

## ROAD INFRASTRUCTURE IMPACT ASSESSMENT ON TOURISM DEVELOPMENT: CASE STUDY OF GOSTIVAR & MAVROVO AND ROSTUSHE

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**Abstract:** Gostivar region, along with the Mavrovo and Rostushe region, creates a joint spatial phenomenon with unique spatial components. This assumption is in favor of further development and expansion of the local tourism in that particular region, observed as a single accessible tourist destination. The geographical uniqueness of both municipalities shaped by distinctive geological forms, stunning natural landscapes, rich cultural and spiritual heritage, combined with the authentic local gastronomy, is the key to promoting year-round tourism and recreational activities. Tourist needs are shaped within specific spatial contexts and satisfied at locations with distinct spatial attributes. The capacity for movement within the tourism space plays a pivotal role in the development of the local tourism industry and therefore, local transportation infrastructure constitutes a central element of the tourist space, enabling mobility of people and goods within and between tourist regions/destinations, thus influencing the development and expansion of tourism-related activities. Tourism has a spatial basis, and accessibility and connectivity are essential elements within the tourism space that influence its dynamics and development. Adequate local infrastructure and accessibility are tools that help tourist destinations to reach a wider range of visitors, ultimately influencing their economic indicators and business results. By incorporating well-designed infrastructure into the local tourist offer, the region becomes more attractive and accessible to a broader spectrum of people, including those with specific needs, reduced mobility and, more generally, any tourist who values easy access, free movement and a pleasant tourist experience. Local tourism can't be self-sustainable nor developed without the existence of a quality and functional local transport infrastructure which plays an integral part of the tourism industry, and serves as a catalyst for tourism development. Fluctuations in the volume of tourist traffic have a profound impact on the economic indicators of the local tourism sector. Adequate local road infrastructure and easy accessibility to tourist destinations in both municipalities are crucial prerequisites for travel and long-term sustainability of the local tourism in this region. In this paper, we aim to assess the impact of the road transport infrastructure on local tourism development, by analysing the residents' assessment of this issue in both municipalities, by applying various scientific research methods, adequate to the research topic, such as conducting an on-site survey by using survey questionnaire on a small-size sample, performing Shapiro-Wilk Normality Test and the Mann Whitney U Test for two independent samples, as well as the methods of analysis and induction. As a result, conclusions were formulated based on the observation and analysis of individual indicators. Ultimately, the obtained data and performed statistical tests strongly rejected the formulated basic hypothesis and confirmed the null hypothesis which states that there is no statistically significant difference in the assessed impact of road infrastructure on municipal tourism development between the two neighboring municipalities.

**Keywords:** Road infrastructure, impact, local tourism development.

### 1. INTRODUCTION

Municipality of Gostivar (area of 513.39 km<sup>2</sup> with total of 35 inhabited places) and Municipality of Mavrovo and Rostushe (area of 663.19 km<sup>2</sup> with total of 42 inhabited places) are an integral part of the Polog Planning Region comprised of nine (9) municipalities. Both municipalities are geographically adjacent to one another in the western part of the Republic of North Macedonia, forming a sequential geographic and travel corridor from the Polog Valley into the heart of the Bistra and Korab mountain ranges. Together, they create a joint spatial phenomenon with unique spatial components in favor of further development and expansion of the local tourism in that particular region, observed as a single accessible tourist region. The geographical uniqueness of both municipalities shaped by distinctive geological forms, stunning natural landscapes, rich cultural and spiritual heritage and authentic local gastronomy, is the key to promoting year-round tourism and recreational activities. Tourist needs are shaped within specific spatial contexts and satisfied at locations with distinct spatial attributes. The capacity for movement within the tourism space plays a pivotal role in the development of the local tourism industry and therefore, local transportation infrastructure constitutes a central element of the communicative space, enabling movement of people and goods within and between the tourist regions, thus influencing the development and expansion of tourism-related activities. Quality local road infrastructure and easy accessibility

to the tourist destinations in both municipalities are crucial prerequisites for travel and long-term sustainability of the local tourism in this region. Overview of the local road infrastructure in the municipalities of Gostivar & Mavrovo and Rostushe, in 2025, is displayed in Table 1.

**Table 1: Local road infrastructure overview in the municipalities of Gostivar & Mavrovo and Rostushe, in 2025**

| 2025                       | Municipality of Gostivar (km) | Municipality of Mavrovo and Rostushe (km) |
|----------------------------|-------------------------------|-------------------------------------------|
| Asphalt and cobbled street | 295                           | 71                                        |
| Macadam                    | 3                             | 4                                         |
| Earth                      | 7                             | 3                                         |
| Designed roads             | 10                            | 0                                         |
| Total                      | 315                           | 78                                        |

Source: State Statistical Office

## 2. MATERIALS AND METHODS

For the purposes of this scientific paper, we tested the formulated basic (alternative  $H_a$ ) hypothesis which states that there is a statistically significant difference in the assessment of the impact of road infrastructure on municipal tourism development between the Municipality of Gostivar and the Municipality of Mavrovo and Rostushe. As opposed to that, our null hypothesis ( $H_0$ ) stated that there is no statistically significant difference in the assessment of the impact of road infrastructure on municipal tourism development between the Municipality of Gostivar and the Municipality of Mavrovo and Rostushe. We investigated the validity of the basic hypothesis by using adequate scientific research methods, specifically, the survey method, the Shapiro-Wilk normality test, the non-parametric Mann-Whitney U test for two (2) independent samples, and methods of analysis and induction. In addition, conclusions were formulated based on the observation and analysis of individual indicators. To determine whether a statistically significant difference exists in the assessed impact of road infrastructure on municipal tourism development between the observed two (2) neighboring municipalities, an on-site random choice survey was conducted in the municipalities of Gostivar and Mavrovo and Rostushe in the period 12-13 September 2026, on a relatively small sample size consisting of sixty (60) respondents in total, divided in two (2) independent groups i.e. 30 respondents - residents of the Municipality of Gostivar, and other 30 respondents - residents of the Municipality of Mavrovo and Rostushe ( $N = 30$  per group). The survey questionnaire sample (Likert 5-point scale used in the Survey Questionnaire) is shown in Figure 1.

**Figure 1: Survey Questionnaire Sample**

SURVEY QUESTIONNAIRE

ID No. \_\_\_\_\_

Place/Date: \_\_\_\_\_ / \_\_\_\_\_

Participation in this survey is anonymous and voluntary.  
Obtained data shall be used only and solely for scientific purposes.  
Thank you for your participation.

Please circle the YES field below, should you wish to participate in this survey.

**YES**      I hereby declare that I give my consent to participate in this survey on a voluntary basis.

**Please circle the right answer.**

1. **Age range** (\* Mandatory age for participation in the survey is not less than 18 years).

A. 18-35  
B. 36-50  
C. 51-65  
D. 65+

2. **Current place of residence.**

A. Municipality of Gostivar  
B. Municipality of Mavrovo and Rostushe  
C. Other

3. **On a scale from 1 to 5, rate the impact of the road infrastructure on tourism development of your municipality.**

1 No influence at all    2 No influence    3 Neutral    4 Has influence    5 Has major influence

Source: Designed by the co-authors

If we analyse respondents' age structure of both independent groups combined, most of the respondents (N = 60), were categorised in the age range between 18-35 years of age, followed by 35% in the age range between 36-50 years of age, while the remaining 16.67% and 8.33% represented the remaining respondents in the age range between 51-65 and 65+ years of age respectively (see Table 2).

**Table 2: Respondents' Age Structure**

| Age Range | Group 1<br>(N=Residents of<br>Municipality of<br>Gostivar) | Group 2<br>(N=Residents of Municipality of<br>Mavrovo and Rostushe) | Group 1 + Group 2<br>(N) | Group 1 + Group 2<br>(%) |
|-----------|------------------------------------------------------------|---------------------------------------------------------------------|--------------------------|--------------------------|
| 18-35     | 13                                                         | 11                                                                  | 24                       | 40                       |
| 36-50     | 8                                                          | 13                                                                  | 21                       | 35                       |
| 51-65     | 6                                                          | 4                                                                   | 10                       | 16.67                    |
| 65+       | 3                                                          | 2                                                                   | 5                        | 8.33                     |
| Total     | 30                                                         | 30                                                                  | 60                       | 100                      |

Source: Calculations by the co-authors performed in MS Excel Programme

### 3. RESULTS & DISCUSSIONS

The performed Shapiro-Wilk normality test proved the assumption of non-normality of obtained data from the conducted survey by generating p-value < .001, thus suggesting violation of the assumption of normality (see Figure 2).

**Figure 2: Shapiro-Wilk Normality Test**

| Normality Test (Shapiro-Wilk)                                           |       |        |
|-------------------------------------------------------------------------|-------|--------|
|                                                                         | W     | p      |
| SCORE                                                                   | 0.799 | < .001 |
| Note. A low p-value suggests a violation of the assumption of normality |       |        |

Source: Calculations performed in JAMOV Software Programme used by the co-authors

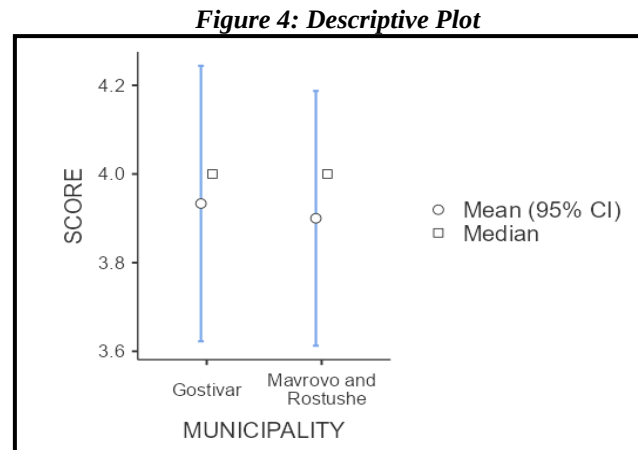
Additionally, we performed a Mann-Whitney U Test, adequate test when dealing with small sample size with two independent groups, non-normality of data and very robust to skewed data and outliers. The performed test generated U value of 442. The maximum value U can reach is  $n_1 \times n_2$ . Since  $n_1 = 30$  and  $n_2 = 30$ , the maximum U is 900. A U of 442 is positioned somewhere in the middle (close to 450), which indicates no statistically significant difference between the two independent groups (Group 1 = residents of Gostivar and Group 2 = residents of Mavrovo and Rostushe). Generated p-value, which was set at 95% confidence interval, equaled 0.906 (p-value > 0.05), while the Rank biserial correlation ( $r_B$ ) was slightly negative equaling - 0.0178, indicating that **the distributions of the two groups were nearly identical, showing almost non-existent negative relationship** between them and no distinct pattern or separation in the ranks between the two groups (see Figure 3).

**Figure 3: Mann-Whitney U Test Results**

| Independent Samples T-Test                                             |                      |           |       |                           |         |       |
|------------------------------------------------------------------------|----------------------|-----------|-------|---------------------------|---------|-------|
|                                                                        |                      | Statistic | p     | Effect Size               |         |       |
| SCORE                                                                  | Mann-Whitney U       | 442       | 0.906 | Rank biserial correlation | -0.0178 |       |
| Note. $H_0: \mu_{\text{Gostivar}} = \mu_{\text{Mavrovo and Rostushe}}$ |                      |           |       |                           |         |       |
| Group Descriptives                                                     |                      |           |       |                           |         |       |
| Group                                                                  |                      | N         | Mean  | Median                    | SD      | SE    |
| SCORE                                                                  | Gostivar             | 30        | 3.93  | 4.00                      | 0.868   | 0.159 |
|                                                                        | Mavrovo and Rostushe | 30        | 3.90  | 4.00                      | 0.803   | 0.147 |

Source: Calculations performed in JAMOV Software Programme used by the co-authors

Group Descriptives revealed that respondents from the Municipality of Gostivar provided a nearly identical average rating ( $M = 3.93$ ,  $SD = 0.868$ ,  $Med = 4.00$ ) compared to respondents from the Municipality of Mavrovo and Rostushe ( $M = 3.90$ ,  $SD = 0.803$ ,  $Med = 4.00$ ). Therefore, the statistical test confirmed the null hypothesis ( $H_0$ ) validity and the basic (alternative  $H_a$ ) hypothesis lacked empirical evidence to be supported i.e. it was rejected, **which led us to a conclusion that there is** no statistically significant difference in the respondents' assessment of road infrastructure impact on municipal tourism development between both municipalities. The impact of road infrastructure on municipal tourism development in both municipalities is assessed similarly at a high level (median 4.00 - has influence), without significant variations in the attitudes of the two different group of respondents (see the Descriptive Plot in Figure 4).



Source: Graphics generated in JAMOV Software Programme used by the co-authors

#### 4. CONCLUSION

The performed statistical tests ultimately confirmed the null hypothesis ( $H_0$ ) validity, **concluding that there is** no statistically significant difference in the assessment of road infrastructure impact on municipal tourism development between the Municipality of Gostivar and the Municipality of Mavrovo and Rostushe. The impact of road infrastructure on municipal tourism development in both municipalities is assessed similarly at a high level by the two independent groups of respondents i.e. the road infrastructure it does have an influence/impact on the prospective for local tourism development. Road infrastructure, including its current state and planned improvements, is a significant factor in local tourism development because it improves accessibility, supports tourism-related businesses, creates employment opportunities, and has spreading economic effects to less-developed and high-altitude regions. Despite this fact, road infrastructure development should be carefully planned taking into considerations many important aspects such as environmental protection, traffic management, and local community interests.

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