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CAUSES OF TRAFFIC INCIDENTS IN THE WIELKOPOLSKIE PROVINCE IN THE YEARS 2011-2013

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Abstract

Although in recent years the number of traffic accidents and collisions on Polish roads has been decreasing, it is important to identify their most significant causes. This study presents an analysis of 34 causes of road incidents reported by the police in the Wielkopolskie province in the years 2011-2013. A total of 34 causes of traffic incidents (accidents and collisions – X1, ..., X34, respectively) were grouped by means of hierarchic cluster analysis using the nearest neighbour method with Euclidean distances, in a four-dimensional space of parameters (the number of accidents – LW, the number of killed – LZ, the number of casualties, including slightly injured in collisions – LR, the number of collisions – LK). Calculations were conducted using the Statistica ver. 12 package. Analyses showed that the most common cause of traffic incidents included side collisions and rear collisions of vehicles, failure to yield to the right-of-way, failure to adjust the speed to the traffic conditions and failure to keep adequate distance between vehicles. Hitting a tree was only the 19th cause (out of 34 analysed ones); however, consequences of these incidents were tragic (8% of fatal accidents).

Keywords: traffic accidents, collisions, causes, the Wielkopolskie province

INTRODUCTION

Development of road infrastructure results from economic transformations in Poland and from constantly growing importance of the road transport. The

number of vehicles registered in Poland reaches c.a. 25 million. To ensure the proper throughput of the public roads it is necessary to modernize and extend communication network and improve the safety of traffic (Narodowy Program Bezpieczeństwa Ruchu Drogowego 2013-2020).

A research has been conducted for many years at the Department of Forest Engineering, at the University of life Sciences in Poznań on the structure of road incidents, particularly those involving animals and analysis of the functionality of upper and lower wildlife crossings. Recommendations and guidelines for construction of such objects have been developed (Czerniak and Tyburski 2014). The area of interests of the Department covers also the assessment of the impact of roadside trees on traffic safety (Leszczyńska 2015).

Road incidents include collisions (only material loss), and accidents (injuries or death). In 2015 there were almost 33 thousand accidents and 362 collisions registered on Polish roads, including 216 accidents involving animals and over 22 thousand collisions (6.11% of all collisions). Despite the increasing traffic on Polish roads the traffic safety has been improving successively (Table 1).

Table 1. Traffic safety in Poland in the years 2011-2015 (Department of Prevention and Road Traffic of the Police Headquarters – data from the Traffic Accidents and Collisions Record of 8.02.2016)

Year	Total			Hitting an animal			Collisions		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Collisions	Collisions involving animals	Percentage
2011	40065	4189	49501	162	3	205	366520	17453	4.76%
2012	37046	3571	45792	166	5	205	339581	18648	5.49%
2013	35847	3357	44059	179	12	221	335943	19280	5.74%
2014	34970	3202	42545	193	8	246	348028	20379	5.86%
2015	32967	2938	39778	216	10	265	362265	22145	6.11%

Despite the fact that the number of the killed and injured in result of road accidents has been decreasing, it is important to identify and successively eliminate their most important causes.

The aim of the paper is characterisation of causes of accidents and road collisions, particularly hitting a tree, registered in Wielkopolskie province in the years 2011-2013.

METHODS

The analysis of road incidents structure (divided into accidents and collisions) was conducted in cooperation with Police Headquarters in Warsaw. Analysed were the causes of collisions and traffic accidents which happened in the years 2011, 2012 and 2013 in the Wielkopolskie province. The causes were identified according to the Regulation No 31 of the Police Commander-in-Chief dated 22 October 2015 on the forms and methods of keeping statistics of traffic incidents. 34 identified causes of traffic incidents (accidents and collisions, respectively X1,…, X34) were grouped using hierarchical cluster analysis by means of the nearest neighbor method with the use of Euclidean distances method in the four-dimensional spaces of parameters (LW – number of accidents; LZ –number of killed; LR – number of casualties, including slightly injured in collisions, LK – number of collisions). The computations were conducted using Statistica vr.12 package. The similar partitions of hierarchical clusters analysis for each investigated years show on clear regularity of road incidents – accidents and collisions. A deficiency of this similarity show on lack occurrence of road incidents regularity.

RESULTS

Traffic accidents and collisions, which happened in the Wielkopolskie province in 2011-2013 were compiled in Table 2. The most common cause of the accidents and collisions were side collisions of vehicles (X32) (respectively 2535 and 32960 incidents). The subsequent four most common causes of the road incidents were: rear collisions of vehicles (X34) (a total of 21289 incidents), failure to yield to the right-of-the way (X17) (19755), failure to adjust speed to the road traffic conditions (X4) (15596) and failure to keep the adequate distance between vehicles (X18) (12538). Hitting a tree (X23) (2012 incidents) was the 19th most common cause of traffic accidents and collisions.

Figure 1 shows the results of cluster analysis grouping of the causes of traffic accidents and collisions in the years 2011, 2012 and 2013. Identified attributes of the causes of traffic incidents (X1,…,X34) are: the number of accidents (LW), the number of killed (LZ), the number of casualties (LR) and the number of collisions (LK). A different course of dendrograms for individual years may indicate that the identified 34 causes of accidents and collisions cannot be grouped unanimously. However, it may be noticed that the most common cause of the analyzed incidents – side collision of vehicles (X32) constitutes a separate group.

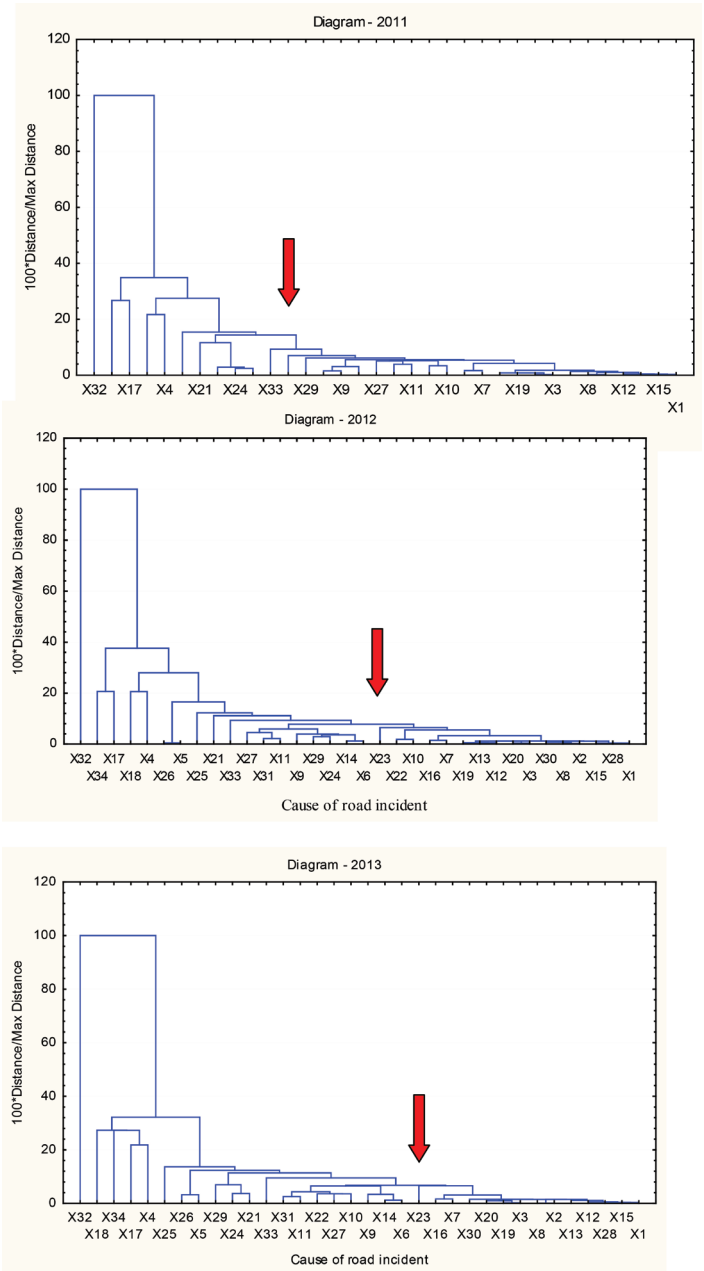
A characteristics of selected causes of traffic accidents and collisions in the Wielkopolskie province for one year period was compiled in Table 3. Hitting a tree (X32) is not a very common cause of the analysed road incidents, but it

usually has tragic consequences (8% fatal accidents). If only the accidents were analysed, it would be seen that e.g. the head-on collisions (X33) account for 22% of fatal accidents, whereas hitting a tree (X23) constitutes 26% of these. Actually, driving without the required lights (X2) yielded the highest percent of fatal accidents, however it is difficult to regard this fact in view of statistics, because the registered numbers of deaths in 2011-2013 were respectively: 0, 2 and 1 persons.

Table 2. Road incidents in Wielkopolskie province in 2011-2013

Cause of accident/collision (P)	Number of accidents (LW)	Number of killed	Number of casualties (incl. slightly injured)	Number of collisions (LK)	LW + LK	100*LZ/ (LW+LK) [%]
Emergency braking (X1)	31	3	32	210	241	1.2
Driving without required lights (X2)	12	3	13	19	31	9.7
Driving on the wrong side of the road (X3)	109	30	159	571	680	4.4
Failure to adjust speed to traffic conditions (X4)	1808	296	2475	13788	15596	1.9
Unsafe reversing (X5)	133	9	129	8405	8538	0.1
Unsafe bypassing (X6)	119	9	134	3844	3963	0.2
Incorrect driving through pedestrian crossing (X7)	464	27	463	404	868	3.1
Wrong crossing of bike lane (X8)	11	1	10	28	39	2.6
Unsafe turning (X9)	236	18	268	3330	3566	0.5
Unsafe passing (X10)	100	19	124	1721	1821	1.0
Unsafe overtaking (X11)	447	84	556	2633	3080	2.7
Incorrect stopping and parking (X12)	4	3	3	332	336	0.9
Unsafe U-turn (X13)	25	2	29	456	481	0.4
Unsafe lane change (X14)	118	19	169	3710	3828	0.5
Failure to observe other signals (X15)	17	3	19	244	261	1.1

Cause of accident/collision (P)	Number of accidents (LW)	Number of killed	Number of casualties (incl. slightly injured)	Number of collisions (LK)	LW + LK	100*LZ/ (LW+LK) [%]
Failure to yield to the right-of –the way for a pedestrian (X16)	510	37	509	593	1103	3.4
Failure to yield to the right-of-the way (X17)	1925	126	2469	17830	19755	0.6
Failure to keep the adequate distance between vehicles (X18)	433	19	559	12105	12538	0.2
Going through a red light (X19)	82	5	110	507	589	0.8
Fatigue, falling asleep (X20)	138	34	194	618	756	4.5
Other (X21)	284	28	342	6353	6637	0.4
Hitting a protection barrier (X22)	64	13	74	1353	1417	0.9
Hitting a tree (X23)	621	160	813	1391	2012	8.0
Hitting a pothole or hump (X24)	14	0	15	6296	6310	0.0
Hitting a pedestrian (X25)	1972	260	1824	1964	3936	6.6
Hitting a stationary vehicle (X26)	96	5	117	8056	8152	0.1
Hitting a pole or road sign (X27)	112	11	142	2429	2541	0.4
Hitting a railway gate (X28)	0	0	0	182	182	0.0
Hitting an animal (X29)	38	1	46	4895	4933	0.0
Accidence with a passenger (X30)	100	6	131	80	180	3.3
Capsizing of a vehicle (X31)	601	49	753	2472	3073	1.6
Side collision X32)	2535	200	3181	32960	35495	0.6
Head-on collision (X33)	901	195	1377	3486	4387	4.4
Rear collision (X34)	849	71	1069	20440	21289	0.3
Total	14909	1746	18308	163705	178614	1.0



(symbols the same as in Table 1)

Figure 1. Cluster analysis of causes of road accidents and collisions in the years 2011, 2012 and 2013

Table 3. Characteristics of selected road incidents causes in Wielkopolskie province (mean yearly)

P	LW		LZ		LR		LK		100*LZ/(LW+LK) [%]
	μ	σ	μ	σ	μ	Σ	μ	Σ	
X4	603	62	99	30	825	84	4596	216	2
X17	642	44	42	7	823	75	5943	181	1
X18	144	11	6	3	186	23	4035	104	0
X23	207	14	53	11	271	18	464	4	8
X32	845	41	67	23	1060	58	10987	349	1
X34	283	44	24	6	356	69	6813	218	0

μ – mean value, σ – standard deviation, the other signs as in Table1

CONCLUSIONS

1. Generally, road safety in Poland has been improving, however the number of collisions involving animals is growing. Analysis of the causes of traffic accidents and collisions indicates side collisions of vehicles as the most common cause of road incidents. The subsequent four most common cases of these incidents comprise: rear collisions of vehicles, failure to yield to the right-of –the way, failure to adjust the speed to traffic conditions and failure to keep the adequate distance between vehicles. A deficiency of clear regularity of road incidents was shown.
2. Hitting a tree was only the 19th (out of 34 analysed) cause of traffic accidents and collisions, yet these incidents were tragic (8% of fatal accidents).
3. To restrain incidents, dedicated solutions must be given – for example: marking roadside trees with reflective tape can significantly improve visibility.

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