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A New Methodological Approach to Assessing the Potential of Spa Tourism

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Abstract
Spa tourism has significantly contributed to the economic, socio-cultural, and all-around development of regions. There is no holistic, applicable concept for assessing the sector's potential, posing a significant methodological problem for science and research. The methodology of the study is based on the systematization of existing procedures and indicators for measuring the sector's potential, which identified 80 relevant indicators. In the specific environment of the spa tourism sector, the situation is complex, and the authors focus only on partial components of the potential or its assessment, which does not provide an objective view of this sector. The main objective of the study is to present an original methodological approach for assessing the potential of spa tourism. Several methods were used in the study: the four-phase Delphi method, the Analytic Hierarchy Process (AHP), the Spa Tourism Development Index (TDI), and the Spa Tourism Development Potential Index (TDP). The originality of the study lies in the new methodological approach based on a set of indicators that enable the assessment of the development potential of spa tourism in a destination, and in the subsequent implementation to derive index values. The author's team intends to fill the methodological gap. The average TDP value of 0.3189 over the six-year period indicates a moderate but positive growth potential. The results indicate the need for state and regional interventions in an interdisciplinary context to ensure the sustainable growth of this key form of tourism. The findings can be used in the preparation of spa tourism strategies as an argumentative basis for proposed policies and instruments.

Key Words: SPA, tourism, potential, new methodological approach.

JEL Classification: L83, Z32, C43

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1. Introduction

The consumption of tourism services is conditioned by location. This means that primary supply, complemented by a quality tourism superstructure and infrastructure, is a prerequisite for the realization of production that is accepted by consumption. It is therefore justified to address the availability and quality of resources for high-quality, sustainable tourism production. In the context of primary and secondary supply resources, spa tourism in some countries (for example, Slovakia, Hungary, Iceland, Italy, Austria, Germany, Greece) plays a significant role. We consider it important to assess the potential

of this tourism sub-sector due to its social value. (Krstić et al., 2026). This is reflected not only in the economic area but also in the socio-cultural and environmental spheres. Specifically, spa tourism in the Slovak Republic has development potential based on quality natural resources, tradition, material-technical base, and proven know-how. Assessing the potential for its sustainable development is the ambition of this study. Currently, spa tourism in Slovakia is experiencing a revival following the pandemic. In 2023 and 2024, growth has been recorded across all monitored performance indicators (revenues of spa enterprises, number of visitors, number of overnight stays, and GNP of the "Spas and Therapeutic Care" sector), except for the average length of stay (Štatistický úrad Slovenskej republiky, 2025; Slovakia Travel, 2025). The value chain of spa tourism is a system that, compared to other forms of tourism, includes specific inputs from medical services, thereby strengthening the multiplier effect of spa tourism production relative to other types (Khiewpan et al., 2024). Moreover, spa tourism brings both economic and social benefits to society, linked to the positive effects of treatment on patients and spa guests. The societal importance of spa tourism services, their strong tradition, and unique know-how justify examining the potential of this sector, which is defined as one of the key forms of tourism in Slovakia.

Several authors have examined the potential of economic activities through various theoretical frameworks. There is no holistic and generally applicable approach available. This is logical given the heterogeneity of economic activities, in which production resources and their importance differ. Various partial perspectives on the assessment of sector potential are available, focusing on competitive potential (Madiyarova, Luniewski, Ibraeva, 2019; Purwono et al., 2024; Uctu & Al-Silefanee, 2024; Dilanchiev et al., 2024; Iddouch & Jaoual, 2025; Tovmasyan, 2021), innovation potential (Berkeley, Wood, Glisovic, 2016; Blichfeldt, Faullant, 2021; Cetin, & Erkisi, 2023), competitive advantage potential (Porter, 1980; Safari, Saleh, 2020; Bathaei et al. 2025), management potential (Drucker, 2011; Sari et al., 2025), innovation systems potential (Taraniuk, 2022; Prokop et al., 2024), enterprises growth potential (Ahmad, 2024; Keller et al., 2023), human capital potential (Bowes et al., 2024; Grugulis, 2024; Androniceanu, 2025a), strategies to attract tourists (Saura et al., 2023; Papcunová et al., 2024), the impact of digital technologies (Alnasser, , Alkhozaim, S., 2024; Bilan et al., 2024; Androniceanu 2025c; Androniceanu & Streimikiene, 2025; Wang et al., 2025a,b); , or mobile augmented reality adoption (Song et al., 2024), among others.

The situation regarding a comprehensive approach to assessing tourism potential is also very limited, focusing on the valorization of natural resources, the assessment of locational and selective prerequisites (Gúčik, 2006; Gregorová & Korec, 2017; Xu & Chen, 2025), and the realization of prerequisites (Korec, 2012). Authors Mota, Nossa, and Oliveira Moreira (2023) assessed tourism potential using socio-economic indicators, considering the destination's attractiveness to tourists as the main potential. It is important to recognize the great significance of examining tourism potential also in the context of the sustainability of these business activities. Therefore, sustainable spa tourism is a challenge not only for the present but also for future generations, as efforts to develop this potential must maintain the three-pillar balance (economic, social, environmental) in tourism (Šenková et al., 2023; Tometzová et al., 2024; Bilan et al., 2025).

The diversity of approaches to assessing spa tourism potential is also evident. According to Pessot et al. (2021), potential primarily includes natural and cultural resources. Simchenko and Yanovskaya (2020) expand the understanding of potential to include intangible assets, such as professional knowledge and staff qualifications, the historical and cultural values of spas, the brand, and the destination's image (Zhang, 2025). From a quantitative perspective, the potential of spa tourism is conceptualized by Štefko et al. (2020), Jenčová et al. (2019), and Da Costa Guerra et al. (2022) in terms of performance and capacity indicators.

It is thus clear that assessing the potential of spa tourism poses a challenge for methodology and its application. It represents an uncovered area in theory and practice, particularly with an emphasis on quantifying potential and reflecting the approach of sustainable growth (Nastase et al, 2025). The authors,

reflecting on this gap, present a proposal for their methodological approach, which they verify using the example of assessing the potential of spa tourism in the Slovak Republic. The development of a novel methodological approach constitutes the added value of this scientific article.

The main objective of the study is to present an original methodological approach for assessing tourism potential. A partial objective is to apply the new methodological approach, using spa tourism in Slovakia as an example.

2. Literature review

The potential of a sector is primarily determined by its ability to create value through the effective use of available resources, technological innovations, and adaptability to market conditions (Arsyad, Violin, 2021; Khalid, 2024). The selection of appropriate theoretical approaches to examining the potential of economic sectors provides a robust framework for identifying and analyzing the factors that influence their development and competitiveness. In the effort to acknowledge these factors and demonstrate their effectiveness, there is diversity in how the indicators of sectoral potential are identified.

The study of tourism potential assessment can draw on various theories that focus on the sources of growth of tourism entities. The authors Dwyer, Kim (2003) use the theory of competitive advantage of enterprises, while Li, Zhang (2020) apply the theory of creative destruction. Attention in this context is given to the resource-based theory (Claver-Cortés et al., 2007; Blay et al., 2024), the theory of management and efficiency (Fragoulakis & Stavrinoudis, 2010), the theory of innovation systems (Mei et al., 2012; Hjalager, 2008; Vrtana et al., 2025), the theory of business growth (Peters & Pikkemaat, 2006), as well as the theory of human capital (Progoulaki & Theotokas, 2010).

In the literature, we find the acceptance of various dimensions of spa tourism potential. Smith and Puczkó (2009) identified the market potential of spa tourism through demand analysis, pointing to the growing interest, particularly in wellness and health services. Phuthong et al. (2023) applied a PESTLE analysis to assess the competitiveness of destinations and concluded that the quality of infrastructure and provided services is a decisive factor in competition. Spacilova (2014) focused on seasonal potential, and the analysis showed that seasonality significantly affects spa facility visitation and economic stability. Environmental potential was the subject of research by Atalaya et al. (2024), who confirmed through sustainability analysis that ecological and sustainable practices significantly contribute to the long-term attractiveness of spas. Szymańska and Wiśniewska (2022) dedicated two studies to the marketing and socio-economic potential. They found that targeted marketing, especially through digital tools, plays an important role in acquiring new clients, while the economic and social development of spa municipalities (Krajčo & Hoke, 2025) is closely tied to spa and health care activities. Demographic potential was analyzed by Anaya-Aguilar et al. (2021) and Könnyid et al. (2022), with customer profiling showing that the main clientele of spas is primarily the older generation. Chrobak et al. (2020) and Urošević (2020), using SWOT analysis, demonstrated that cultural-historical potential significantly increases the attractiveness of destinations with rich heritage. Favargiotti et al. (2022), using the Delphi method, identified the innovation potential of spa tourism and proposed a new strategy for the effective use of natural capital. Finally, Metodijeski et al. (2023) analyzed natural potential and noted that the effective use of mineral waters enhances the competitiveness of spa destinations at the national level.

The differing understandings of spa tourism potential in the studies mentioned confirm that it is a multidimensional issue, encompassing not only natural and demographic aspects but also marketing, environmental, and cultural factors, which mutually influence and condition its sustainable development. At the same time, the diversity of research methods and approaches used to assess the potential of this tourism sub-sector is evident.

2.1 Methods of assessing the potential of spa tourism

Assessing the potential of spa tourism represents a fundamental tool for strategic planning and the development of destinations striving to enhance their competitiveness and attractiveness. The basis of this process is the identification and analysis of various factors, including the quality of infrastructure, services, environmental conditions, and marketing activities.

Within methodological approaches, various analytical and decision-making techniques are applied. Rosič and Klamár (2009) offer a classification approach based on a point evaluation of the area in terms of locational, cultural, and social aspects, thereby defining four levels of potential. Similarly, Gregorová and Korec (2017) applied a point system to areas in eastern Slovakia, evaluating natural, anthropogenic, and service potential, thus contributing to regional typology.

Quantitative approaches are exemplified by the research of Ianeva & Basmadzhieva (2022), who, through data collection and subsequent factor analysis, identified key economic, environmental, and political factors. The DEA model applied by Čabinová et al. (2020) enabled effective evaluation of input-output relations of spa enterprises, with the average efficiency score indicating a significant level of reserves in the current use of inputs.

A more complex approach is presented by Pan et al. (2019), who used a combination of AHP (Analytical Hierarchy Process) and the Delphi methods. These tools take into account the complexity of decision-making processes, including natural, climatic, cultural, and economic factors, thereby contributing to more precise modelling of potential. Lopes and Rodríguez-López (2022) applied the PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations) and GAIA (Geometrical Analysis for Interactive Decision Aid) methods, which allow multicriteria evaluation and classification of spa facilities, thus achieving high reliability of results for various stakeholders.

Qualitative analysis methods were applied in the study conducted by Ünal et al. (2022), who used SWOT analysis to identify strengths and weaknesses, opportunities, and threats for the development of spa tourism. Its extension is the TOWS matrix technique (Threats, Opportunities, Weaknesses, Strengths) (Pirnar & Kurtural & Eris, 2019), which serves to formulate strategic recommendations considering internal and external factors.

Traditional approaches to categorizing potential, such as the square method (Vepřek, 2002) or the point method (Ruda, 2008), do provide basic frameworks for assessment, but are increasingly complemented by innovative approaches, including GIS (Geographic Information System) technologies, which allow a higher degree of accuracy and efficiency in processing input data.

2.2 Selection of criteria and indicators for assessing the potential of spa tourism

The selection of appropriate criteria and the determination of indicators are key steps in any assessment process, especially in studies that require both quantitative and qualitative approaches. A clearly defined framework for selecting criteria and setting indicators is essential to ensure a comprehensive and methodologically sound evaluation of spa tourism potential.

According to MacKay (2015), the choice of criteria must be carefully made to maintain the validity and reliability of the results. The process of selecting criteria has been extensively studied across various disciplines – from engineering to the social sciences. Saaty (2008) recommends using AHP, which allows prioritizing criteria based on their relative importance. In the field of environmental studies, de Castro-Pardo et al. (2019) emphasize the importance of multicriteria decision analysis (MCDA), which allows for balancing economic, social, and environmental factors. In the social sciences, methods such as the Delphi method and the Nominal Group Technique (NGT) are often used to enable consensus among experts and stakeholders (Mills & Gay, 2016).

Criteria can be divided into categories that reflect the degree of objectivity and context-specific criteria (Luque & Hegedus, 2011; Wu et al., 202; Dzurov Vargová et al., 2024).

Once the criteria are selected, the next step is to determine the indicators, which form the quantitative basis of the assessment. Indicators must be defined in a way that allows precise measurement

– e.g., through threshold values, ranges, or data points. Montibeller & Franco (2010) emphasize the need for a balance between accuracy and feasibility, taking into account data availability and system complexity. According to Zhang et al. (2024), key performance indicators (KPI) are crucial for quantifying potential outcomes.

Sensitivity analysis (Saltelli et al., 2008) helps to identify indicators with the greatest impact on results (Santos et al., 2023). O'Hagan (2010) warns against excessive parameterization, which can complicate data collection and interpretation, while under-parameterization can lead to the loss of important information. Techniques such as principal component analysis (PCA) or regression analysis are also suitable.

In spa tourism research, commonly used indicators include the number of visitors, the number of overnight stays, the profitability of spa enterprises, and competitiveness (Gúčik et al., 2016; Šenková et al., 2021; Anaya-Aguilar et al., 2021; Štefko et al., 2020; Pirnar et al., 2019).

Some authors (Kakogiannis, 2024), however, point out that these performance and capacity indicators may not be suitable from a sustainability perspective. In the field of sustainable development, Ilić et al. (2012) recommend using indicators that reflect destination attractiveness, integration with complementary activities, investment in innovation, and effective marketing strategies.

The literature analysis shows that there is no unified methodology for assessing the potential of spa tourism. Nevertheless, indicators such as the number of visitors, overnight stays, and economic performance appear repeatedly. The challenge remains in finding a balance between quantitative and qualitative indicators, as well as between performance and sustainability in assessment.

The aim of our study is to present an original set of indicators that will enable objective quantification and observation over time, applying forecasting of development, as well as reflecting the goals of sustainable development (UNWTO, 2004; Lozano-Oyola et al., 2012; Juracka et al., 2024), Iannaccone et al., 2025). In doing so, we draw on studies that use performance indicators to assess spa tourism potential (Zhang et al., 2024; Gúčik et al., 2016; Šenková et al., 2021; Anaya-Aguilar et al., 2021; Štefko et al., 2020; Pirnar et al., 2019). The choice of AHP and Delphi research methods in this study reflects the ambition to create a consensus-driven and balanced system of indicators that feed into the calculation of the TDI and TDP indexes.

3. Methods

This study addresses the following research questions:

RQ1 Which indicators enable the objective quantification of the potential of spa tourism under the conditions of the Slovak Republic?

RQ2 What is the development of the spa tourism potential in the Slovak Republic?

RQ3 What is the forecast of the development of spa tourism potential in the Slovak Republic?

The identification of the set of indicators (RQ1) is based on the Delphi method, conducted in four rounds, with a final participation of 18 experts in spa tourism management. The data collection process was conducted through electronic questionnaires distributed to 83 experts. The questionnaire for the Delphi method was created using Google Forms and distributed to selected email addresses of experts in spa tourism in Slovakia, whether in theoretical or applied practice. The panel of 18 experts provides, at a 95% confidence level (assuming p=0.5p=0.5p=0.5, N=83N=83N=83), a maximum margin of error of approximately 20.6%, which is acceptable for an exploratory Delphi design but requires cautious interpretation of the resulting weights and consensus.

An expert in practice was defined as a professional with expertise in spa management and operations, holding a mid- or senior-level management position for at least 5 years. An academic expert was selected based on scientific and publication preferences related to spa tourism. The responses were collected anonymously. The survey was conducted from February 2025 to May 2025.

The largest share of respondents came from the academic sphere (33.3%) and spa enterprises (27.8%). In addition, representatives of destination management organizations (DMOs) participated (22.2%), serving as executive directors or DMO directors. The experts involved have extensive experience in spa facility management, academic research in spa tourism, and strategic destination development.

The assignment of weights using a three-point scale (1 – agree, 2 – unsure, 3 – disagree) is methodologically supported in Delphi studies, with the weights reflecting the importance and degree of agreement with the given indicator. The proposed methodology employed a weighted scoring system with values of 1, 0.5, and 0 to express the significance of responses, which were subsequently used to calculate average values and overall consensus.

For the final evaluation of the indicators, the Analytical Hierarchy Process (AHP) was applied, taking into account the varying importance of each indicator as expressed by experts in the third round of the Delphi process (Ngo-Hoang, 2019). The fourth round of the Delphi method confirmed the relevance of the proposed indicators, which were subsequently proposed as suitable for achieving a comprehensive methodology for assessing spa tourism potential in the Slovak Republic.

Each indicator was reviewed and categorized into the following value groups: economic, cultural, natural, and value of sustainability, based on its ability to reflect the respective value and in the context of existing academic literature (Japutra et al., 2023; Szromek, 2020).

The following matrix was used in the evaluation of the main criteria using the AHP method:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \quad (1)$$

where a_{xy} is the pairwise comparison value between criterion x and criterion y of a given level with respect to the higher level, and the a_{xy} entries are governed by the following rules:

$$a_{xy} > 0;\ a_{xy} = 1/a_{yx};\ a_{xx} = 1\ \forall\ x \quad (2)$$

Criterion priorities can be estimated by finding the principal eigenvector W of matrix A [21]. When vector W is normalized, it becomes the priority vector of the criteria at one level with respect to the higher level, as follows:

$$AW = \lambda_{max} W \quad (3)$$

where λ_{max} is the maximum eigenvalue of matrix A.

When the pairwise comparison matrix satisfies transitivity for all pairwise comparisons, it is consistent and verifies the following relationship:

$$a_{xy} = a_{xh} a_{hy}\ \forall\ x, y, h \quad (4)$$

Scale of pairwise comparison in the Analytic Hierarchy Process (AHP).

Interpretation of the a_{xy} value:
1 - x and y are equally important,

3 - x is slightly more important than y,
5 - x is more important than y,
7 - x is significantly more important than y,
9 - x is absolutely more important than y.

The Analytical Hierarchy Process (AHP) adapts to a certain level of inconsistency in decision judgments while offering a quantitative evaluation of inconsistency for each set of assessments. The consistency of the matrix is evaluated using the consistency ratio (CR), which is defined as:

$$CR = \frac{CI}{RI} \quad (5)$$

where CI is the consistency index; RI is the random index. The consistency index (CI) for a matrix of order *n* is defined as:

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (6)$$

A consistency ratio of 0.1 or lower is considered acceptable for reliable assessment. Values exceeding this threshold suggest potential inconsistencies in the evaluations and indicate that the assessments should be reviewed. The evaluation of indicators in the proposed methodology for assessing spa tourism potential was conducted by subjectively comparing pairs of values (criteria) and assigning weights based on expert judgment. Qualitative responses were converted into quantitative values (e.g., 1 for "agree", 0.5 for "not sure", and 0 for "disagree"), and a pairwise comparison was carried out. The average score for each indicator was calculated from expert evaluations and may serve as the basis for the pairwise comparison matrix in AHP. The next step involved creating a normalized pairwise comparison matrix from these average scores. A pairwise comparison matrix was constructed based on the results of the 4th round of the Delphi method. This matrix defines the relative weights assigned to individual indicators for assessing the potential of spa tourism, based on expert evaluations. The recalibrated consistency ratio is 0.0, indicating an ideal level of consistency within the pairwise comparison matrix.

The final set of indicators was used to calculate the *Tourism Development Index* (TDI) (Opačić et al., 2022), and the *Tourism Development Potential* (TDP) (Zhang et al., 2024). The application of this methodology addresses RQ2.

The data source for the individual indicators was obtained from annual reports of spa enterprises, thematic statistical outputs from the National Health Information Centre of the Slovak Republic (https://www.nczisk.sk/Statisticke_vystupy/Tematicke_statisticke_vystupy/Kupelna_starostlivost/Pages/default.aspx), the Tourism Satellite Account of the Slovak Republic (Statistical Office of the Slovak Republic, 2023), annual reports of health insurance companies, annual reports of the Health Care Surveillance Authority of the Slovak Republic (2023), and statistical outputs on spa tourism provided by Slovakia Travel for the period 2016–2023 (Slovakia Travel, 2023). Among other challenges, the authors also had to deal with data availability, as the data from the Tourism Satellite Account of the Slovak Republic are updated and available with a significant time delay (currently available for the year 2022); therefore, the TDI and TDP values were identified for the years 2017–2022. The following years are thus evaluated as a forecast (2023–2030).

TDI is calculated by normalizing selected indicators to a common scale and aggregating them for each year. Normalization ensures comparability of indicators measured in different units.

$$z_i = log_{28}(1 + \frac{x_i}{R_i}) \quad (7)$$

where:

z_i = normalized value of indicator,

x_i = value of the indicator for a given year,

R_i = reference value for the individual indicator,

the resulting TDI values are interpreted similarly to the approach by Opačić et al. (2022) and Mitrică et al. (2021), using a custom evaluation scale:

- *Value 0–1.99 – Very low development,*
- *Value 2.00–2.99 – Low development,*
- *Value 3.00–3.99 – Medium development,*
- *Value 4.00–4.99 – High development,*
- *Value 5.00 and above – Very high development.*

TDP was calculated based on a formula and represents the overall potential of tourism develompent, calculated as the average of all TDI values for a given year.

$$TDP_i = \frac{\sum_{j=1}^{n} TDI_{ij}}{n} \quad (8),$$

where:

- TDP_i: Index of spa tourism development potential for year *i*.
- TDI_{ij}: Normalized value of indicator *j* for year *i*.
- *n*: Number of selected indicators.

The evaluation scale was defined based on statistical indicators (mean, standard deviation) as follows (Zhang et al., 2024):

- *Very low potential:* TDP ≤ 0.10,
- *Low potential:* 0.10 < TDP ≤ 0.30,
- *Medium potential:* 0.30 < TDP ≤ 0.45,
- *High potential:* 0.45 < TDP ≤ 0.50,
- *Very high potential:* TDP > 0.50.

Forecasts of TDI and TDP development for the years 2023–2030 (RQ3) were carried out using the extrapolation method. The extrapolation method uses historical data to predict future values. For simple linear extrapolation, the following formula based on the line equation is used (Tsai et al., 2023):

$$Yt = a + b * t \quad (9)$$

where:

· Yt is the predicted value for time t,

· a is the intercept (value on the Y-axis when t = 0),
· b is the slope of the straight line (it shows the change of rate of Y per unit change in t),
· t is a time variable (e.g., year or period); in our case: 2017, …, 2025.

1. slope (b):

$$b = \sum(ti - \bar{t})(Yi - \bar{Y}) \sum(ti - \bar{t})2 \quad (10)$$

2. Intercept (a):

$$a = \bar{Y} - b * \bar{t} \quad (11)$$

Where:
· ti and Yi are historical values of time and corresponding indicators,
· $\bar{t}$ and $\bar{Y}$ are the means of time and indicator values.

Linear regression analysis was also used for prediction, implemented in the statistical program R. This approach assumes continuity of past trends, absent major structural changes or external shocks, providing an indicative forecast suitable for strategic orientation rather than precise prediction.

4. Results and discussion

The overall consistency ratio of the AHP matrix was below the threshold of 0.1, indicating a satisfactory level of internal consistency among expert judgments. Based on the calculated weights, a set of key indicators was identified as the most significant for the proposed evaluation methodology. The results of the Delphi method provided a final ranking of indicators essential for assessing the potential of spa tourism destinations in the Slovak Republic. The findings highlight economic performance, cultural wealth, natural resources, and sustainability as fundamental factors in evaluating the potential of spa destinations in Slovakia. The consensus among experts highlights the need for a comprehensive approach that considers both financial and non-financial aspects to ensure a thorough assessment of spa tourism's potential.

Table 1 provides an overview of the final methodology, including all indicators selected through the Delphi process. Each indicator was validated based on expert consensus and categorized into four core dimensions: economic value, cultural value, natural value, and sustainability. The right-hand column lists the indicators as presented in the methodology, with consideration of their measurability and relevance to spa tourism.

4.1 Set of indicators integrated into the methodology

Table 1: Final set of indicators integrated into the methodology for assessing the potential of spa tourism in the Slovak Republic

Table 1. **Final set of indicators integrated into the methodology for assessing the potential of spa tourism in the Slovak Republic**

Indicators evaluated by the AHP method in the 3rd round of the Delphi method (weights)	**Indicators confirmed in the 4th round of the Delphi method**
Economic value	

Occupancy rate of spa facilities (0.04)	Internal consumption of spa tourism by products, at purchasers' prices
Profitability of spa enterprises (0.07)	Gross fixed capital in total, by tourism industries
Average revenue per room/bed (0.05)	Profitability of spa enterprises (ROA + ROE + ROS)
Ratio of domestic to foreign clientele (0.06)	Expenditures of health insurance companies on spa care
Number of visits to the spa website (0.07)	
Share of spa tourism GDP in the total GDP of the Slovak Republic (0.06)	
Curtular value	
Number of tourist attractions in spa destinations (0.04)	
Number of cultural and historical landmarks (0.06)	
Natural value	
Number of natural resources (mineral and thermal springs) (0.05)	
Sustainability value	
Number of visitors in spa accommodation facilities (0.05)	Percentage of permanent bed utilization
Number of overnight stays in spa accommodation facilities (0.05)	Development of accommodation revenues in Slovak spas
Number of innovative projects for the development of spa industry (0.05)	Number of beds
Number of spas and spa facilities (0.05)	Number of spas in destination management organizations
Average length of stay of clients in spas (0.06)	
Ratio of number of staff to number of spa guests (0.06)	

Source: authors' own processing

The proposed methodology for assessing the potential of spa tourism in the Slovak Republic also includes performance indicators, which play a key role in analyzing the efficiency and competitiveness of this sector. From an expert perspective, they are a significant factor, as the performance of individual spa businesses and destinations fundamentally influences the overall development of spa tourism in the national context.

This resulting structure represents a comprehensive, multidimensional approach to evaluating the potential of spa tourism destinations. By combining expert judgment with operational data, the methodology ensures scientific accuracy and applicability for regional and national strategic planning.

The results are consistent with previous studies (Ngo-Hoang, 2019; Szromek, 2020), which also emphasize the need to integrate quantitative performance metrics with broader considerations of sustainability and cultural heritage in assessing tourism potential. This indicator framework not only supports decision-making at the local and national levels but also provides a replicable model for similar spa tourism assessments.

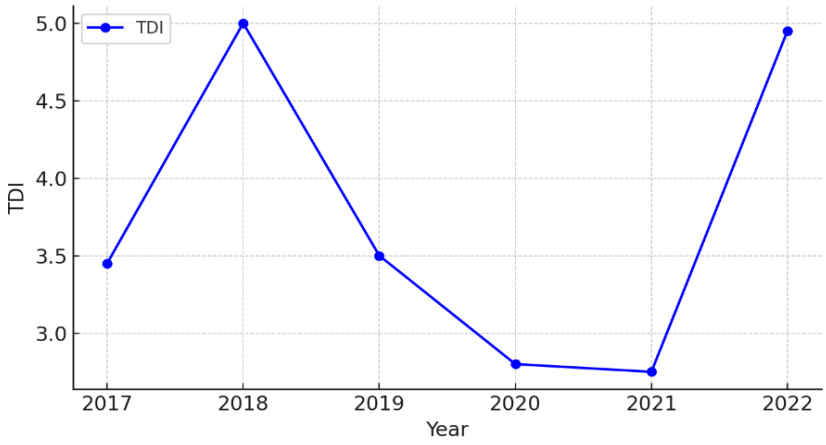
The methodology ensured expert engagement, methodological rigor, and applicability of findings in real-world conditions, thereby offering a validated foundation for strategic planning of spa tourism development in Slovakia.

The Delphi–AHP–TDI/TDP approach provides a clear structure, yet results remain sensitive to expert subjectivity and the assumption of criterion independence; changes in weights or normalization can significantly affect year classifications, while the compensatory nature of aggregation is questionable for sustainability. Conclusions are further limited by delayed and heterogeneous data and insufficient granularity, which may mask regional disparities. Forecasts based on linear extrapolation fail to capture non-linear recovery, seasonality, or regime shifts, and they do not quantify uncertainty.

4.2 Solution to RQ2

The year 2017 (TDI = 3.42) showed moderate development in spa tourism, indicating that while it progressed in key indicators with solid performance, there still remained potential for further growth. In 2018 (TDI = 4.94), there was a significant increase in TDI, marking a year of strong spa tourism performance, characterized by notable growth in key indicators (number of visitors and overnight stays). In 2019 (TDI = 3.49), spa tourism development declined slightly compared to 2018, driven by slower visitor growth and lower spa business revenues. The drop in TDI in 2020 (TDI = 2.80) was due to the impact of the COVID-19 pandemic, which reduced spa tourism visitors, spa business revenues, and employment in the sector. The TDI remained low in 2021 (TDI = 2.74) due to the ongoing effects of the pandemic. Although there were some improvements, spa tourism still struggled to reach pre-pandemic levels. A significant recovery in 2022 (TDI = 4.83) indicates a strong revival of tourism, attributed to improved pandemic management and the return of visitors, resulting in improved performance across most tourism indicators (see Fig. 1).

Figure 1. **Development of the spa tourism development index (TDI) in the Slovak Republic, 2017–2022**

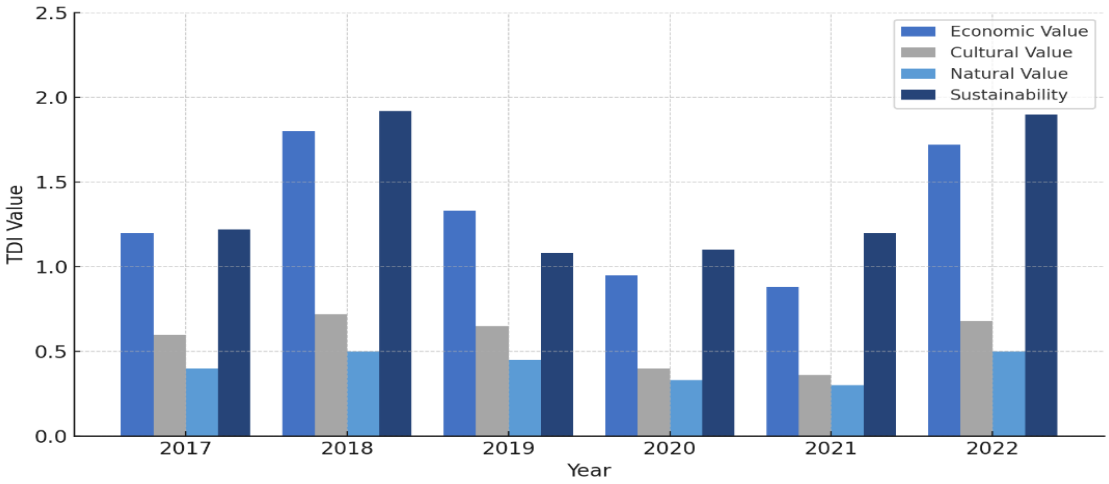


Source: authors' own processing in the statistical program R based on TDI calculations

Figure 2 illustrates the development of the Spa Tourism Development Index (TDI) from 2017 to 2022, divided into four key dimensions: economic value, cultural value, natural value, and sustainability.

The most notable finding is that economic value and sustainability have consistently been the most significant contributing factors to TDI. In 2018 and 2022, these dimensions peaked, reflecting periods of strong growth and investment in the spa sector. Conversely, the years 2020 and 2021, marked by the COVID-19 pandemic, saw declines in the economic and cultural dimensions, while sustainability remained relatively stable, indicating adaptability and the presence of long-term support systems.

Figure 2. **Structural distribution of the Spa Tourism Development Index by dimensions**

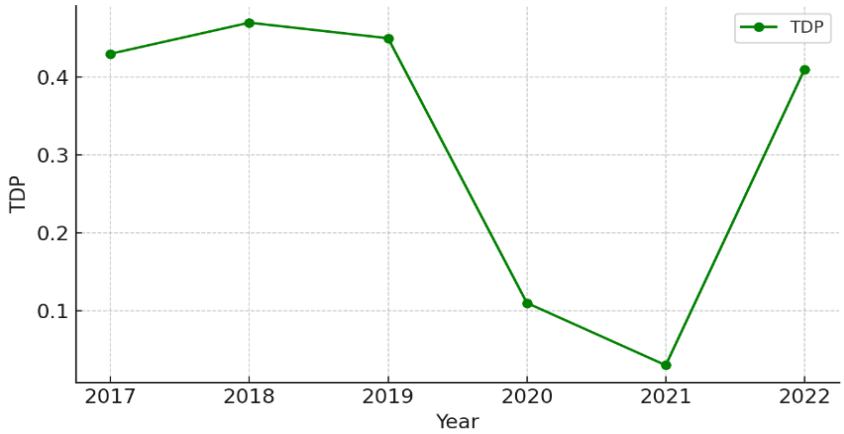


Source: authors' own processing

Cultural and natural value maintained a lower but relatively stable contribution throughout the entire period, with the cultural dimension slightly increasing in 2018. The natural dimension shows the lowest weight in all years, indicating the stability of these resources. However, a deeper investigation might reveal their underuse and undervaluation in practice. At the same time, it follows that sustainability and the economic performance of spa enterprises form the main pillars of sector development. In the context of regional planning, this signals the need for investment primarily in infrastructure, service quality, and sustainable practices that enhance the competitiveness of spa destinations.

Figure 3 shows a sharp decline in the TDP index during the pandemic years (2020–2022) and a significant recovery in 2022. During the years 2017–2019, the TDP was relatively stable. A slight increase was recorded in 2018, followed by a small decrease in 2019. This development suggests that the potential for spa tourism development was improving, but no significant changes were present.

Figure 3. **Development of the spa tourism development potential index in the Slovak Republic, in the years 2017–2022**



Source: authors' own processing in the statistical program R based on TDP calculations

The Spa Tourism Development Potential Index reflects the stability and continued, though not dramatic, growth of the sector. In 2020, the TDP declined sharply due to the COVID-19 pandemic,

which had a serious impact on spa tourism. The decline in visitors, tourism revenues, and employment in spa tourism reduced the sector's development potential. In 2021, the TDP remained low, indicating that spa tourism had not returned to its pre-pandemic level. Although various measures were implemented to support the recovery of spa tourism, pandemic-related restrictions and challenges prevented the TDP from returning to pre-crisis levels. In 2022, a strong increase in TDP was observed, indicating a recovery of spa tourism. This positive trend is the result of the gradual return of visitors, the restoration of travel flows, and improvements in tourism infrastructure. This year thus marked the beginning of a more significant recovery of spa tourism after pandemic restrictions.

The average TDP value during the observed period is 0.3189. The sector has moderate growth potential. This positive development is the result of growth in key indicators, including spa tourism production, spa businesses' revenues, and visitor numbers. The growing potential of spa tourism also indicates that it is ready for further growth in the coming years.

The results of the Tourism Development Index (TDI) and the Tourism Development Potential Index (TDP) provide a robust framework for analyzing temporal trends in the spa tourism sector's performance and readiness for growth in Slovakia. These indices, specifically adapted for spa tourism, offer two perspectives – TDI reflecting the current dynamics of development, and TDP capturing the latent potential based on available capacities and systemic resilience.

TDI values show significant fluctuations over the examined period (2017–2022), with the highest growth recorded in 2018, a year of strong performance across key indicators, including the number of visitors and overnight stays. In contrast, 2020 and 2021 saw a sharp decline, clearly influenced by the COVID-19 pandemic, which reduced both demand and supply-side factors. These findings align with global tourism disruption trends observed during the pandemic (e.g., UNWTO, 2021), confirming spa tourism's vulnerability to public health crises.

On the other hand, the TDP index showed greater overall stability between 2017 and 2019, with only slight increases and decreases, indicating that the structural and infrastructural capacity of spa tourism remained relatively resilient even amid mild fluctuations. However, the sharp decline in TDP in 2020–2021 suggests that the pandemic negatively affected not only performance but also long-term potential. The recovery observed in both indexes in 2022 suggests that the sector is regaining strength, supported by post-pandemic recovery measures, renewed tourism flows, and revitalized infrastructure.

Together, these indices demonstrate the short-term volatility and long-term adaptability of the spa tourism sector in Slovakia. Their complementary nature underscores the importance of assessing both realized and potential growth when designing sector-specific development strategies.

4.3 Solution to RQ3

The forecasts presented in Table 2 are based on the continuation of trends observed from 2017 to 2022, assuming no major disruptions such as new economic crises or global pandemics. The lowest TDI value is expected in 2030, reaching 3.63. The lowest TDP is also expected in 2030, at -0.21.

Table 2. **Forecasts of TDI and TDP development for the years 2023–2030**

Year	TDI	TDP
2023	3.68	0.14
2024	3.67	0.09
2025	3.66	0.04
2026	3.66	-0.009
2027	3.65	-0.06
2028	3.64	-0.11
2029	3.63	-0.16

2030	3.63	-0.21

Source: authors' own processing

Deteriorating forecasts of the development potential of spa tourism in the Slovak Republic provide a rationale for interventions by relevant stakeholders to support its development. It is important to ensure solutions across the affected sectors (healthcare, tourism, finance, innovation) as well as in destination and business management. Linear extrapolation assumes that past trends will continue unchanged, which limits its reliability in dynamic sectors like tourism. It does not account for seasonal fluctuations, structural changes, or unexpected shocks (e.g., pandemics), making long-term forecasts highly uncertain.

5. Conclusion

This study developed and validated a methodology for assessing the potential of spa tourism in Slovakia that combines expert input with structured decision-making techniques. In doing so, it answered the formulated RQ1–RQ3. Through a multi-round Delphi process involving 18 experts from academia, industry, and public administration, a set of 20 measurable indicators was identified, refined, and divided into four fundamental dimensions: economic value, cultural value, natural value, and sustainability.

The final set of indicators reflects a balance between performance-based metrics (such as occupancy rate, profitability, and revenue per bed) and context-sensitive factors (including cultural heritage, environmental assets, and infrastructure).

This indicator model not only contributes to a more objective assessment of spa tourism potential but also serves as a tool to support decision-making in national and regional planning. Its structure ensures applicability at various levels of management while remaining adaptable to other forms of health or wellness tourism.

By integrating multidisciplinary perspectives and ensuring data availability and comparability, the proposed methodology offers a replicable, scalable framework for developing sustainable spa tourism, especially in regions with a high concentration of spas, such as Slovakia.

The application of the proposed methodology to assess spa tourism potential for calculating the Tourism Development Index (TDI) and the Tourism Development Potential Index (TDP) in Slovakia provided valuable insights into the sector's development over 2017–2022. The analysis confirms that while spa tourism experienced strong growth before the pandemic, it was severely affected by COVID-19-related disruptions in 2020 and 2021. Nevertheless, the significant recovery in 2022 points to the sector's resilience and latent potential.

The average TDP value of 0.3189 over the six-year period indicates a moderate but positive growth potential. This is a promising signal for policymakers and stakeholders, suggesting readiness for further investment and strategic development. The observed recovery trajectory also highlights the importance of timely support measures, robust infrastructure, and adaptable business models in maintaining and revitalizing tourism sectors in the post-crisis period.

In conclusion, the integrated use of TDI and TDP enhances strategic planning and monitoring and offers a repeatable model for tourism assessment. In the case of Slovakia's spa destinations, this dual-index approach supports evidence-based decision-making, aimed at maximizing immediate recovery and long-term sustainable growth.

The main contribution of this study lies in the development of an original, multidimensional methodology for assessing spa tourism potential, combining Delphi and AHP techniques with the calculation of TDI and TDP indexes. This approach integrates economic, cultural, natural, and sustainability dimensions, offering a more balanced and objective evaluation than traditional performance-based models. By validating the methodology on the Slovak context using real operational

and statistical data, the study demonstrates its practical applicability for strategic planning at national and regional levels. Furthermore, the inclusion of forecasting capabilities enhances its relevance to policy-making and investment decisions, while its replicable, adaptable structure provides a scalable tool for other forms of health and wellness tourism.

Table 3. **Overview of barriers in the implementation of the methodology for its use in the following years, proposed measures to overcome them, and the responsible authorities for their resolution**

Spa tourism in the Slovak Republic		
Barrier	**Measure**	**Responsible authority**
Insufficient number of participating experts and data inaccuracy	Expanding the expert base, improving data collection and control, and data standardization	Authors of the methodology, data analysts
Possible changes in sustainability principles	Creating a framework of sustainable methodology, and continuous updating of the methodology	Sustainability experts, methodology development team
Change in legislation	Continuous monitoring of legislative changes, preparation for possible legislative scenarios	Legal experts, legislative team, methodology coordination team
Challenges in the context of data complexity across relevant areas	Engaging experts in the decision-making process, and regular consultations with data analysts	Data analysts, spa management
Spa enterprises in the Slovak Republic		
Barrier	**Measure**	**Responsible authority**
Human potential	Staff training and development, motivational programs to attract qualified experts	Spa management, educational institutions
Risk of strict (blind) use of tables by management	Supplementing the methodology with flexible recommendations, and modularization of the methodology	Spa management, methodology development team
Perception of the difference between stays in spas and it's payment	Segmented analysis of visitors, research of the impact of funding on visitor behaviour	Research institutions, visitor behaviour analysts
Complexity of data reported by spas themselves	Digitalization and automation of data collection, data standardization	Spa management, IT specialists

Source: authors' own processing

The limits of the proposed methodology lie in the availability of statistical data and in the management of evaluation. In the context of the conditions of Slovak spa tourism, we identify barriers to implementing the proposed methodology. These are presented in Table 3, including measures for their solution.

The methodological limitations of the study include the limited availability and accuracy of statistical data, which are updated with significant delays, as well as the complexity of processing data across sectors such as healthcare, tourism, and finance. Another issue is the relatively small number of experts involved, which may affect the representativeness of the results, and the need for continuous updates of the methodology in response to legislative changes or new sustainability requirements. There is also a risk of rigidly applying the methodology without considering context, which could lead to incorrect decisions, as well as a shortage of qualified personnel in spa facilities. Additional possible limitations include the subjectivity of expert evaluations, which may influence indicator weights; limited generalizability of results to other forms of tourism; dependence on historical data for forecasting; and potential distortions caused by external shocks (e.g., pandemics or economic crises) that the methodology cannot fully predict. The authors recommend solutions such as digitalizing data collection, expanding the expert base, providing flexible guidelines, regularly updating the methodology, and investing in staff training.

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