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The efficiency of actions to improve road safety – assessing the implementation of the programme objectives

Skuteczność działań na rzecz poprawy bezpieczeństwa ruchu drogowego – ocena realizacji założeń programowych

Abstract. Road accidents and, above all, their negative consequences are a serious problem worldwide. Preventing them is a challenge that involves many actions taken by governments, international organisations, economic operators, and non-profit organisations. The actions that are to lead to a significant reduction in the number of casualties and fatalities are considered essential. In order to make a significant change in this field, it is necessary to take rational action. In Poland, the objectives for the improvement of road safety and the methods of achieving them were endorsed in the National Road Safety Programme 2013–2020. As the period of these seven years is to come to an end, this article will present the achieved results for years 2010–2018 in relation to the main causes of accidents induced by drivers.

Key words: road safety, National Road Safety Programme 2013–2020, road safety management

Synopsis. Wypadki drogowe, a przede wszystkim ich negatywne skutki są poważnym problemem na całym świecie. Zapobieganie im stanowi wyzwanie i wiąże się z podejmowaniem wielu działań przez rządy państw, organizacje międzynarodowe, podmioty gospodarcze czy organizacje non-profit. Jako zasadnicze uznaje się te, które mają doprowadzić do znacznej redukcji liczby zabitych i rannych. Aby wpłynąć w istotny sposób na zmianę w tym zakresie, niezbędne jest podjęcie racjonalnych działań. W Polsce cele w zakresie poprawy bezpieczeństwa ruchu drogowego oraz metody ich osiągnięcia przyjęte zostały w Narodowym Programie Bezpieczeństwa Ruchu Drogowego 2013–2020. Ponieważ okres ten dobiega końca, w artykule przedstawiono uzyskane efekty w latach 2010–2018 w odniesieniu do głównych przyczyn wypadków powodowanych przez kierowców.

Słowa kluczowe: bezpieczeństwo ruchu drogowego, Narodowy Program Bezpieczeństwa Ruchu Drogowego na lata 2013–2020, zarządzanie bezpieczeństwem ruchu drogowego

Introduction

In view of the high number of road accidents worldwide [WHO 2019], a global action has been taken to improve road safety. The main courses of action are reflected in documents of both international and national level [Communication COM(2010) 389, WHO 2011]. In Poland (pertaining to the national level of action) it was the National Road Safety Improvement Programme 2013–2020 to set out the objectives and directions of actions to improve road safety, and the implementation of those is expected to result in reduction in number of:

- fatalities (FATs) by at least 50% from 2020 onwards;
- serious casualties (CASs) by at least 40% by 2020 as compared to 2010.

The aim of this article is an attempt to examine the implementation of the general objectives set out in the National Road Safety Programme 2013–2020 and to analyse the changes related to the reduction of fatalities and casualties while taking into account the main causes of accidents resulting from drivers' actions in the years 2010–2018. The adapted research methods consist of a diagnosis of both the literature on the subject and program documents, and an analysis of quantitative data showing the discussed problem.

The systemic approach to road safety management

The matters of road safety and the initiatives to improve it appeared much earlier than the first motor vehicles and – in essence – were similar to those that are currently underway [Dąbczyński 2011, Serbeńska 2015]. The contemporary approach, which was the subject of scientific research [Shapiro and Mortimer 1969, Sabey 1991] and the activities of the road safety management authorities, began to take shape when the first motor vehicles were built¹ and has changed over time. The development stages of road safety research are set out within Figure 1.

As can be made out from Table 1, the approaches to road safety research have changed due to addressing different causes of road accidents and changes in the approach to road safety management. The first concepts for research related to road safety management emerged in the 1950s. As a result of constant changes in the area of motorisation, the significant number of road accidents, and their negative socio-economic impact, the current approach to achieving the goals of improving road safety has been changing. The current approach is systemic in nature. According to the basic assumption of system theories, an accident is the result of a mismatch between system components. Conforming to this theory, it is not possible for any part of the system to be more relevant than others [Elvik et al. 2009]. It is the relation between the elements of the system, and not the nature of the components themselves, that determines the system's properties and functioning [Skytner 2005, Larsson et al. 2010]. This theory is considered the best one to be developed so

¹ The date of the beginning of automobilism is often assumed to be year 1885, when Karol Benz, the founder and co-owner of the factory Mannheimer Gasmotoren-Fabrik A.G. in Mannheim, and engineer Gottlieb Daimler, the technical director of the gas engine factory Deutz, independently of each other, completed the construction of the prototypes of the first motor vehicles with internal combustion engines [Grzywacz and Burnewicz 1968, Brzosko 1982, Gądek-Hawlena and Zabińska 2017].

Time line					
Perspective of consideration	Early years of motorisation	1950-1960s	1970-1980s	1990s	2000s
Road safety management (OECD, 2008)	n/a	Focus on driver interventions	Focus on system-wide interventions	System-wide interventions, with targeted results and leadership	Safe-system approach
Road safety research paradigms (OECD, 1997)	Vehicle control; descriptive research ("what")	Mastering traffic situation ("why"); research around the classical 3E's Engineering, Education, Enforcement	Managing the traffic system ("how"); mathematical models; cost-benefit analysis	Managing the transport system; multi-dimensional analysis	Cross-disciplinary analysis; theory development
Main road crash causes (Wegman et al., 2007)	Crashes as a chance phenomenon	Crashes are mono-causal	A combination of crash causes fitting within a 'system approach'	The road user is the weak link: more behavioural influence	Better implementation of existing policies; Systems' management perspective

Figure 1. The development stages of road safety research

Rysunek 1. Etapy rozwoju badań dotyczących bezpieczeństwa ruchu drogowego

Source: [Hakkert and Gitelman 2014].

far. Using system theories and models, all the dependencies and relationships affecting the cause of the accident (the so-called time and space transfer factors), and the factors acting on site and at the time of the road accident are sought. This search for correlation makes it possible to build a system of preventive actions, and a system for monitoring and controlling the functioning of individual relationships and dependencies. According to the systemic approach to safety management – again, at national and regional levels – three interrelated elements should be taken into consideration: institutional management functions, specific actions (interventions), and results [KRBRD 2013]. An institutional approach means a complex institutional structure including some cooperating and collaborating bodies that support the necessary tasks and processes to prevent and reduce road traffic injuries [Muhlrod et al. 2011, Papaclimiton and Yannis 2013]. The complexity of actions to improve road traffic safety causes the process of road traffic safety management to require modern tools that would help to identify threats to road users, to assess the safety of road infrastructure, and to select effective measures to improve road traffic safety [Jamroz et al. 2014]. At the same time, it is not simple to determine exactly how the implementation of (many) road safety interventions would affect its development, i.e. the obtained results. A special edition of “Science on Safety Science on Scientific Research on Road Safety Management” presents various approaches to the subject taken from different countries. Topics discussed included the ways to support decision making on the design of individual security interventions, questions on how to design strategies with multiple interventions in which those can interact and how to evaluate the implementation of individual interventions and implemented strategies. It was noted that the design and evaluation of road safety programs did not seem to be a very popular topic

among researchers, given the limited number of mutual interviews on this topic [Wegman et al. 2015]. Bax et al. [2009] stated that the designers of road safety programmes make little or no use of the research results but that there is some growing interest from both research and policy-making areas. One reason may be that more and more countries are setting quantitative road safety targets (e.g. 50% fewer road fatalities in 10 years). Data and knowledge are the necessary elements to establish realistic objectives. As those who set the targets are held accountable for achieving them, more and more attention is being paid to the monitoring progress over time as well as to using the results to further improve their achievements [Wegman and Hagenzieker 2010].

Improving road safety in the light of the programme objectives – actions in favour of drivers

The study titled “The critical values of driver response time and their influence on lowering the reliability and safety of road traffic” indicated that the main risk factors on roads are: human, as a participant of the traffic, the vehicle, and the road. These factors may impact the risk individually or several factors may combine [Kornacki et al. 2017]. Based on research and statistics, the main causes of human-induced road accidents include speeding, pedestrian and cyclist behaviour, young drivers’ behaviour, alcohol, medicine and drugs, driver fatigue, and mobile phone use. Other causes, independent from human behaviour, include insufficient visibility, and road-related and vehicle-related factors [Jackisch et al. 2015].

Under the National Road Safety Programme 2013–2020, safe behaviour of road users, including drivers, is one of its pillars. The fundamental actions in favour consist of [KRBRD 2013]:

- shaping safe activities of road users – this refers to developing a conscious and cultural road user who respects the rights of others. This goal can be achieved mainly through activities related to proper education and traffic surveillance. Supervising road user behaviour is preventive through, i.e. discouraging dangerous behaviour;
- protection of road users – the aim is to carry out safety measures aimed at changing the behaviour of road users to ensure their safety through systems they do not control and sometimes are not even aware of. Mainly, these activities include: engineering activities (the construction of secure roads and surroundings), development of modern technology (safety systems in vehicles), control, or supervision and information activities.

A certain number of measures, particularly concerning drivers, have been taken since 2013. According to the reports of the National Road Safety Council (Krajowa Rada Bezpieczeństwa Ruchu Drogowego), in the years 2013–2019, among others, the following operations were carried out: the control of professional drivers’ licences, the start of many social campaigns, including, for example, the Roads of Trust programme aimed at protecting the life and health of people on national roads, the “Armadillo Club Clicks in the Seats”, a number of campaigns concerning the issue of driving under the influence of alcohol or the problem of using passive safety devices in cars, and a campaign related to shaping safe road etiquette for road users. Another means of concern for the safety of road users was the police intensifying their supervision in areas with a high level of pedestrian

risk [KRBRD 2014, 2015, 2018]. Apart from the National Road Safety Council, there are business entities that are also active in improving road safety in line with the programme assumptions: the company Solaris conducting so-called Safe Driver trainings, breweries actively indicating the negative effects of drink-driving, PKN Orlen among others trying to take care of road safety as part of CSR, as well as non-governmental organisations can be mentioned. The actions taken by stakeholders in this respect are based on their awareness of bearing costs in connection to road accidents.

The effects of actions to improve road safety in Poland in 2013–2018

As specified in the National Road Safety Programme, the fatalities' toll caused by accidents should be less than 50% by 2020, as compared to 2010, and is set to be no more than 2,000 fatalities in 2020. In 2018, the number of road accident fatalities was 662 victims higher than the assumed level (Fig. 2); however, the assumptive target is to be achieved in 2020 and seems quite realistic. The situation is decidedly worse for the casualties in road accidents. As shown in Figure 2, the number of road accident casualties in 2018 was 37,359, 30% less than in 2010. It can therefore be concluded that a systemic approach to road safety management is only effective in that one field. No less than one in the case of accidents caused by drivers, no visible improvement was observed.

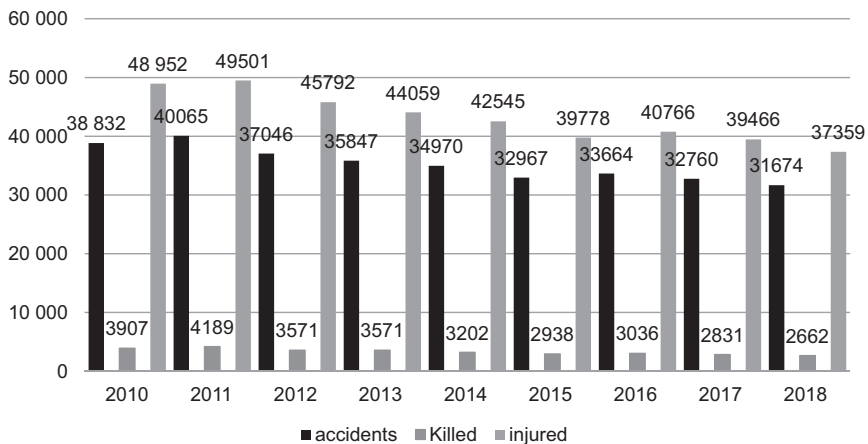


Figure 2. The structure of road accidents in Poland in years 2010–2018

Rysunek 2. Struktura wypadków drogowych w Polsce w latach 2010–2018

Source: own elaboration based on [Komenda Główna Policji 2017, 2019].

In Poland, since 2015, the main cause of road accidents is the failure to respect the right of way (Fig. 3). As shown in Figure 3, there are no significant changes in the structure of endured fatalities and casualties in road accidents which would be the result of not respecting the right of way, despite a substantial amount of training courses and social campaigns or police control and the implementation of modern ITS solutions. In both cases, i.e. the number of FATs and CASs, the fall in the number of victims is less than 50%.

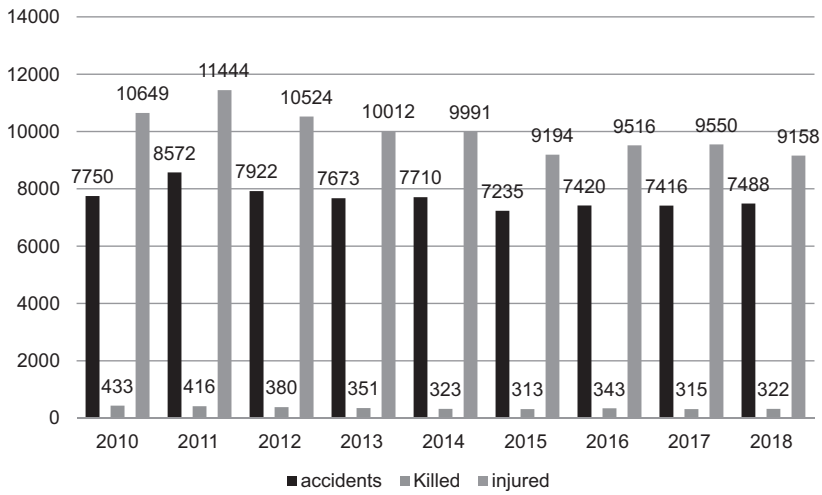


Figure 3. The structure of road accidents – failure to respect the right of way
 Rysunek 3. Struktura wypadków drogowych – nieprzestrzeganie pierwszeństwa przejazdu
 Source: own elaboration based on [Komenda Główna Policji 2016, 2017, 2018, 2019].

Another cause of road accidents in Poland is speeding. The structure of accidents resulting from driving a car at excessive speed is shown in Figure 4. The number of fatalities and casualties, even if the cause of the accident was indeed speeding, has not changed radically and is at an appropriate decrease of 339 FAT and 4,850 CAS.

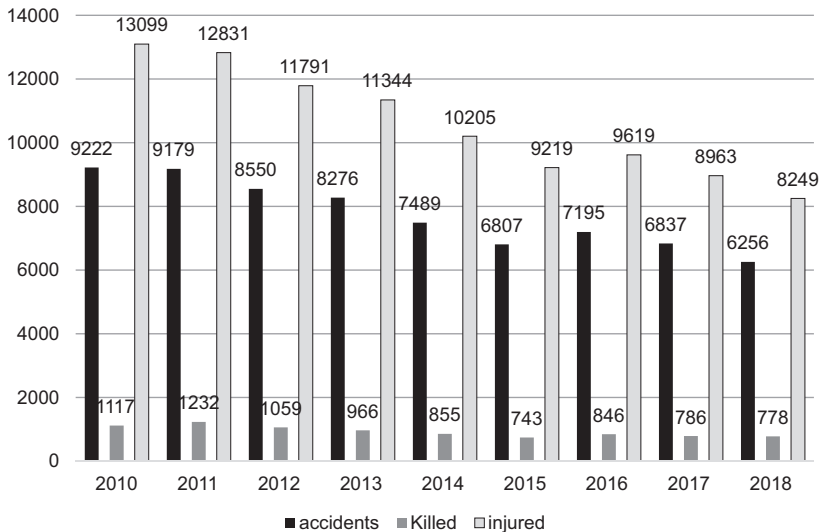


Figure 4. The structure of road accidents – excessive speeding
 Rysunek 4. Struktura wypadków drogowych – nadmierna prędkość
 Source: own elaboration based on [Komenda Główna Policji 2016, 2017, 2018, 2019].

Despite the police surveillance, the distribution of speed cameras or preventive measures, the results are unsatisfactory. Perhaps one of the reasons for these results is the increase in the number of fast cars and their safety systems that put the driver alertness to sleep.

The last factor discussed is the issue of not yielding the right of way to pedestrians (Fig. 5). From the presented list of tolls, the current one is much worse than the others. There are no positive changes in the number of fatalities, and even in 2018 the number of FATs was higher than in 2010. Concerning the toll of casualties, the decrease was 1,254 CAS. This situation is undoubtedly quite unfavourable and requires a change in the approach to the problem.

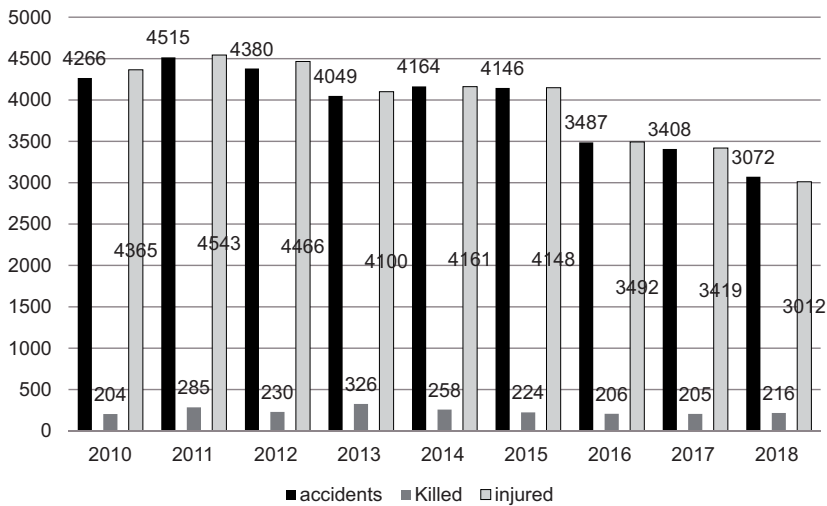


Figure 5. The structure of road accidents – not yielding the right of way to pedestrians
 Rysunek 5. Struktura wypadków drogowych – nieustąpienie pierwszeństwa pieszemu
 Source: own elaboration based on [Komenda Główna Policji 2016, 2017, 2018, 2019].

Conclusions

To sum up the presented observations, several conclusions can be drawn:

1. The steps to improve road safety are taken on the basis of objectives and directions of action set out in the programme documents and are based on a systemic approach.
2. When considering the overall number of fatalities and casualties in road accidents, it is to be expected that the objectives set out in the National Road Safety Programme 2013–2020 will be achieved, or that we will be significantly closer to achieving them.
3. The main factor of causing road accidents is man, including, above all, motor vehicle drivers, and, despite the important targets set for improving the safety of road users and the many actions taken, these initiatives are still not working. The number of fatalities and casualties during the considered period, either due to lack of right of way, speeding, or not yielding the right of way to pedestrians, is still above 50% compared to 2010.

4. However, some new action taken in this field should include autonomous vehicles. If in autonomous vehicles at Level 5 – Full Automation the driver will not participate in the driving process and the car will operate without him, then the issue of man causing accidents should be expected to resolve itself.
5. A significant problem that may be causing an increase in the number of accidents can be the transition period, i.e. the operation of traditional and autonomous vehicles but, at this stage, it is quite difficult to take action in this field, due to the lack of such occurrences.

Therefore, it can be concluded that the implementation of the programme objectives did not bring the intended effects in all fields.

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