

THE IMPACT OF THE COVID-19 PANDEMIC ON THE FREQUENCY OF VEHICLE ACCIDENTS IN POLAND

DAMIAN PAWEŁ FREJ¹, ANDRZEJ ZUSKA²

Abstract

This article analyzes the impact of the Covid-19 pandemic on the intensity of road accidents in Poland. The pandemic affected not only the health of citizens, but also their preferences in terms of communication. It significantly inhibited the mobility of the society and increased the capacity of urban traffic during the rush hour of some cities. The article contains statistics on the number of road accidents that occurred in 2011–2021 and the number of people who died as a result of these accidents. The period from 2019 to 2021 was subjected to a detailed analysis in this respect. It was observed that during this period there was a significant decrease in the number of road accidents as well as a significant 30% decrease in people fatalities on the road. Such a large decline has not been recorded so far since Poland joined the European Union. The article presents a forecast of the number of people fatalities in road accidents in Poland in the years 2022–2030 (taking into account the pandemic period), which predicts an annual decline in the number of road fatalities by 7%. This article emphasizes that the duration of the Covid-19 virus pandemic should be treated as a transitional period. The decreasing number of road accidents as well as the number of fatalities in road accidents over the next years may change and their annual downward trend may not be maintained.

Keywords: road accidents; fatalities; Covid-19; pandemic

1. Introduction

The European Union is heavily influenced by the COVID-19 pandemic. The disease has spread on a global scale from Wuhan, China, to the rest of the world [20, 21, 22]. The developed public transport along with the freedom to cross the borders of the European Union countries contributed to the rapid spread of the virus [4, 21, 22]. The dynamics of the infectious disease pandemic, despite the fact that they do not cause massive damage to the infrastructure, significantly affects the country's economy. Since the beginning of the COVID-19

¹ Kielce University of Technology, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland, e-mail: dfrej@tu.kielce.pl, ORCID: 0000-0003-1899-4712.

² Kielce University of Technology, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland, e-mail: a.zuska@tu.kielce.pl, ORCID: 0000-0002-9343-9914.

pandemic, European Union countries have implemented various strategies to contain the spread of the pandemic, including physical distancing, quarantine, no stay at home, school closings, and travel and mass gathering restrictions. These actions limited road traffic in all European Union countries, which influenced the number of road incidents on the road [4, 5, 22].

Road accidents are among the ten leading causes of death worldwide. As a result, about 1.3 million people die each year [5, 7, 10]. According to the WHO, between 20 and 50 million people suffer non-fatal injuries each year as a result of a road traffic accident, and many suffer disabilities [9, 13, 19]. Deaths and road accidents cost developing countries between 3% and 5% of GDP [15, 23, 24].

During the COVID-19 pandemic in 2020, travel restrictions significantly reduced vehicle mobility worldwide (50%). The restrictions introduced in the European Union resulted in a reduction of public transport from 60% to 80% and a significant decrease in the number of public transport users by 40.90% [5, 23, 24]. It should be noted that there has been a significant drop in people traveling and using the road network worldwide. This was due to the restrictions imposed on both civilians and entrepreneurs. Movement restrictions contributed to the reduction in the intensity of truck traffic in the European Union by 15% to 30%. For example, in Great Britain, traffic in 2020 was comparable to the level in 1955. The phenomenon of communication peaks has disappeared in many cities of the European Union countries. Public transport during the pandemic also underwent a cycle of changes [12, 14, 25]. In the initial stage of the spread of the virus, the number of people using public transport was significantly reduced, which practically forced the suspension of some types of public transport [12, 25, 27].

The introduced restrictions related to the pandemic have changed the way society functions in the European Union. From March 2020, remote job offers appeared more and more often. Cultural centers, hotels, government offices and large shopping malls have been closed. Staying at home contributed to the reduction of road accidents [18, 31, 33]. In the European Union, the number of fatalities in road accidents dropped by 17% in 2020. And the fatalities on EU roads dropped to 42 deaths per million inhabitants (the global average was over 180 fatalities per million inhabitants) [31, 33, 34].

In March 2020, restrictions were introduced in the European Union, which contributed to the reduction of road traffic, the number of road accidents, the movement of people, the number of people using public transport and the use of a passenger vehicles [23, 32, 33]. And the abolition of restrictions on the movement of people, which took place at the turn of July and August 2020, in many European Union countries resulted in a sharp increase in the number of road accidents. The most common causes of these accidents were distraction while driving, failure to respect right-of-way rules and speed. Moreover, according to European Union statistics, the number of violations of the Highway Code (speeding, non-compliance with signs) is decreasing compared to 2019 [23, 24, 25].

Road accidents are a global problem that attracts the interest of many researchers around the world. Information about accidents is collected and analyzed primarily by government authorities. Information is collected using police reports and databases of insurance companies and hospital records. In [30], the impact of Covid-19 on road safety and travel behavior was reviewed.

The works [16, 26, 29] showed that the number of road accidents decreased during the pandemic due to the reduced road intensity. The period of home isolation also contributed to an increase in speeding by drivers and an increase in serious accidents [2, 3].

In the paper [8], the state of road safety was assessed based on public opinion on road safety during the COVID-19 epidemic. The results of public opinion confirmed the increase in serious and fatal road accidents. In [1], the impact of the government strategy to combat the Covid-19 pandemics on the intensity of road accidents in fifteen countries was examined. The results confirmed that the strict restrictions contributed to the reduction of deaths and injuries during the government's lockdown.

It should be noted that the Covid-19 epidemic has had different impacts on countries around the world. The introduction of government restrictions and the introduction of traffic bans resulted in a reduction in the number of vehicles, which contributed to increasing road safety [11, 17, 28]. However, the lifting of restrictions resulted in a sudden increase in road users, which resulted in an increase in road accidents and an increase in fatalities. Thus, the more vehicles are on the road, the greater the probability of a collision [6, 16, 35].

2. Number of vehicles in Poland

The data contained in the Central Register of Vehicles and Drivers shows that the number of motor vehicles in Poland during the COVID-19 pandemic increased by 3%. The number of registered motor vehicles in Poland in 2011–2021 is shown in Figure 1.

The number of newly registered passenger vehicles in 2020, compared to 2019, decreased by as much as 23%. The number of newly registered passenger vehicles in Poland in the years 2011–2020 is shown in Figure 2. Due to the COVID-19 pandemic, vehicle production decreased. In the whole of 2020, a total of 451.4 thousand vehicles were produced in Poland, which was 30.5% less than in the previous year. The deepest decline, amounting to 35.8%, was recorded in the production of passenger vehicles. In 2021, the number of newly registered passenger vehicles increased by about 4% compared to 2020.

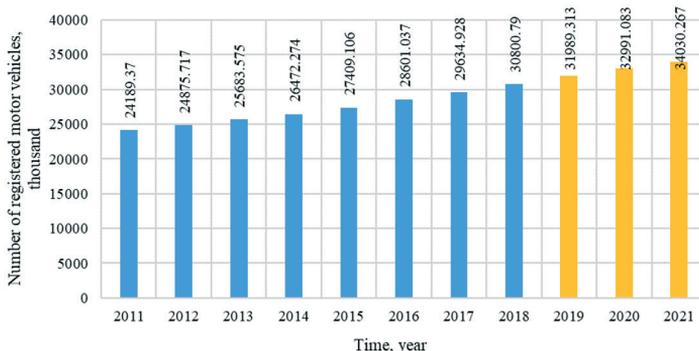


Fig. 1. The number of registered motor vehicles in Poland in 2011–2021

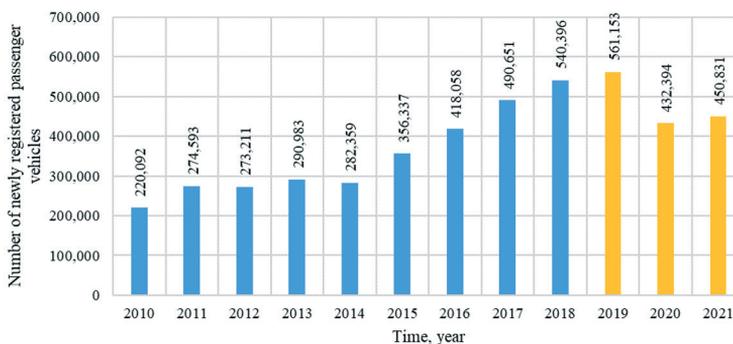


Fig. 2. The number of newly registered passenger vehicles in Poland in 2011–2021

Newly registered passenger vehicles in Poland in 2010–2021 in particular quarters are shown in Figure 3. In the second quarter of 2020, the number of newly registered passenger vehicles amounted to 72,945 units and was as much as 48% lower than in 2019. In 2021, the second quarter saw the highest number of registrations of new passenger vehicles. In 2020, the largest number of registrations of new passenger vehicles occurred in the fourth quarter.

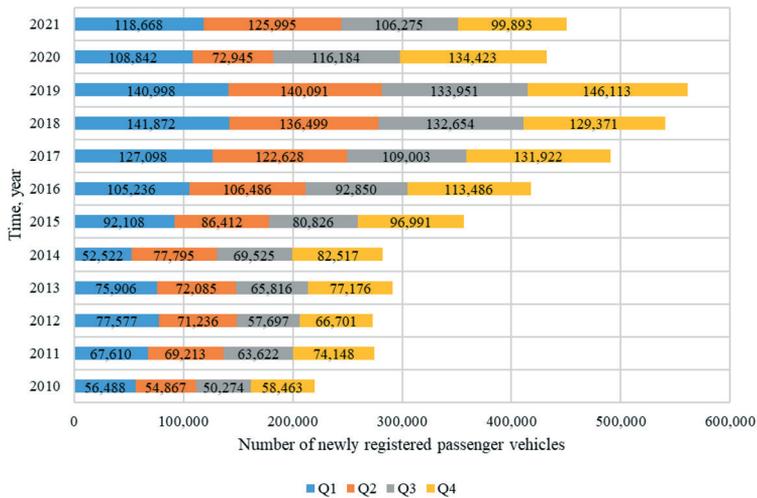


Fig. 3. Newly registered passenger vehicles in Poland in 2010–2021

3. Road accidents in Poland

The number of road accidents in Poland in the analyzed period of time (2011–2021) decreased from 40,065 to 22,816. The total number of road accidents in Poland in 2020 decreased by 22.3% compared to 2019. In 2021, the number of road accidents in Poland decreased by 4% compared to 2020 (Figure 4).

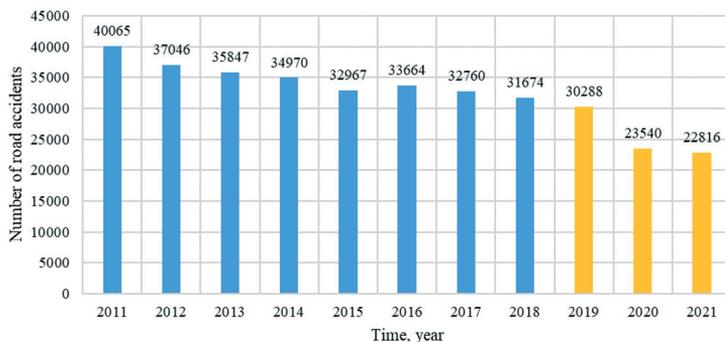


Fig. 4. Number of road accidents in 2011–2021

The number of road accidents in Poland per 100,000 inhabitants in 2019 was 78.9. This indicator decreased as a result of the Covid -19 pandemic to 61.4 in 2020. The indicator of the number of road accidents in Poland per 100,000 inhabitants decreased by 22.3% in 2020 compared to 2019. Moreover, in 2021, the indicator decreased to 58.2. It should be noted that during the two years of the Covid -19 pandemic, the number of road accidents in Poland per 100,000 inhabitants decreased by 26% (Figure 5).

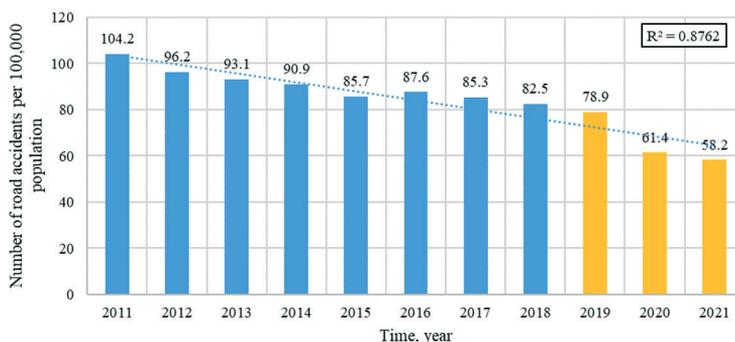


Fig. 5. Number of road accidents per 100,000 population in the years 2011-2021

The annual percentage decrease in the number of road accidents per 100 thousand people in Poland in the years 2003-2021 is shown in Figure 6. In the analyzed period, the largest decrease in the number of road accidents per 100 thousand people in Poland took place in 2020 (-22.3% compared to 2019). Since 2017, Poland has experienced an annual percentage decrease in the number of road accidents per 100,000 inhabitants.

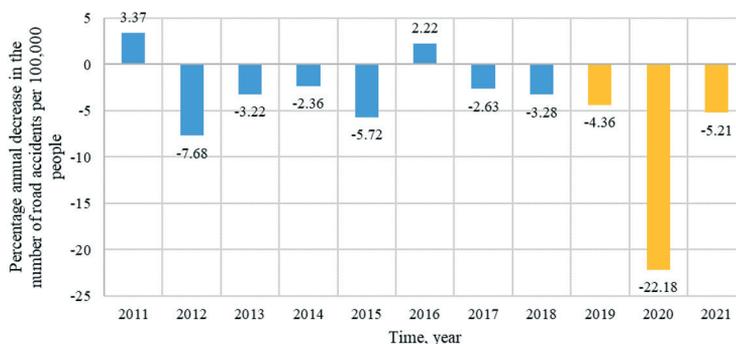


Fig. 6. Percentage annual decrease in the number of road accidents per 100,000 population in the years 2011-2021

The restrictions introduced in March 2020, related to the ban on the movement of people, work and distance learning, resulted in a significant decrease in the number of accidents on Polish roads. As shown in Figure 7, their number in April 2020 was over 40% lower than in January and by over 30% lower than in February. From April, the number of accidents unfortunately started to rise again from 1,144 in April to 2,595 in August. The expiry of the restrictions in May resulted in an increase in the number of road accidents until October 2020, when the restrictions were reintroduced.

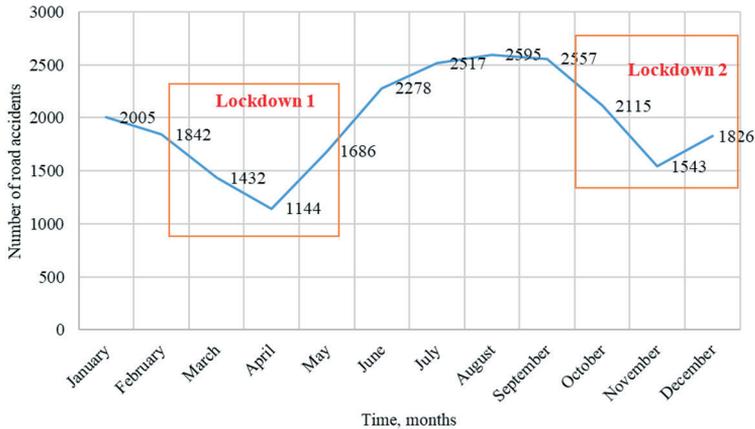


Fig.7. Number of road accidents in individual months in Poland in 2020

The number of road accidents in Poland in particular quarters of 2019–2021 is presented in Figure 8. The first quarter of 2020 brought a significant decrease in the total number of accidents. Compared to 2019, there were over 12% fewer of them. A further decline occurred in the first quarter of 2021 and amounted to 43% compared to 2019. In Q2 and Q4 of 2020, over 30% less accidents were recorded than in Q2 and Q4 of 2019. The holiday period (Q3) turned out to be the most tragic in terms of the number of road accidents during the Covid-19 pandemic. In 2020, there were 7,669 road accidents in the third quarter of the year, and 6,402 road accidents in 2021. The number of road accidents in 2021 decreased by 16% compared to 2020 and by 25% compared to 2019. In addition, it should be noted that most road accidents, both in 2019, 2020 and 2020, took place during the holiday season.

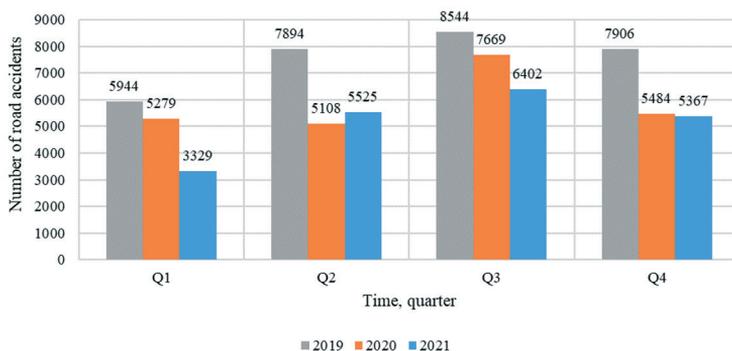


Fig. 8. Number of road accidents in Poland in individual quarters of 2019–2020

4. Number of fatalities in road accidents in Poland

In 2020, the number of fatalities on Polish roads decreased. Compared to 2018, this decline was 12%, while compared to 2019, this decline amounted to 14%. A further decline in the number of fatalities on Polish roads occurred in 2021. compared to 2019, this decrease was 23%, while compared to 2019, this decrease amounted to 11%. It should be noted that the number of fatalities in road accidents in 2018–2019 increased, despite the reduction in the number of accidents from 31,674 in 2018 to 30,288 in 2019 [Figure 9].

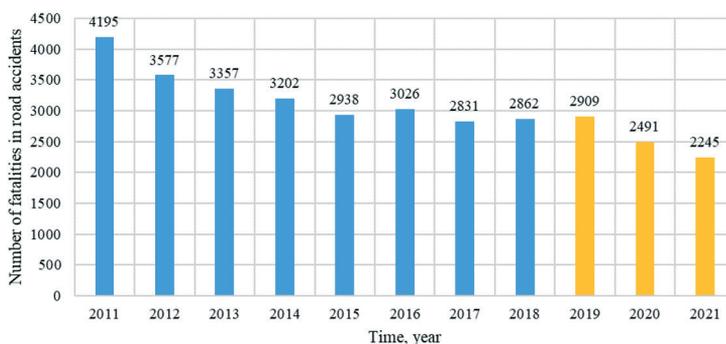


Fig. 9. Number of fatalities in road accidents in Poland in 2011–2021

The number of fatalities per 100,000 inhabitants in 2011–2021 is shown in Figure 10. In 2015–2019, the average number of fatalities per 100,000. inhabitants remained at the level of 7.6. During the pandemic, this number dropped significantly and amounted to 6.5 in 2020 and 5.9 in 2021. This result is lower by almost 50% compared to 2011.

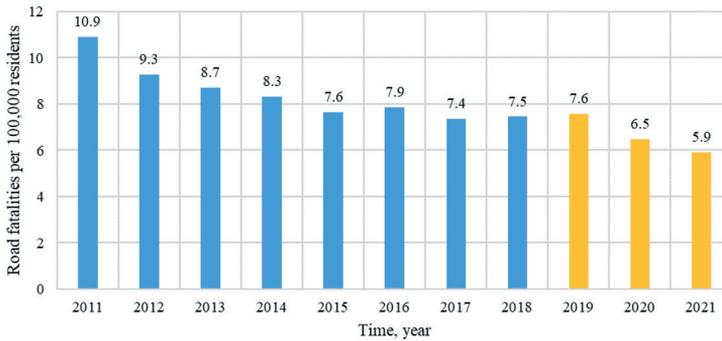


Fig. 10. The number of fatalities in road accidents per 100,000 inhabitants in Poland in the years 2011-2021

The number of fatalities in road accidents per 100,000 vehicles in Poland in 2011–2021 is presented in Figure 11. The year 2020 brought a 16% decrease in the number of road accident victims per 100,000 registered motor vehicles compared to 2019. In 2021, this number decreased again, but this time by 9.5% compared to 2020. The number of fatalities in road accidents per 100,000 vehicles in Poland in 2011–2021 is shown in Figure 11.

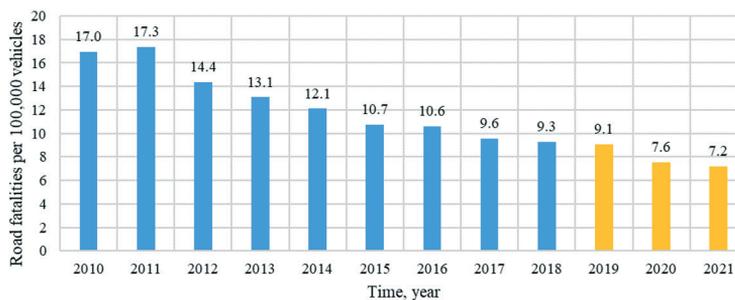


Fig. 11. The number of fatalities in road accidents per 100,000 vehicles in Poland in the years 2011-2021

In 2019, the number of fatalities per 100 road accidents was 9.6. As a result of the Covid-19 pandemic, the death rate per 100 road accidents in 2020 increased to 10.6. The value of the index was the highest in the analyzed period of time (2011–2021). In 2021, the rate was 9.8 people per 100 road accidents, this result was 6.5% lower than in 2020 and, at the same time, 2.5% higher than in 2019. It should be noted that despite the reduction in the number of road accidents and the number of fatalities in road accidents during the pandemic, there was an increase in the number of fatalities per 100 road accidents (Figure 12).

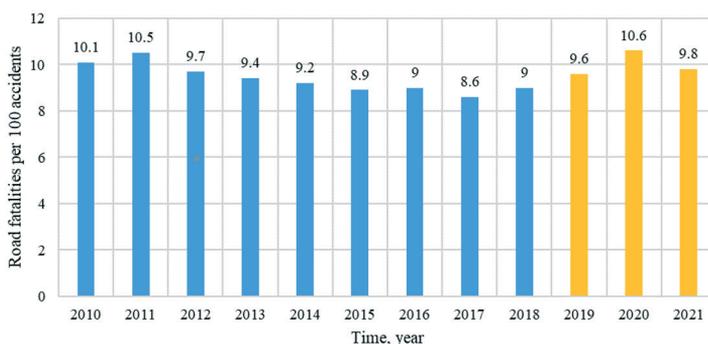


Fig.12. Number of fatalities per 100 road accidents in Poland in 2011-2021

Based on the monthly analysis of the number of fatalities caused by road accidents, in 2020, it was found that the greatest number of deaths occurred in August (11%), September (10.9%) and July (10.7%). On the other hand, in 2019, the greatest number of deaths caused by various types of road accidents occurred in June (9.9%), October (9.6%) and September (9.5%). In 2021, the most deaths caused by various types of road accidents occurred in July (8.5%). October turned out to be the most tragic month in 2019 and 2020, and July in 2021. Both in October 2019 and 2020, Poland recorded the highest number of fatalities as a result of a road accident (Figure 13).

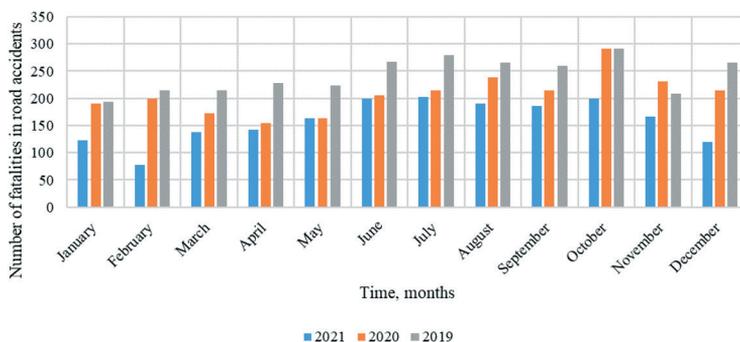


Fig. 13. Number of fatalities in road accidents in individual months in Poland in 2019-2020

5. Forecast of fatalities in road accidents in Poland for 2020–2030

On the basis of statistical data on road incidents that took place in the years 2003–2021, two forecasts of the number of fatalities in road accidents until 2030 have been established (Figure 14). One of them was developed on the basis of data from 2011–2021, and the other based on data from 2011–2019. The first forecast assumed a drop in the number of fatalities in road accidents to 1,736 in 2030. The second forecast, taking into account the years of the COVID-19 pandemic, assumed a decrease to 1,312 deaths in road accidents in 2030. Thus, the forecast number of people fatalities in road accidents in 2030 differs by as much as 35%. Maintaining the downward trend of people fatalities in road accidents, taking into account 2020 and 2021, gives Poland a chance to meet the assumptions of Vision Zero by 2030.

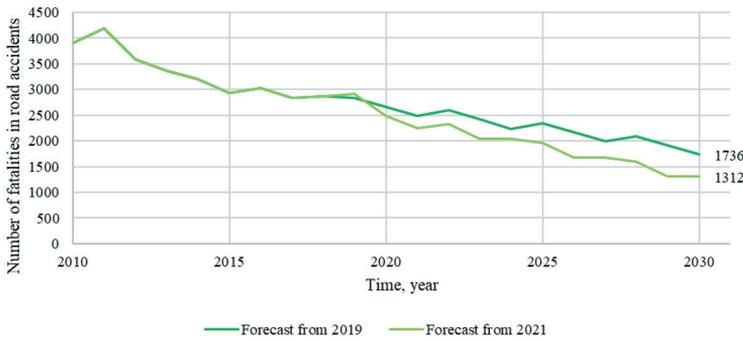


Fig 14. Forecast of fatalities in road accidents in Poland in 2020–2030

In the case of the forecast of the number of fatalities in road accidents per 100,000 inhabitants in 2020–2030, the downward trend was maintained (Figure 15). According to the first forecast, taking into account data from 2020–2021, in 2030 the number of people fatalities in road accidents per 100,000 inhabitants will be 4.08, while in the second forecast in 2030 the number of people fatalities in road accidents per 100,000 inhabitants will be 4.57. The results differ by 11%.

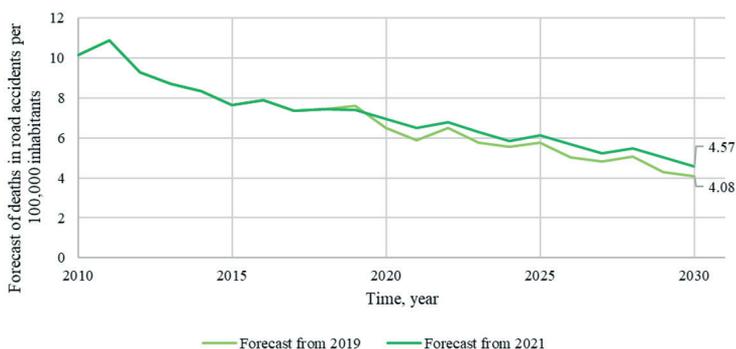


Fig.15. Forecast of fatalities in road accidents per 100,000 inhabitants in Poland in 2020-2030

6. Conclusions

The Covid-19 pandemic affected not only the public health sector, but also contributed to numerous changes in the country's economic sector. The introduced restrictions aimed at fighting the spread of the virus resulted in the mass isolation of people at home. Movement bans, remote work, and remote schooling all contributed to the reduction of the number of road accidents in Poland in 2019-2021. Unfortunately, the decreasing number of road accidents and people fatalities on the roads in the first and fourth quarters of 2020 is most likely only an effect of the isolation of the society. This observation is confirmed by an increase in the number of accidents in the spring of 2020 and 2021, which was probably related to the lifting of restrictions related to the pandemic and the possibility of traveling.

It should be noted that road accidents are a serious problem for society, they bring huge losses related to the death of people, treatment of the injured, as well as permanent incapacity from work of people injured as a result of road accidents. It is estimated that the costs of road accidents in individual European Union countries account for 3% of GDP.

The Covid 19 pandemic has had a significant impact on the behavior of road users. Initially introduced government restrictions contributed to the reduction of road accidents and fatalities in road accidents. Subsequently, the lifting of government restrictions contributed to a sudden increase in road users, which resulted in an increase in accidents and fatalities. Further work of the authors related to road accidents will include forecasts of fatalities in Poland and EU countries until 2030, taking into account the impact of the Covid-19 pandemic.

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