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Safety in road traffic — selected aspects of safety on Polish roads

Bezpieczeństwo w ruchu drogowym — wybrane aspekty bezpieczeństwa na polskich drogach

Abstract

The article presents the subject matter of safety in road traffic in Poland in the aspects selected by the authors. The research objective of the study was to identify, analyse and evaluate road safety in Poland. A review of the literature, i.e. books and scientific articles, as well as analysis of statistical data from the Polish Border Guard Headquarters in Warsaw, the National Police Headquarters in Warsaw and the Central Statistical Office were used to examine the problem matter. The status of road safety depends on numerous factors: the article analyses road accidents that occurred in specific months, days of the week and times of the day and considers alcohol intoxication of road users. The authors emphasize that one of the most essential problems that Poland faces today is low level of road safety. This may be for two reasons. First of all, there is an increase in the number of passenger cars, trucks, and tractor units. Secondly, the pace of road infrastructure improvement is insufficient.

Keywords:

transport, safety, evaluation, passenger, road accidents

Streszczenie

W artykule zaprezentowano tematykę bezpieczeństwa w ruchu drogowym w Polsce w wybranych przez autorów aspektach. Celem badawczym opracowania była identyfikacja, analiza i ocena bezpieczeństwa drogowego w Polsce. Do poznania problematyki zastosowano przegląd literatury, tj. pozycji zwartych oraz artykułów naukowych, analizę danych statystycznych pochodzących z Komendy Głównej Straży Granicznej w Warszawie, Komendy Głównej Policji w Warszawie oraz Głównego Urzędu Statystycznego. Stan bezpieczeństwa ruchu drogowego uwarunkowany jest wieloma czynnikami, zaś w artykule dokonano analizy wypadków drogowych, które miały miejsce w określonych miesiącach, dniach tygodnia i określonych porach doby oraz wzięto pod uwagę nietrzeźwość użytkowników dróg. Autorzy podkreślają, że jednym z ważniejszych problemów, jakie dotyczą dziś Polskę, jest ciągle niski poziom bezpieczeństwa ruchu drogowego. Może to wynikać z dwóch powodów. Pierwszym jest wzrost liczby pojazdów osobowych i ciężarowych oraz ciągników siodłowych. Drugi to zbyt wolna poprawa infrastruktury drogowej.

Słowa kluczowe:

transport, bezpieczeństwo, pasażer, wypadki drogowe

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Introduction

Transport is one of the most significant factors determining state's economic development. Well-developed transport infrastructure strengthens the social, economic, and spatial cohesion of the country and contributes to strengthening of the competitiveness of Polish economy (Kwaśniewski & Bieńczyk, 2017).

One of the key challenges facing modern transport is the issue of its safety. According to the Polish Language Dictionary, the term "safety" means a state of no threat. In relation to road traffic, safety refers to the methodological and systematic analysis of risk in the human-technology-environment system, which is carried out in order to eliminate, control or reduce (to the desired level) the incidence of undesirable events, i.e. traffic incidents, which involve a conflict or a traffic incident that originates on a public road (Wicher, 2012).

Of all transport modes, road transport is commonly considered to be most dangerous, for it has the highest accident losses in terms of fatalities and injuries. It is estimated that over 90% of all transport fatalities are directly related to road transport.

Road transport in Poland and road safety

Road transport plays a key role in Poland as a very large proportion of freight is carried by trucks. In addition, many vehicles in transit between Western and Southern Europe and countries in the eastern part of the continent pass through Poland. Road structure has, nevertheless, served users as the foundation for convenient and fast transport, which makes its stability and durability of utmost importance (Caban *et al.*, 2015).

The location of Poland on the map of Europe and the position of the country on the east-west transport route generate very high volume of transit traffic. According to the Polish Border Guard Headquarters, 12,212,171 vehicles entered Poland through the external EU borders in 2020, of which 8,678,670 were passenger cars and 1,987,921 were trucks (Polish Border Guard Headquarters, 2021).

One of the most important problems that Poland faces today is low level of road traffic safety. This is for two reasons. The first one is an increase in the number of passenger cars, trucks and tractor-trailers. The second is the fact that road infrastructure is improving too slowly (Caban *et al.*, 2015). According to statistical data, an increasing volume of traffic has

been observed on Polish roads for years. This is confirmed by the number of registered vehicles in Poland which rose by approximately 43% in 2020 compared to 2010 (Komenda Główna Policji, 2010–2020). This surge is indicative of the increasing mobility of the society.

A well-developed and modern network of motorways, expressways and dual carriageways is a prerequisite for proper functioning of economically developed countries. In countries that are modernised intensively, there is a significant acceleration in the development of the above specified types of roads. This phenomenon is also present in Poland, especially after joining the European Union (Targosz & Wiederek, 2019). According to the data of the General Directorate for National Roads and Motorways, the total number of motorways and expressways increased by 180% between 2010 and 2020. Currently, motorists have at their disposal a dual carriageway network of 4,295.4 km, consisting of 1 712 km of motorways and 2,583.4 km of expressways (Generalna Dyrekcja Dróg Krajowych i Autostrad, 2021).

Transport safety issues are some of the most strategic elements of the White Paper on Transport adopted by the European Commission in 2011, where one of the objectives for the creation of a competitive and resource-efficient transport system is to achieve nearly zero fatalities in road transport by 2050. In accordance with this objective, the European Union aims to halve the number of road accident victims by 2020. There is a call for the EU to be the world leader in safety and security for all modes of transport (European Commission, 2011).

The status of road traffic safety is determined by a number of factors, which include traffic volume, number of vehicles as well as technical and organisational solutions for road traffic (Siedlecka & Mądziel, 2016). The most serious threat to road safety is posed by drivers and their irresponsible behaviour, including speeding, failure to respect the right of way, pedestrian priority and other applicable rules. Speeding causes dangerous accidents with the highest number of fatalities (Zielińska, 2015).

A large portion of road accidents is caused by mistakes made by road users in favourable road conditions. However, road as a direct cause of accidents is rarely indicated. According to current road accident statistics, the impact of road factors on traffic safety is often underestimated and is in the range of 2–4%, while detailed studies by experts from European countries prove that inadequate road infrastructure contributes directly and indirectly to 28–34% of accidents (Barcik & Czech 2010).

Poland in comparison with the European Union member states

The state of road safety in Poland remains unsatisfactory. Between 2010 and 2020, the number of fatalities on EU roads fell by 36%, meaning that the target of a 50% reduction in fatalities set for that decade was not achieved. Only Greece exceeded the target set in the EU road safety programme (–54%), followed by Croatia (44%), Spain (44%), Portugal (43%), Italy (42%) and Slovenia (42%). In total, nine Member States recorded a decrease of 40% or more. In Poland, the number of fatalities decreased by 36% between 2010 and 2020, which is in line with the EU average.

The situation related to the COVID-19 pandemic has led to some changes in the ranking of mortality rates across the countries in 2020. Nevertheless, the safest roads are still found in Sweden (18 fatalities/1 million inhabitants), while the highest value of the indicator in 2020 was recorded in Romania (85). The EU average was 42, while in Poland this indicator reached 65 in 2020, which is the fourth highest value in the EU (Skoczyński, 2021).

Road accidents in Poland

A traffic accident is an incident which occurs as a result of an even unintentional violation of safety rules in road traffic (land, water or air traffic) which results in a bodily injury of another person causing a violation of bodily organ functions or a health disorder for a period exceeding 7 days (§ 1) or death of another person or a serious health impairment

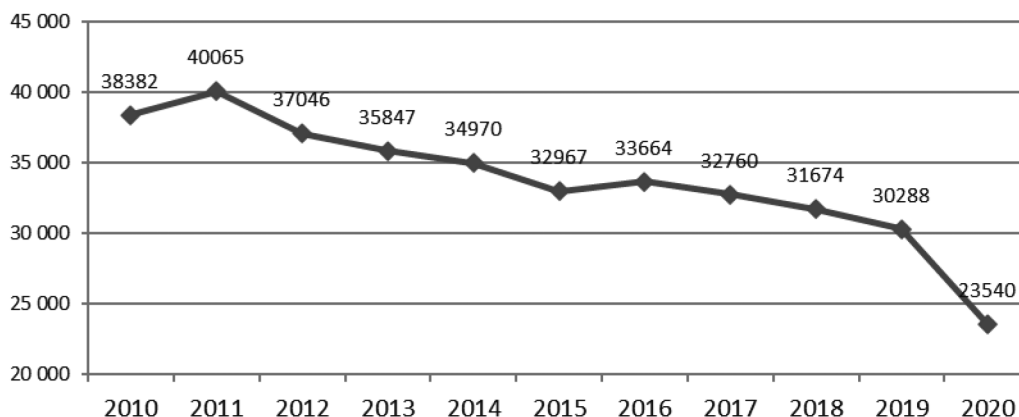
(§ 2). A road traffic incident which is not the result of any violation of traffic safety rules or which has caused a bodily injury of the offender is not considered an accident. A traffic accident referred to in Article 177 § 1 of the Penal Code is neither an event which, although it caused a bodily injury, violated the function of a bodily organ, or caused a health disorder lasting no longer than 7 days (Kodeks karny, 2021).

The analysis of data presented in Figure 1 demonstrates that in the year 2010 in Poland there were 38,832 road accidents, whereas in 2020 there were 23,540. This gives a decrease in the total number of accidents of about 38% in 2020 compared to 2010. However, during the period analysed, the safety situation became worse between 2010 and 2011 and 2015 and 2016. Since 2016, there has been a downward trend of 30% in road accidents as compared to 2020. It is shown that there has been a decrease in accidents in 2020 compared to 2019 by around 22%. This is likely to have been influenced mainly by the Covid-19 pandemic, where restrictions on free movement were imposed, resulting in reduced traffic on roads.

The analysis of Figure 2 data demonstrates that in the last decade the highest number of accident victims and injuries was recorded in 2011. Since 2012, there has been a downward trend in the number of accident victims and injuries as compared to 2020.

As regards fatalities, there was a decrease of around 42% and as for injuries there was a decrease of around 30% as compared to 2012. It has also been shown that there was a decrease in the number of persons killed and injured in 2020 as compared to 2019 by 25% and 14% respectively.

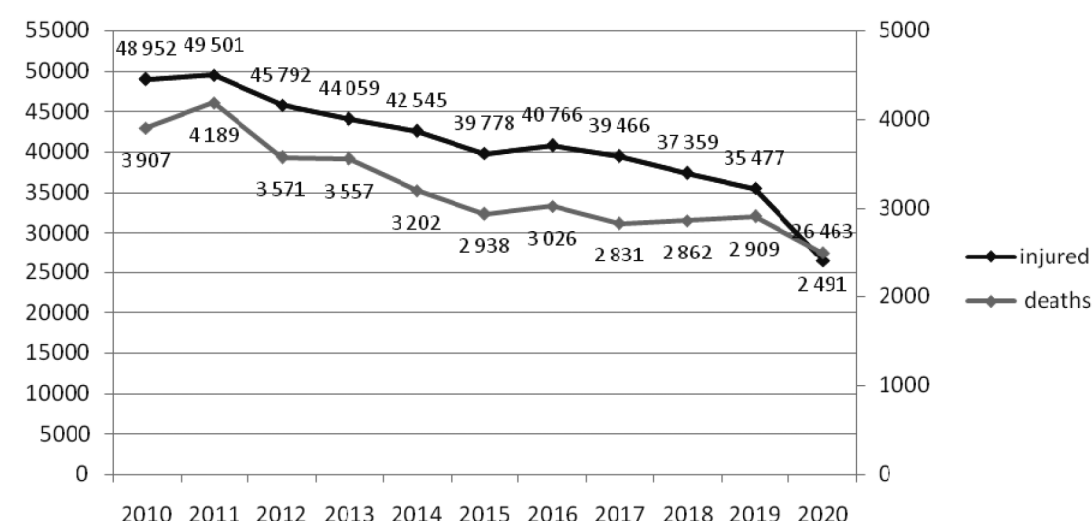
Figure 1
Road accidents in the years 2010–2020



Source: own study compiled based on Central Statistical Office data (Główny Urząd Statystyczny, 2021).

Figure 2

Road accident deaths and injuries in the years 2010–2020



Source: own study based on the report of the National Police Headquarters (Komenda Główna Policji, 2011–2021).

Analysis of the reasons of road accidents

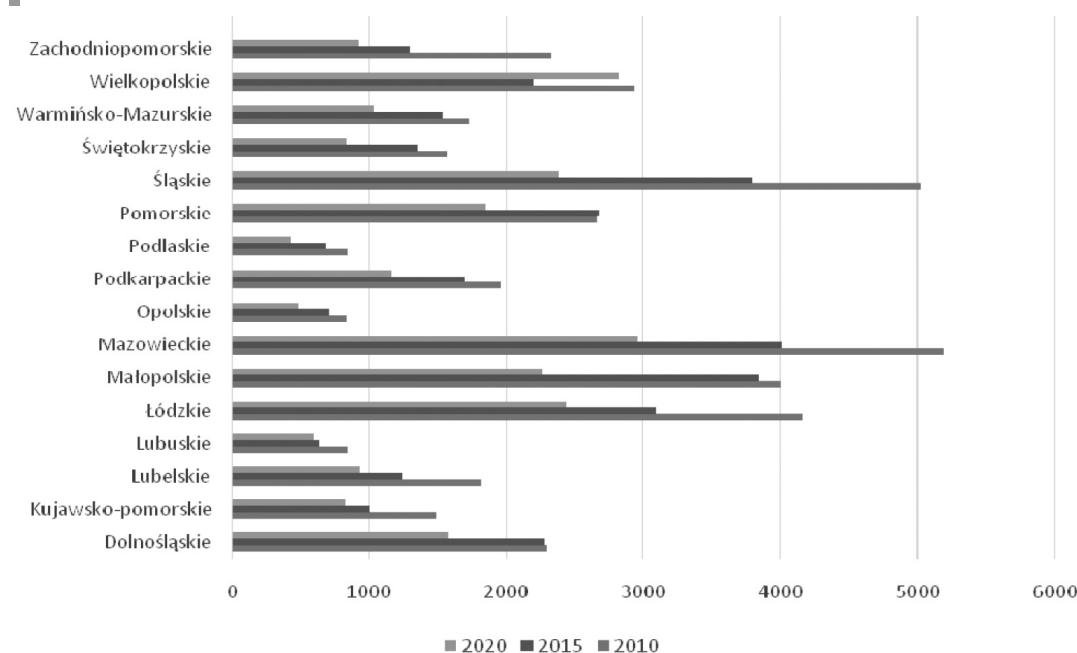
Road accidents in Poland can be considered in terms of many factors e.g.: accident territory, vehicles involved, weather conditions, time of day, time of month, etc. The study considers such factors

as: voivodship, days of the week, time of the day, types of roads, insobriety of the participants.

When analysing Figure 3, we can state that the highest number of accidents was recorded in the following voivodeships: Śląskie, Mazowieckie, Łódzkie and Wielkopolskie. On the other hand, the lowest number was recorded in Lubuskie, Podlaskie, and Opolskie. This might have been influenced by

Figure 3

Number of accidents by voivodeships in the years 2010, 2015, 2020



Source: see Figure 2.

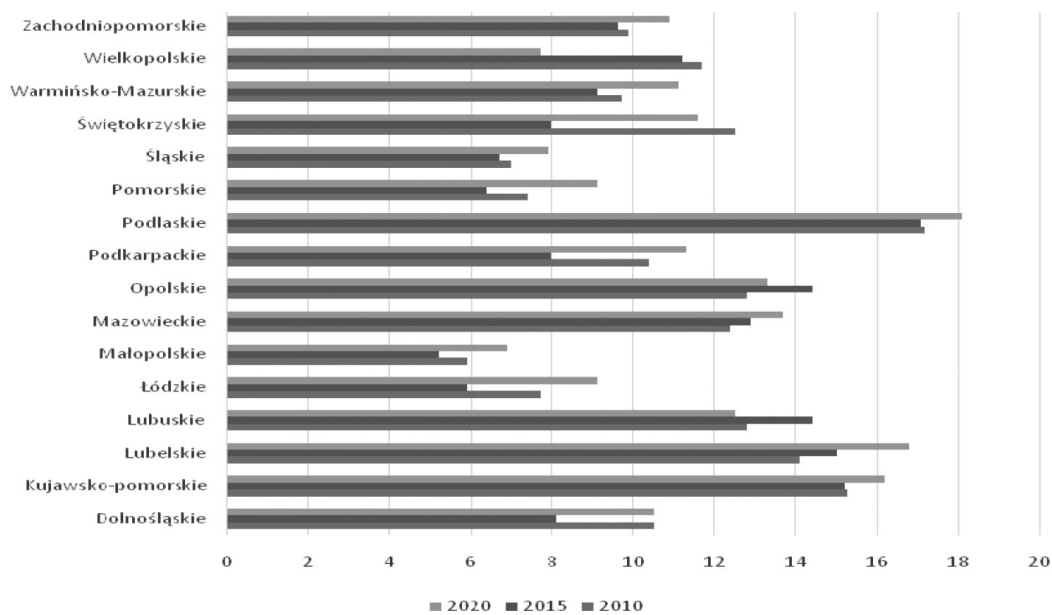
various factors specific to a given voivodeship, not only the size of cities and the number of vehicles, but also education and the level of ability of drivers and ensuring of the safety by pedestrians themselves.

Given the differences between voivodeships, both in terms of population, area, traffic density and other conditions, for comparison purposes the rate of fatalities per 100 road accidents is adopted, which tells us about the severity of an accident.

When analysing the data of Figure 4, it was found that the most unfavourable rate of fatalities per 100 accidents was recorded in Podlaskie Voivodeship, 17.2, 17.1, and 18.1 in the years 2010, 2015, 2020, respectively. On the other hand, the lowest rate was found in Małopolskie Voivodeship, 5.5, 5.2, 6.9, respectively. Although Podlaskie Voivodeship belongs to the group of voivodeships with the lowest number of accidents, the accident severity rate is high.

Figure 4

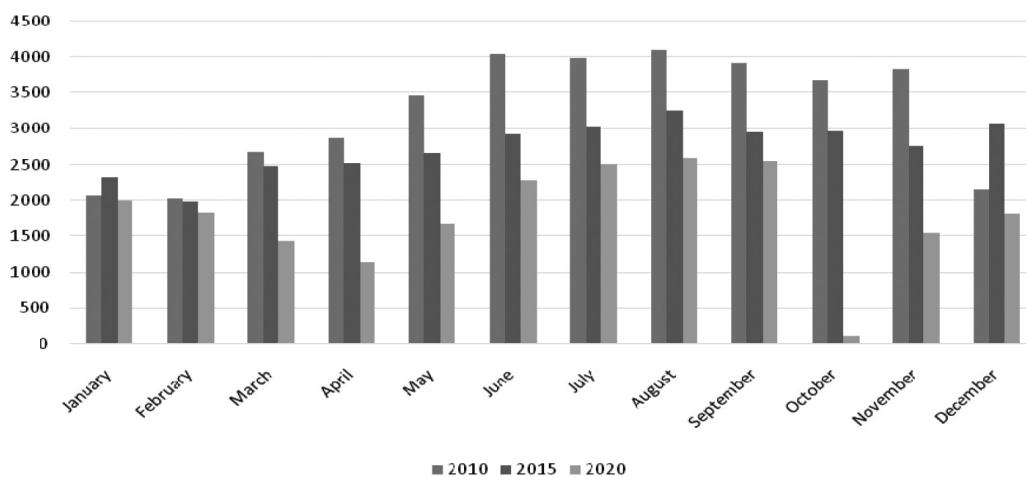
Rate of fatalities per 100 accidents for individual voivodeships in 2010, 2015, 2020



Source: see Figure 2.

Figure 5

Number of accidents by months in the years 2010, 2015, 2020



Source: see Figure 2.

In the analysed period, Figure 5 shows that the highest number of accidents occurred in the autumn and summer months. The reason for this may be that during the summer period there is an increase in traffic due to holiday trips. In contrast, an increased number of accidents was recorded in the autumn months. This tendency has been observed for several years. During this period, weather and road conditions deteriorate and it gets dark early. In particular, pedestrians are hit as they become less visible. In winter months, a significant reduction in accidents and casualties was recorded due to difficult weather conditions.

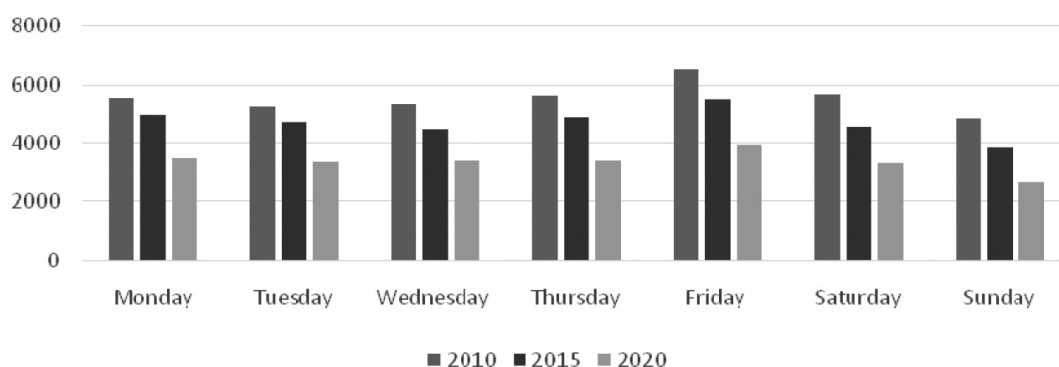
During the period analysed in Figure 6, police data shows that the highest number of road accidents occurred on Friday. Friday is a special day as many people return home from work, do their shopping, or go away for the weekend. As a result, there are more

vehicles on the roads and, therefore, more accidents are likely to occur. On average, the safest day is Sunday. This is probably due to the fact that Sunday is a day off work and there is less traffic on the roads.

The analysis of the data in Figure 7 indicate that the highest number of road accidents was recorded during the day, which is due to significantly higher traffic volumes than at other times of the day. In contrast, the analysis of night conditions showed that more accidents occur on lit roads. It can be seen that the less visibility there is, for instance at dusk and dawn, the fewer the road accidents.

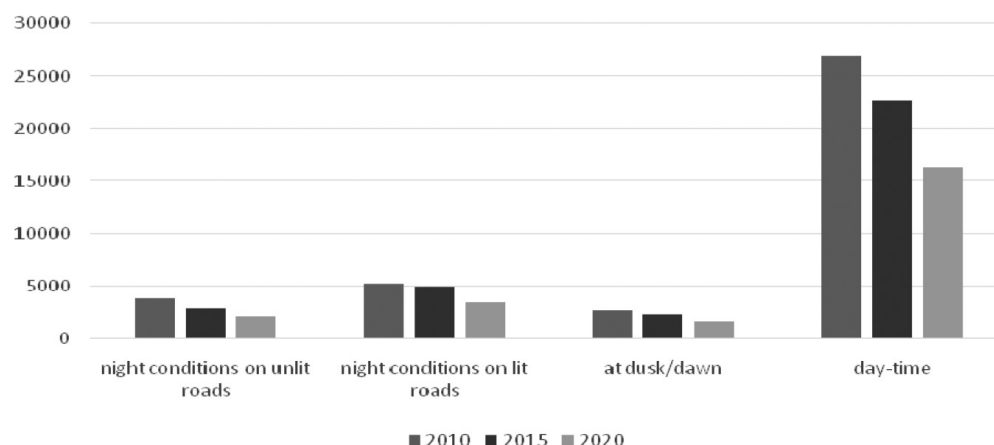
When analysing the data in Table 1, it can be reported that most accidents were observed on two-way single carriageway roads, which amounted to around 82% of all accidents. The analysis of the years of the study indicated a downward trend. The fewest accidents occurred on expressways, i.e. about

Figure 6
Number of accidents by days of the week in the years 2010, 2015, 2020



Source: see Figure 2 .

Figure 7
Number of accidents by various times of the day in the years 2010, 2015, 2020



Source: see Figure 2 .

Table 1

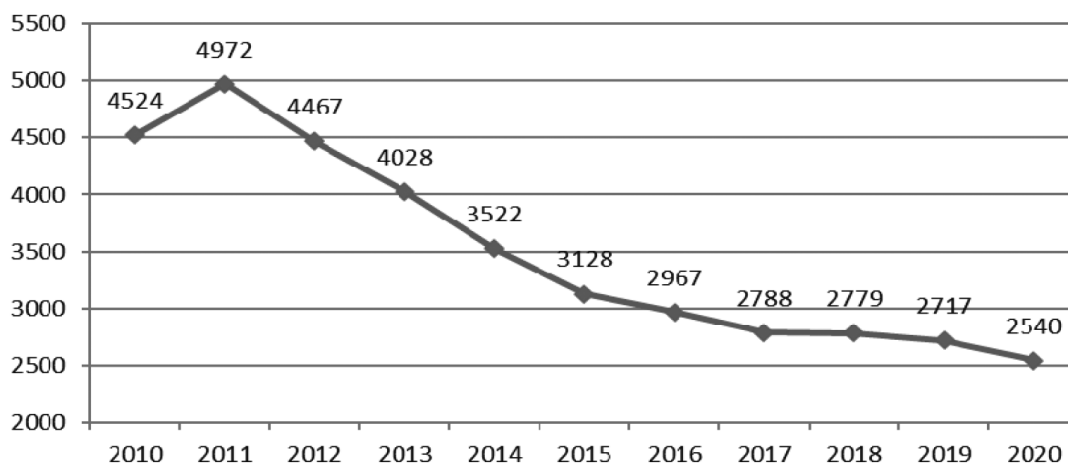
Structure of accidents by types of roads in the years 2010, 2015, 2020 (%)

Road type	Years		
	2010	2015	2020
Motorway	0.7	2.1	1.2
Expressway	0.4	0.8	1.7
Dual carriageway	13.3	13.5	11.9
One-way road	2.8	3.5	3.7
Two-way, single carriageway road	82.8	81.0	81.5

Source: see Figure 2.

Figure 8

Incidence of road accidents involving road users under the influence of alcohol in the years 2010–2020



Source: see Figure 2.

0.4% of all accidents were recorded in 2010 with an increasing trend to about 1.7% in 2020.

According to the National Police Headquarters, the main causes of accidents on two-way single carriageway roads are as follows: failure to yield the right of way to vehicles, failure to adapt the speed to traffic conditions, failure to yield the right of way to pedestrians on pedestrian crossings, failure to maintain a safe distance between vehicles and improper overtaking. The main causes of accidents on dual carriageways are as follows: failure to yield the right of way to vehicles, failure to adapt the speed to traffic conditions, failure to yield the right of way to pedestrians on pedestrian crossings, failure to maintain a safe distance between vehicles.

The examination of Figure 8 details reveals that the number of accidents in the last 10 years involving road users (drivers, pedestrians, passengers) under the influence of alcohol in successive years changed as follows: in 2010, there were 4,524 accidents, while, in 2020, there were 2,540 accidents. In 2020, as compared to 2019, about 6.5% less accidents were

recorded. However, it can be assumed that a small negative change was visible in this respect (caused, i.a., by the reduced mobility of Poles during the pandemic).

Summary

Without a doubt, many people use roads to travel on a regular basis, which is why road safety is a desirable condition for everyone. Unfortunately, road transport is considered to be the most dangerous of all transport modes. Based on the analysis of the statistical data, it can be concluded that the number of accidents in Poland has been decreasing over the years, yet this is not a satisfactory situation. A similar conclusion can be drawn as regards accident victims: the numbers of killed and injured are falling year by year, but unfortunately the volumes continue to be very high. The most unfavourable rate of fatalities per 100 accidents was

recorded in Podlaskie voivodeship, followed by Lubelskie and Kujawsko-pomorskie. The highest number of accidents occurred in the autumn and summer months whereas, considering the days of the week, the highest number of accidents was recorded on Friday and accidents occurred mainly during the day. Most incidents occurred on two-way single carriageway roads and their causes were failure to yield the right of way to vehicles, failure to adapt the

speed to traffic conditions, failure to yield the right of way to pedestrians on pedestrian crossings, failure to keep a safe distance between vehicles and improper overtaking. The subject of road safety is an extremely important one to work on in order to minimise the impact of road incidents. Road safety improvement constitutes a major challenge for the state. Thus, it is important to educate and raise public awareness of the risks on the roads.

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