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SPATIAL DIVERSITY OF TOURIST FACILITIES IN THE SILESIAN BESKID MOUNTAINS IN POLAND

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Abstract

This article proposes a method of the assessment of distribution of tourist facilities. The main aim of presented study is to assess a spatial density of tourist elements. The evaluation of the distribution of tourist facilities in the landscape allows to indicate overloaded areas. The second purpose is the proposition of an indicator measuring the landscape saturation of tourist facilities, i.e. density index developed by the authors. The index, referred to river basin, is based on the ratio of the area of the tourist facilities to the total area of the unit. For the purposes of calculation, the authors developed a framework for the classification of tourist facilities based on its spatial character. The method was examined in the Silesian Beskid mountain range and can be applied in similar mountain areas.

Key words

Silesian Beskid • tourist landscape • tourist facilities • human impact on landscape • index of tourist facilities density • impact of tourist facilities on landscape

Introduction

Increasingly often, tourism develops spontaneously and puts pressure on the natural environment and on landscape. The effects of tourism, and especially of mass tourism, and its global scale are currently seen

as some of the most significant manifestations of human pressure on natural systems (Cohen, 1978; Myga-Piątek, 2011). The landscape is subject to pressure from expanding tourist infrastructure and tourist traffic, which causes urbanisation in tourist destinations and lasting spatial transformations (Mullins,

2009; Boori, Voženílek, & Choudhary, 2015; Petrikovičová, Krogmann, Fialová & Svorad, 2019).

Because of the dynamic development of tourist facilities, the material, physiognomic and symbolic values of the landscape can be damaged or lost. Very often, conflicts arise at the intersection of economics, socio-cultural issues, environmental protection and resource usage. (Inskeep, 1987; Burns, 2004; Pawłowski, 2009). Conflicts between investors and environmentalists related to the protection of areas of special environmental value, such as mountainous areas, are often widely discussed in scientific works (e.g. Butler, 1980, 1996; Barker, 1982; Stalski, 1986; Agarwal, 1998; Softys, 2009; Partyka, 2010; Myga-Piątek, 2011, 2016; Włodarczyk, 2011, 2014; Duffy, 2014; Stoffelen & Vanneste, 2015) and receive coverage in the media (i.e. WWF post concerning plans for new skiing areas in the region around the Carpathian Mountains and the Balkans, Ski area plans threaten Europe's last untouched forests, 2009). In Poland, for example, there is much controversy surrounding the construction of new ski lifts and ski runs, such as the construction of a ski station in Wierchomla (Okraśniński, 2012), the expansion of the ski resort on the Pilsko mountain (Ślusarczyk & Bożek, 2006), and the construction of large hotel complexes in the Beskid and Karkonosze mountains. Striking examples of such developments are the large Gołębiewski Hotel in Karpacz (Żemła & Żemła-Siesicka, 2010) and the recent construction of an enormous hotel with architecture resembling a castle on an island inside the Natura 2000 area in Stobnica, in the Notecka Forest (Zamek na obszarze Natura 2000).

As a result of the particular sensitivity of the academic community to this issue and its importance, numerous articles on the relationships between tourist activities and landscapes have been published (Gunn, 1979; Baranowska-Janota & Kozłowski, 1984; Łajczak, 1994; Gormsen, 1997; Terkenli, 2002; Mika, 2004; Myga-Piątek, 2006, 2016; Gkoltsiou & Terkenli, 2008; Myga-Piątek & Jankowski,

2009; Andrejczuk, 2010; Pietrzak, 2010; Jansen-Verbeke & McKercher, 2013). There has also been a lot of work undertaken so far on the influence of tourism on the physiognomic aspects of the landscape (i.e. Wyrzykowski, 1991; Chmielewski, 2012; Gkoltsiou & Terkenli, 2012; Nita, Myga-Piątek, & Absalon, 2015; Chmielewski, Śleszyński, Chmielewski, & Kułak, 2018), but they have not attempted an objective approach to spatial issues in the study of tourist infrastructure. The quantity, quality and diversity of types of existing elements has so far been neglected.

Considering that the excessively intensive development (in terms of the number of tourist facilities) may lead to the negative changes of the landscape properties which attracted the tourists in the first place, it is important to identify areas where the density of existing elements is high. In such areas, further development may disturb the visual integrity of the landscape. The indication of the intensity of tourist facility development is important for the planning of further investments, especially in the case of areas with important natural and landscape values, such as mountainous areas.

This article closes the research gap in the spatial analyses of tourist infrastructure by proposing a method of the assessment of distribution of tourist facilities. The main aim of presented study is to assess a spatial density of tourist elements. The evaluation of the distribution of tourist facilities in the landscape allows to indicate overloaded areas. The second purpose is the proposition of an indicator measuring the landscape saturation of tourist facilities, i.e. density index developed by the authors. The calculation of the index is based on several innovative assumptions. First, the spatial distribution and intensity of tourist facilities in the studied mountain area is connected to the landscape background, which is the river basins. Such units integrate natural processes and are clearly visible in space.

Second, all types of tourist facilities are taken into account in the research, i.e. accommodation, food and beverage facilities,

supporting and transport facilities. All inventoried elements are distinguished and parameterized in terms of their morphological (shape) properties. This enables to describe the physiognomic differentiation of the tourist facilities. In this case, the study include *cubature* elements, such as hotels, guesthouses or shelters, *area* elements (e.g. parking lots, downhill skiing routes) and *linear* elements (tourist trails, ski lifts). The tourist facility's impact on the landscape depends strongly on its spatial form. *Cubature elements* affect the landscape significantly, while the impact of linear elements, e.g. tourist trails, is minor. However, in this study the space in geographical scale was studied. It was considered in what degree the space was occupied by tourist facilities. This enables a quantitative assessment of the entire infrastructure of the area, as well as spatial differentiation.

An integral indicator of the degree of infrastructure density was worked out. The index is based on the ratio of the area of the tourist facilities to the total area of the unit. The method enables an objective and unified approach to assessing the strain exerted by tourist facilities on the landscape and determining the prospects for the development of these elements in the analysed area.

The *novum* of the work is the study of the existing tourist infrastructure in landscape (spatial) aspects in geographic field and planning scale, which is based on the density index and classification of the tourist infrastructure proposed by authors. Results presented in this paper are a part of larger study on the impact of tourist infrastructure on the physiognomy of the landscape and concentrate only on the spatial aspects.

Overview of indicators used for analysis of the spatial differentiation of the development of tourism

Diagnostic indicators are an important element of the process of tourism development, from the assessment of existing phenomenon to decisions indicating further proceedings

(Szromek, 2012). The existing measures concerning tourism development (broadly defined) can be divided into two main groups. The first (which is particularly commonplace) includes indicators measuring the phenomenon of tourism in relation to tourist traffic or the capacity of a facility or area. The second trend, related to environmental studies, measures the influence of tourism on the natural environment.

The first set of trend indicators are often used in relation to the study of tourism economics. These include Baretje-Defert (tourist function indicator, expressed in number of tourist accommodation places per 100 permanent residents) and Charvat index (saturation index of the tourist accommodation), expressed in number of granted overnight stays per 100 inhabitants of the area), as well as the accommodation density index (expressed as the number of beds offered to tourists per 1 km² area) (Baretje & Defert, 1972; Szromek, 2012; Hendel, 2016). The latter measures both tourist facilities and tourist traffic. The second group of indicators includes indices presenting the impact of tourism on the natural environment. They indicate changes in the natural environment caused by various types of tourist activities (Baranowska-Janota & Kozłowski, 1984; Buckley & Pannell, 1990; Butler, 1996; Krzymowska-Kostrowicka, 1997; Ptaszycka-Jackowska & Baranowska-Janota, 1998; Sun & Walsh, 1998; Buckley, 2004; Rixen & Rolando, 2013; Tesler & Clark, 2016; Bodoque et al., 2017). Limits of the impact of tourism to the natural environment can be used to establish optimal usage standards, e.g. carrying capacity (the maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic, sociocultural environment and an unacceptable decrease in the quality of visitors' satisfaction, UNWTO, 1981) and, similar, natural capacity (the maximum number of people that may visit a tourist destination at the same time, which does not cause degradation in the specific character of its use, Baranowska-Janota & Korzeniak, 1991) (Bartkowski, 1972; Marsz, 1972; O'Reilly, 1986;

Butler, 1996; Coccossis & Mexa, 2004; Simón, Narangajavana & Marqués, 2004; Marsiglio, 2016; Butler, 2019). Szromek (2012) describes this group as indicators of tourist space and environment. They are the basic measures used in tourism development planning, but they do not consider existing changes in the natural environment or the landscape. Architectural methods constitute a separate group of indicators which are not directly related to tourism. This includes the urban indexes and methods concerning the physiognomic impact of buildings on the landscape, which are derived from the technical sciences. The indicators commonly used in architecture and spatial planning are i.a. index of development intensity (i.e. the ratio of the total area of all overground storeys to the parcel area, Act on spatial planning and development 2003), or Building Site Coverage (area of ground floor footprint of building divided by the parcel area, Forsyth, 2003). This indicators are also very useful for the purposes of assessing tourist facilities, but only apply to cubature elements analysed on an urban scale.

The methods of objective assessment of the impact of an individual object (not necessarily those associated with a tourist function) on a landscape are used in architectural-landscape methods. It includes visual absorption capacity (the landscape's ability to absorb physical changes without transformation in its visual character and quality, Amir & Gidalizon, 1990) (Rygiel, 2007; Ozimek, Tarko & Łabędź, 2010; Krajewski & Mastalska-Cetera, 2014), visual absorption capability (a tool to assess a landscape's susceptibility to visual change caused by man's activities, Anderson et al., 1976) or visual impact assessment (a tool to estimate, in perspective view, the potential visual effect of proposed operations on the scenic landscape, Visual Impact Assessment Guidebook, 1995) (Giedych, 2016), understood as an analysis of the visibility range and aesthetic evaluation of the object itself and its impact on the environment or area assessment in terms of the possibility of accepting new facilities (often carried out for the purpose

of location of wind farms, Molina-Ruiz, Martínez-Sánchez, Pérez-Sirvent, Tudela-Serrano & García Lorenzo, 2011). The above criteria cannot be applied for development intensity analysis considered in geographical terms, in which not only cubature elements, but also area elements are taken into account.

One of the indicators illustrating the impact of tourism on the natural environment is the index of tourism development pressure on the environment (Mika, 2004). It includes a wider range of elements of tourism development compared to the methods used in the economic sciences. Mika considers the space occupied by individual elements (tourist settlements, active recreation areas and other areas with a function related to tourism) and gives them the correct value for evaluation, depending on the estimated impact on the natural environment. For the purpose of spatial analysis of tourist facilities, the above index can be the basis for further research, due to its complex approach to the issue of tourism development. However, it is not sufficient for the study of the visual aspect of landscape change under the influence of tourist facilities.

In summary, despite numerous measures being described in the literature cited above, there is a clear lack of indicators referring to landscape saturation with tourist facilities. Existing indicators related to tourism development refer to tourist traffic, accommodation, or food and beverage facilities, and they mostly focus on the number of beds, which cannot be applied to spatial research. Only the index of tourism development pressure on the environment (Mika, 2004) includes facilities other than accommodation and food and beverage (although this also does not include the entire spectrum of tourist facilities, which is largely due to a lack of statistical data).

The above-mentioned indicators also omit the issue of the magnitude of the impact on the space occupied by tourist facilities. In the landscape approach, the space occupied by various tourist facilities (not only cubature elements) is very important.

Considering the above-mentioned factors, the authors have developed a different

indicator (see below), which in their opinion is more “objective” and useful for solving the research problem – the assessment of pressure exerted by tourist facilities on the Silesian Beskid landscape, and further optimisation of development in the area based on this assessment.

Classification of tourist facilities

It is difficult to clearly define the term of ‘tourist infrastructure’ (Mandic, Mrnjavac & Kordić, 2018). It includes physical elements – facilities necessary to receive tourists (Jovanović & Ivić, 2016) but often includes also services necessary to develop tourist reception area (Gunn & Var, 2002; Kowalczyk & Derek, 2010). In the current paper, the term ‘tourist facilities’ will be used to refer to the physical infrastructure (settlements, roads, parking spaces, trails and tourist and recreation routes) used for tourist activities, which shape and change the landscape.

The classification of tourist infrastructure is not unified. In Polish-language papers, there are numerous criteria of classification, including function, time of use, accessibility to users, spatial form and geographical distribution (Kowalczyk & Derek, 2010). According to the division most commonly accepted in tourism, based on the function criterion (Rogalewski, 1974; Warszyńska & Jackowski, 1978), accommodation, food and beverage, transport and supporting facilities and services can be distinguished. Accommodation facilities include, *i.a.*, hotels, hostels, youth hostels, motels, camp sites, resorts, home stays, agro-tourism accommodation, holiday and training resorts, clusters of houses or bungalows, and health resorts (Płocka, 2005; Statistical Yearbooks of the Central Statistical Office, 2018). Food and beverage facilities include, *i.a.*, restaurants, bars, cafés, teahouses, confectioners, wine bars, and pubs (Płocka, 2005). Transport facilities concern *i.a.* parking lots, tourist trails, ski lifts and also technical infrastructure as roads, airports and railways system (Kowalczyk & Derek, 2010). Supporting facilities include tourist

information, services facilities necessary for tourist (as medical services, souvenir shops, post agency), cultural-entertainment facilities (as museums, cinemas) and sports and recreation facilities as pools, sports halls (Płocka, 2005). Pawlikowska-Piechotka (2008) classifies tourist and recreational facilities (such as pools, ski lifts, sports fields, tennis courts) and others (semi-tourist) (such as museums, theatres, cinemas) as supporting facilities. A different classification is presented in the WTO classification (International Recommendations for Tourism Statistics 2008). In this document, tourist facilities are presented in relation to characteristic tourist activities or industries. The main groups of tourism industries are distinguished: accommodation, food and beverage provision, passenger transportation, travel agencies and other reservation services activities, cultural activities, sport and recreational activities, retail trade of country-specific characteristic foods for tourists and other country-specific characteristic activities.

In most studies evaluating existing tourist infrastructure, a classification using the function criterion is used (Płocka, 2009; Bogucka, 2010), and the evaluation refers most of all to accommodation and food and beverage facilities. Narrowing the approach to these two functional types is reflected in tourism function indicators. The classification of tourist infrastructure plays a key role in assessing existing elements, and deciding whether or not to include an element in research. Focusing on accommodation and food and beverage elements leads to a lack of indicators in planning further development for recreational and sports facilities, which are appearing more and more often in the tourist landscape (e.g. rope parks, toboggan runs). As a consequence, we often find littering and the commercialization of space resulting from the accumulation of these elements.

Table 1 presents a proposition for the classification of tourist facilities, combining spatial and functional aspects. The presented classification has been used in the presented study on the density of tourist facilities.

Table 1. Classification of tourist facilities

Tourist facilities		Cubature elements	Area elements	Linear elements
Accommodation facilities		Hotels, hostels, apartments, bed&breakfast, youth hostels, motels, resorts, homestays, agri-tourism accommodation, holiday&training resorts, health resorts,	Clusters of houses or bungalows, camping, campgrounds,	-
Food and beverage facilities		Restaurants, bars, cafés, teahouses, confectioneries, wine bars, pubs, fast food, cocktail bars (if located in separated buildings),	-	-
Supporting facilities	Information	Tourist information centres (if located in separated buildings),	-	-
	Trade and service	Souvenir shops (if located in separated buildings),	-	-
	Culture and recreation	Amphitheatre, theatre, cinemas, museums, exhibition rooms, events halls,	Outdoor events areas,	-
	Sports and recreation	Sports halls, swimming pools, ski jumps, horse riding halls, lookout towers,	Tennis courts, sports fields, parks, downhill runs, summer toboggan runs, off-road areas, training areas, paintball fields, mini-zoo, horse farms, golf courses, amusement parks	-
	Health and spa	Sanatoriums, spas and wellness centres, mineral water pump room, graduation towers,	-	-
Transport facilities	Tourist trails	Lookout towers, shelters, resting places, marinas,	-	Hiking, biking, skiing, water, horse trails, educational paths,
	Ski lifts and tourist railways	Ski lift station, rescue centres,	-	Aerial tramways, chairlifts, gondola lifts, hybrid lifts, surface lifts,
	Transportation	Multi-storey car parks	Car parks, airports	Roads, railways, promenades, boulevards

Source: Own compilation based on Kowalczyk, Derek, 2010; Płocka, 2005; Statistical Yearbook, 2018.

The authors of this study propose taking into account the spatial division of elements into *cubature*, *area* and *linear* elements (see chapter 5. Methods).

Geography of the study area

The study area is located in Poland, in the Western Carpathian mountains. It covers

the geographical macroregion of the Silesian Beskids (Kondracki, 2002) and also, in accordance with the latest division into mesoregions (Balon, Jodłowski & Krąż, 2018; Solon et al., 2018), comprises part of the Koniaków Intermontane mesoregion (Fig. 1). The location of the area, in the immediate vicinity of large towns (Bielsko-Biała and Żywiec) and a few dozen kilometres from the Katowice conurbation, is important for the development of tourism. The area has particular landscape values, determined by the diversity of the relief (rolling hills, whose which height reaches 1000-1500 m above sea level, with denivelations of 300-600 m), significant areas

of forests, rivers and springs, and also the specific culture of the region (Mika, 97). The presence of spa resources, which was crucial to the development of tourism, is also significant (Gonda-Soroczyńska, 2013).

The conditions mentioned above have impacted land use and led to tourism being of particular importance in the development of the region. The natural landscape of the Beskids has been strongly transformed, to a large extent under the influence of activities related to tourism. The area was and still is under strong pressure from tourism (Mika, 2001, 2004). It is also characterized by a diversity of forms of tourism, and therefore there

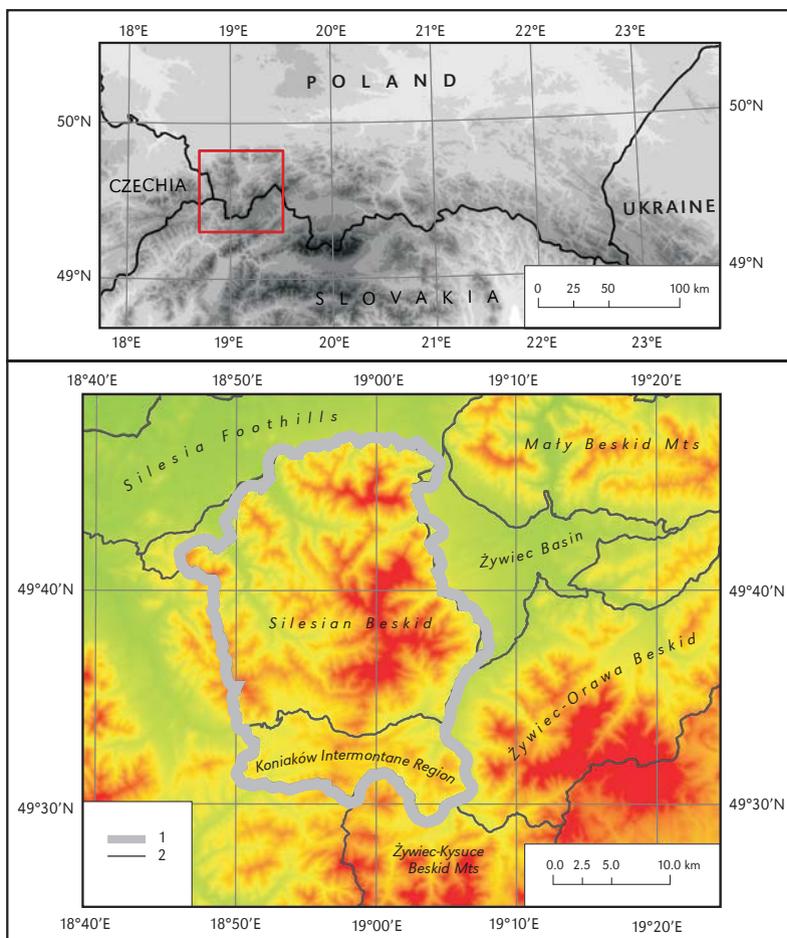


Figure 1. Location of the study area; 1 – study area boundaries, 2 – mesoregions boundaries

are various tourist facilities, which are functionally and spatially different. The large hotels and resorts are located mostly in Ustroń and Wisła, while small accommodations, like guest rooms and “second homes” or recreation houses, are situated in Szczyrk, Brenna and so-called Triple Village (Koniaków, Istebna, Jaworzynka). The tourist activities are also diversified. In Triple Village more important is cultural tourism (Faracik, Kurek, Mika, Pawlusiński, 2009). In Ustroń, Wisła and Szczyrk the mass tourism is present, which is proved by high Defert index for this municipalities (Hendel, 2016). The special landscape and natural values combined with the pursuit of tourism development have led to numerous conflicts between landscape preservation and tourism (Mika, 1997; Mika, Krzesiwo & Krzesiwo, 2007; Myga-Piątek & Jankowski, 2009).

Numerous areas of the Silesian Beskids are under excessive tourist pressure and there has been a significant reduction in landscape values due to the accumulation of tourist facilities (Mika, 2004). The uncontrolled accumulation of tourist attractions has caused a decrease in landscape values which can be observed, for example, on the slopes of Równica. Although the mountain hostel was built in the 1920s, and road access was provided in the 1930s, tourism developed particularly rapidly at the turn of the 20th and 21st centuries (Barański, 2007). In last 20 years, not only have numerous accommodation and catering facilities been built on the slopes of Równica, but so have a rope and paintball park, a zoo, a toboggan run and car parks serving the above attractions (Petryszyn & Zuzanska-Żyśko, 2009).

The spatial conflicts mentioned above and the lack of evaluation of the impact of tourism on the physiognomy of the landscape were the basis for choosing the Silesian Beskids as the study area.

Methods

The following research algorithm was used in the presented studies: after determining the boundaries of the study, based

on Kondracki's mesoregions (2002), delimitation of the primary (spatial) units based on the basin model was carried out. Next, an inventory of tourist facilities according to the developed classification was made and related to individual spatial units. The final step was to determine the index and calculate the density of tourist facilities for the studied area.

Delimitation of primary units

As mentioned above, in this study the primary spatial unit (used in calculations) is a river basin of the appropriate category (microbasin). The use of microbasins as a primary unit in landscape research is not a typical approach (Żemła-Siesicka, 2017). In research on tourist facilities, administrative divisions are most often used as primary units. This is undoubtedly a convenient approach, because decisions and statistics regarding tourism are provided in relation to administrative boundaries. However, the presented goal, related to the analysis of the impact of existing facilities on space in the landscape, requires a different, more “visual” approach. This is due to the fact that, in mountain areas, catchments (understood here as individual valleys determined on the basis of water divides), create clear, visible and cohesive units. Conversely, artificially-set administrative boundaries are “invisible” in the field (although some boundaries between communes coincide with clearly visible topographic elements).

Basins are usually used as spatial units in hydrographic studies (e.g. Lipski, Kostuch & Ryczek, 2005; Małek & Gawęda, 2005), landscape dynamics and function studies (e.g. on geodiversity: Najwer & Zwoliński, 2014), and rarely in other studies (np. Zolotov & Chernykh, 2015). In the case of spatial studies in mountain areas, basins form functional units integrating natural processes (Kistowski, 2001) and processes related to land cover (Bertolo, 2000).

Using the basin criterion, it was possible to obtain spatial units based on water divides

of various categories, ranging from the European watershed to category III water divides (water divides marked on a hydrographic map (geoportal.gov.pl, 1:50,000 scale) were used). As a result, 68 spatial units were obtained, delimited in the catchments of smaller rivers in the northern part of the Beskids (units 513.451.1-513.451.11), in the catchment of the Brennica (units 513.452.1-513.452.8), Żylica (units 513.453.1-513.453.5) and Vistula (units 513.454.1-513.454.16), in the catchment of Soła on eastern slopes of Barania Góra (units 513.455.1-513.455.11) and Olza (units 513.456.1-513.456.10), and in the area between Soła and its tributaries – Roztoka and Janaszka (units 513.457.1-513.457.7).

Inventory of tourist facilities

The tourist facilities of the Silesian Beskids were divided into *area elements* (e.g. camp sites), *cubature elements* (e.g. hotels) and *linear elements* (e.g. tourist trails). This kind of division based on spatial form is presented and defined by Kowalczyk and Derek (2010). Based on their adopted and modified definitions, the authors of this article developed the following terms: *cubature elements are an association of tourist facilities gathered in one building, which have tourism as the sole or predominant function.*

Linear elements, which were considered by Kowalczyk and Derek (2010) to be tourist trails, have been extended in this research to include ski lifts (classified by Kowalczyk and Derek as area facilities) due to their linear character and particular impact on the landscape. So *linear elements* include linear technical elements such as ski lifts and elements without technical equipment as tourist paths and trails. In the research only separated trails and paths were taken into account, i.e. if several trails have the same route, they are considered as one element, and if a trail or path overlaps with a circular road it is not considered. Those assumptions results from the fact that the space (area) is the main criterion taken into consider, so it can't be duplicate.

Area elements are areas that perform tourist or recreational functions without buildings, as well as complexes of facilities with an area of ground floor footprint less than 50 m² (e.g. clusters of houses or bungalows, camp sites). If there is a building associated with an area element (i.e. ticket and ski rental office at the foot of downhill slope), these buildings are considerate separately as cubature elements.

Calculation of the density of tourist facilities

To calculate the density of tourist facilities, an index based on existing similar tourism indices, particularly on the density of accommodation index, was proposed. The density of tourist facilities index is a quantity indicator specifying the intensity of the area, including all facilities. The index is calculated according to the formula:

$$G_i = P_i / P_j \times 100$$

where:

G_i – density of tourist facilities

P_i – area of all facilities (m²) within a given spatial unit

P_j – area of a spatial unit (m²)

Area of all facilities is calculated on the base of summary of area of the *cubature elements*, area of the *area elements* and area of the *linear elements*. The area of *cubature* and *area elements* was provided from GIS, the *linear elements* area was calculated on the base of the length of the elements multiplied by the assumed average width of 3 m in the case of trails and paths, of 5 m in the case of ground ski lift and of 6 m in the case of chair and gondola lift.

Results

Occurrence of tourist facilities in the studied area

Inventory of tourist facilities in the studied area shows that the *cubature elements* are concentrated along rivers, especially the

main rivers of Silesian Beskid. The most numerous are small *cubature elements*, i.e. hostels, small hotels, restaurants, bars and mountain shelters. The least numerous are large cubature elements, i.e. those located in Szczyrk and Wisła (Gołębiewski hotel in Wisła, Jawornik hotel in Wisła-Jawornik, Orle Gniazdo hotel in Szczyrk-Biła). Many hotels are located in holiday districts such as Ustroń-Zawodzie and Ustroń-Jaszowiec, most of which were built in the period of People's Republic of Poland (PRL – Polska Republika Ludowa). Some of these have been modernized (e.g. Gwarek in Ustronie-Jaszowiec), and some parts have been completely rebuilt. Some of the facilities have been closed, such as Magnus Resort in Bystra. Guest houses, homestays and agro-tourism accommodation (usually this is true in name only, and these are *de facto* guest rooms located in separate buildings especially designed for tourists) occur frequently almost throughout the entire area. A particularly high concentration can be observed along the Vistula, Brennica and Żylica valleys. Numerous elements are dispersed in Istebna. In the last decade or so, the number of food and beverage facilities has increased significantly, especially restaurants – inns designed in the highland style, most often on the main roads but also in the higher mountain areas, e.g. in Równica. The spatial distribution is presented on figure 2.

Area elements are represented in Silesian Beskids by transportation elements (parking) and rarely by accommodation facilities (camp-sites, clusters of bungalows). Car parks with different areas are very numerous throughout the study area, constituting one of the basic elements of technical infrastructure. Most of them are located near ski lifts. Area elements inventoried in Silesian Beskid also include facilities for recreation and sports: tennis courts, sports fields, outdoor swimming-pools and parks and also more typical tourist elements: off-road trails, rope parks, paintball fields and a mini-zoo. Other important element of tourist facilities include downhill runs, ski slopes and one cross-country

skiing area (concentrated in Kubalonka). A spatial distribution shows that these elements occur the most often in central and west areas of the Silesian Beskid, in Wisła, Szczyrk and Brenna.

Linear elements occur throughout almost the entire area of the Silesian Beskids. This includes transportation elements: hiking, biking, skiing routes, educational paths, ski lifts, cable cars, MTB routes, promenades. Hiking routes are the most common tourist elements, forming a dense network covering almost the whole area of the study, except for the south-eastern part. Educational paths are also common but, as they are usually part of walking routes, they were not separated in the research, with the exception of the nature path "In the Zimnik Valley" at the foot of Skrzyczne (the path doesn't lead together with other tourist trails). The specific layout of the routes depends, to a certain extent, on tourist values, first of all on the relief, but also it results from the methodological assumptions of the studies, which did not take into account the tourist routes running along roads. This is why the visible system refers very clearly to the water divisions – most of the routes run along mountain ridges.

Ski lifts in Silesian Beskid form a specific system. Usually, they form isolated elements; only on Czantoria and in Szczyrk they show a network character. In the Silesian Beskids, ski lifts, and the increasingly common chair-lifts occur frequently. The main centre for ski infrastructure is Szczyrk, which has recently undergone significant changes. Numerous ski lifts are also located in Wisła, Ustoń, Brenna and Zwardoń. In recent years, the ski centre in Istebna with lifts on the slopes of Złoty Gróń has also been developed.

Quantitative analysis shows the dominance of cubature elements (514 cubature elements, 187 area elements and 432,42 km of linear elements). Most of elements is located in the valleys of Vistula, Żylica and Brennica. Some elements occur in area of Istebna-Koniaków-Jaworzynka. In south-east of Silesian Beskid there are very few of cubature and area elements and some linear elements.

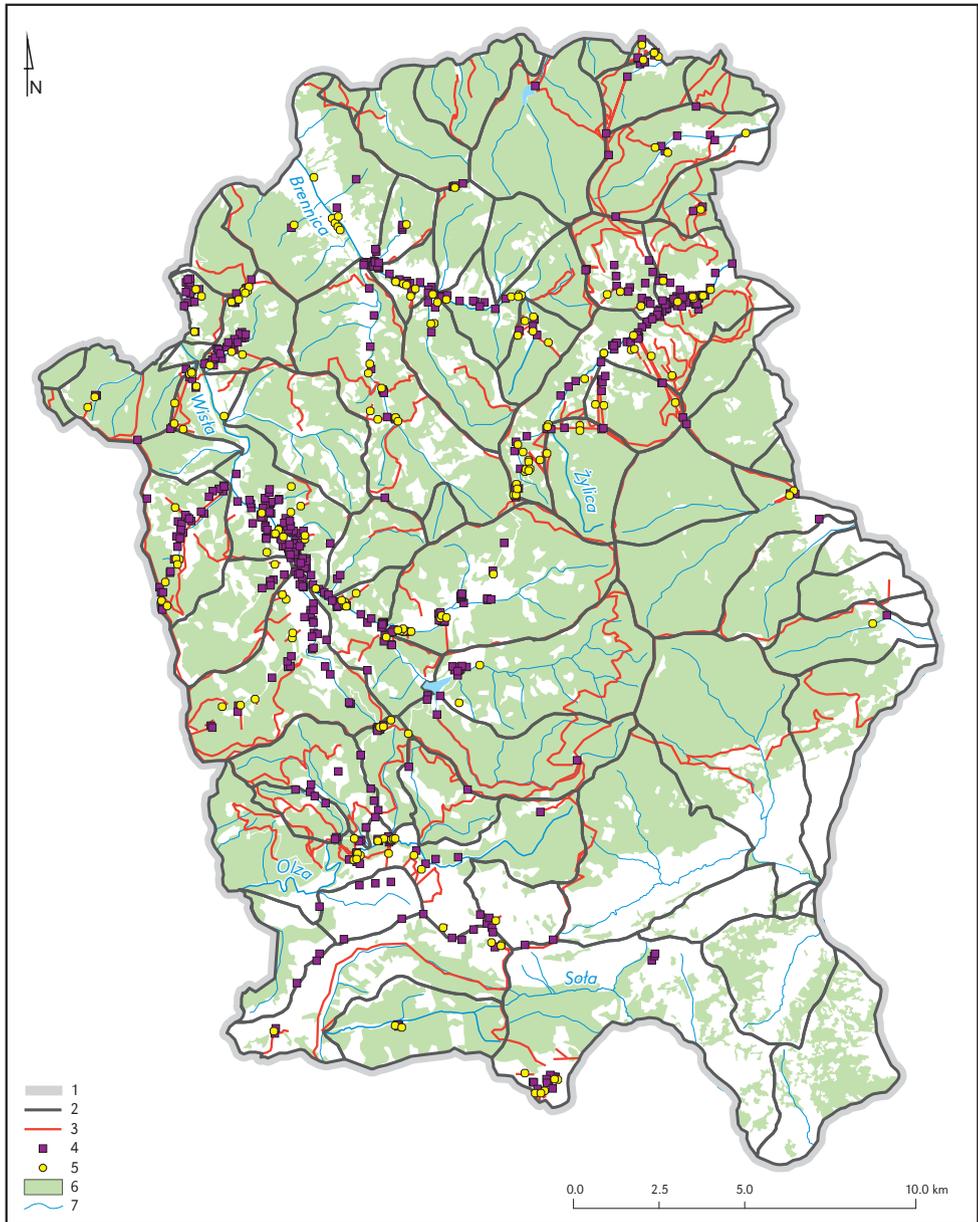


Figure 2. Spatial distribution of facilities in the Silesian Beskid mountain region. 1 – study area boundaries, 2 – spatial unit boundaries, 3 – linear elements, 4 – cubature elements, 5 – area elements, 6 – forests, 7 – rivers

Density of tourist facilities in the studied area

On the basis of the inventory, density index calculations for each of the spatial units (primary units) were made. The values of indicators remain closely correlated to the area occupied by individual elements. The units with the highest value of the index are: 513.453.4 (North-eastern slopes of Skrzyczne, 18.68) and 513.451.7 (Dębowiec, 11.90). Those high values are the result of the occurrence of large areas of downhill runs and, additionally, several point elements. High values also appear

for the units 513.454.2 (Ustroń-Zawodzie, 8.46), 513.452.7 (Brenna-Węgierski, 6.32), 513.456.2 (Istebna-Kubalonka, 5.95) and 513.453.2 (Szczyrk in Żylica valley, 5.75). The lowest values characterise the units located in the eastern part of studied area (microregions 513.455 and 513.457). There are very few units with an index of zero: 513.451.4, 513.452.4, 513.452.8, 513.454.4, 513.455.2, 513.455.3, 513.455.6, 513.457.2, 513.457.3, 513.457.4, 513.457.6, 513.457.7. The values of the received index are presented in Table 2.

The most intensely developed areas in terms of tourist facilities are areas in the

Table 2. The values of the tourist facility density index for spatial units

Spatial unit	Values of the tourist facilities density index	Spatial unit	Values of the tourist facilities density index	Spatial unit	Values of the tourist facilities density index
513.453.4	18.68	513.452.6	0.58	513.455.11	0.16
513.451.7	11.90	513.454.11	0.53	513.455.10	0.14
513.454.2	8.46	513.454.5	0.51	513.454.9	0.12
513.452.7	6.32	513.457.5	0.47	513.455.1	0.11
513.456.2	5.95	513.453.3	0.43	513.455.8	0.10
513.453.2	5.75	513.454.16	0.41	513.457.1	0.07
513.454.3	3.30	513.456.3	0.36	513.452.3	0.07
513.454.8	3.13	513.454.14	0.36	513.455.7	0.04
513.452.2	2.67	513.456.7	0.35	513.456.6	0.03
513.453.1	2.52	513.454.6	0.33	513.456.8	0.01
513.454.10	2.36	513.455.4	0.29	513.451.4	0.00
513.451.8	1.19	513.451.3	0.28	513.452.4	0.00
513.456.5	1.12	513.454.12	0.28	513.452.8	0.00
513.452.5	1.11	513.456.1	0.25	513.454.4	0.00
513.451.10	1.09	513.453.5	0.24	513.455.2	0.00
513.452.1	0.98	513.451.2	0.22	513.455.3	0.00
513.454.13	0.93	513.456.10	0.22	513.455.6	0.00
513.451.11	0.83	513.454.7	0.22	513.457.2	0.00
513.456.4	0.71	513.451.5	0.20	513.457.3	0.00
513.451.9	0.68	513.455.9	0.19	513.457.4	0.00
513.451.1	0.67	513.455.5	0.18	513.457.6	0.00
513.454.1	0.59	513.454.15	0.18	513.457.7	0.00
513.456.9	0.58	513.451.6	0.17	-	-

western and central part of the Silesian Beskids (Fig. 3). A particularly intense density of tourist facilities has occurred in the Żylica basin (Szczyrk), and a slightly lower density can be observed in the basin of Brennica, Vistula and Olza. The lowest density occurs on the eastern slopes of Barania Góra and in the south-eastern part of the Silesian Beskids.

located in the central and western part of the Silesian Beskids, and the least developed are in the south-eastern part. The areas in the central and western parts of the Silesian Beskids are the best developed, while the south-eastern part is the least developed. Similar results concerning tourism in Silesian Beskid were obtained by Mika (2004) in the study of the

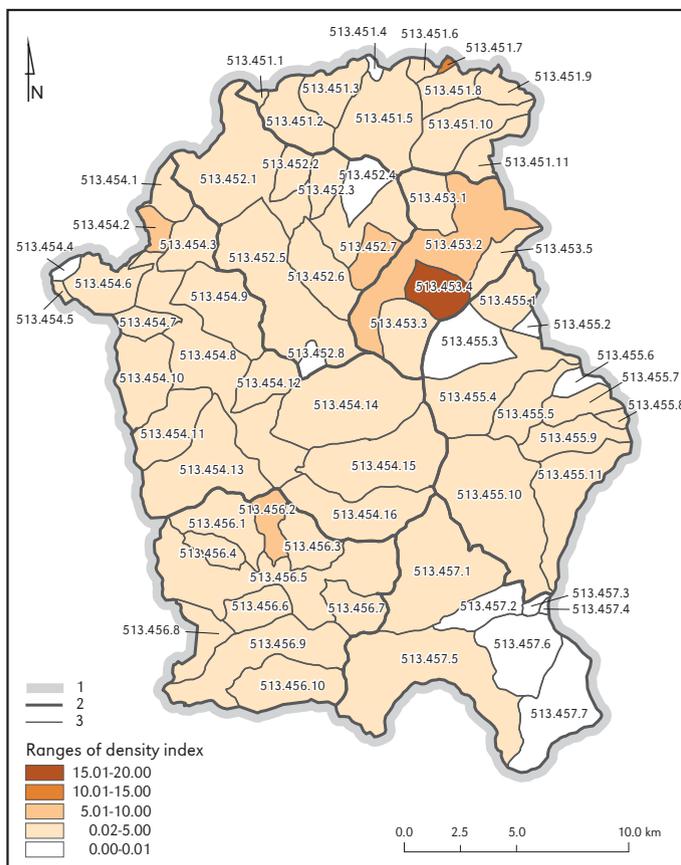


Figure 3. Density of the tourist facilities in the Silesian Beskid mountain region. 1 – study area boundaries, 2 – main catchments boundaries, 3 – spatial unit boundaries

Discussion

The results show the spatial distribution and spatial diversity of tourist facilities in the Silesian Beskids area. The density index shows that the most developed areas in terms of the occurrence of tourist facilities are those

located in the central and western part of the Silesian Beskids, and the least developed are in the south-eastern part. The areas in the central and western parts of the Silesian Beskids are the best developed, while the south-eastern part is the least developed. Similar results concerning tourism in Silesian Beskid were obtained by Mika (2004) in the study of the

on the landscape is clear. The areas of Szczyrk, Wiśła, Ustroń, Brenna and Bystra are the most transformed in the assessment of both the environmental impact and the density index. In Hendels' study the highest values are reported for Ustroń, followed by Szczyrk and Wiśła, while Brenna have values even several times lower. The case of Brenna shows differences in results depending on the kind of infrastructure considered in study. While the accommodation facilities (which are taken into account in Defert and Charvat index) are not so much developed, the other kind of tourist infrastructure (considered in Mika indicator and in density index) are numerous. It should be also noted that the river basin units adopted in the article allow a much more detailed presentation of the impact of tourism than larger administrative units.

Based on the values of the index obtained in this particular area, it is possible to indicate the opportunities and limitations of their further development (in a spatial sense). Therefore, units were assigned to five groups, depending on the value of index: areas indicated as *recommended for further development* (minimal value of the index, interval of index 0-0.5), areas where *further development is possible* (interval of index $\geq 0.5-1$), areas where *further development should be limited* (interval of index $\geq 1-5$), areas where *further development should be strongly limited* (interval of index $\geq 5-10$) and areas where *further development is forbidden* (interval of index $\geq 10-20$).

However, it should be remembered that the final evaluation of the area depends also on other conditions: natural, such as forest cover or surface waters, but also economic or social situation. In this particular spatial studies it was considered that forest cover has the greatest impact on the distribution of elements, because it is a form of land protection that prevents any permanent development. The forestation in Silesian Beskid is very differentiated. The forest cover mostly the north part of study area and in the south the percentage of forest cover is very low. The opportunities for tourist investments are strongly limited in units covered mostly or entirely by forests. In these cases, only linear elements (tourist trails) should be developed. On the other hand, if the area is almost unforested, there is a space for tourist investments. Therefore, the division was additionally supplemented with information on the extent of forest cover. Forest cover was divided into intervals ($<40\%$, $\geq 40-60\%$, $\geq 60-80\%$ and $\geq 80\%$) and assigned to the groups mentioned above. So the first step was the division of density index. Then intervals of forest cover were the second criterion of providing the groups of indicated development. The results of the division are shown in table 3. The results of integral evaluation are shown in the table 4.

As seen below (Fig. 4), the areas *possible to invest in* or *recommended for further development* are located in south-eastern parts of Silesian Beskid mountain region and cover

Table 3. Criteria of division of groups of opportunities of tourist facilities development

Development	Criterion of density index	Additional criterion of forest cover
Forbidden	$\geq 10-20$	irrelevant
Strongly limited	$\geq 5-10$ < 5	irrelevant $\geq 80\%$
Limited	$\geq 1-5$ < 1	irrelevant $\geq 60-80\%$
Possible	density index $\geq 0.5-1$ < 0.5	irrelevant $\geq 40-60\%$
Recommended	density index 0-0.5	< 40%

Table 4. Types of units indicating opportunities of further development of tourist facilities within the Silesian Beskid mountain region

Development	Criterion	Spatial unit	Values of the tourist facilities density index	Forest cover [%]	Spatial unit	Values of the tourist facilities density index	Forest cover [%]
Forbidden	density index <10;20)	513.453.4	18.68	79	513.451.7	11.9	63
Strongly limited	density index <5;10) forest cover <80%;100%)	513.454.2	8.46	55	513.456.2	5.95	81
		513.452.7	6.32	86	513.453.2	5.75	50
		513.451.8	1.19	88	513.453.5	0.24	84
		513.451.10	1.09	80	513.451.2	0.22	93
		513.451.9	0.68	97	513.455.5	0.18	82
		513.451.1	0.67	100	513.451.6	0.17	99
		513.454.1	0.59	89	513.455.1	0.11	85
		513.452.6	0.58	82	513.452.8	0.00	100
		513.454.5	0.51	100	513.455.3	0.00	99
		513.453.3	0.43	95	513.454.4	0.00	98
		513.454.16	0.41	82	513.455.2	0.00	92
		513.454.6	0.33	90	513.451.4	0.00	91
513.451.3	0.28	99	513.452.4	0.00	83		
Limited	density index <1;5) forest cover <60%;80%)	513.454.3	3.30	71	513.454.10	2.36	66
		513.454.8	3.13	45	513.456.5	1.12	43
		513.452.2	2.67	66	513.452.5	1.11	46
		513.453.1	2.52	65	-	-	-
		513.454.13	0.93	62	513.456.1	0.25	77
		513.451.11	0.83	69	513.456.10	0.22	76
		513.456.4	0.71	77	513.454.7	0.22	74
		513.454.11	0.53	71	513.451.5	0.20	71
		513.456.3	0.36	78	513.455.9	0.19	77
		513.454.14	0.36	69	513.454.15	0.18	61
		513.455.4	0.29	71	513.454.9	0.12	73
		513.454.12	0.28	79	513.452.3	0.07	79
Possible	density index <0.5;1) forest cover <40%;60%)	513.452.1	0.98	35	513.456.9	0.58	32
		513.455.11	0.16	51	513.456.8	0.01	45
		513.455.10	0.14	41	513.457.3	0.00	48
		513.457.1	0.07	52	513.457.7	0.00	44
		513.455.7	0.04	50	513.457.6	0.00	43
Recommended	density index <0;0.5) forest cover <0%;40%)	513.457.5	0.47	38	513.455.6	0.00	33
		513.456.7	0.35	11	513.457.4	0.00	13
		513.455.8	0.10	2	513.457.2	0.00	10
		513.456.6	0.03	7	-	-	-

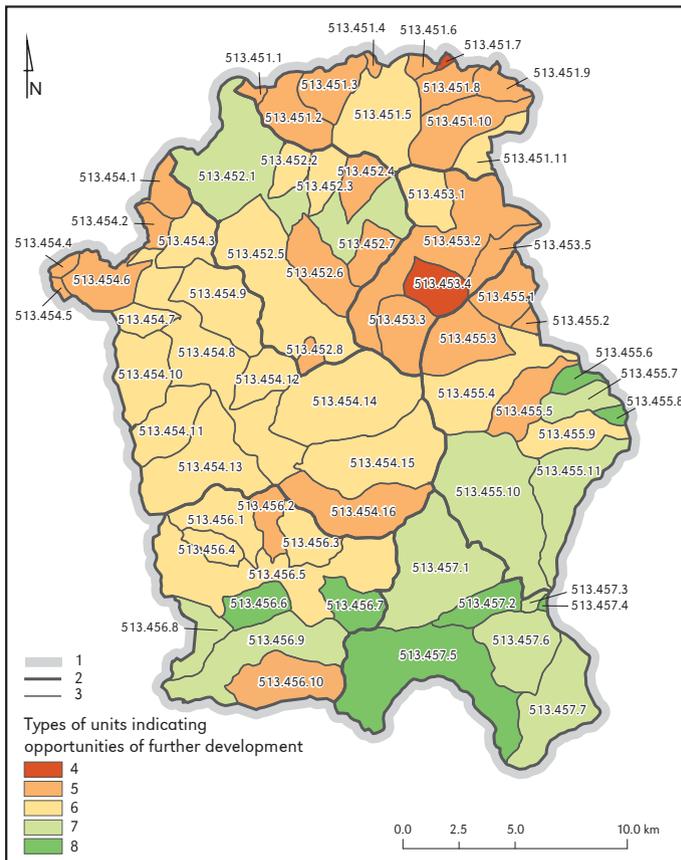


Figure 4. Types of units indicating opportunities of further development of tourist facilities in the Silesian Beskid mountain range. 1 – study area boundaries, 2 – main catchments boundaries, 3 – spatial unit boundaries, 4 – forbidden, 5 – strongly limited, 6 – limited, 7 – possible, 8 – recommended

a large part of it. The largest part of the area, located in the northern and western regions, are covered by units where further development is *limited* and *strongly limited*. Further investments in these areas should therefore be carefully considered, because the location of new objects could lead to a significant reduction in landscape values.

Conclusion

Based on above results, the following conclusion can be provided:

- the spatial distribution of tourist facilities in Silesian Beskid is differentiated, the *cubature elements* are concentrated along

rivers, especially the main rivers of Silesian Beskid, *area elements* occur the most often in central and west areas of the Silesian Beskid, in Wisła, Szczyrk and Brenna, *linear elements* are present in almost the entire area of the Silesian Beskids,

- the density index shows that the most intensely developed areas in terms of tourist facilities, which can be considered as overloaded, are areas in the western and central part of the Silesian Beskids,
- differences in the result of the comparison with the Charvat and Defert indexes indicate that all types of tourist infrastructure, including accommodation, food and beverage facilities, supporting and transport

infrastructure should be taken into account. Those differences prove also the need to introduce an indicator for tourism spatial studies.

The conducted studies on the density of tourist facilities in the area of Silesian Beskids have both scientific and application implications. First, the proposed method allows to describe and understand the spatial implications of the tourism. Both proposed classification and the density index contribute a new possibilities to measure the influence of tourism on the landscape. The second contribution of the article is an application one. As was mentioned in the Introduction, an indication of the intensity of tourist facilities development is very important for the planning of further investments. The obtained results enable the evaluation of the pressure exerted by tourist facilities on the landscape of the Silesian Beskids, and the determination of further development optimisation in the studied area. The presented density index can be used for studies of tourist facilities as a basis for indicating *opportunities for further development*.

However, it is worth to notice, that to indicate the further development of tourist facilities, it is important to examine diverse approaches, not only the spatial dimension. Research in other areas is equally important, including environmental protection (impact of new investments on soils, water, air, etc.),

economics (study of the profitability of new facilities) or tourism (research on tourist preferences). The presented research only highlights the significant impact of tourism infrastructure on the landscape space. The spatial-physiognomic aspect of the tourist region largely determines if the area is attractive to tourists or not. Taking care of landscape quality is therefore in the interest not only of tourists, but also of the local population who benefit economically from tourism.

The presented method of analysis and indications regarding tourist facilities was tested for a specific area, so it can be used primarily in mountains similar to Silesian Beskid, (as Beskid Żywiecki) due to the adopted basin spatial units which are useful for areas where the valleys are clearly visible. The method should be also tested in other areas to verify its suitability. If administrative units were substituted as a primary units, the density index could also be applied in lowland areas. With minor methodological corrections (adopting other primary units) it would also be possible to assess landscape changes on a more detailed scale and in a smaller area (e.g. for municipalities).

Editors' note:

Unless otherwise stated, the sources of tables and figures are the authors', on the basis of their own research.

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