



LOGISTICS INFRASTRUCTURE OF MOTORWAYS IN SUSTAINABLE DEVELOPMENT OF A REGION

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Abstract: In this article the author develops the concept of logistics, linear infrastructure of car transport in Czestochowa region. He also discusses whether current state as well as possible future changes of this infrastructure meet the requirements of sustainable development concept. The basis for the study is an analysis of secondary sources related to the issues (quarry library, factual and cartographic inquiries) as well as non-formal interviews (directional) with the representatives of the authorities responsible for managing infrastructural objects as well as organs responsible for the planning of infrastructure's further development. Observed general patterns can be considered as representative also for the other areas of Poland.

Keywords: car transport, infrastructure, region, sustainable development

DOI: 10.17512/znpcz.2017.3.2.09

Introduction

A specific and positive trend can be observed in today world. It relates to ecology and environment protection. Scientists have warned for years about catastrophic consequences of negligence in this sphere. However, it seems that only recently people have begun to treat this problem with due seriousness. More and more people are beginning to lean toward the idea of an absolute need to protect the environment. This results is the introduction of a wide range of solutions aimed at stopping the progressive degradation of the environment. For example car manufacturers have been imposed with emission limits, companies are persuaded to design and implement effective business models (see more: Brzóska, Jelonek 2015, p. 48-52), smart grid networks are introduced (see more: Zawada, Tomski, Kuceba 2015, p. 44-45), preparers of all kinds of green ideas are honored with prizes, innovative ways of managing institutions and organizations are also promoted (Nowicka-Skowron, Stachowicz, p. 59).

One of the key concepts which underlies the need to take determined actions in order to safeguard ecological balance in the world is sustainable development. It represents a process of change in which the use of natural resources, the direction of technological development as well as all institutional changes must be made in such a way as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (Skawińska, Sobiech-

-Grabka, Nawrot 2010, p. 129). Although the balanced approach is still not a dominant concept in the realities of economic and social life (Brzezinski 2016, p. 58), it will become increasingly important in time and with the progressive degradation of the state of environment.

For this reason appropriate measures should be taken just now, in order to assess areas of socio-economic reality from the point of view whether they are already ecological and if they may become sustainable in the immediate future. One of the areas that need to be considered is logistics infrastructure of car transport. The author evaluates and describes it based on studies carried in form of quarry library, analysis of secondary sources as well as direct, informal interview with selected representatives of authorities responsible for managing the infrastructural facilities as well as developing plans for their further development. Author primarily concentrates on linear infrastructure (natural as well as artificial routes with all the necessary equipment for the movement of means of transport where materials and products are also often sent directly¹). He also wonders whether prospects for the development of this infrastructure are promising in the view of sustainable development concept's requirements.

Area of study

There are many trends in nowadays logistics. Without doubt one of them relates to the way of carrying out logistics studies (Nowicka-Skowron 2017, p. 59). More and more often there are based on studies made up in a region. The concept of a region is often defined as a geographically homogeneous area, or a grouping of areas with a uniform tradition, inhabited by communities having certain common elements. "These communities are striving at the same time to preserve this specificity in order to achieve social, cultural and economic progress" (Tomaszewski 2007, p. 49).

Traditional way of determining the extent of such way defined area, as well as making it's description, begins with ethno-genetic designation of historical conditions (administrative and tribal structures, migrations), sociological aspects (e.g. self-definition of the group), cultural phenomena, specific linguistic and geographical features, including the characteristic features of the natural environment and terrestrial physiology. At the same time, however, it seems that in the process of regionalization of a particular area, the author should not be restricted solely to traditional factors. In order to correctly define the boundaries of the region, many other criteria should be taken into account (Damrosz 1987, p. 35-36).

Therefore, precise determination of the scope of Częstochowa region is not an easy task and could be itself elaborated as a subject of extensive elaboration. For the purpose of this paper, the author defines spatially Częstochowa region using a linear (administrative) delimiter. This approach seems to be justified in the light of the considerations of researchers who claim that the political divisions, have significant influence on the establishment of ethnic boundaries.

¹ Roads of car transport are artificial what means that they haven't been created by the nature. Have been created from the ground by human (see more: Ficoń 2009, p. 60).

Considered region is identified with Częstochowa county (along with Częstochowa city itself). Mentioned agglomeration is not a part of the terrestrial district of Częstochowa (constitutes a separate territorial unit – city district) (Antoniewicz 2000, p. 31; Grajewski 2008, p. 485), but at the same time headquarter of county authorities are set there (Rozporządzenie Rady Ministrów z dnia 7 sierpnia 1998 r. ...). Moreover, Częstochowa district closely cooperates with Częstochowa city in the form of strategic partnership. This alliance is conditioned by the specific position of both units and specific solutions, resulting from this, regarding the location of county units carrying out tasks for all the citizens. In counties surrounding the cities with the county rights most of the public services at the county level are usually organized in a city, so *de facto* in a separate district. Such situation also occurs in the case under consideration.

Częstochowa county has been formed in 2009 as a result of the last one administrative reform of Poland. The most visible effect of the reform, which entered into force on 1 January 1999, was the reduction of the number of voivodeships – from 49 to 16 (Niziołek 2008, p. 79-84). At present Częstochowa county is the largest in Silesia state and one of the largest in the scale of whole country. Its area is about 1519 km², which accounts for almost 12.4% of the area of Silesian province (Starostwo Powiatowe w Częstochowie 2012, p. 2). The population reaches almost 135 thousand people.

County headquarter is located in Częstochowa. This city is located in southern Poland, on the bank of Warta river, on the northern edge of Silesian Voivodship. Modern Częstochowa is a federation of villages, in the old times independent settlements, which with the development of the city were absorbed naturally or attached by administrative decisions (Czekaj et al. 2002, p. 31). Area of city is about 160 km² and the population approaches 250 thousand people. This means that Częstochowa is the second largest city in Silesia and one of the 15 largest cities in the whole country (Bednarek, Latacz, Piwowarczyk 2009, p. 7). This is an important industrial center (Kruczek 2005, p. 160). Among more than 26 000 REGON – registered business entities, there are many involved in the manufacture of flat glass, chemicals, automotive parts as well as food processing (Michalski, Dobrzyńska 2011, p. 32). Częstochowa is also educational, tourism and cultural center (Pucek 2006, p. 25). Scientific potential of the city is confirmed by the presence of several higher schools, among which the largest and best – known one is Czestochowa University of Technology.

Study results

The linear, road transport infrastructure is connected with specific environmental hazards. First and foremost, motor roads are artificial and occupies a relatively large area. In addition, the vehicles moving through them are the source of atmospheric pollution as well as noise. Traffic accidents occurring on the streets lead to hazardous material leaks into the soil (see more: Huderek-Glapska 2014, p. 83-90). Moreover, the amount of waste from wrecked vehicles is increasing. Too

high density of low-quality motorways in the region, which do not guarantee safe driving, should therefore be considered in terms of environmental concern.

In the Częstochowa region, however, there are roads well adapted to car traffic. *Figure 1* constitute an overview of a network of car routes in Częstochowa region that meet the technical and utility requirements of national roads. It confirms that the western part of Częstochowa county is characterized by a much higher degree of development of the national road network than its eastern part. The only national road running through the eastern part of the county (from south to east) is the single-track road no. 46. This road is moving from Częstochowa to Kielce and Radomsko area, passing through the municipalities of Olsztyn, Janów and Lelów (Sobel, Świtycz, Krasoń, Ociepa 2006, p. 16). More precisely, the course of route 46 in the eastern area of the county can be described by determining the consequence of more significant towns which are situated on the route. These are: Olsztyn, Janów, Logoczanka, Lelów, Nakło. Cartographic query results in the conclusion the length of this road 46 section is closed with a number of 50 kilometers.

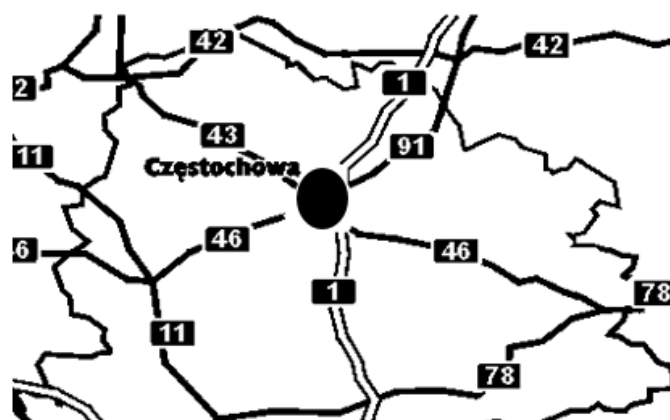


Figure 1. National car roads in Częstochowa county

Source: Own elaboration on the basis of (Starostwo Powiatowe w Częstochowie 2016, p. 18)

The only two-lanes road in Częstochowa county is located in its western part. Fragment of National Road no. 1 runs from the north of the county to its south. In the area under consideration DK1 runs along towns: Wikłów, Kruszyna, Zawada (about 25 km), and crosses the area of the city of Częstochowa (aleja Wojska Polskiego), somehow dividing it into two parts: eastern with such districts as Raków, Dąbie, Zawodzie, Rząsawy, Aniołów as well as western where is located, among others, downtown with old town². In its further course south, it runs through or near such towns as: Wrzosowa, Poczesna, Koziegłowy, Zawada (≈ 15 km) (*Mapa. Polska ...*, 2013, p. 14). Total length of the DK1 road in county is about 40 km.

² The cartographic query shows that the area of Częstochowa located on west from aleja Wojska Polskiego is larger than its eastern part.

National Road number 1 should be considered in terms of the most important communication corridor in the district. This is due to two facts:

- access to the Częstochowa fragment of the road and further continuation of the ride according to its course, allows the inhabitants of the county, depending on the direction, direct access to important provincial cities: Łódź (in the north) and Katowice in the south,
- when meeting the requirements for dual-carriage national motorways class: GP (major of accelerated traffic), it makes it possible to have a relatively smooth, reliable as well as fast journey (*Table 1*).

Table 1. Essential technical requirements for GP-class national roads

Parameter type	Parameter value	
	Built-up area	Outside built-up area
Minimum distance of buildings from the outer edge of the street ¹ /road [m]	10.0	25.0
Minimum allowed distance of a tree trunk from the edge of the road [m]	3.0	3.0
Minimum permissible distance of a pavement from the edge of the road [m] ²	5.0	
Distance of the lane border from the outer edge of an earthwork or ditch [m]	0.75	
Minimum width of the road within the boundaries and boundary lines of the road GP [m]	40.0	-
The minimum permissible road width in the demarcation lines [m]	-	35.0
Statutory defined lane width [m]	3.25 ⁵	3.5
Height of the gauge [m] ³	4.7 / 4.5	
Width of possible shoulder [m]	1.5 - 2.0	
Allowable single vehicle axle load on the road surface [t] ⁴	115.0 / 100.0	
Acceptable types of roads' nodes	Collision free, partially collision free	
Links to other categories of roads	Connections with second class roads (exceptionally "L") as well as with higher class roads	
Additional technical conditions	Necessity to use a transverse slope allowing the flow of water, the possibility of applying serpentines with the preservation of detailed requirements, constructional guidelines and parking belts in case the surrounding causes a demand for parking spaces	

Equipment	X ⁵	X + two roadways in one direction, emergency journeys to the roadway intended for the opposite direction, located not more than 4 km apart (excluding bridges and tunnels)
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¹ Street means a section of a road running through a built-up area. Street within the road is in the same category as this road.

² Pavements may be placed directly at the edge of the road provided, however, that a separation fence or other mean of traffic safety is used.

^{3,4} Lower value is used in case of road repair or it's reconstruction.

⁵ "X" – set of equipment components consisting of: drainage and lighting equipment (where necessary), facilities as well as equipment for the service of traffic participants, technical equipment for traffic leading (including traffic lights), other road infrastructure (sewer lines for road dewatering, special purpose underground equipment, etc.).

Source: (Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 2 marca 1999 r. ...; Ustawa z dnia 21 marca 1985 r. ...)

The national road network in county is complemented by one-lane roads, including:

- road no. 91 running from Częstochowa through the communes of Rędziny, Rudniki, Kłomnice, north towards Radomsko, and further up to Piotrków Trybunalski (less than 30 km).
- road no. 46, running from the border of Częstochowa town through the Blachownia commune area, towards Lubliniec (approximately 6 km).

In addition to the already mentioned urban section of E75 (length = approx. 16 km), other national roads are also running along the streets of the Częstochowa, capital of county (Table 2).

Table 2. National roads running through the area of the city of Częstochowa

Road number	Sequence of streets	Succession of districts	Length
43	św. Rocha, al. Jana Pawła II	Grabówka, Lisiniec, Śródmieście	≈ 8 km
46	Przejazdowa, Główna, św. Barbary, św. Augustyna, Pułaskiego, Bohaterów Monte Cassino	Bańbor, Gnaszyn, Kawodrza, Śródmieście, Stradom	≈ 9 km
Joint part of DK43, DK46	św. Jadwigi	Podjasnogórska	≈ 1.9 km

Source: Own elaboration on the basis of cartographic query

Statistically, this results in the fact that 0.08 km of national road is present on 1 square kilometer of the area of the characterized region. In comparison, this ratio for the entire voivodship is 0.09 and for the whole country: 0.06 (Alke et al. 2013, p. 17).



Figure 2. Voivodship, county and communal roads against national roads in the region

Source: Own elaboration on the basis of (Starostwo Powiatowe w Częstochowie 2016, p. 19)

In addition to the national routes in Częstochowa region, there is an extensive network of voivodship, county and communal roads (*Figure 2*). They cannot be considered as fully prepared for safe and eco- friendly traffic. At the same time, however, they allow access to almost every aggregation of population in the region. The total length of the county and communal roads is 1698.1 km of which the roads with a hard surface are 1443.3 km (Urząd Statystyczny w Katowicach 2010, p. 306).

Forecasts on the development of the characterized infrastructure seem positive in the near future. Częstochowa is located in the transport corridor of the A1 motorway, being part of the Trans-European Transport Corridor (direction: North-South), linking the Scandinavian countries (Sweden, Norway and Finland) to the south of Europe. In 2016 the construction of a section of this road (linking Częstochowa with Pyrzowice town) has begun. The A1 motorway, like other roads of this type, should be a source of unquestionable advantage for the inhabitants of the region. The advantages of high speed routes are pointed e.g. by: D. Jones and M.K. Jha. These are, among others: increased transport speed and, what is more important, increased safety which translates into less danger to the environment (Jones, Jha 2010, p. 124).

Conclusions

The existence of appropriate transport infrastructure in the region determines to a large extent the effectiveness of the business entities operating there (Mendyk 2009, p. 170-172). In this context, it is welcomed that the transport infrastructure in the region of Częstochowa seems to be appropriate to handle car transportation

processes. At the same time however, there are many environmental hazards linked with the road transport infrastructure, which were presented in the second chapter of the work. They are not too severe only in the case of the highest categories' roads. Than it is glad to know, that present structures meet the requirements foreseen for the efficient operation of car services. The prospects for infrastructure development in the future are also quite promising. All the plans and projects, put forward by the relevant institutions, allow users of motor vehicles to assume that the state of infrastructure will develop in the near future. The emergence of new high-profile roads as well as modernization of already existing sections is undoubtedly in line with the assumptions underlying the concept of sustainable development.

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LOGISTYCZNA INFRASTRUKTURA DRÓG SAMOCHODOWYCH W ZRÓWNOWAŻONYM ROZWOJU REGIONU

Streszczenie: W artykule rozwinięto tematykę liniowej infrastruktury transportu samochodowego w regionie częstochowskim. Rozważono, czy stan obecny tej infrastruktury oraz perspektywy jej dalszego rozwoju odpowiadają postulatam sformułowanym w koncepcji zrównoważonego rozwoju. Podstawę opracowania stanowi analiza źródeł wtórnych dotyczących rozpatrywanej tematyki (m.in. kwerenda bibliograficzna i kartograficzna). Posłużono się także wynikami badań przeprowadzonych w formie wywiadu swobodnego (ukierunkowanego) z przedstawicielami organów odpowiedzialnych za tworzenie planów dotyczących rozbudowy infrastruktury w regionie. Ogólne wnioski z rozważań mogą być rozpatrywane w kategoriach reprezentatywnych także dla innych obszarów kraju.

Słowa kluczowe: infrastruktura, region, zrównoważony rozwój