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# ASSESSMENT OF TOURISM CARRYING CAPACITY AT CULTURAL HERITAGE SITES: THE CASE OF CHASHMA-AYUB MAUSOLEUM

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**Abstract.** In this study, tourism carrying capacity of the Chashma-Ayub mausoleum was assessed on the basis of the Cifuentes methodology. Based on field observations, GPS measurements and statistical data, the physical carrying capacity (PCC) and real carrying capacity (RCC) of the site were determined to be 24,241 and 17,251 visitors/day respectively. The results serve as a basis for developing scientific and practical recommendations for managing the tourist flow.

***Keywords:*** *tourism carrying capacity, PCC, RCC, Cifuentes model, sustainable tourism, heritage tourism.*

## Introduction

In recent decades, global tourism has evolved into one of the most dynamic and economically significant sectors of the world economy, exhibiting sustained growth and an expanding contribution to international trade and employment. The intensifying interest in cultural heritage sites, in particular, has accentuated the imperative of ensuring sustainable tourism development and has brought this issue to the forefront of both academic and policy discourse. Within this context, the historic centre of Bukhara - endowed with an exceptional architectural and historical legacy - assumes particular scholarly and practical relevance as an object of inquiry.

The Chashma-Ayub mausoleum, located in the historical centre of Bukhara, is a unique architectural monument of religious and cultural significance. This site dates back to the 12$^{th}$ century and, according to legend, is revered as a sacred place associated with the name of the Prophet Ayyub (peace be upon him). Today, the mausoleum functions not only as a historical heritage site but also as an important place of pilgrimage and a tourist destination [9; 10].

In recent years, the increase in the number of tourists visiting this site has given rise to the problem of tourist load. Uncontrolled growth of the tourist flow may have a negative impact on the preservation of historical monuments. For this reason, there is a need to determine the Tourism Carrying Capacity (TCC) on a scientific basis.

The aim of this study is to determine the physical (PCC) and real (RCC) tourism carrying capacity of the Chashma-Ayub mausoleum and, on the basis of these results, to develop effective management measures.

**Figure 1. Chashma-Ayub Mausoleum**

Figure 1 depicts the external appearance of the Chashma-Ayub mausoleum during field research, at a time when the site was crowded with tourists. The image clearly shows the historical and architectural features of the structure, including walls built of fired brick, a tall conical dome and the entrance section. Also, in the open square located in the foreground, the intensity of tourist movement can be observed, demonstrating that the site possesses a high level of tourist attractiveness. The photograph confirms not only the importance of the object as cultural heritage but also that it is an active place of pilgrimage and tourism.

**Literature Review**

The concept of Tourism Carrying Capacity (TCC) was originally formed in ecology and was subsequently applied to the field of tourism. Srivastava (2017) defines TCC as the maximum number of tourists that an area can accommodate without being damaged [1].

The methodology developed by Cifuentes (1992) is the most widely used model and comprises three stages:

1. Physical Carrying Capacity (PCC)
2. Real Carrying Capacity (RCC)
3. Effective Carrying Capacity (ECC) [2]

In international practice, this model has been successfully applied at Petra (Jordan), Amasya (Turkey) and at pilgrimage sites in India [3; 4; 5]. These studies show that calculating carrying capacity is the principal tool for sustainable tourism management. In the conditions of Uzbekistan, however, such studies have not been sufficiently developed, and calculations at the level of individual sites are rare. In this regard, the present study possesses scientific novelty.

## Methodology

The following methods were applied in the study:

1. Field observations (more than 50 visitors);
2. GPS measurements;
3. Analysis of documents;
4. Mathematical calculations.

The physical carrying capacity (PCC) was calculated using the following formula:

$$\mathbf{PCC = (A / a) \times Rf}$$

Where:

A - the area available for use

a - area per person

Rf - rotation coefficient

The real carrying capacity (RCC) is determined through correction coefficients:

$$\mathbf{RCC = PCC \times Cf_1 \times Cf_2}$$

In this study, the climatic coefficient amounted to 71.16%.

## Results and Discussion

The empirical implementation of the Cifuentes model - incorporating the measured spatial parameters of the site, the established rotation coefficient and the locally derived climatic correction factor - produced quantitative estimates of both the physical (PCC) and real (RCC) carrying capacity of the Chashma-Ayub mausoleum. The calculations yielded the following results (Table 1).

**Table 1**

**Calculated tourism carrying capacity indicators of the Chashma-Ayub mausoleum**

| Indicator | Value | Unit |
|---|---|---|

| | | |
|---|---|---|
| Physical Carrying Capacity (PCC) | 24,241 | visitors/day |
| Real Carrying Capacity (RCC) | 17,251 | visitors/day |
| Rotation coefficient | 27 | - |

The results indicate that the site is being used at a high intensity. In particular, during the tourist season, the load approaches the normative threshold. This situation gives rise to the following risks, as destruction of architectural monuments; deterioration of the experience of pilgrims/visitors; disruption of the management system.

Therefore, it is necessary to introduce scientifically grounded management measures.

## Conclusion and Recommendations

Based on the results of the study, 17,251 visitors/day was established as the optimal limit for the Chashma-Ayub mausoleum. The following recommendations have been developed:

- Introducing entrance quotas and a booking system;
- Optimizing infrastructure;
- Introducing a digital monitoring system;
- Balancing the seasonal load;
- Strengthening measures for the protection of cultural heritage.

These measures will contribute to the sustainable development of tourism and to the preservation of the site.

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