

# ACTA GEOGRAPHICA SLOVENICA

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## Contents

<b>Derya OZTURK</b> <i>Fractal analysis of spatio-temporal changes of forest cover in Istanbul, Turkey</i>	7
<b>Sándor ILLÉS, Áron KINCSES, Péter SIMONYI</b> <i>From fluid migration to stable circular migration: A case study from Hungary</i>	21
<b>Mateja JELOVČAN, Mojca ŠRAJ</b> <i>Comprehensive low-flow analysis of the Vipava river</i>	37
<b>Francisco Xosé ARMAS-QUINTÁ, Francisco RODRÍGUEZ-LESTEGÁS, Xosé Carlos MACÍA-ARCE, Yamilé PÉREZ-GUILARTE</b> <i>Teaching and learning landscape in primary education in Spain: A necessary curricular review to educate citizens</i>	55
<b>Marko ZAJC</b> <i>The Kolpa as a border river in the newspaper Slovenski narod, 1868–1914</i>	65
<b>Vuk Tvrtko OPAČIĆ, Zoran KLARIĆ, Ivo BEROŠ, Snježana BORANIĆ ŽIVODER</b> <i>Tourism Development Index of local self-government units: The example of Croatia</i>	77
<b>Igor JURINČIČ</b> <i>Tourism carrying capacity in the municipalities of Tolmin, Kobarid and Komen</i>	89
<b>Haraldur OLAFSSON, Iman ROUSTA</b> <i>Remote sensing analysis to map inter-regional spatio-temporal variations of the vegetation in Iceland during 2001–2018</i>	105

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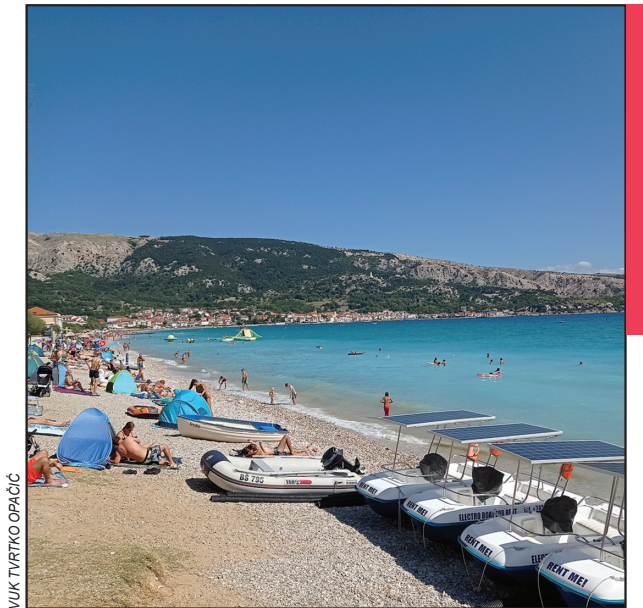
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*Front cover photography:* Large avalanches like the January 2021 »twin avalanche« in the upper Soča Valley that reach the valley floor will be unavoidable in the Alps in the future, as climate warming actually triggers them, contrary to expectations (photograph: Jure Tičar).  
*Fotografija na naslovnici:* Velikim snežnim plazovom, kakršen je bil »dvojček« januarja 2021 v Zgornjem Posočju, ki dosežejo dolinsko dno, se v Alpah tudi v prihodnosti ne bomo izognili, saj jih otoplitev podnebja, nepričakovano, celo povzroča (fotografija Jure Tičar).

# TOURISM DEVELOPMENT INDEX OF LOCAL SELF-GOVERNMENT UNITS: THE EXAMPLE OF CROATIA

Vuk Tvrtko Opačić, Zoran Klarić, Ivo Beroš, Snježana Boranić Živoder



VUK TVRTKO OPAČIĆ

Baška on the island of Krk, one of the leading municipalities in Croatia according to the Tourism Development Index.

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**Vuk Tvrтко Opačić<sup>1</sup>, Zoran Klarić<sup>2</sup>, Ivo Beroš<sup>2</sup>, Snježana Boranić Živoder<sup>2</sup>**

## **Tourism Development Index of local self-government units: The example of Croatia**

**ABSTRACT:** The goal of the research was to construct a model for calculating the Tourism Development Index (TDI) at the local level. TDI is based on ten indicators: total number of beds, total number of beds per 100 residents, number of beds in hotels and similar establishments, number of beds in hotels and similar establishments per 100 residents, number of tourist arrivals, number of tourist arrivals per capita, number of overnight stays, number of overnight stays per capita, number of employed in tourism and hospitality and share of employed in tourism and hospitality in total employment. Based on TDI, 556 cities/towns and municipalities were categorised into five classes. Due to the usage of both absolute and relative values, TDI recognises the tourism development better than the previously used indices.

**KEY WORDS:** tourism geography, tourism flow, accommodation facilities, employment in tourism and hospitality, tourist destination, regional development, Croatia

## **Indeks turističnega razvoja enot lokalne samouprave: primer Hrvaške**

**POVZETEK:** Cilj raziskave je bil zasnovati model izračunavanja indeksa turističnega razvoja na lokalni ravni. Indeks turističnega razvoja je osnovan na desetih kazalnikih: število postelj, število postelj na 100 prebivalcev, število postelj v hotelih in drugih turističnih nastanitvah, število postelj v hotelih in drugih turističnih nastanitvah na 100 prebivalcev, število turističnih prihodov, število turističnih prihodov na prebivalca, število prenočitev, število prenočitev na prebivalca, število zaposlenih v turistični dejavnosti ter delež zaposlenih v turistični dejavnosti med vsemi zaposlenimi. Na podlagi izračunanega indeksa smo 556 hrvaških mest in občin razvrstili v pet razredov. Ker smo uporabili absolutne in relativne vrednosti, indeks turističnega razvoja bolje prikaže razvitost turizma kot indeksi, ki so bili uporabljeni v predhodnih tovrstnih raziskavah.

**KLJUČNE BESEDE:** geografija turizma, turistični tokovi, nastanitvene zmogljivosti, zaposlenost v turizmu in gostinstvu, turistična destinacija, regionalni razvoj, Hrvaška

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# 1 Introduction

Tourism is considered as one of the most prosperous, most important and most successful branches of economy in European Mediterranean countries, especially in regions situated along the coast. In order to be able to ensure optimal usage of tourism spatial resources and direct further tourism development, it is necessary to collect reliable statistical data and choose objective indicators of spatial development on national, regional, but also on the local level. Namely, strategic documents in the tourism domain focus mainly on economic aspects and aspects of tourism on the macro level, and focus less on tourism attractions, spatial particularities of tourism and spatial implications on the micro level.

The starting point for the construction of a model for calculating tourism development on the local level, was the need to exactly determine the level of tourism development in local self-government units (cities/towns and municipalities), with the goal of increasing efficacy and transparency in tourism planning. The authors developed a method in the frame of the project »Establishment of a model for calculation of index of tourism development of local self-government units in the Republic of Croatia« for the Croatian Ministry of Tourism and Sports for co-financing the development of touristically underdeveloped parts of Croatia.

The construction of such an index is understood to include definitions of available indicators on the basis of their relevance, dependability, and interdependence; followed by testing for anomalies. This is followed by defining the weight of the indicators used to calculate the index.

There are different approaches for measuring tourism development that have been proposed in previous researches. Baggio (2018) pointed out that on the side of tourism demand, the two most frequently used groups of indicators are those related to tourism flow and tourism expenditure/receipts. Because of the more reliable statistical data, we considered the indicators related to tourism flow as more appropriate for calculating the composite index of tourism development on the local level. Klarić (1990) selected the six most significant indicators used to classify the former (Yugoslav era) municipalities of Croatia in relation to the significance of tourism in the area (number of beds per 100 residents, hospitality object capacity per 100 residents, number of tourist arrivals per capita, number of tourist overnight stays per capita, share of population active in tourism and hospitality in the total population, and the contribution of hospitality and tourism in total GDP).

An analysis of diversification of tourism development level in Poland was undertaken on the local level, based on synthetic indicators that took three groups of variables with different indicators into account: variables of tourism quality (natural and anthropogenic); variables of tourism development; and variables of tourism flow (Derek 2008). In researching the tourist function of rural areas of Poland, Durydiwka (2013) used the following indicators: the number of tourists using accommodation facilities; and the number of companies registered for tourism and catering activities. Borzyszkowski, Marczak and Zarębski (2016) used the Defert tourist function index (DTFI) as the indicator for identification the spatial diversity of tourist function development in the West Pomerania Province in Poland. The Baretje-Defert's index of tourism development, along with Defert's index of tourist traffic density, Charvat's index of intensity of tourist traffic, and Schneider's index of tourism intensity, were used as tourism function indicators in studies regarding the Polish Baltic coast (Parzych 2020) and in the City of Užice in Serbia (Marković et al. 2017). When researching the spatial diversity of tourism in the EU, Roman, Roman and Niedziółka (2020) conducted three cluster analyzes based on: accommodation facilities, tourism traffic, and tourism-related expenditures and revenues.

The use of different indicators of tourism development level is also characteristic of publications dealing with sustainable tourism. Accordingly, the Croatian Environmental Protection Agency determined a list of 266 indicators in 15 thematic areas in order to monitor the environmental changes in Croatia. Tourism is represented by 11 absolute and relative indicators, which mainly relate to tourism flow, accommodation capacity, and the economic and ecological implications of tourism (Kozić and Mikulić 2011). In 2016, the European Commission published the European Tourism Indicator System (ETIS), which identified 43 basic indicators divided into four groups of variables: destination management, economic variables, variables of the social and cultural influence of tourism, and variables of the environmental influence of tourism. Tourism development level is largely covered by economic variables that relate to tourism flow, tourism business, employment in tourism, and tourism supply. Bošković, Vujičić and Ristić (2019) also took the Commission's recommendation into account in their research of indicators of sustainable tourism applied in mountain tourist destinations in Serbia, whereby they selected five groups of variables: economic, tourist

satisfaction, cultural, social, and environmental. Pivčević, Petrić and Mandić (2020) analyzed the inter-regional differences among selected Mediterranean regions with regard to sustainable tourism development. As indicators for pressures, they singled out: arrivals in hotels and similar establishments, non-residents, arrivals in hotels and similar establishments, residents, arrivals in other establishments, residents, airport rank, arrivals of tourists/km<sup>2</sup>, nights spent/km<sup>2</sup>, arrivals of tourists/1000 people, nights spent/1000 people, and number of congresses held in the region.

Curić, Glamuzina and Opačić (2012) measured the level of tourism development of cities/towns and municipalities in Croatia using GIS analysis of seven tourism indicators: number of beds, number of arrivals, number of international arrivals, overnight stays, international overnight stays, number of arrivals per surface area of local self-government units, and number of arrivals per capita. Glamuzina, Madžar and Putica (2017) applied a nearly identical set of indicators in their research of regional aspects of tourism development of Bosnia and Herzegovina. Similar indicators were also used by Šulc and Opačić (2015) to create a typology of tourist resorts in Dubrovnik-Neretva County according to the level of tourism development.

In the research of the influence of tourism on the physiognomic characteristics of the landscape of the interior of Istria, Vojnović (2013) used the tourism functionality coefficient (CTF) for measuring spatial load of tourism, i.e. the number of beds in commercial and non-commercial lodgings per 100 residents. Vojnović (2018) also dealt with the classification of cities/towns and municipalities according to the intensity of tourist activities using multiple indicators: total number of beds; total number of arrivals; total overnight stays; estimate number of town/municipal residents; and town/municipal area.

Aubert, Jónás-Berki and Marton (2013), when constructing the tourism index as an indicator of tourism intensity on the example of Hungary, identified the parameters from both the demand and the supply side.

Table 1: Frequently used indicators of tourism development level.

Group of indicators	Indicators
Indicators of tourism flow	<ul style="list-style-type: none"> <li>• number of tourist arrivals</li> <li>• number of foreign tourist arrivals</li> <li>• number of tourist arrivals per capita</li> <li>• number of tourist arrivals per 100 residents (intensity of tourism flow)</li> <li>• number of tourist arrivals per km<sup>2</sup></li> <li>• number of day trippers</li> <li>• number of overnight stays</li> <li>• number of foreign overnight stays</li> <li>• number of overnight stays per capita (coefficient of intensity of tourism flow)</li> <li>• number of overnight stays per day per 100 residents (tourism penetration rate)</li> <li>• number of overnight stays per km<sup>2</sup></li> <li>• number of tourist arrivals or overnight stays per day in a given area (km<sup>2</sup>) (tourism density rate)</li> <li>• number of overnight stays according to types of accommodation</li> <li>• level of accommodation vacancy</li> <li>• average tourist stay (in days)</li> <li>• seasonality of tourist arrivals shown in the share of the number of tourist arrivals in and out of season</li> </ul>
Indicators of tourism supply	<ul style="list-style-type: none"> <li>• number of beds</li> <li>• number of beds per 100 residents (coefficient of tourism functionality)</li> <li>• number of beds per km<sup>2</sup></li> <li>• number of beds in hotels and similar establishments in the total number of beds</li> <li>• number of seats in hospitality/gastronomic objects per 100 residents (apart from lodgings)</li> </ul>
Indicators of tourism in the local economy	<ul style="list-style-type: none"> <li>• share of those employed in hospitality and tourism in total employment</li> <li>• share of GDP generated by hospitality and tourism in total GDP of a destination</li> <li>• tourist expenditure per capita in a destination</li> <li>• daily tourist expenditure</li> <li>• value of hospitality traffic (specific tourism traffic coefficient)</li> <li>• share of businesses in the tourism sector in the total number of businesses</li> <li>• share of food, drink, and other goods and services in the tourism supply of the destination</li> <li>• share of seasonal jobs in tourism available in the destination</li> </ul>

The number of guest nights spent at commercial and private accommodations is recognised as the main indicator from demand side.

Finally, the former Croatian Regulation on the criteria for categorising settlements into tourism classes (2009) was based primarily on the number of registered overnight stays, although it also listed other quantitative and qualitative criteria by which Croatia's 556 cities/towns and municipalities were classified into classes: 17 into class A, 8 into class B, 15 into class C, 364 into class D, while 152 touristically underdeveloped municipalities were not mentioned. The Regulation was abandoned partly due to numerous illogicalities (the class of a given city/town or municipality could significantly change based on the registration of a single lodging facility), and partly due to issues with collecting data.

Based on an overview of the presented literature, we can conclude that the list of commonly used indicators is very extensive and impossible to measure annually in different countries (Table 1).

Previous models for calculating tourism development revealed a lack of ability to change class boundaries every year or every few years without compromising the basic concept of the calculation. Therefore, the ability for simple collection of data on an annual basis and minimisation of the influence of special circumstances (e.g. the COVID-19 pandemic) on the determination of classes were the important goals in the creation of a new model for calculating the composite tourism development index on the local level.

The goal of this research was to create a model for calculating the Tourism Development Index (TDI) on the local level. Based on identified disadvantages of previous studies, we wanted to develop a new model that would ensure: a) dynamic approach towards measuring tourism development with annually available statistical data; b) composite index that has a proper balance between sensitivity and robustness; c) internationally applicable model for local self-government units that can be useful for evidence-based tourism policy.

## 2 Methods

For the purposes of this research, the ten basic indicators of tourism development level are selected. There are five indicators based on absolute values and five corresponding indicators based on relative values (per capita or similar). All the indicators simultaneously indicate all key aspects of tourism, and are exact and available annually. The indicators are:

- Total number of beds and Total number of beds per 100 residents represent the potential for tourism development in a given area.
- Number of beds in hotels and similar establishments and Number of beds in hotels and similar establishments per 100 residents highlight areas that have a well-developed overall tourism supply, which generates higher revenues from tourism compared to areas where there are relatively few such facilities.
- Number of tourist arrivals and Number of tourist arrivals per capita indicate how attractive an area as a whole is, and thus greatly compensates for the difficulty in collecting comprehensive data on the number of visits to attractions in a given area, i.e. when entry is not charged. This indicator additionally emphasises the tourism potential of local self-government units that are oriented toward year-round tourism, and areas where tourists have relatively short stays.
- Number of overnight stays and Number of overnight stays per capita are the indicators of the total effect of tourism in a given area that is used the most, despite not offering a sufficient picture of tourism potential and attractiveness, and highlights areas with large shares of complementary capacity and relatively low tourism expenditure.
- Number of employed in tourism and hospitality and Share of employed in tourism and hospitality in total employment are significant as the indicators of the importance of tourism in creating jobs. Therefore, these indicators show the importance of tourism as a development engine for the continental Croatia. Also, both indicators implicitly consider same-day visitors because same-day visitors increase tourism demand in the area, and more employees are needed to satisfy their requirements.

Indicators based on absolute values are important for showing the total significance of tourism in a given area. Large absolute values of all five indicators are generally shown only in larger cities, while (apart from rare exceptions) all municipalities with relatively few residents also showed lower absolute values for the majority of indicators. Indicators based on relative values are important for showing the significance of tourism for locals, i.e. how dependent a given area is on tourism. In contrast to absolute indicators, extremely high



values of all five relative indicators were generally only found in smaller towns and municipalities on the Croatian coast and islands, where tourism was the dominant economic activity.

Data from 2019, the last year before the COVID-19 pandemic, were used in the research: tourism statistics from e-Visitor (<https://www.evisitor.hr>), official population estimates provided by the Croatian Bureau of Statistics (Towns in statistics, Population – Estimate and natural change), as well as data regarding the number of persons employed in hospitality and gastronomy (Employment – Review by counties).

The Tourism Development Index (TDI), as a composite index, was obtained from the values of ten indicators of tourism development on the level of cities/towns and municipalities. Because the indicator values differed according to both range of value and measuring unit, a combination of linear and logarithmic transformation was applied to get normalised values of indicators (Booyesen 2002; OECD 2008; Chakrabartty 2017). For any indicator  $x_i$ , referential value of the indicator  $R_i$  was chosen as the arbitrary value close to the highest value of indicator across all cities/towns and municipalities. The normalised value  $z_i$  for the given value of indicator  $x_i$  was obtained by

$$z_i = \log_{10} \left( 1 + \frac{10.000}{R_i} \cdot x_i \right),$$

where  $\log_{10}$  is the logarithmic function to the base of 10. Due to the choice of  $R_i$ , the highest normalised values are around 4. Referential values for all indicators are presented in Table 2.

Table 2: Referential values of indicators.

Number	Indicator	Referential value
1.	Total number of beds	25,000
2.	Number of beds in hotels and similar establishments	10,000
3.	Number of tourist arrivals	1,000,000
4.	Number of overnight stays	2,000,000
5.	Number of employed in tourism and hospitality	5,000
6.	Total number of beds per 100 residents	1,000
7.	Number of beds in hotels and similar establishments per 100 residents	100
8.	Number of tourist arrivals per capita	100
9.	Number of overnight stays per capita	1,000
10.	Share of employed in tourism and hospitality in total employment	100%

TDI was calculated as the sum of the normalised values of all ten indicators. The obtained values were used to classify cities/towns and municipalities into five classes. The ranges of values for each class are presented in Table 3.

Table 3. Values of TDI by class.

Class	Value of TDI
I	$\geq 30$
II	20.00-29.99
III	10.00-19.99
IV	0.01-9.99
0	0

It is noteworthy that the scaled values of Baretje-Defert's index of tourism development, Charvat's index of tourism intensity, and Schneider's index of tourism intensity (Parzych 2020) are among the indicators used in TDI calculation. The correlation between TDI and previously mentioned indices exists, but it is not particularly strong (Table 4).

Table 4: The Pearson correlation coefficient between the Tourism Development Index (TDI), Baretje-Defert's index of tourism development ( $I_{BD}$ ), Charvat's index of tourism intensity ( $I_C$ ), and Schneider's index of tourism intensity ( $I_S$ ) for all the self-government units in Croatia.

	TDI	$I_{BD}$	$I_C$	$I_S$
TDI	/	0.61	0.62	0.56
$I_{BD}$			0.94	0.98
$I_C$				0.96
$I_S$				/

### 3 Results

All 556 cities/towns and municipalities in Croatia were classified according to the Tourism Development Index (TDI) (Figure 1).

In class I, we find all of the most significant Croatian tourist destinations with high values of absolute indicators, we also find large cities in which tourism is not the dominant economic activity such as Zagreb, Split, Zadar, Šibenik, and Pula. We also find smaller municipalities and cities/towns with high values of relative indicators in this class, in so far as they possess a tourism supply capable of attracting a large number of tourists. The highest values of TDI were found in the three most important Croatian tourist destinations: Rovinj, Poreč, and Dubrovnik, followed by cities/towns and municipalities with moderately high accommodation capacity in relation to their size: Medulin, Umag, Tar-Vabriga, and Mali Lošinj (Table 5). Apart from Zagreb, in the continental part of Croatia, we only have the municipalities of Rakovica and Plitvička Jezera in class I. There were 56 cities/towns and municipalities in Croatia in 2019 classified as class I.

Cities/towns and municipalities in class II are also developed tourist destinations, but some of them are ranked lower due to the total number of tourists and overnight stays (relative to their size) or, in the case of larger cities, due to the weaker influence of tourism on the local economy. Belonging to class II, however, can be seen as an advantage, because it indicates lower dependence on tourism. Therefore, class II includes the majority of the remaining cities along the Croatian coast (e.g. Trogir, Senj, Rijeka) and all larger cities and municipalities in continental Croatia that are established tourist destinations. Thus, in class II we have important urban continental destinations like Osijek, Varaždin, Karlovac, and Vukovar, and tourist towns such as Slunj, Otočac, Gospić, and Ogulin, as well as towns and municipalities where the most popular Croatian hot springs are located (Tuhelj, Sveti Martin na Muri, Stubičke Toplice, Krapinske Toplice). In 2019, 96 towns and municipalities in Croatia belonged to class II.

In class III there were 154 self-government units in 2019. In this class, we have the majority of the remaining continental cities/towns in Croatia, and small tourist destinations (that have potential) like Kneževi Vinogradi in Baranja or Bednja with Trakošćan Castle in Hrvatsko Zagorje. In class III, we also find a moderate number of municipalities with poor tourism valorisation on the Croatian coast such as Novigrad (near Zadar), Nerežišće on the island of Brač, and Janjina on Pelješac Peninsula.

There are no cities/towns or municipalities from the Croatian littoral in class IV. This class mostly consists of cities/towns located in continental Croatia, e.g. Zlatar, Čazma, Lipik, or Pleternica, indicating the need for stronger tourism valorisation. In 2019, there were 195 towns or municipalities in class IV.

Class 0 (the lowest level) is made up of municipalities that show values of 0 according to all indicators. There were 55 such municipalities in 2019 and all were found in the continental Croatia, apart from Pojezerje in Dubrovnik-Neretva County. No Croatian cities/towns showed 0 for all indicator values.

### 4 Discussion

In this research we have developed a new model for calculating the Tourism Development Index (TDI), as the composite index of tourism development, that fulfils three objectives. Firstly, the index is based on annually available statistical data that ensure dynamic approach towards measuring tourism development. If the index should track changes in tourism development annually, it is important to have easily accessible and reliable statistical data, which, according to Aubert et al. (2013), is a frequent obstacle in calculating similar indices.

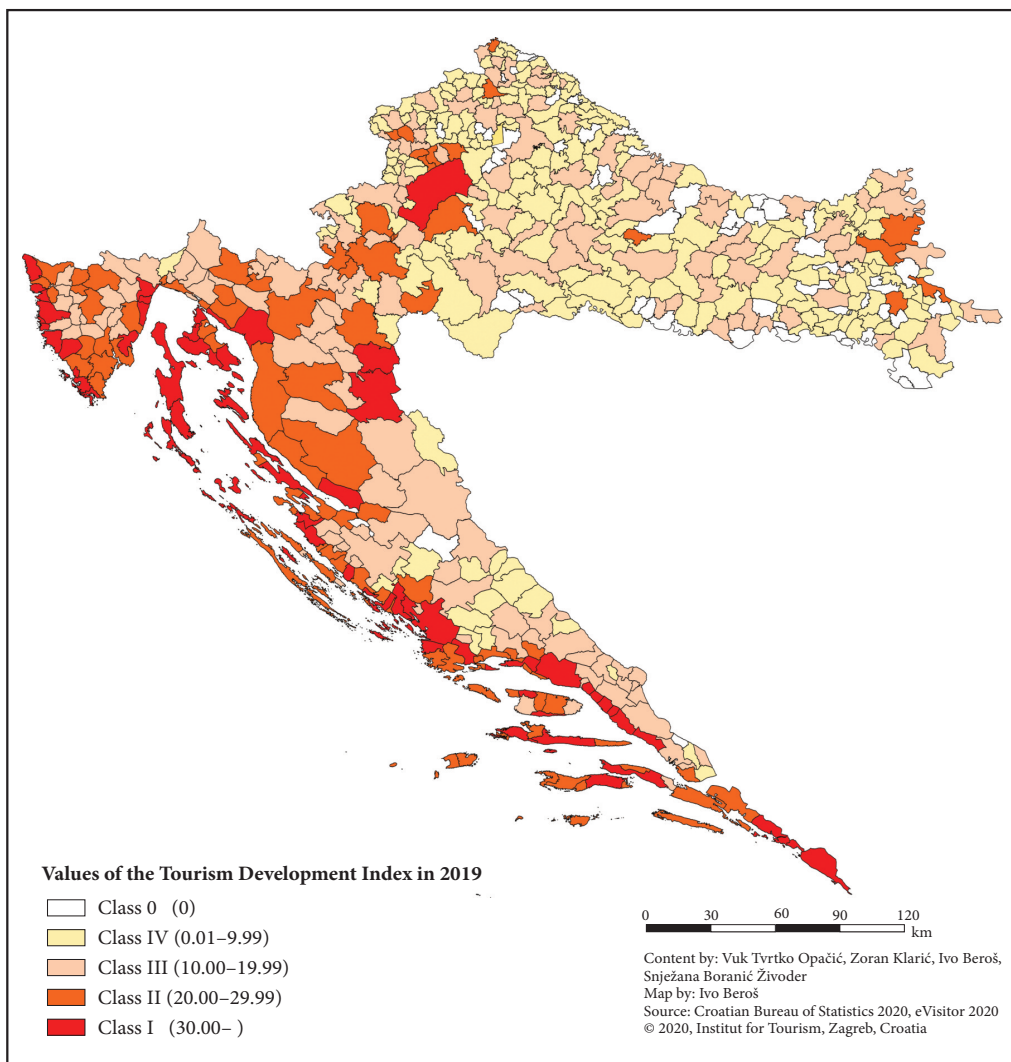


Figure 1: Cities/towns and municipalities in Croatia according to values of TDI in 2019.

Table 5: Top ten cities/towns and municipalities in Croatia according to TDI 2019 (Croatian Bureau of Statistics; e-Visitor).

Rank	City/Town; Municipality	County	TDI
1.	Rovinj	Istria	37.57
2.	Poreč	Istria	37.16
3.	Dubrovnik	Dubrovnik-Neretva	36.81
4.	Medulin	Istria	36.14
5.	Umag	Istria	36.05
6.	Tar-Vabriga	Istria	35.89
7.	Mali Lošinj	Primorje-Gorski Kotar	35.81
8.	Podgora	Split-Dalmatia	35.70
9.	Baška	Primorje-Gorski Kotar	35.43
10.	Tučepi	Split-Dalmatia	35.39

Secondly, this index has a proper balance between sensitivity and robustness, since it is constructed from important data which reflect significant changes in tourism development at the local level. One of the most commonly used tourism index is Defert tourist function index (DTFI). However, basing the analysis on only one indicator can lead to incomplete conclusions, as Borzyszkowski, Marczak and Zarębski (2016) pointed out, citing the example of unregistered accommodation capacities. TDI therefore balances both supply and demand side indicators to minimize the lack of reliable data on both sides. The importance of using indicators on both demand and supply side has been highlighted by Aubert et al. (2013).

Thirdly, the proposed model covers the entire territory of Croatia. It can easily be applied in other countries by setting the referential values (Table 2) close to the highest values of the indicators for a particular country or area. With regard to Parzych (2020), who pointed out the problems of comparing the results of tourism indices in areas of different size, TDI can be applied not only locally, but also regionally and nationally because all indicators used for its construction are available and comparable at all statistical levels.

Finally, TDI places greater significance on the self-government units with large population. For example, Dubrovnik, Split, Zagreb, Pula and Zadar are among the top ten self-government units in Croatia according to the number of overnight stays and the population of those cities is larger than 40,000. According to the TDI, they are ranked 3, 46, 57, 37 and 43, respectively, but, according to e.g., Charvat's index of tourism intensity, they are ranked 72, 142, 202, 122 and 128. The use of Schneider's index of tourism intensity or Baretje-Defert's index of tourism development produces similar results.

Table 6: Cities/towns and municipalities in classes by values of TDI in Croatia and recommendations for the efficient spatial organisation of tourism boards.

Class	Basic features	Challenges for further tourism development
I	Includes the most important tourist destinations in Croatia upon which Croatian tourism is based, i.e. cities/towns and municipalities in which tourism has a key role in the local economy.	Due to the high level of tourism development, these destinations are largely faced with problems of acceptable accommodation and monoculture tourism. For further development, incentives are needed for achieving sustainability and balance in development and improving the level of competitiveness on the international tourism market. These destinations should have independent local tourism boards or be the seat of the tourism board for the wider area.
II	Includes the remaining important tourist destinations in Croatia, i.e. cities/towns and municipalities in which tourism has an important role in the local economy, but other activities are of greater importance (than in class I).	Due to the significant level of tourism development, these destinations are often faced with problems of acceptable accommodation and monoculture tourism. For further development, incentive is needed for improving the level of competitiveness on the domestic and international tourism markets. These destinations should have independent local tourism boards or be the seat of the tourism board for the wider area.
III	Includes tourist destinations that are partially developed and therefore need further development incentives; this class also includes cities/towns that have a somewhat developed tourism supply that provides basic accommodation facilities, but the role of tourism in total economic activity is relatively small, due to this, such locations do not function sufficiently as full tourist destinations.	Due to weaker tourism development level, these destinations need, to varying extents, incentives to improve their tourism supply and move to higher classes, especially if they possess valuable tourist attractions that have not yet been valorised. These destinations should be incentivised to join the tourism boards of their greater area, with surrounding cities/towns and municipalities with which they make a logical spatial whole.
IV	Includes cities/towns and municipalities that are just starting to develop touristically and are therefore, not yet tourist destinations.	Due to insignificant tourism development level, these cities/towns and municipalities need various incentive measures to improve their tourism supply and move to higher classes, especially if they have valuable tourist attractions that have not yet been valorised. These cities/towns and municipalities should integrate with tourism boards of cities/towns and municipalities in classes I, II, and III with which they make a logical spatial whole.
0	Includes municipalities in which there is no tourism activity, or where tourism activity is so low that it is not possible to accommodate tourists or properly put local tourist attractions to use.	Due to lack of tourism activity, and with the goal of activating potential tourist attractions, these cities/towns and municipalities should integrate with tourism boards of cities/towns and municipalities in classes I, II, and III with which they make a logical spatial whole.

TDI is an important tool not only in tourism development planning, but also in the overall regional planning. As an example of utilising TDI in Croatia, we can suggest better organisational structure of tourist boards as a part of evidence based tourism policy. Some suggestions for the Croatian case are given below (Table 6).

Given the transparency, relevance, and ease of annual monitoring of such an index of tourism development level, the possibilities for its application are extensive. The two most important applications of this model for calculating the index of tourism development level are: a) its use as a condition for obtaining support for tourism development at the state level, and b) as a criterion for determining the position of a city/town or municipality in the system of tourist boards.

## 5 Conclusion

Despite the strong development of Croatian tourism from the early 2000s to 2019, in which there were 19.6 million tourist arrivals and 91.2 million overnight stays, the difference between the seven coastal counties (in which 94.6% of all overnight stays were recorded) and the 14 continental counties (with 5.4% of overnight stays) is stark (Croatian Bureau of Statistics 2020). In order to objectively confirm and document the great differences in local tourism development level, we constructed a precise model for calculating the Tourism Development Index (TDI), as a composite index on the ten indicators (total number of beds, number of beds in hotels and similar establishments, number of tourist arrivals, number of overnight stays, and number of employed in tourism and hospitality, total number of beds per 100 residents, number of beds in hotels and similar establishments per 100 residents, number of tourist arrivals per capita, number of overnight stays per capita and share of employed in tourism and hospitality in total employment).

The comparative advantage of TDI is that it allows dynamic approach to measuring tourism development annually and can reflect significant changes in tourism development at the local level. The recommended model has been tested on cities/towns and municipalities in Croatia and is applicable in other countries, which is reflected in the main applicable value of the research. Its implementation could contribute to developing successful tourism policy and more efficient systems of tourism administration in a given area, which would mitigate imbalances in tourism development and better valorise tourist attractions.

## 6 References

- Aubert, A., Jónás-Berki, M., Marton, G. 2013: Tourism index as an indicator of the intensity of tourism. *Acta geographica Slovenica* 53-2. DOI: <https://doi.org/10.3986/AGS53205>
- Baggio, R. 2018: Measuring tourism: Methods, indicators, and needs. *The Future of Tourism: Innovation and Sustainability*. Cham. DOI: [https://doi.org/10.1007/978-3-319-89941-1\\_13](https://doi.org/10.1007/978-3-319-89941-1_13)
- Booyens, F. 2002: An overview and evaluation of composite indices of development. *Social Indicators Research* 59-2. DOI: <https://doi.org/10.1023/A:1016275505152>
- Borzyszkowski, J., Marczak, M., Zarębski, P. 2016: Spatial diversity of tourist function development: The municipalities of Poland's West Pomerania province. *Acta geographica Slovenica* 56-2. DOI: <https://doi.org/10.3986/AGS.769>
- Bošković, N., Vujičić, M., Ristić, L. 2019: Sustainable tourism development indicators for mountain destinations in the Republic of Serbia. *Current Issues in Tourism* 23-22. DOI: <https://doi.org/10.1080/13683500.2019.1666807>
- Chakrabarty, S. N. 2017: Composite index: Methods and properties. *Journal of Applied Quantitative Methods* 12-2.
- Croatian Bureau of Statistics 2020: Tourism, 2019. Statistical Reports 1661. Zagreb.
- Curić, Z., Glamuzina, N., Opačić, V. T. 2012: Contemporary issues in the regional development of tourism in Croatia. *Hrvatski geografski glasnik* 74-1. DOI: <https://doi.org/10.21861/HGG.2012.74.01.02>
- Derek, M. 2008: Funkcja turystyczna jako czynnik rozwoju lokalnego w Polsce, Ph.D. thesis, University of Warsaw. Warsaw.
- Durydiwka, M. 2013: Tourist function in rural areas of Poland. Spacial diversity and changing trends. *Miscellanea Geographica – Regional Studies on Development* 17-3. DOI: <https://doi.org/10.2478/v10288-012-0041-2>

- European Commission 2016: The European tourism indicator system: Toolkit for sustainable destination management. Luxembourg. DOI: doi:10.2873/983087
- Glamuzina, N., Madžar, I., Putica, J. 2017: Regional aspects of modern tourism development of Bosnia and Herzegovina. *Hrvatski geografski glasnik* 79-1. DOI: <https://doi.org/10.21861/HGG.2017.79.01.03>
- Klarić, Z. 1990: Kriteriji za određivanje turističko-geografskih regija (primjer Hrvatske), Ph.D. thesis, University of Zagreb. Zagreb.
- Kožić, I., Mikulić, J. 2011: Mogućnosti uspostave sustava pokazatelja za ocjenu i praćenje održivosti turizma u Hrvatskoj. *Privredna kretanja i ekonomska politika* 21.
- Marković, S., Perić, M., Mijatov, M., Doljak, D., Žolna, M. 2017: Application of tourist function indicators in tourism development. *Journal of the Geographical Institute Jovan Cvijic* 67-2. DOI: <https://doi.org/10.2298/IJGI1702163M>
- OECD 2008: Handbook on constructing composite indicators: Methodology and user guide. Internet: <https://www.oecd.org/sdd/42495745.pdf> (23. 2. 2022).
- Parzych, K. J. 2020: The Polish Baltic coast as a tourist area in the light of tourism indicators. *Studia Periegetica* 32-4. DOI: <https://doi.org/10.5604/01.3001.0014.6595>
- Pivčević, S., Petrić, L., Mandić, A. 2020: Sustainability of tourism development in the Mediterranean – Interregional similarities and differences. *Sustainability* 12-18. DOI: <https://doi.org/10.3390/su12187641>
- Roman, Mi., Roman, Mo., Niedziółka, A. 2020: Spatial diversity of tourism in the countries of the European Union. *Sustainability* 12-7. DOI: <https://doi.org/10.3390/su12072713>
- Šulc, I., Opačić, V. T. 2015: Typology of tourist resorts in Croatia: The case of South Dalmatia. *Mitteilungen der Österreichischen Geographischen Gesellschaft* 157. DOI: <https://doi.org/10.1553/moegg157s229>
- Vojnović, N. 2013: Application of selected abiotic and ecological indicators of ecologically sustainable tourism on the example of Inner Istria. *Geoadria* 18-1. DOI: <https://doi.org/10.15291/geoadria.148>
- Vojnović, N. 2018: Tourist intensity in Croatia's leading tourist towns and municipalities. *Geoadria* 23-1. DOI: <https://doi.org/10.15291/geoadria.1453>