^2, while this density cannot be considered as homogeneous across the country. For example, in the Warmian-Masurian Voivodeship the density of roads with a hard surface (at the end of 2015) was about 55.2 km/100 km^2, while in the Silesian Voivodeship it was 175.5 km/100 km^2[15]. The technical condition of road surfaces may also be a source of a number of difficulties. For example, the state of national roads, managed by the General Directorate of National Roads and Highways, at the end of 2015 in 60.6% was assessed as satisfactory, but 25.3% were roads with a warning state, and 14.1% – roads with a condition critical. At the end of 2016, there were 51.8% of roads with satisfactory pavement condition, but the decrease in relation to the previous year is largely a consequence of methodological changes as well as more precise measurement procedures and technologies, which have been implemented by General Directorate for National Roads and Highways since the beginning of 2016[16]. Another characteristic problem for the national road network in Poland is their non-adaptation to the load transfer of 115 kN/axle. Not without significance is the fact that many roads in Poland with high traffic flows through urban areas. In addition, although the national road network in Poland accounts for only 4.6% of public roads in total, it transfers as much as 60% of traffic[17]. That is why it seems so necessary to systematically modernize the above-mentioned infrastructural elements, as well as to expand them.

Highways and expressways, which are characterized by the highest technical standard, remain the most important roads for national security. However, it is worth emphasizing that currently there is a lack of a coherent network of expressways in Poland[18]. At the same time, it should be added that as of March 2018, 1638.45 km of highways and 1807.3 km of expressways were built in Poland, which gives a total length of 3445.75 km of expressways[19]. According to the Regulation of the Council of Ministers of 19th May 2016 amending the regulation on the network of motorways and expressways, approximately 7650 km of expressways will be created in Poland, including about 2000 km of motorways[20].

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[14] https://www.gddkia.gov.pl/pl/a/6846/zarzadzanie-drogami-publicznymi (access: 3.03.2018).

[15] *Transport – results of operations in 2016*, Central Statistical Office, Warsaw 2017, p. 51, https://stat.gov.pl (access: 9.01.2018).

[16] M. Radzikowski, G. Foryś, M. Bogdaniuk, *Raport o stanie technicznym nawierzchni sieci dróg krajowych na koniec 2016 roku*, https://www.gddkia.gov.pl/userfiles/articles/r/raporty_18751/Raport%202016.pdf (access: 13.03.2018).

[17] Annex to Resolution No. 105/2017…

[18] *Ibidem*.

[19] https://www.gddkia.gov.pl/pl/926/autostrady (access: 13.03.2018).

[20] Regulation of the Council of Ministers of 19 May 2016 amending the regulation on the network of motorways and expressways (Journal of Laws of 2016, item 784).

In summary, the road transport infrastructure, as one of the elements of the country's transport system, enables meeting various needs related to relocation and thus forms the basis for socio-economic development. However, at the same time the unsatisfactory condition of its individual elements may have a negative impact on the security of the state, hence the need to strive for its continuous development.

2. The development of road transport infrastructure in Poland from the perspective of national security

In the deliberations under consideration it is worth considering what determinants have a major impact on the development of Polish road transport infrastructure. The analysis of scientific and journalistic sources made it possible to identify the following key development factors:

- multi-channel financing of infrastructure investments (including noticing the necessity of cooperation between the public and private sectors);
- using the development of innovations in the construction and modernization of transport infrastructure facilities, as well as the implementation of new technologies;
- continuity of investment implementation regardless of political changes;
- making decisions in the field of modernization and development of the car transport infrastructure by educated staff based on extensive analyzes in the scope of determining priority activities and optimal ways of their implementation.

In addition to identifying the determinants of the development of Polish road transport infrastructure, it is worth considering what activities in the scope of its extension, modernization, implementation of new organizational, legal and technological solutions can shape the security of the state. The examples presented below refer to the improvement of military and ecological safety and road traffic safety.

The quantitative and qualitative condition of the road transport infrastructure should enable the implementation of a number of transport tasks not only during the uninterrupted functioning of the country, but also when different types of challenges or threats start to affect the country's transport system, or if there is already an armed conflict in the country. Therefore, the defensive preparations of the country are being carried out, defined as a process implemented by all entities of the state defense system, covering the entirety of planning, organizational and material-financial undertakings aimed at preparing forces and means and procedures of these entities to ensure survival the state and its citizens in the event of an external threat to security and during the war[21].

One of the many areas of defensive tasks implementation by the state defense system entities is the preparation of transport and transport infrastructure for defensive needs. It should be pointed out that the preparation of road transport infrastructure includes: preparation of public roads for use during the war, construction of detours of selected cities and road junctions, reduction of single-level

[21] M. Kuliczkowski, *Pozamilitarne przygotowania obronne w Polsce. Próba systematyzacji procesualnych oraz funkcjonalnych aspektów przygotowań*, National Defence Academy, Warsaw 2016, p. 29.

road intersections with railway lines characterized by high frequency of traffic, maintenance of existing journeys and collision-free crossroads, construction of so-called bridges duplicating, construction and maintenance of road border crossings, construction and modernization of roadside airport sections[22].

The effects of implementing the above actions can affect the flow of people, equipment, supplies etc. during a possible crisis or war, but also cause beneficial changes in the everyday use of roads in time of peace.

It is worth mentioning that at the beginning of 2018, the President of the Republic of Poland signed the amendment to the Act on Public Roads, concerning roads of defensive importance. These roads are designated in time of peace, but they can be used both during peace, crisis and war in order to carry out transports essential for the defense of the country and fulfillment of allied obligations. Until now, the roads with a defensive significance were mainly highways and expressways. The legislative changes introduced make it clear that currently defensive roads can belong to all road categories[23]. Therefore obstacles of defensive importance will be county and commune roads, access sections to airports or seaports, polygons, material depots or special objects, as long as they are deemed necessary for the movement of the Polish Armed Forces and allied troops[24]. This means that tasks related to the reconstruction and modernization of roads of defensive importance, carried out as part of state defense preparations, will be able to be financed from the state budget as part of defense expenditures[25]. This solution will avoid a situation where, for example, a particularly important road for the future transport of heavy equipment (e.g. tanks on low-loader sets) is not adjusted, while local managers do not have the funds for such investments. It is also worth adding that in a situation when a reconstruction of a county road with a defensive significance is planned, its manager will be able to report the desire to build a sidewalk or bicycle path, if he participated in its financing[26].

Apart from the area related to defense preparations, the car transport infrastructure can also shape ecological safety. Road transport is a branch that has a very negative impact on the natural environment, primarily through the emission of pollutants into the atmosphere, however, solutions that reduce these phenomena are increasingly being used. An example of this may be the use of intermodal transport on a larger scale or the use of eco-driving rules by drivers, but particular importance is attributed to emerging technological and infrastructural innovations. The development of the electric car market entails the need to develop appropriate charging solutions. According to the act on electro mobility and alternative fuels adopted at the beginning of 2018, nearly 6400 vehicle charging points by electricity will be created in Poland by 2020[27]. Referring to the linear infrastructure of the described

[22] See the Regulation of the Council of Ministers of February 3, 2004 on the conditions and manner of preparation and the use of transport for defense purposes of the state, as well as its protection during the war, and the properties of organs in these matters (Journal of Laws 2004 No. 34, item 294).

[23] The Act of 21 March 1985 on public roads (Journal of Laws 1985 No. 14, item 60).

[24] Justification of the draft act amending the act on public roads, http://www.sejm.gov.pl/sejm8.nsf/druk.xsp?nr=2038 (access: 13.03.2018).

[25] The Act of 21 March 1985 on public roads (Journal of Laws 1985 No. 14, item 60).

[26] http://www.polska-zbrojna.pl/home/articleshow/24227 (access: 14.03. 2018).

[27] http://www.me.gov.pl/node/28115&quot (access: 10.03.2018).

transport branch, it is worth pointing to the innovative technology of wireless charging of electric cars while driving, which is currently under testing. Dynamic charging of car batteries would be possible thanks to the installations located in the road surface. Spread of such a method could become another turning point in the development of motorization, and at the same time a solution supporting proecological trends and an element affecting the country's environmental safety[28].

Another important point in the deliberations under consideration is road traffic safety. Although in Poland the number of people killed and injured in recent years has decreased (for example, since 2007 the risk of death as a result of an accident has been reduced by 46%), we still rank among countries (such as Romania, Bulgaria, Latvia) with the worst statistics on road accidents and their consequences[29]. Among the various causes of road accidents, the occurrence of irregularities in the road transport infrastructure is also mentioned, bearing in mind both technical and organizational deficiencies. However, it should be noted that the influence of road factors on traffic safety is given as a reason for only 2–4% of events. At the same time, detailed studies carried out by experts from European countries lead to the conclusion that inadequate road infrastructure indirectly and directly contributes to the creation of up to 30% of accidents[30]. Therefore, it is necessary to expand and modernize the road network and at the same time the remaining elements included in the line infrastructure of the indicated transport branch, including the implementation and spreading innovative solutions. An example of this is the introduction of staple speed measurements, speed bumps with speed radar, which only come out when the car is driving at too high a speed or intelligent pedestrian crossings based on motion sensors and radio signals.

The above examples allow to state that country security can be perceived through the prism of particular types of security, which allows to precisely determine the directions of further development of road transport infrastructure and to take specific implementation measures.

Conclusions

This article presents the role of the national road transport infrastructure from the perspective of ensuring Poland's security, analyzed in terms of the criteria adopted by the author, as well as the possibilities for its further development. Among the identified problems occurring in the infrastructure of the described transport branch, among others for a large percentage of national roads in poor or

[28] http://wgospodarce.pl/informacje/36882-renault-bezprzewodowe-ladowanie-rozwiaze-problem--zasiegu-aut-elektrycznych (access: 10.03.2018).

[29] *The state of road traffic safety and activities carried out in this area in 2016*, the Secretariat of the National Road Safety Council, the Ministry of Infrastructure and Construction, http://www.krbrd.gov.pl/files/file_add/download/407_stan-bezpieczenstwa-ruchu-drogowego-oraz-dzialania-realizowane-w-tym-zakresie--w-2016-r..pdf, p. 10 (access: 9.03.2018).

[30] M. Szruba, *Wpływ infrastruktury drogowej i oświetlenia na bezpieczeństwo ruchu*, Nowoczesne Budownictwo Inżynieryjne, May–June 2017, http://www.nbi.com.pl/assets/NBI-pdf/2017/3_72_2017/Pdf/16_Wplyw_infrastruktury_drogowej_i_oswietlenia_na_bezpieczenstwo_ruchu.pdf (access: 9.03.2018).

unsatisfactory condition, unsuitable for carrying 115 kN/axle load or lack of a consistent network of expressways. Among the main factors determining the development of infrastructure in this mode of transport, the following were considered the most important: multi-channel financing, implementation and spread of innovations, participation in the planning and decision-making process of experienced staff, as well as continuity of implementation of the undertaken investments. The last part of the article presents examples of connections between transport infrastructure and country security. The issues related to defense preparations, adaptation of proecological solutions and implementation of elements reducing road accidents and their tragic consequences were also recalled here. The author acknowledges that the work can be the basis for further research in the area of road transport infrastructure in Poland, as well as be helpful in identifying elements affecting modern state security.

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