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SCENIC VALUES OF THE KATOWICE-CZĘSTOCHOWA SECTION OF NATIONAL ROAD NO. 1

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Abstract

The road investment stage is always preceded with projects, which relate to multifaceted economic, environmental and spatial analyses. The visual values of the surroundings are usually neglected when designing and building motorways and express roads The authors believe that the increasingly large-space range of motorway construction requires that more attention be paid to the landscape context of such investments. Functioning of all objects of the accompanying infrastructure of the transportation system affect the way the space is organized. The aim of the article is to assess, in detail, the scenic values of a selected section of the Pan-European Transport Road Corridor – National Road No. 1, in the Silesian Voivodship. The Pan-European Transport Road Corridor runs through Poland from south to north.

Key words

landscape assessment • landscape aesthetic • scenic values • visibility map • motorway • Silesian Voivodship

Introduction

Road investments are currently treated as wide-range economic enterprises. The investment stage is always preceded with projects, which relate to multiple-aspect economic, environmental and spatial analyses. Dominating pragmatic reasons mean that the economic criteria usually take priority in such analyses. Motorways and express roads are almost exclusively treated as optimum routes for the transportation of goods and as sources of profit for their owners (door-to-door deliveries requiring as much as possible in the shortest time possible, exchange of goods, and TIR transportation (Dołzbłasz 2012). As the principles of sustainable development are popularised, designers are paying more attention to the local and regional conditions of the natural environment, which force particular technical and technological solutions (Fajer 2005). The phenomenon

of transport anthropopressure is expressed not only in scientific research, but also has its media reflection, which is loaded with emotions[1]. The influence of transport routes on the natural environment mainly consists in changes in land morphology (construction of cuts and embankments in the ground), disturbances in hydrological conditions, large area wood cutting, changes in natural biotic and ecological systems (including disrupted natural migratory routes for animals) as well as increased air pollution and noise levels. System operations have been developed to neutralise some of the unfavorable environmental consequences of motorway construction (Manecki 2000). The operations concern e.g. animal protection and preservation of existing routes of species migration. Uniform standards are applied, e.g. for construction of footpaths, bridges or culverts (Dziennik Urzędowy 1995; Georgij et al. 1999; Iuell et al. 2003).

The visual values of the surroundings are neglected when designing and building motorways and express roads (Forczek-Brataniec 2008). The development and protection of aesthetic values of space, especially areas adjacent to roads, are a planning challenge. In the current legal system, however, which regulates issues related to spatial planning and management, the aesthetic terms are poorly dealt with (Polska 2011).

The authors believe that the increasingly large-space range of motorway construction requires that more attention be paid to the landscape context of such investments (Bishop 2003; Arriaza et al. 2004; Koziarski 2004; Janeczko 2008, 2012; Lörzin 2010). Being a multi-lane and large-distance element of the landscape, express roads and motorways change the landscape significantly. A 'cut-through' effect is produced for areas having different types of use (*de facto* different types of cultural landscapes). The presence and functioning of all objects of the accompanying infrastructure of the transportation system (including viaducts, cuts, tunnels, bridges, turnoffs, car parks, gas stations, acoustic screens, etc.) affect the way the space is organised. Thus, these objects determine the scenic and aesthetic values of the vicinity. Objects of transportation infrastructure remain as permanent elements of the landscape for dozens of years (Rydzykowski & Wojewódzka-Król 1997; Parsons & Daniel 2002). For some large-space road investments, it would be appropriate to use the term 'transportation landscape', as a relatively new functional type of cultural landscape (Myga-Piątek 2012). This is particularly true of such interchanges as the Sośnicowice interchange. Such transportation landscape are relatively permanent in their function and are not restored to their original state (reclamation). That is why it is so important to design new transport road routes in a harmonious way. The designs should expose rather than destroy or isolate landscape values. The authors believe this issue to be particularly important and timely since large road investments are presently being made in Poland.

The issue of the scenic values of roads being destroyed by excessive, and frequently unjustified, 'isolating' of motorways with sound screens, is currently a hot topic in the Polish media. Noise screens are installed more and more often, and there are absurd examples of their use. This situation largely results from the excessively strict Polish norms on traffic-induced noise limits in built-up areas – 50 dB night time and 60 dB day time average (Dziennik Urzędowy 2007). Screens isolate the road from built-up areas, but also hide the surrounding from the view of drivers and passengers. A trip can become exceptionally monotonous (tunnel ride effect). Consequently, traffic safety is hindered. Screens increase landscape fragmentation and have a negative effect on the perception of the vicinity. Sometimes, their absurd location causes residents of housing estates to complain that screens reduce visibility in their immediate vicinity. Screens reduce

[1] The most known examples of social commitment include large-scale protests of ecological organizations concerning plans for the construction of Motorway A4 near St. Anna's Mountain or the Augustów ring road in the Rospuda Valley.

scenic values both for road users and residents of areas adjacent to roads.

It is not only drivers who use roads, but also tourists and passengers of cars and coaches, for whom the road is more than an element of the transportation system. A trip along a motorway is also for sightseeing and first impressions. Various views are provided by the direction of the road, and new sights are just around the bend (Hornbeck 1970; Hornbeck & Okerlund 1973; Żakowska 2001; Forczek-Brataniec 2008; Garre et al. 2009; Rogowski 2009). When appropriately designed, a road can be an excellent promotional tool of the region people travel to or through. A road is also important, because it offers what is often the first important encounter with the region. Being a kind of landmark for a region, it may give travelers aesthetic impressions (positive or negative) and be judged by them. An opinion about a region can then spread further (e.g. the widespread myth of 'black Silesia').

The concept of a scenic route is hardly popular in Poland. Scenic values of roads are well exposed in the United States. 'Scenic routes' or 'scenic byways' are legally protected and treated as tourist attractions (Walker 1993; WSDT 2005; Rogge et al. 2007; CALTRANS 2013). A classical example could be the renowned historic 'Route 66' or scenic roads like 'US Route 40 Scenic' and 'US Route 412 Scenic'. In Europe, scenic values are exposed along old motorways, e.g. along A2, which goes through the Austrian Alps, or the Italian A10 also called the Highway of Flowers. There are the newly constructed motorways which Croatia and Slovenia take pride in. These motorways provide service and parking places with lookouts (Dell'Acqua et al. 2011). This concept is not popular in Poland yet.

Objectives and scope

The aim of the article is to assess, in detail, the scenic values of a selected section of the Pan-European Transport Road Corridor (Fig. 1) – National Road No. 1 (E75 on international nomenclature) in the Silesian Province. The Pan-European Transport Road Corridor runs through Poland from south to north. The two-lane road was built in the 1970s to connect the country's two most economically advanced centers – Warsaw and the Upper

Figure 1. Pan-European Transport Corridor running through Poland from the south to the north, and the location of the fragment of the discussed route on the map of Poland

Silesia conurbation. No improvements had been made on the road for the last few decades. It is currently an example of Poland's large delays in the construction of roads of high technical-functional parameters. Our detailed analyses concerned one of the most traffic-congested sections, Katowice-Częstochowa, 74 km in length, which leads traffic from Upper Silesia to the north. Average daily traffic (ADT) on Road E75 in 2005 was over 18,000 vehicles per day (data from GDDKiA – General Directorate of National Roads and Motorways). This makes the road the second most traffic congested route in Poland (after E40). New route construction of a paid motorway in this direction will make the modernised 'gierkówka'[2] an alternative road. This shows how very important the discussed road is for national and international transportation. This particular section was also chosen for pragmatic reasons. Living and working in the neighborhood of the road, the authors use this section on a daily basis. Thus, this part of the road has been the subject of many-year-long detailed observations, enhanced recently with thorough analytical work and measurements. We have already drawn the profile of the road (Fig. 2) and developed the hypsometric cross-section of the terrain where the road runs (Fig. 3). Also, a landscape map of the area within 2.5 km from National Road No. 1 has been worked out (Figs. 4A and 4B).

Methods, tools and data

Landscape designs for scenic exposure of roads were suggested by Forczek-Brataniec (2008), among other authors. Visibility conditions should be determined prior to a perception analyses. Finding out what the visibility conditions are requires a potential visibility analysis (Fisher 1991, 1993; Llobera 2003; Ayad 2005) and the actual visibility analysis. The potential visibility analysis is determined based on surface features. The actual visibility analysis takes into account the land cover. Such analyses make it possible to develop visibility maps and determine the so-called scenic absorption. Potential locations of objects, which should be hidden or exposed in the landscape would be pointed out. Using the above procedure as general inspiration, the authors based their analyses on topographic maps (1:10,000) and an orthophoto map as well as a digital terrain model (DTM). Data were analysed using GIS, cartography, remote sensing and geoinformatics, including map algebra and others. Software that was used included ArcInfo, Mapinfo, Vertical Mapper, Global Mapper, Surfer and specialist open source applications like Ilwis. Analyses of the developed 3D (2.5D) model allowed for more detailed information and

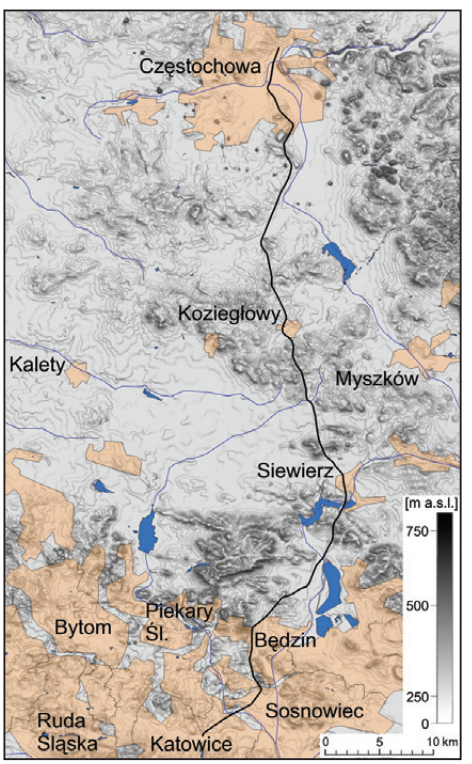

Figure 2. Digital Terrain Model with National Road No. 1 Katowice-Częstochowa (74 km) marked on it (DTED 2, available from WSK Warsaw 2005)

[2] The road is popularly called 'gierkówka' because it was built in 1973-1976 period, at the initiative of the former communist dignitary Edward Gierek.

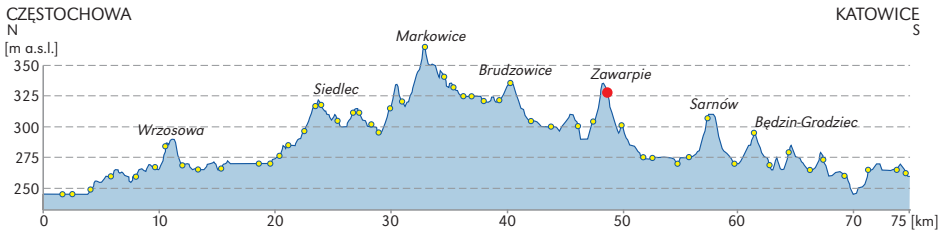

Figure 3. Hypsometric profile of National Road No. 1 of the Katowice-Częstochowa section

for distinguishing new spatial divisions, which were significant from the scenic point of view. Methods of computer-aided modeling and visualisation also helped to verify current surface landscape elements in relation to data obtained from topographic maps and orthophoto maps. For areas heavily overgrown with dense high vegetation, modules of the Digital Terrain Model (DTM) generated for the Silesian Province were used, based on digital data (0.2 m pixel size) obtained from aerial photos from 2002-2003 and 2009 (grid spacing 25 m), further completed with field data. Data necessary to generate digital models came from the LPIS project (Land Parcel Information Systems), basing on archive 1:26,000 aerial imagery.

Components in the landscape were visualised using both DEM and DTM models:

- DEM (Digital Elevation Model), which includes landscape components not related directly to morphology;
- DTM (Digital Terrain Model), based on DTED (Digital Terrain Elevation Data), where landscape components not related to morphology are ignored (Nita 2002; Nita & Małolepszy 2004; Kraak & Ormeling 2011). This model is used to determine visibility which has not been reduced by other components, but only by surface features.

Field research in the discussed section of the road consisted of photos and films taken from the window of a moving car with GPS localization. The photo and video camera were placed on a support stand at the driver's eye level. The film recorded the view through the front windscreen. Photos were taken intuitively as components of the landscape changed (not less than every 0.5 km) in three directions: the view in front of the car through the front windscreen and to the sides. The views taken were either parallel or perpendicular to the direction the car was moving. Analyses of both photos and still frames of the film were of such basic landscape components as: woods, buildings, elements of road infrastructure, and elements of hydrographic infrastructure. The analysed section of National Road No. 1 was divided into 107 clusters, i.e. areas of similar visibility and comparable scenic parameters. The selected sections were graded on a 1-5 scale for their visibility range and the aesthetic-scenic values of their typical landscape components. The analyses covered the maximum view range of 5 km, and the basic values were graded within this range.

Scenic values along the route

The Pan-European Transport Corridor, which runs south to north from Ploče, Croatia, through Bosnia and Herzegovina, Hungary, Slovakia and Poland, is a peculiar cross-section of European landscape zones (Myga-Piątek 2005; Myga-Piątek & Nita 2012). Many sections of that route have been subjects of analyses, e.g. regarding border-zone cooperation, accessibility for tourists or international traffic (Więckowski et al. 2012).

The Katowice-Częstochowa section of the Express Road, selected for analyses, runs through a few mesoregions: the Katowice Upland, the Tarnowskie Góry Ridge, the Upper Warta Depression, and the Wieluń

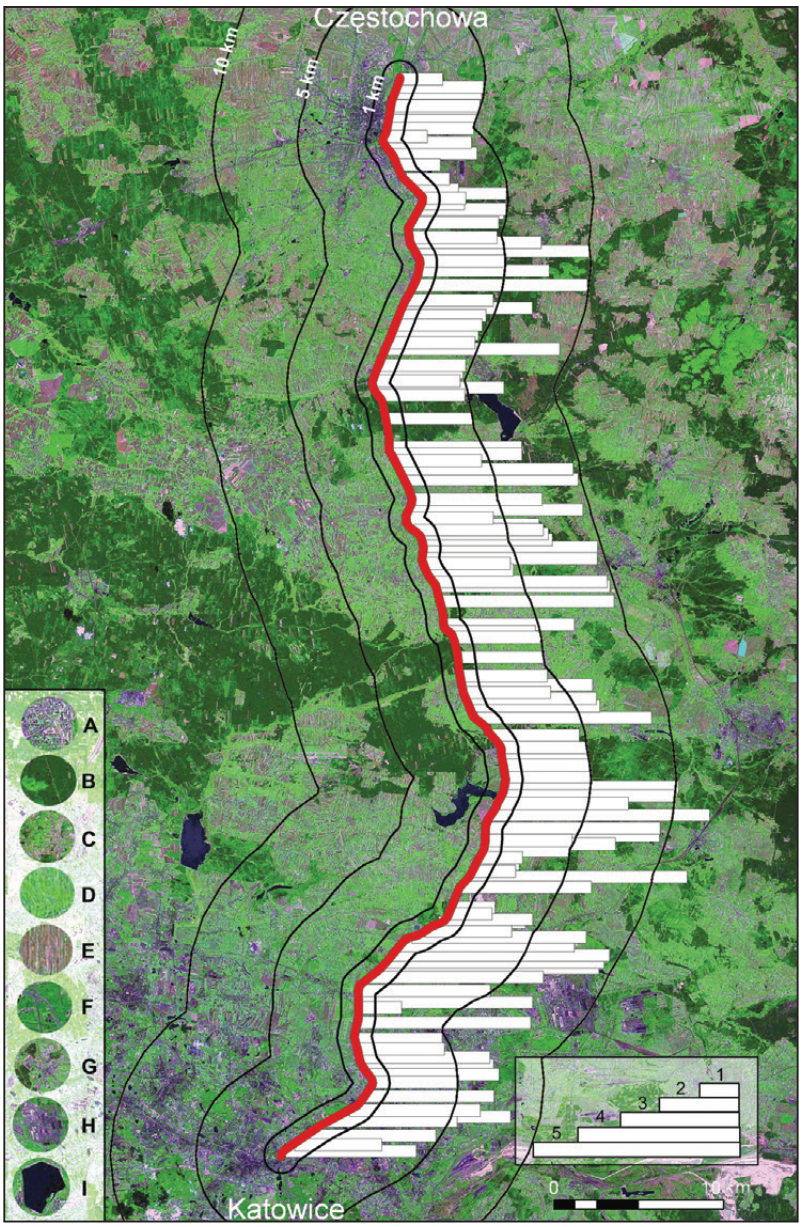

Figure 4A. Results of the assessment of the scenic values on the western side of National Road No. 1

Scenic values of the western side of the road are depicted on the right side of the figure, while those of the eastern side of the road are depicted on the left side of the figure. This was done so that the graphs do not overlap the view (landscape) which is assessed.

The 1-5 grading scale for a passenger car ride (observation at a height of 1 m): 1 – no visibility (e.g. noise screens or cuts); 2 – poor visibility up to 5 km, with numerous obstacles, buildings, woods, and surface features; 3 – average visibility, sporadically over 5 km (up to 10%); 4 – good visibility, over 5 km (over 25%); 5 – very good visibility, over 5 km (over 50%).

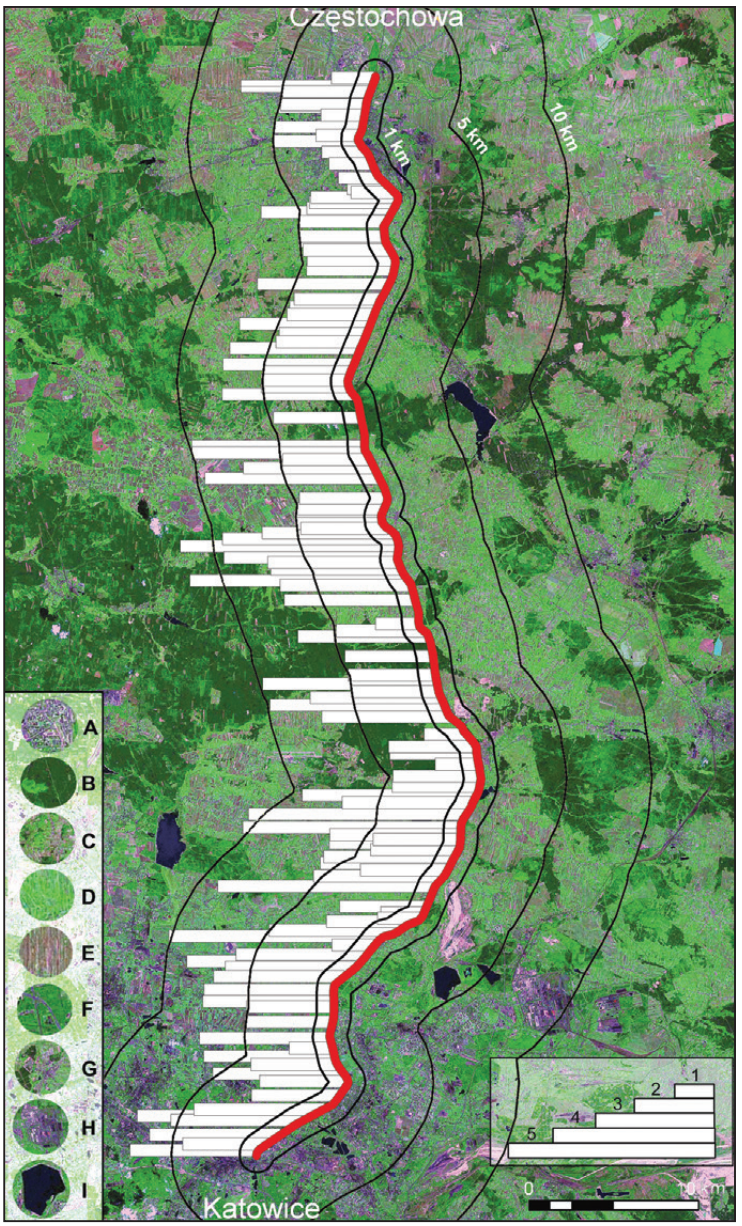

Figure 4B. Results of the assessment of the scenic values on the eastern side of National Road No. 1

Key for interpreting the landscape map (Landsat 7 2000, pixel 14 km 25 cm): A – buildings (compact infrastructure), B – forest areas (woods, groves), C – shrubs and trees (clumps of trees), D – areas of grass vegetation (meadows and pastures, grass), E – arable land (seasonal and perennial crops), F – roads, G – urban areas, H – industrial area (barren land), I – surface water (lakes and reservoirs).

Upland (Kondracki 2011). A number of natural and anthropogenic values occur along the route. The former include surface features like cuestas, ridges or monadnock hills, and rock outcrops (e.g. the St. Dorota Hill – 381.3 m a.s.l.). The numerous water reservoirs, which are part of the anthropogenic lake area (the reservoirs in Przeczyce and Kuźnica Warężyńska – Pogoria IV) are scenic attractions. Also, industrial objects, typical of Upper Silesia, are exposed along the route, like the chimneys of the Łagisza power plant, the buildings of the former Katowice Steelworks – once the largest metallurgy plant in central Europe, the Częstochowa Steelworks, mine dumps in Huta Stara and Wrzosowa, and the Siewierz quarry. There are several significant cultural monuments in the direct vicinity: an old hill fort in Koziegłowy, castle ruins in Siewierz, the John the Baptist chapel in Siewierz (the oldest Romanesque chapel in Upper Silesia), and in Będzin what is probably the most beautiful and best known edifice of a mediaeval castle. The physiognomy of the view is completed with dense patches of woods farmland and urban housing communities (mainly the very noticeable communities of Syberka in Będzin as well as Raków in Częstochowa). The landscape could be regarded as representative of Upper Silesia and, if appropriately exposed, also as a attribute of the region. Typical landscape elements, however, are masked by bush vegetation, roads leading through cuts, noise screens, and roadside billboards.

Appropriately designed exposure areas and selective wood cutting could turn the mentioned scenic points into natural and cultural features of Upper Silesia. These points would be particularly discernable when coming from the north.

Results of the assessment of scenic values

The analysed section of National Road No. 1 is 74 km long. This is equivalent to a straight-line distance of 63.7 km with a starting point in Katowice and the final point in Częstochowa. The zone included in the research, 2 km in width with the road inside, made up a research field of 150.7 km^2. As was calculated, residential buildings make up 21.7 km^2 of this area, and green areas (woods or dense bush and tree cover) 35.8 km^2, open water bodies make up as much as 1.56 km^2, and elements of the hydrographic system (watercourses, ditches, channels) covered a distance as long as 184.3 km. The rest of the area is covered by arable land and barren land. Agricultural land is only visible in the area of the former PGR (State Agricultural Farm) in Będzin-Grodziec.

There are also landscapes of potential agricultural use (up to 40%). These areas are currently not in use – and were not subject to detailed analyses.

Field observations show that the best view points are at hill climbs and descents as well as on some embankments or bridges (the bridge on the reservoir Przeczyce), and also at the bottom of depressions. According to the authors, the most interesting views with the set observation range of 25 km at the DTM are: Zawarpie (16.9% visibility – Fig. 5), Markowice (13.7% cover of the 25 km^2 area), Sarnów (11.7% visibility), Grodziec (8.1% visibility), Brudzowice (7.3% visibility), Wrzosowa (6.1% visibility). The most picturesque view is one from the ridge in the location of Zawarpie southwards on the Dąbrowska Basin. This view includes all the natural and anthropogenic elements that are typical of Upper Silesia and Zagłębie – cuestas, rock outcrops (Dorotka, Góra Parcina, Góra Kijowa), dispersed fragments of farmland with low shrubbery (foothills of Dorotka monadnock) as well as barren land, rivers and post-mining reservoirs, characteristic buildings of mines, power plants and steelworks (with former Katowice Steelworks dominating over them), large-panel housing estates. This view can be considered as an archetype of the discussed region and is undoubtedly its comprehensive value. Sadly, roadside shrubs make it impossible to admire the wide view from the parking lot located on top of the elevation.

The whole analysed section has few visibility-obstructing noise screens; they only appear

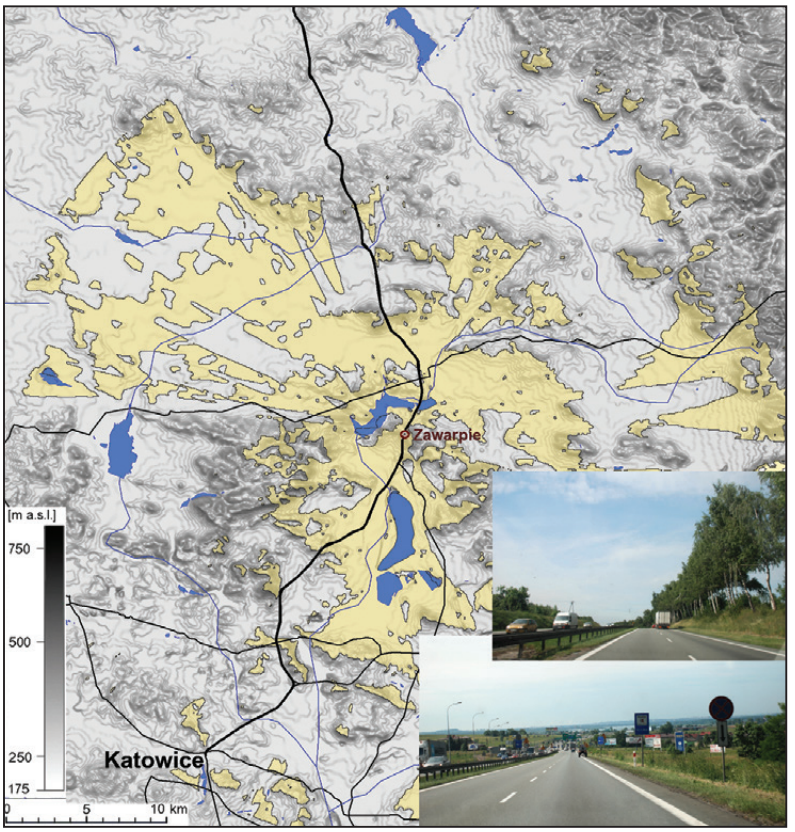

Figure 5. One of the highest points (see Fig. 3) of the discussed route (Zawarpie) with a possible view range marked on the DTM 25 km, viewshed 16.9% (yellow color)

at about the 12 km mark. They are mainly located in the beginning and final sections of the route (Katowice, Sosnowiec, Będzin, Sarnów, Wojkowice Kościelne, Częstochowa). Part of the noise screen is made of transparent material. Visibility is further reduced by aging forests and roadside clumps of trees and shrubs.

An assessment of the scenic values by a driver moving in a passenger car along the Katowice-Częstochowa section of National Road No. 1 will be limited as 70% of the time there is a wall of nearby trees and shrubs (visual observation range about 20°). For the passenger it is a bit better as the – visibility range for a 180° observation angle reaches about 60% of the area within 2.5 km from the route.

The analyses that were carried out allowed for distinguishing 4 basic types of cultural landscapes visible along the selected section of National Road No. 1:

A – agricultural and rural landscape (Fig. 6: photos A, B), possible to observe mainly from descents of nearby elevations, and to a lesser extent from climbs, where the observation range is shortened; generally, however, the road passes elevations in cuts.

B – forest landscape (Fig. 6: photos C, D) – these are mostly separated fragments of four forest complexes. Also, dense shrubbery and coppices occur along the route, which may resemble a forest to a traveler.

C – transport-service landscape (Fig. 6: photos E, F). This is a landscape of embankments and road infrastructures, including

Figure 6. View from the position of a driver driving a passenger car along National Road No. 1, of the Katowice-Częstochowa section (photos A-H): A – agricultural and rural landscape, Rzeniszów surroundings; B – agricultural and rural landscape, Sarnów surroundings; C – forest landscape (road corridor in the forest), Psary surroundings; D – forest landscape (road corridor in the forest), Winowno Forest Cabin; E – service landscape: car parks, bars, and billboards around Katowice hindering the view of typical Upper Silesian landscape forms; F – landscape of embankments and road infrastructure, fully transformed anthropogenically; G – the Rudna district in Sosnowiec; H – view to Katowice city centre

intersections, crossroads, junctions etc. It also includes areas with dominating billboards and buildings of transport and service facilities (parking lots, bars).

D – industrial-urban landscape (Fig. 6: photos G, H), made up of urban buildings and accompanying industrial infrastructures, as well as large housing communities.

Conclusions

Roads provide the most common means of transportation. Time spent while traveling along motorways is usually monotonous, tiring, and sometimes also distressing because of traffic obstructions. A driver's attention is affected by invasive advertisements

located along the road. At the same time, scenic values of further views are obstructed by roadside shrubbery and screens. These regularities are confirmed in the discussed section of National Road No. 1. The researched section is characterised by an aging road infrastructure and the accompanying facilities. Rows of trees and clumps of shrubs have overgrown the sides of a large part of the road, causing a decreased range of view. A limited view range also results from the large billboards and lines of noise screens being installed along the road.

The authors hope that more and more numerous scientific papers regarding scenic values of roads, as well as examples of practical actions abroad, will have a positive effect, and will result in the development of interesting projects and planning decisions. Solutions should be expected which would aim to expose intentionally arranged sceneries surrounding Polish roads. These are huge challenges to be taken by landscape architecture professionals. Appropriate decisions must be made by the General Directorate for National Roads and Motorways and authorities of the communities through which roads run.

Editors' note:
Unless otherwise stated, the sources of tables and figures are the author(s), on the basis of their own research.

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