Quantification of Impacts of Road Accessibility and Selected Factors of Road Surroundings Development on Road Traffic Safety

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INTRODUCTION

One characteristic feature of road networks in some countries of Central and Eastern Europe, including Poland, is lack of their hierarchical structure. Additionally, their structure reveals differences in the development of their surroundings related to intensity and type of buildings. In the last 10 years a noticeable increase in the level of housing construction has been observed in the surroundings of roads with traffic functions. This phenomenon was caused by ever more manifest deglomeration of central parts of cities and the expansion of suburbia, similar to the processes typical of US cities. Many national roads, carrying primarily through traffic, are being surrounded by newly emerging commercial and residential buildings gaining direct access to such roads *(1, 2)*. Traffic generated by serving road surroundings creates several traffic flow disturbances and can further generate accident-risk situations. Frequent driveways produce a larger number of collision points (including those that involve pedestrian traffic), a larger number of vehicle decelerations, stops and accelerations. These disturbances result not merely from unconstrained road access, but also from the nature of the development of road surroundings. Generation of additional traffic, i.e. increased risk exposure is closely connected with the nature of such development. Reported research projects do not take into account impacts of local conditions on drivers' behaviour and, in most cases, do not quantify additional impacts of the surroundings development on accident risk. In most works, the development of road surroundings is a factor represented by qualitative variables e.g. intensity of development (low, medium, high) and quantitative assessment of the impact of road accessibility represented by access points density *(3, 4, 5, 6, 7, 8, 9, 10, 11)*. Compared with known works, the authors analysed a markedly higher set of characteristics, including not only road accessibility but also other features of road surroundings development.

The purpose of this study is to:

- identify the scope of access control on the basis of the Polish road network and assess its impact on road safety,
- identify factors determining accident risk related to road surroundings development in suburban areas and at road passages through small communities,
- assess the impact of road surroundings development and road accessibility on safety.

To reach these aims accident prediction models, created by the authors, have been used.

The paper presents the impact of certain factors of road surroundings development and road accessibility in terms of indicators selected by the authors. The results cover the only works done in Poland in the period of 2005–09.

PRACTICE OF ACCESSIBILITY CONTROL IN POLAND

With a view to identifying access control and the scale of development construction in road vicinity in Poland, research was conducted on randomly selected sections of roads totalling 2850 km in length.

The inventory covered whole lines of national roads, one- and two-lane roads of the road network in Poland. The investigation was carried out on road sections located all over the country, representative of the entire road network (in the aspect of road surroundings development in various regions). This resulted in identification of the following problems associated with to road surroundings development and service (fig. 1):

- big share of sections located in built–up areas, over 30%,
- low level (or lack) of road networks hierarchization and their multifunctionality often related to unrestricted accessibility,
- lack of service roads, commercial facilities located along the nationals road which generate high traffic intensity with proper road infrastructure missing,
- linear development of different types of use and intensity along the roads,
- use of safety measures for vulnerable road users made more difficult by linear development and its dispersion,
- departures from the requirements of Polish technical classification *(12)* for the roads in the area of accessibility control for nearly 50% sections of national roads located in small communities and in suburban zones (fig. 2).

FIGURE 1 Example of development and use of road surroundings with dominating share of through traffic in Poland

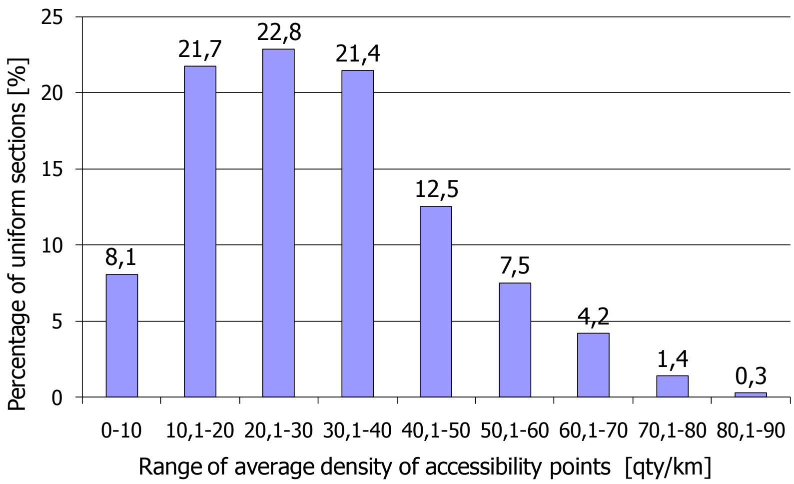

FIGURE 2 Percentage of sections within the ranges of average density of accessibility points in built-up area

In the research conducted abroad, the main variable describing the accessibility which is of statistically significant impact on road traffic safety is the density of accessibility points. It is defined as the number of intersections/driveways per 1 km of the road. Most often, such variable is analysed in connection with the cross–section type, with road location and vehicle traffic intensity. What was singled out were commercial accessibility points of significant traffic intensity and residential ones made use of occasionally. In only studies attention is paid to other safety–affecting factors, i.e. area development (most often as qualitative variables) or demographic indicators *(4, 13)*. The research programs referred to explicitly confirm the existence of statistically significant impact of road accessibility on the values of accident indicators, though many regression models describing such relationships show low values of determination coefficients.

In our research *(2)*, at the first stage also the impact of density of various road accessibility points on accident indicators was evaluated. In the group of accessibility points consideration was given to:

- residential driveways (to private buildings, except those where business operations are run),
- commercial driveways (to the facilities related to business operations),
- intersections with Local Roads (non-marked by vertical signs on the main roadway which would inform about the intersection and which are not residential driveways),
- intersections with other roads marked by vertical signs, of various traffic intensities.

All accessibility points as above have been quantitatively described by means of density indicator *AP* which shows the number of accessibility points of particular type on the analysed road section per the specific reference section 1 km long.

It has been shown that the density of accessibility points is affected by the values of accident indicators analysed, and after their number of 50 qty/km is exceeded, there is a decrease in the value of these indicators. This may be due to a change in the behaviour of drivers of the vehicles passing intensely built-up areas (attention more focused, speed reduction) with a big number of accessibility points.

CHARACTERISTICS OF ROAD DEVELOPMENT AND SURROUNDINGS DESCRIBING THEIR IMPACTS ON TRAFFIC SAFETY

A research focused only and exclusively on evaluating the impacts of density of the road accessibility points is insufficient, as no consideration is given to additional factors related to the type of the road surroundings development and use and to the amount of traffic generated by such surroundings. Traffic is additionally augmented by the risk exposure. Therefore, in our research *(1, 2)* we decided to extend the analysed set of variables by the data describing road surroundings. It has been assumed that the variables (indicators) should quantitatively describe, as far as possible, any factors related to road surroundings development and affecting traffic safety. Such quantitative characteristics could substitute the qualitative variables in accident prediction models.

The indicators, defined below, describing road surroundings indirectly take into account the impacts of intensity and different types of development located along the road on the local traffic generated and on the behaviour of traffic participants. A set of indicators describing the roadside buildings has been defined for roads passing through municipalities and suburban zones. The indicators describing road surroundings cover the following variables describing development: development intensity, the type of road surroundings use, the volume of local traffic generated, distances between buildings and road edge.

Development Density indicator DD_{wide} [%] is a quantitative measure defining the level of development concentration along the road within the bands 50m, 100m and 150m wide from the road, measured on both sides. Such indicator defines the percentage of built-up area of the total area of the land band analyzed, and is calculated from the formula:

$$DD_{wide} = \frac{D_{wide}^{built}}{D_{wide}} \cdot 100 \ [\%] \qquad (1)$$

where:

D_{wide}^{built} – built-up area within the band *50* m, *100* m or *150* m wide (*wide*=) on both sides of the road [m^2],

D_{wide} – total area of the band *50*m, *100*m or *150*m on both sides of the road [m^2],

Development Type indicator DT_B [%] is a variable defining the type, number and proportions of buildings located on this area. The development type description is of significant importance, as it affects the amount and nature of traffic generated. Most often in the prediction models of the accident number or indicators, the development type description appears as qualitative variables. For scalar descriptions the development type indicator DT_B [%] has been suggested because it expresses the area percentages of each type of buildings located on this area (residential, out buildings, commercial included other) of the total built-up area:

$$DT_B = \frac{DT_B^{built}}{\sum DT^{built}} \cdot 100 \; [\%] \qquad (2)$$

where:

DT_B^{built} – built-up area of the particular type of buildings (B) (R – residential, F – farms building, C – commercial) [m^2],

$\sum DT^{built}$ – total built-up area of all buildings [m^2].

Additional feature of the suburban zones and built-up areas located along the roads is the Demographic Population indicator. It is defined as the amount of population of the particular locality per one kilometre section of the road analyzed (built-up area) DP [1000/km. It is closely related to the volume of extra vehicles traffic generated over the roads with through traffic.

Our selection of indicators has been determined by the need to obtain a quantitative description of the development features that would include the factors indirectly affecting the risk exposure components in accident models. Another aim was to make an evaluation of how the space around the road is perceived by vehicle users. It is not possible to quantify road surroundings features by means of individual indicators only. The research, described below, is focused on the identification of the impacts of the indicators of road access points and their type. Another group of impacts to identify covers the indicators describing road surroundings development and the manner it is used, on the accident indicators.

DATA AND METHODS

On the basis of preliminary research some road surroundings development factors have been selected, which might significantly affect road traffic safety. In our analyses due consideration was given to two groups of factors. One covered the number and type of access points and the indicators describing road surroundings specified above. The other group included length of a uniform road section, density of bus stops and pedestrian crossings, and distance between development road edge. All the variables analysed are of scalar type. The only quantitative variable used in road description is the cross-section type. In the analyses the following traffic parameters were also taken into account: traffic volume, vehicle speeds, share of heavy vehicles, share of through traffic and pedestrian traffic volume. The independent variables were selected following an analysis of the correlation between both independent and dependent variables, their statistical significance in models and physical interpretation of the accident prediction model.

The sections selected for the study were those where there are now extra impacts on road safety resulting from road geometry and from traffic organisation. Therefore, these were straight sections of small longitudinal gradient, with no extra speed-reducing elements, with general speed limit for built-up area of 50 km/h. All of the above factors were incorporated into a road database built by the authors. The factors of road surroundings development were quantified by means of accident prediction models. In order to quantify them, the authors used detailed statistics of roads and accidents (2003-2007). The database was divided into two groups on the ground of regional differentiation of road surroundings development in Poland. The first group (group I) covered the territory of southern Poland (three voivodships), and it included information on 356 uniform sections totalling 407 km in length where 1566 accidents had been recorded, characteristic of road surrounding development in the region. Group II covered sections selected all over Poland, of similar characteristics) including the sections in southern Poland. In the final count, 158 uniform road sections were selected totaling 285 km in length wherein 1010 accidents had been recorded

In order to evaluate the impacts of road surroundings development on road traffic safety, models of prediction the road events were created and used. The following dependent variables were selected: total number of accidents (ACC), total number of accidents at daytime (ACC_{DAY}), number of accidents involving vehicles (ACC_{VEH}), number of accidents involving pedestrians (ACC_{PED}), number of accidents over the sections between intersections (intersections and their neighbourhood excluded) (ACC_{SEC}), number of victims (VIC). All measures specified relate to a 5-year period.

In creating models, the authors used general regression models (with Log linked functions), multi-value logistic regression and models of artificial neural networks of various types – linear networks, one-dimensional triple-layer networks – multilayer perceptions – MLP, radial basis function networks - RBF and general regression networks – GRRN, with a linear and logistic activation function). Artificial neural network models were used to search for additional independent variables that would define accident risk, which escaped identification by classic regression techniques. This, in turn, helped to compare kinds and roles of selected factors underlying road surroundings development and their impact on road traffic safety. The final models contain variables which, as it turned out, were statistically relevant (with a relevance level of $p \leq 0.05$ in regression analysis).

In order to construct estimation models by means of the generalized linear regression method, Poisson distribution has been used for the random variable and consideration given to the transformations of independent variables Q (traffic volume) and L (uniform section length) to the form of $x_i = ln(Q)$ and $x_i = ln(L)$ *(11, 14)*. The models include risk exposure variables (Q and L), variables describing road surroundings development and its accessibility, as well as variables describing vehicle traffic. A general model to estimate the dependent variable of accident number is represented by the formula:

$$ACC = Q^{a_1} \cdot L^{a_2} \cdot \exp(a_0 + a_3 \cdot x_3 - a_4 \cdot x_4 + ... + a_n \cdot x_n) \quad (3)$$

where:

$a_0, a_1, ..., a_n$ – unknown model parameters, direction coefficients at the variables,

$x_3, x_4, ..., x_n$ – non-random independent variables observed.

Application of *Poisson* distribution makes it necessary to use a modified coefficient of multi-dimensional correlation suggested *(15)* to evaluate the model matching. When calculating the determination coefficient, consideration was also given to different number of independent variables in the models by using the corrected determination coefficient R^2_C.

In case of searching for statistically significant variables affecting road traffic safety and related road surroundings development by means of logistic regression, its multi-valued form was used, wherein dependent variable Y assumes $n+1$ possible values designated by $1, 2, ..., n, n+1$. For the given set of independent variable values, the probability that any possible dependent variable value is obtained can be determined. The number of $n+1$ conditions is usually small. In case of continuous variable, categorization is used. The multi-valued logistic regression model is a model of parallel straight lines, based on the cumulated probabilities of dependent variable (proportional odds model). The result of the model calculations below is a set of n parallel lines differing in the free term only *(16)*. The general form of model is represented by the following formula:

$$logit\, P = \ln \frac{P_i}{1 - P_i} = A + B \cdot X \quad (4)$$

where:

P_i – the probability that the value of dependent variable Y is less or equal to i-th category,

A – estimator of the free terms vector ($a_1, a_2, ..., a_n$),

B – vector of inclination coefficients for each explanatory variable in the regression formula ($b_1, b_2, ..., b_n$),

X – vector of explanatory variables ($x_1, x_2, ..., x_n$),

For any formula (5) calculated, the probability that the variable value is either less or belongs to the top closed range determined by the particular category can be estimated using the logistic regression model formula (notation as in formula 3):

$$P_i = \frac{\exp(a_i + a_1 \cdot x_1 + a_2 \cdot x_2 + \ldots + a_n \cdot x_n)}{1 + \exp(a_i + a_1 \cdot x_1 + a_2 \cdot x_2 + \ldots + a_n \cdot x_n)} \quad (5)$$

The model results have been verified with reference to *Test for the Proportional Odds* and models match was evaluated by means of determination coefficients *pseudo R-Square* and *Max-rescaled R-Square.*

ESTIMATION OF THE IMPACT OF ROAD SURROUNDINGS DEVELOPMENT AND ITS ACCESSIBILITY ON SAFETY

The created prediction models of accident indicators are shown in tables 1 and 2. Table 1 shows direction coefficients at the variables for a general form of formula (3) estimated on the basis maximum likelihood. In table 2, the values of the formula coefficients for multi-valued logistic regression models are listed. Most of the variables in the formulas (both quantitative and qualitative) are statistically significant on the significance level $p \leq 0.05$. Some variables underlined in the tables 1 and 2 are statistically significant on the significance level $p \leq 0.1$, and their appearance in the model results from the variables in the model physical interpretation. Other variables initially chosen for analyses turned out to be statistically insignificant. For qualitative variables, the variables assume the value of 1 when the particular cross-section type appears and the value of 0 in other cases.

TABLE 1 List of coefficients in the formulas of prediction of the number of accidents and their victims for generalised regression models (3)

dependent variable		group I (southern Poland)						group II (entire Poland)					
		ACC	ACC_{SEC}	ACC_{PED}	ACC_{VEH}	ACC_{DAY}	VIC	ACC	ACC_{SEC}	ACC_{PED}	ACC_{VEH}	ACC_{DAY}	VIC
a_0		-4.922	-4.956	-5.814	-4.878	-5.497	-5.02	-4.453	-2.724	-5.892	-	-4.672	-3.318
Model coefficients for quantitative variables: $a_1, a_2, \dots, a_n$	Q	0.659	0.666	0.604	0.633	0.691	0.7	0.467	0.432	0.573	0.096	0.518	0.533
	L	1.102	1.101	1.209	0.993	1.057	0.982	1.083	1.112	0.978	1.071	1.058	1.000
	API	0.066	-	0.12	-	0.047	0.081	-	-	-	-	-	-
	APR	-	-	-	-	-	-	0.005	-	-	0.006	0.008	-
	APC	-	0.019	-	0.02	0.027	-	0.061	0.047	0.076	0.056	0.057	0.030
	PC	0.078	-	0.138	-	0.1	0.048	0.127	-	0.171	0.11	0.131	0.104
	DT_R	-	-	-	-	-	-	-	-0.013	-	-0.019	-	-0.014
	DT_F	-	-	-	-	-	0.004	0.013	-	-	-	-	-
	DT_C	0.012	-	0.019	0.009	-	0.013	-	-	-	-	-	-
	DD_{50}	-	-	-	-	-	-	-	0.039	-	-	-	0.033
	T	-	-	-	-	-	-	0.007	-	-	0.009	0.006	0.009
Model coefficients for qualitative variables	CP	0.095	-0.011	0.02	0.144	0.105	0.125	0.159	0.27	0.237	0.204	0.118	0.169
	CG	0.174	-0.142	0.178	0.116	0.101	0.184	0.135	0.124	0.116	0.083	0.179	0.167
	CW	-0.269	0.154	-0.198	-0.261	-0.206	-0.308	-0.294	-0.395	-0.353	-0.287	-0.297	-0.336
R^2_C		0.73	0.63	0.68	0.56	0.71	0.5	0.8	0.78	0.69	0.79	0.83	0.67
Formula No		6	7	8	9	10	11	12	13	14	15	16	17

TABLE 2 List of coefficients in the formulas of prediction of the number of accidents and their victims for logistic regression models (5)

dependent variable		group I (southern Poland)						group II (entire Poland)					
		ACC	ACC_{SEC}	ACC_{PED}	ACC_{VEH}	ACC_{DAY}	VIC	ACC	ACC_{SEC}	ACC_{PED}	ACC_{VEH}	ACC_{DAY}	VIC
Coefficient for categorization ranges ai	<1	3.400	3.733	5.710	3.229	4.461	2.405	1.824	1.315	2.485	5.135	2.312	-0.445
	<2	5.839	6.257	8.521	5.534	6.862	4.219	4.479	4.195	4.571	7.811	5.262	1.792
	<3	7.324	7.831	10.018	7.163	8.816	5.165	6.130	5.667	6.036	9.396	6.866	2.552
Model coefficients for quantitative variables	L	-1.885	-1.789	-1.699	-1.361	-1.890	-1.564	-1.542	-1.276	-0.709	-1.445	-1.581	-1.332
	Q	-0.00017	-0.00015	-0.00015	-0.00014	-0.00019	-0.00018	-0.00018	-0.00012	-0.00012	-0.00014	-0.00015	-0.00013
	API	-0.154	-	-0.251	-	-0.205	-0.200	-	-	-	-	-	-
	APR	-	-	-	-	-	-	-0.025	-0.039	-	-	-	-
	APC	-	-	-	-	-	-	-	-0.145	-0.148	-	-0.139	-
	$APLR$	-	-0.084	-	-	-	-	-	-	-	-	-	-
	PC	-0.175	-	-0.335	-	-	-	-0.286	-0.231	-0.233	-0.263	-0.338	-0.268
	DT_R	-	-	-	-	-	-	0.033	0.047	-	-	0.027	0.036
	DT_F	-	-	-	-	-	-	-	-	-	-0.038	-	-
	DT_C	-	-0.026	-	-	-	-	-	-	-	-	-	-
Model coefficients for qualitative variables	CP	0.111	-	-0.249	-	-	0.259	0.309	0.429	-	-	0.351	0.409
	CW	0.767	-	0.642	-	-	0.996	1.324	1.711	-	-	1.283	1.204
Formula No		18	19	20	21	22	23	24	25	26	27	28	29

The variables in the models are: Q – traffic volume [veh/24h], L – length of road section [km], API – indicator of density of intersections [qty/km], APR – indicator of density of residential access points [qty/km], APC – indicator of density of commercial access points [qty/km], $APLR$ – indicator of density of intersections with local roads [qty/km], PC – density of pedestrian crossings [qty/km], DT_R – indicator of type of development for residential buildings [%], DT_F – indicator of type of development for farm buildings [%], DT_C – indicator of type of development for commercial buildings [%], DD_{50} – indicator of development density along the road within a 50-m band on either side of the road [%], T – percentage share of through traffic in total traffic [%], CP, CG, CW – qualitative variables denoting a one-lane Cross-section, 7.0 m wide with a Paved shoulder, Ground shoulder and pavements respectively.

On the basis of the models created, impacts of the road surroundings factors and its accessibility to the road traffic safety, which enables – among other things –impacts of various road network changes and of the way the road surroundings are developed to the selected accident indicators. The impacts of quantitative and qualitative variables describing the road accessibility and its surroundings development were evaluated. In our analyses we estimated impacts of the selected individual independent variables to the dependent ones, with averaging values of other independent values provided for the analyzed set of road sections. Exemplary impacts of the density indicator of commercial access points, of the development type indicator and the development density indicator to the number of accidents as estimated to the regression models are shown in fig. 3÷5.

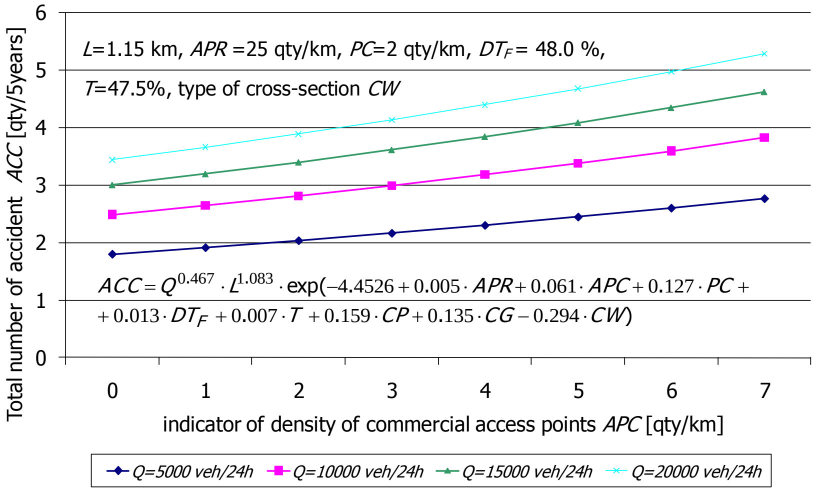

FIGURE 3 Impacts of commercial driveways density to the estimated number of accidents (from formula 12)

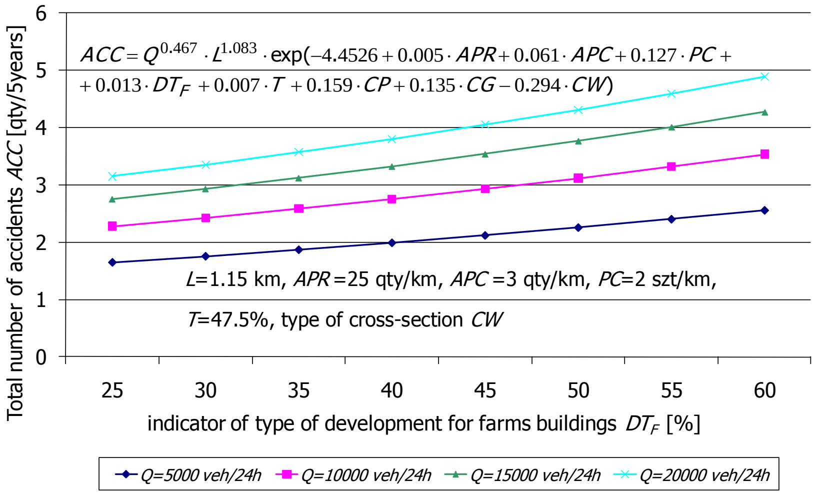

FIGURE 4 Impacts of farm type on the estimated number of accidents (from formula 12)

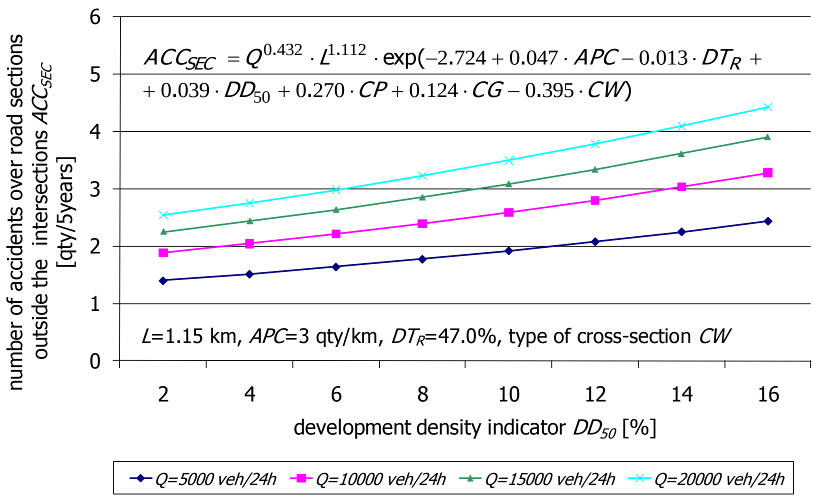

FIGURE 5 Impacts of development density within 50m band on the estimated number of accidents over sections between intersections (from formula 13)

In order to evaluate the impact of changes in the road surroundings development on the probability of accident occurrence or victims counted in the given category, models of multi-valued logistic regression were used. Figs 6 and 7 show examples of results of estimation of impacts of the development density indicator and farm type on the probability of accidents. In the said example, the values of independent variables to estimate the probability of average number of accidents occurring throughout the year in the particular category were: L = 1.15 km, Q=10000 veh/24h, APR=25 qty/km, APC=3 qty/km, $APLR$=2 qty/km, API=3 qty/km, PC=2 qty/km, DT_F = 48%, DT_R = 47%, DT_C = 5%, cross – section type *CW.* Evaluation of the obtained results of logistic model analyses confirms the conclusions from the analyses of generalized linear regression model of the impact of accessibility and road surroundings development on the accident indicators. Qualitatively, the impact is the same as for the models obtained for generalized regression.

On the grounds of analysis of the impact of farm type on the probability of the number of vehicle involving accidents occurrence, it can be stated that (fig. 7):

- the growth in farm indicator DT_F causes a decrease of the probability of more vehicle involving accidents happening,
- probability P_i of up to 1.0 vehicle involving accident, happening yearly on average drops from 0.42 down two 0.22 as the farm indicator grows from 35 up to 60%, which gives an average probability of 0.04 per each extra 5% buildings,
- probability of to 2 vehicle involving accidents happening yearly on average is doubled, approximately.

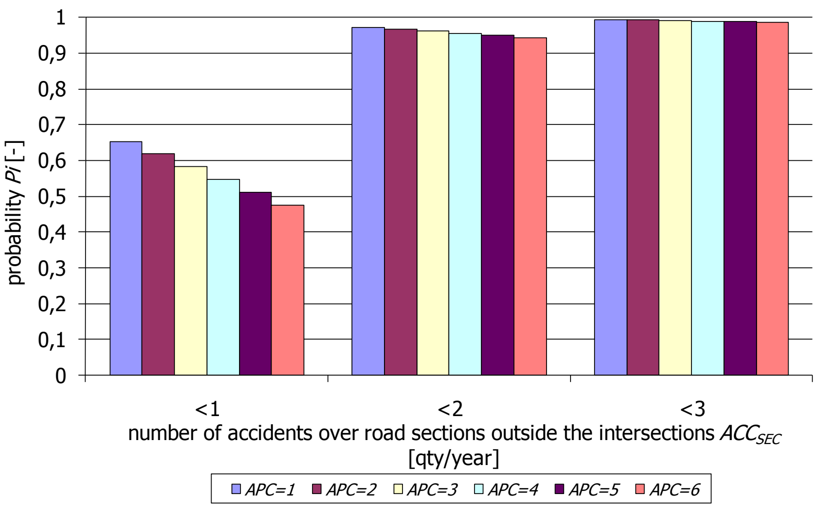

FIGURE 6 Impact of the density indicator of commercial access points on the probability of a number of accidents happening over road sections outside intersections (from formula 25)

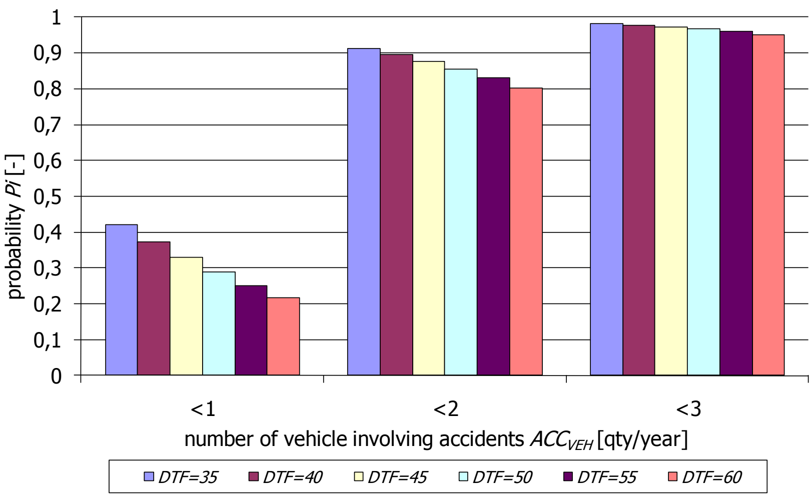

FIGURE 7 Impact of farm type development indicator on the probability of vehicle involving accidents happening (from formula 27)

RESULTS

The variables defining road surroundings development and road accessibility determining road traffic safety emerged to be statistically relevant and were: density of pedestrian crossings *PC*, road accessibility indicators (*API, APR*, *APC* and *APLR*) and indicators of the type of buildings (DT_F, DT_R and DT_C) and building density (DD_{50}). When using the artificial neural networks, road accessibility indicators (*API, APR*, *APC*), indicators of the type of buildings (DT_F, DT_R and DT_C) and building density (DD_{50}, DD_{100}, DD_{150}) proved to be statistically relevant determinants of road safety. Moreover, a variable representing the share of through traffic in the flow of vehicles *T* was also relevant.

In number terms, the impacts are as follows:

- An increase in the density of intersections leads to an estimated 6.8% growth in the number of accidents per each additional intersection per kilometre of the road (priority type intersections with traffic volume of 100 veh/h). Each additional commercial access point over a one kilometre section of the road leads to a 6.3% increase in the number of accidents. Each 10 additional residential driveways per kilometre of the road account for an estimated 4.7% increase in the number of road traffic accidents.
- A 5% increase in building density DD_{50} leads to an estimated 20.5% increase in the number of road traffic accidents as computed on the basis of regression models on sections of the road other than intersections.
- A 5% increase in the share of residential buildings reduces the number of road accidents by 6.2% at sections of the road other than intersections.
- Each additional pedestrian crossing per one kilometre of the road leads to an estimated 13.5% increase in the number of road accidents.
- Based on models of multi-value logistic regression, removal of one access point reduces the estimated probability of a road accident by 1% in the case of residential driveways, 3.5% in the case of commercial driveways and 3.7% in the case of intersections, respectively.
- Qualitative impact of the road surroundings development and surroundings service for generalized regression models and for multi-valued logistic regression is the same. The type of impact of the independent scalar variables is in conformance with the expectations following from physical interpretation of the role of such variables.
- Practical applicability of accident prediction models is restricted to road sections of characteristics similar to the sections on which data were collected.

CONCLUSIONS

On the basis of empirical research and analyses of accident prediction models, the following conclusions can be drawn:

- The results of analyses confirmed the considerable impact of access control and road surroundings development on road traffic safety, which confirms the need to change land-use policy in the vicinity of roads and access control. A quantitative description of the impacts is presented by the models developed in the study. On the ground of the results obtained, recommendations have been formulated for a road network planning and transformation policy, including the network surroundings management *(2).*

- The key parameters that have an impact on the number of road accidents and victims thereof estimated on the basis of prediction models are parameters representing risk exposure, i.e. traffic volume and length of passage through a given locality. Speed was found to have impact on the accident risk and the consequences, but the prediction models developed by the authors take speed into account indirectly through other variables correlated with it;
- Other statistically relevant variables in the estimation models of accident numbers include: indicator of road accessibility, type of buildings, building density, density of pedestrian crossings, rate of through traffic and type of cross-section.

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