

# **TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND (CASE OF A2 LODZ-WARSAW MOTORWAY)**

*PIOTR ROSİK*

*Stanisław Leszczycki Institute of Geography and Spatial Organization, Warsaw*

*rosik@twarda.pan.pl*

## **INTRODUCTION**

The construction of the A2 motorway linking the Polish and German capitals is one of the key investment projects in the Eastern Europe. At present Warsaw suffers from the lack of high-speed road connection to the European motorway network. Currently, the existing part of the A2 is between Nowy Tomysl (55 km west of Poznan) and Strykow near Lodz (length of about 250 km). The “missing” section from the Polish-German border in Swiecko to Nowy Tomysl (106 km) is being constructed since the July 2009 under a PPP scheme and is planned to be finished before the end of 2011. The another missing A2 section, and probably the most important one, is 94 km Strykow-Konotopa linking Lodz and Warsaw – two largest Polish cities. This section will be built using public funds. According to GDDKiA (General Directorate for National Roads and Motorways) the road will be finished before June 2012 when Poland, together with Ukraine, is to host the European Football Championship.

Most of the A2 Lodz-Warsaw traffic forecasts are based on the current network state and traffic flows on national roads which are parallel to A2 section – DK2 (Lowicz-Warsaw section) and DK8 (Wroclaw-Warsaw). Although extrapolation is the most usual method of forecasting, one should take into account also the induced traffic level and the shortest path algorithm between the origin and destination. For that reason, the traffic forecast has been conducted using three scenarios which have different underlying assumptions. These assumptions are in accordance with the shortest path algorithm and the data from the Warsaw Traffic Study (WBR 2005). The forecast has been made for the years 2012 and 2020. The A2 Lodz-Warsaw construction is assumed to be completed in 2012. Eventually, all

*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr*

express roads which can reduce the traffic volume on the A2 are planned to be finished by the end of 2020. The analysis of potential accessibility improvement after adding the A2 Lodz-Warsaw section has also been presented.

## **TRAFFIC VOLUME IN THE DK2 AND DK8 CATCHMENT AREAS**

The catchment area is a term in human geography understood as the area from which people are attracted by the city, airport, university, etc. In the article the term “catchment area” means rather a drainage basin. Drainage basin is the area which drains water (streams, rivers) into the same river, lake etc. The catchment area is then the area that covers the origins of all of these trips, the last part of which is the same section of road network leading to the destination. For example, the A2 Lodz-Warsaw motorway will be used by drivers travelling to Warsaw from different origins located in the A2 Lodz-Warsaw catchment area. In case of road infrastructure, one should assume that all travelers choose the shortest path in reaching the same destination. The shortest travel times have been obtained from Traffic Model used at the IGSO PAS (Institute of Geography and Spatial Organization Polish Academy of Sciences) in Warsaw (Komornicki et al., 2009). Road traffic regulations, population density and lay of the land in the road surrounding area have been taken into account as variables that could influence the average travel speed between the cities with the poviats’ capitals (NUTS 4) and Warsaw.

The catchment areas of national roads that are parallel to A2 Lodz-Warsaw – DK2 (Lowicz-Warsaw section) and DK8 (Piotrkow-Warsaw section) have been taken into consideration. In 2008, the DK2 catchment area’s population exceeded 7 mln while the DK8 catchment area’s population was more than 11,5 mln (fig. 1).

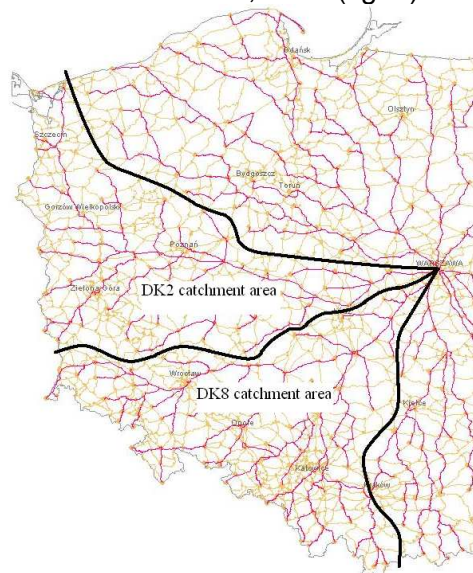


Fig. 1. The shortest travel routes to Warsaw and the DK2 and DK8 catchment areas in 2008

**TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr**

The traffic volume on the national and voivodship roads is measured in Poland by General Directorate for National Roads and Motorways every 5 years (*General Traffic measurement, 2005*). The last study was conducted in 2005 (fig. 2).

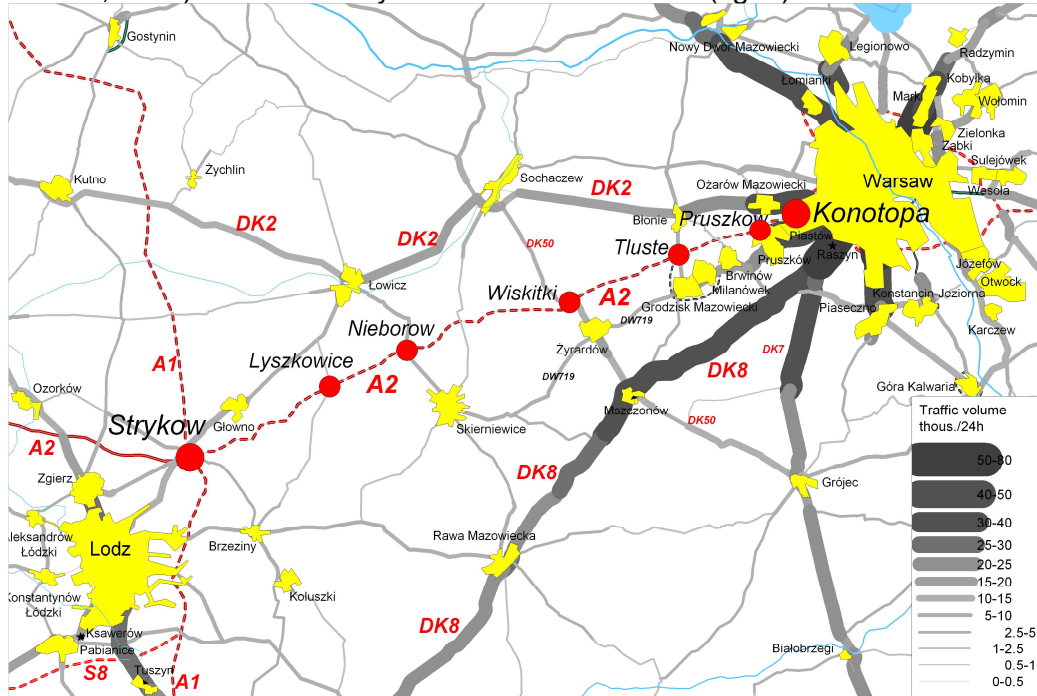


Fig. 2. The average 24 hour traffic volume of motor vehicles in 2005 in the area between Lodz and Warsaw

The highest traffic in the area between Lodz and Warsaw was recorded in the surrounding area of Warsaw on DK8 (more than 50000 motor vehicles/24h) and on DK2 (more than 25000 motor vehicles/24h). The traffic volume decreased substantially in the direction of Lowicz and Kutno on DK2 (in 2005 the construction of the A2 Konin-Strykow near Lodz section was not completed and travelers from the western Poland went by DK2 from Konin through Kutno and Lowicz to Warsaw). On DK8 the only slight decrease of traffic volume was observed in the direction of Lodz and Piotrkow Trybunalski (to about 25000 motor vehicles/24h). The route DK8 is a part of one of the main transit routes linking southern Poland (Silesia region), Warsaw and (on the north) Baltic states. The traffic on this route is much more balanced among sections than on the DK2. All other roads in the area between Lodz and Warsaw (except for DK7 – an alternative route to Cracow) were characterized by lower traffic volume.

In case of freight traffic volume in 2005 the traffic was more concentrated on the two main roads (DK2 and DK8) (fig. 3). However, the transit traffic through Warsaw was “neutralized” by the so-called DK50 ring-road linking Sochaczew, Mszczonow and Gora Kalwaria. The highest traffic on DK8 was observed near Mszczonow – about 7000 trucks/24h. The truck’s destination could have been located in the west of the city of Warsaw in Janki Shopping Centre (DK8) or Warsaw Agricultural-Food Wholesale Market in Bronisze (DK2) as well. For these reasons the freight traffic at the border of the city of Warsaw is

**TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr**

above 1 000 trucks/24h lower than the one observed about 50 km outside city of Warsaw on DK2 and DK8.

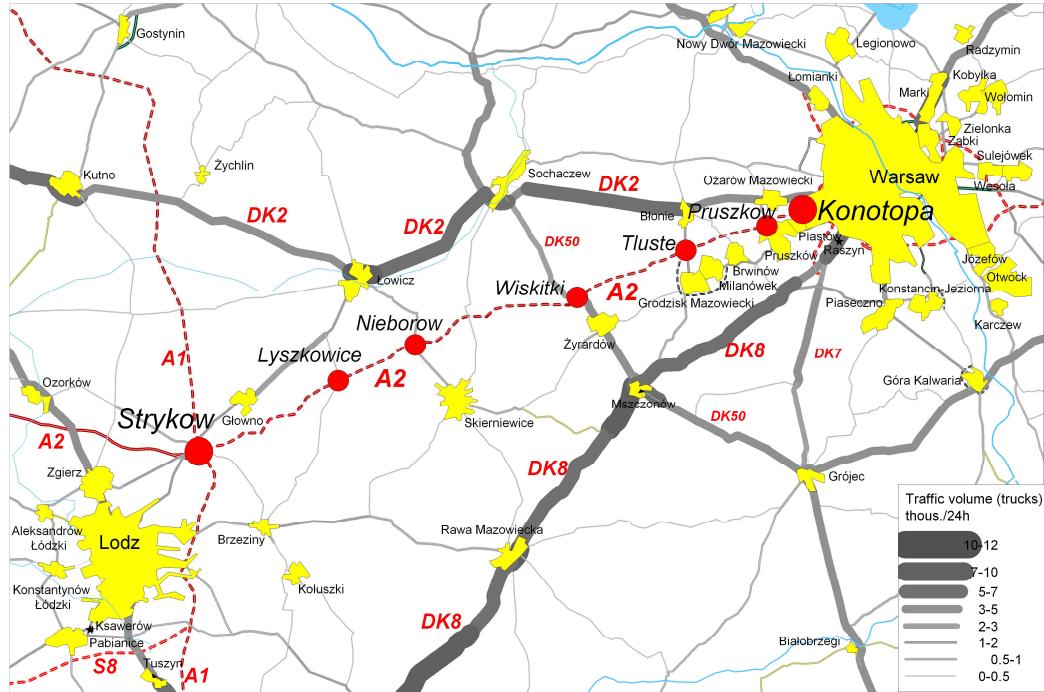


Fig. 3. The average 24 hour traffic volume of trucks in 2005 in the area between Lodz and Warsaw

## TRAFFIC FLOWS AT THE BORDER OF THE CITY OF WARSAW IN 2005

The study of traffic flows at the border of Warsaw has been conducted on the basis of the data from the Warsaw Traffic Study (WBR, 2005) which was carried out in 2005 by Warsaw Development Planning Office. In the day of the study, the volume and structure of traffic was observed at all 21 major entry roads to the city of Warsaw. The drivers stopped in a police operation were asked to fulfill the questionnaire concerning, among others: the origin and destination of the journey and its motivation. The observed traffic flow in the south-western side of the city of Warsaw (1-5 entries, see fig. 4) ranged from more than 15000 motor vehicles/24h (Warszawska Str.) to more than 73000 motor vehicles (Krakowska Av. – DK8) and the share of trucks – from 3% of traffic (Warszawska Str.) to 11% (Polczynska Str.). The highest freight traffic volume was observed for Krakowska Av. (6875 trucks/24 h).

**TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr**

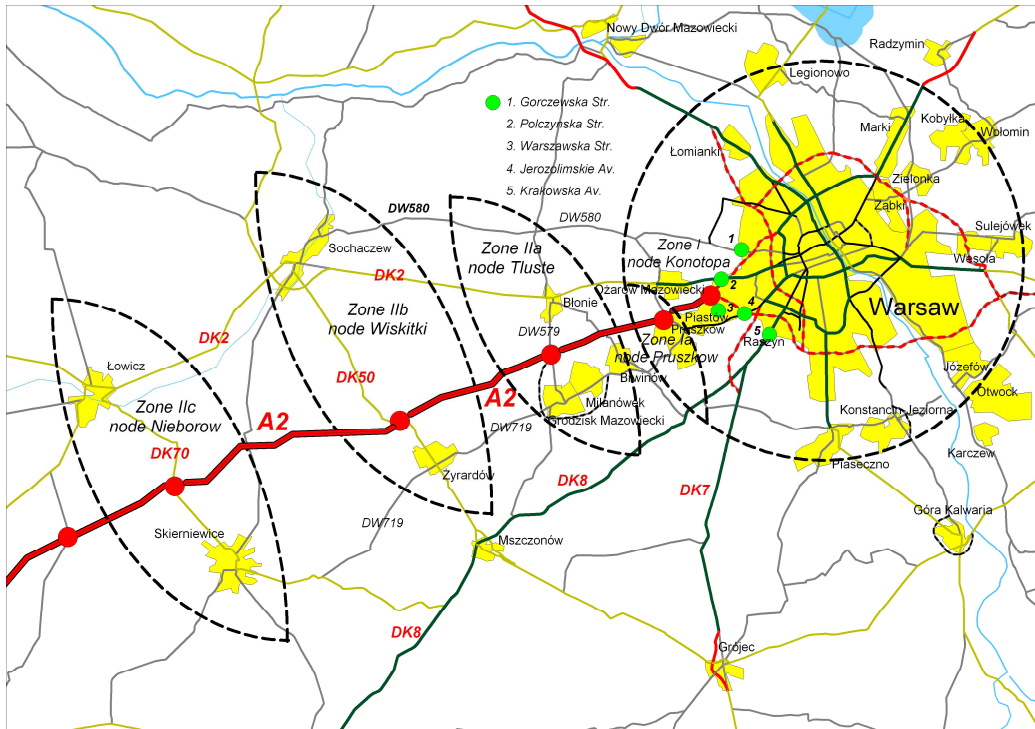


Fig. 4. The A2 nodes, their “attraction areas” and the entries to the city in the south-western side of Warsaw

The classification of journeys has been made according to the distance of travel. The trips have been divided into the short (within a 20 km radius from the center of Warsaw – I zone), medium (20-80 km from the center – II zone) and longdistance (beyond 80 km from the center) trips. The comparison of traffic volume is shown in tab. 1:

Tab. 1. Traffic volume estimation according to the travel origin and entry to Warsaw in 2005

Nr	Entry	Travel origin												Traffic volume in zones I-III (without interior journeys)*	
		I zone (<20 km)				II zone (20-80 km)				III zone (>80 km)					
		Traffic volume 24 h		Share of zone I in a total traffic volume (%)		Traffic volume 24 h		Share of zone II in a total traffic volume (%)		Traffic volume 24 h		Share of zone III in a total traffic volume (%)			
total	trucks	total	trucks	total	trucks	total	trucks	total	trucks	total	trucks	total	trucks		
1	Gorzewska Str.	12880	402	67	50	5466	331	28	41	939	71	5	9	19285	803
2	Polczyńska Str.	28530	2339	64	48	12119	1276	27	26	3772	1276	8	26	44421	4891
3	Warszawska Str.	12278	381	81	86	2606	63	17	14	298	0	2	0	15182	444
4	Jerozolimskie Av.	34779	1769	68	57	13768	697	27	22	2515	643	5	21	51062	3109
5	Krakowska Av.	33644	2604	46	38	22734	1667	31	24	16963	2604	23	38	73341	6875

Red colour – dominant entry (highest traffic volume or highest percentage of use)

\* Interior journeys are the journeys with the origin and destination in Warsaw.

Source: own calculation based on Warsaw Traffic Study (WBR 2005).



*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSİK, Piotr*

In 2005 traffic to Warsaw was mainly generated in the I zone – from 46% (Krakowska Av.) to 81% (Warszawska Str.). In case of trucks, the share of I zone was relatively high for the entry which has a local character (Warszawska Str. – 86%) and rather low for the rest of entries (the share of trucks was generally higher in the higher distance). The distance between 20 and 80 km from the centre of Warsaw characterized 17% (Warszawska Str.) to 31% (Krakowska Av.) of the origins of journeys. In case of trucks the share of II zone was the highest for Gorczewska Str. (41%) and lower in all other cases (less than 30% of traffic volume). The share of travelers from the III zone was very low for Warszawska Str. (only 2%) and relatively high for Krakowska Av. (23%). In case of trucks, the origin of more than 38% of trucks going through the city border on Krakowska Av. is located further than 80 km from the centre of Warsaw.

## **A2 LODZ-WARSAW CATCHMENT AREA IN 2012 AND 2020**

The forecast assumption is that motorways and express roads will be built according to the official plans of the government of Poland. It means that it will be possible to drive on motorway from the Polish-German border in Swiecko to Warsaw (A2) in 2012, from the Polish-German border in Zgorzelec through Wrocław to Cracow (A4 completed in 2009) and Tarnow in 2012, from Gdansk to Torun in 2011 (A1) and from Lodz (Strykow) to the Polish-Czech border in Gorzyczki (A1) in 2012. The missing sections of the motorway network in 2012: from Torun to Lodz (Strykow) (A1), from Warsaw to the Polish-Belarus border (A2) and from Tarnow to the Polish-Ukrainian border (A4) should be completed by 2020. Besides motorways, the missing parts of the express road network will be build in the period of 2012 to 2020, of which the most important in the context of this article are S8 (linking Wrocław, Lodz and Warsaw) and S7 (linking Gdansk, Warsaw and Cracow).

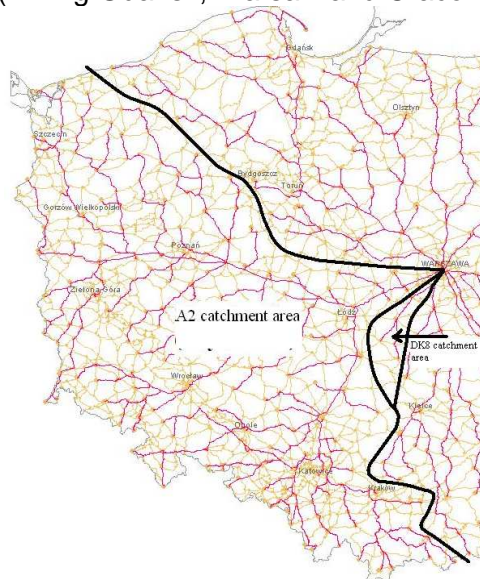


Fig. 5. The shortest travel routes to Warsaw and the A2 Lodz-Strykow and DK8 catchment areas in 2012

*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSZAW MOTORWAY)  
ROSİK, Piotr*

The most important change between 2008 and 2012 is that the A2 Lodz-Warsaw catchment area will cover more than half of Polish territory, with population above 20 mln people. For all these inhabitants, the shortest route to Warsaw will lead through the missing A2 Lodz-Warsaw section. The existing DK2 will not be regarded as the shortest travel path to Warsaw (except for local purposes) and the DK8 will be used only by people living in a relatively small area in the eastern part of the Lodzkie Region (see fig. 5). The shortest route from Wroclaw and Cracow to Warsaw will be through the A2 Lodz-Warsaw section. For a long time the DK7/S7 won't be a sensible alternative road from Cracow due to the works which would probably reduce the travel time.

There is a wide range of evidence which shows the existence of induced traffic. One of the reasons for the induced traffic volume on the A2 Lodz-Warsaw section is that in 2012 Warsaw will be finally connected with the European motorway system. It means that many more travelers from western countries and Polish western regions will choose car as a mode of transportation (instead of air or rail). Moreover, the A2 Lodz-Warsaw section and new express roads in the city of Warsaw will take over the significant part of truck traffic volume. Nowadays trucks need to go through the old and narrow ring-road (DK50) around Warsaw.

The A1 Torun-Lodz section will be completed by 2020 (probably much earlier). The S8 Piotrkow Trybunalski – Janki near Warsaw express road will be also completed which means that the S8 will be a temporally alternative route to Warsaw. One can expect that the travelers may choose this route and the traffic will be divided between the A2 and S8 routes (fig. 6).

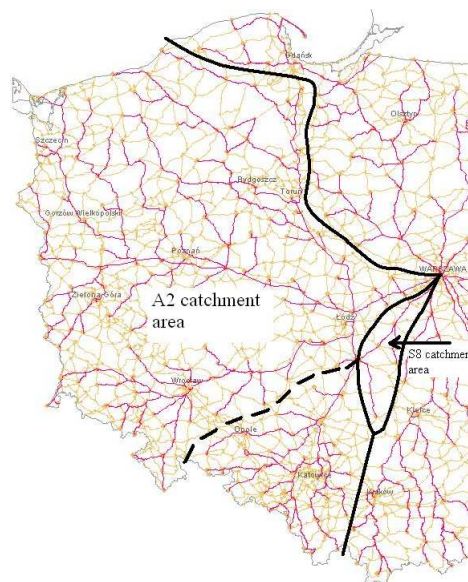


Fig. 6. The shortest travel routes to Warsaw and the A2 Lodz-Strykow and DK8 catchment areas in 2020

In 2020 the A2 Lodz-Warsaw catchment area will be reduced in the south by the area of Cracow and Podhale. However, in the northern side of Poland the A2 Lodz-Warsaw section will increase its catchment area due to the construction of new A1 Torun-Lodz

*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSZAW MOTORWAY)  
ROSIK, Piotr*

section. The shortest route from Gdansk to Warsaw will still go through S7 express road. However, the travel-time differences between S7 and A1/A2 will not be high. The chosen route will depend on the toll level on the A1 and A2 motorways. The same problem of choosing between variants of A1/A2 and A1/S8 will be faced by the travelers in the south, from Upper Silesia Region.

## TRAFFIC VOLUME FORECAST FOR THE A2 LODZ-WARSZAW SECTION

The traffic volume forecast for the A2 Lodz-Warsaw subsections requires an array of assumptions. First assumption is that the traffic volume increase is correlated with the GDP growth. The truck traffic increase is assumed to be equal to the growth of GDP and the motor vehicle traffic increase is assumed to be 85% of GDP growth. The economic slowdown in the years 2008 and 2009 and 10 years economic cycle have been taken into account (fig. 7).

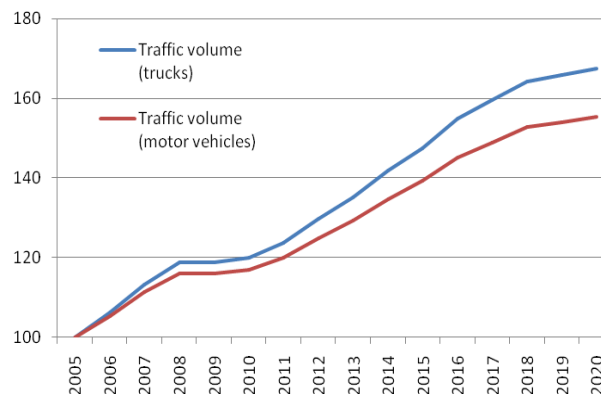


Fig. 7. Traffic volume forecast for motor vehicles and trucks in the period of 2005-2020 (the last available data from 2005 = 100)

Second assumption is that the forecast results depend on the traffic flow scenario. The three scenarios of traffic flow are considered (S1, S2, S3). The difference between scenarios lies in the share of motor vehicles and trucks going to Warsaw on the A2 motorway from different gminas (NUTS 5) (tab. 2).

Tab. 2. Three scenarios of share of travelers going to Warsaw on the A2 motorway according to the travel origin node (%)

Zone (distance to the centre of Warsaw in km)	Travel origin (city)	Share of motor vehicles going to Warsaw on the A2 motorway (%)			Share of trucks going to Warsaw on the A2 motorway (%)		
		S1	S2	S3	S1	S2	S3
III (> 80 km)	All origins in zone III	85	95	100	90	100	100
II (20-80 km)	IIc Skierniewice	75	90	100	80	95	100



**TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr**

	IIb	Lowicz	75	90	100	80	95	100
		Zyrardow	75	90	100	80	95	100
		Sochaczew	50	75	100	80	95	100
	IIa	Brwinow, Podkowa Lesna, Milanówek, Grodzisk Mazowiecki	50	75	100	60	85	100
		Blonie, Teresin	50	75	100	60	85	100
I (< 20 km)	Pruszkow	50	75	100	60	85	100	

The first scenario can be regarded as a minimal and the third scenario as a maximal one. The assumption is that the longest distance to Warsaw, the higher number of motor vehicles choose the A2 as a route to Warsaw (except of the zone IIb where Sochaczew is located relatively farer from the A2 motorway than Zyrardow). The share of trucks is assumed to be relatively higher than the share of motor vehicles in all scenarios. The results are shown in tab. 3.

Tab. 3. Traffic volume forecast for motor vehicles and trucks for the years of 2012 and 2020 on particular subsections of the A2 Lodz-Warsaw motorway

A2 subsection	2012						2020					
	motor vehicles/24h			trucks/24h			motor vehicles/24h			trucks/24h		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
Strykow (Lodz)- Nieborow	23022	25731	27085	5010	5566	5566	28548	31906	33586	6474	7193	7193
Nieborow-Wiskitki	24766	27950	29410	5596	6263	6300	30710	34658	36468	7232	8094	8141
Wiskitki-Tluste	29510	34317	37234	6008	6751	6814	36592	42553	46170	7764	8725	8806
Tluste-Pruszkow	45279	57971	68772	7285	8455	8943	56146	71884	85277	9415	10926	11557
Pruszkow- Konotopa (Warsaw)	64658	87039	107530	8568	10272	11081	80176	107929	133337	11072	13274	14320

The traffic volume on the A2 Lodz-Warsaw section will be exceptionally high in Polish conditions. The traffic volume higher than 100000 motor vehicles/24h was observed in 2008 only on the short section of A4 motorway in the city of Katowice (Upper Silesia). However, there are four lanes in each direction. The General Directorate for National Roads and Motorways of Poland is going to build on the A2 Lodz-Warsaw only two lanes in each direction except of the A2 Pruszkow-Konotopa section, which is planned to have 3x2 lanes. The congestion is inevitable. Fortunately it will be possible to widen the motorway in the future (the space for an additional lane in each direction) when traffic demands it. However, if the congestion and toll price are high, the travelers will choose other routes to Warsaw and the traffic will decrease on the A2 motorway.

## POTENTIAL ACCESSIBILITY IMPROVEMENT

*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr*

The potential accessibility improvement after the realization of the A2 Lodz-Warsaw motorway section is calculated basing on the power distance-decay function which produces the well-known Hansen-type indicator (Hansen, 1959). The accessibility indicator is the sum of the mass of each other region divided by the shortest travel time to it. The closer the opportunity (mass of each other region), the more it contributes to accessibility. The larger the opportunity, the more it influences the accessibility. Hansen-type potential accessibility indicator looks as follows:

$$A_i = \sum_j \frac{M_j}{t_{ij}} \quad (1)$$

where:  $A_i$  – accessibility of region  $i$ ,  $M_j$  – mass of region  $j$ ,  $t_{ij}$  – travel time by car between region  $i$  to region  $j$ .

The potential accessibility model assumes that masses are in proportional to their position in a hierarchy of the Polish socio-economic settlement system. Separate settlement centers (at the poviats level – NUTS 4) are of different weight when considering their significance from a socio-economic perspective. In the devised potential model, the importance of diverse centers is determined on the basis of their weight. For the purposes of calculating that weight, a set of 14 socio-economic variables was taken into account (sold production of industry, population, etc.). The attraction of masses of 286 nodes has been obtained (fig. 8).

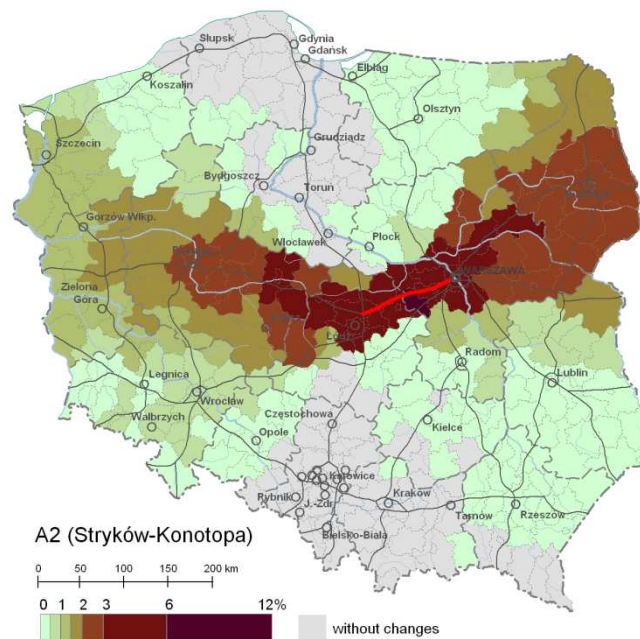


Fig. 8. A2 Lodz (Stryków) –Warsaw (Konotopa) motorway. Accessibility improvement

Source: Komornicki et al. (2009)

*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSAW MOTORWAY)  
ROSIK, Piotr*

The major beneficiaries of the A2 Lodz-Warsaw motorway are Lodz and the cities located between Lodz and Warsaw (fig. 8). Thanks to the new motorway people living in these cities will have much better access to the demographic and economic potential of Warsaw. The positive effects on accessibility improvement are predicted also in poviats situated on the north-west from Lodz and on the north-east from Warsaw. This pattern can be seen as an evidence of a shortage of good express road access to Warsaw and central Poland from the northern Poland (lack of S7 and S10), while on the southern part of the country, there is the A4 motorway facilitating convenient east-west connection for traffic.

## **CONCLUSIONS**

The motorway construction program in Poland was based on the assumptions undertaken in the time of central planning (before 1989). The infrastructure development plans took into account the Warsaw Pact military requirements and the Comecon (Council for Mutual Economic Assistance) economic needs. The chessboard pattern of Polish motorway network was preferred due to the freight traffic flows in the east-west direction between Soviet Union and DDR and in the north-south direction between Polish harbors and the Upper Silesia coal region. The political situation has changed and paradoxically the hexagonal model of Christaller (1933) meets much better the XXI century requirements.

Although there are many arguments for the use of the hexagonal model in Poland based on the structure of traffic, international and migration flows, the idea of the chessboard model seems to be still up-to-date for the authors of the National Concept of Spatial Development (2001). The highest priority is put on the construction of the parallel (A2 and A4) and meridian (A1) routes. The motorway connection, between Wroclaw (Lower Silesia) and Warsaw, was cancelled from the infrastructure development plans at the beginning of the nineties. Other routes, particularly these which radiate from the city of Warsaw in all directions, were moved as the express roads to the second priority level. The praxis shows that the traffic volume on the future express roads in the radius of 100-150 km from the centre of Warsaw (Warsaw-Piotrkow DK8/S8 and Warsaw-Radom DK7/S7) is now much higher than on other existing motorway sections.

The untolled express roads proved to be more difficult to realize than the motorways and they have to be financed by the state funds (with the help of European funds). This led to the pathology because the toll motorways will compete with the free express roads (e.g. the toll A2 Lodz-Warsaw section with the free S8 Piotrkow-Warsaw section). The technical parameters of Poland motorways and express roads are similar to each other. It means that the private operator will have to compete with the public investor. The goal for the state is to reduce traffic on the most congested roads, while for the private sector the key is to increase the profit from tolls and increase traffic volume on the toll motorway.

The results of the study show that building the motorway network according to the chessboard pattern may lead paradoxically to prolonging the travel time between main Polish cities and Warsaw. The capital of Poland will be situated at the edge of motorway network instead of in the centre of it. The list of realized investment priorities and the construction

*TRAFFIC FLOW FORECAST, POTENTIAL ACCESSIBILITY AND CATCHMENT AREAS  
IN THE CONTEXT OF TRANSPORT INVESTMENT POLICY IN POLAND  
(CASE OF A2 LODZ-WARSZAW MOTORWAY)  
ROSİK, Piotr*

schedule will lead to the A2 Lodz-Warsaw undercapacity. The growing traffic concentrated on the A2 will lead to congestion about 2020. The solution is to build new express roads S8 and S7. One of the most important tasks is to build the routes from the southern Poland (Upper and Lower Silesia) via Piotrkow (not via Lodz – which will increase the traffic on the A2) to Warsaw and Budzisko (Polish-Lithuanian border). One should remember, that more than 50% of transit road freight traffic in Poland goes through the three frontier crossing points – in Swiecko (Polish-German border), in Cieszyn (Polish-Czech border) and in Budzisko (Polish-Lithuanian border).

The recommendations for the transport policy decision makers in Poland should be as follows:

- to accelerate the construction of the S8 (from Piotrkow Trybunalski to Warsaw),
- to accelerate the works on the S7 (from Gdansk to Warsaw and Cracow) which will create the shortest route to Warsaw either from the north or the south of Poland,
- to build two alternative routes from Wroclaw to Warsaw, the first one – via Piotrkow Trybunalski (S8), the second one – via Lodz (S8, A1 and A2),
- to build the external ring-road around Warsaw which will take over transit traffic going on the A2 and Warsaw arterials,
- to increase the capacity of at least half of the A2 Lodz-Warsaw section by widening to three lines in each direction,
- to do away with the artificial division between the motorways and express roads, especially in the institutional context (regulations) and impose the vignette system as it is in many other countries (Czech Republic, Slovakia, Hungary etc.).

The lack of motorway connection between Warsaw and the European motorway network is a symbolic weakness of the transition period in Poland. Nowadays, when the dream of high-speed road network is turning into real, one can see that the results may differ from expectations. As it is shown in the article, the A2 Lodz-Warsaw motorway will be the shortest route to Warsaw for more than a half of Polish population. One can doubt if such a traffic concentration was the intent of politicians and other decision makers.

## **BIBLIOGRAPHY**

- Christaller, W. (1933). Die zentralen Orte in Süddeutschland, Gustav Fischer, Jena
- General traffic measurement (GPR) (2005). Transprojekt, Warsaw [in Polish].
- Hansen W.G. (1959). How accessibility shapes land-use, Journal of the American Institute of Planners, 25, s. 73-76.
- Komornicki T., Śleszyński P., Rosik P., Pomianowski W. with cooperation Stępnia M., Siłka P. (2009). Spatial Accessibility as a Background for Polish Transport Policy, Biuletyn KPZK PAN, z. 241 [in Polish].
- National Concept of Spatial Development (2001). Monitor Polski, 26, 503-595 [in Polish].
- Warsaw Traffic Study (WBR) (2005). Warsaw Development Planning Office (BPRW SA) [in Polish].