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ارزیابی ظرفیت برد گردشگری سایت تاریخی ربع رشیدی از منظر بیش‌گردشگری (Overtourism) و کم‌گردشگری (Undertourism)
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Original Research Article

Assessment of the Tourism Carrying Capacity of the Rab' e Rashidi Historical Site from the Perspective of Overtourism and Undertourism*

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Abstract

Problem statement: In recent years, tourism growth in many historical sites and monuments has been accompanied by factors such as overtourism and undertourism, phenomena that can threaten the physical, managerial, and perceptual sustainability of cultural heritage. Despite its outstanding historical value, the Rabʿ e Rashidi historical site in Tabriz, as one of the most prominent complexes of the Ilkhanid period, has often been overlooked within the urban tourism system of Tabriz. Due to the absence of quantitative and spatial analyses concerning visitor distribution patterns, intensity of spatial use, and the tourism carrying capacity, the site has remained under examined in these respects.

Research objective: This study aims to evaluate the tourism carrying capacity of the Rabʿ e Rashidi historical site in Tabriz with the purpose of addressing the imbalance in tourism activity and planning for the reduction of physical degradation of the archaeological complex. The research seeks to answer the following question: Considering contemporary approaches to heritage site tourism, what is the tourism carrying capacity of the Rabʿ e Rashidi historical site in Tabriz?

Research method: This research employs a mixed method strategy, integrating quantitative and qualitative approaches through library studies and field surveys. The study estimates the Limits of Acceptable Change (LAC) and presents results across three primary levels of carrying capacity analysis: Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC).

Conclusion: Findings indicate that this valuable historical site, when physical, environmental, and managerial factors are taken into account, will fall within the range of minimal tourism by 2025. According to the calculated data, of the original 90 hectare area of Rabʿ e Rashidi, currently less than 13 hectares are recoverable, and the site is capable of hosting more than 5,000 visitors per day. However, on average, only about 7 visitors per day have visited the site throughout the year.

Keywords: *Cultural Heritage Tourism, Tourism Carrying Capacity, Overtourism, Undertourism, Rabʿ e Rashidi Historical Site.*

Introduction and Problem Statement

Tourism is widely recognized today as the largest voluntary movement of people in times of peace and as a socially and culturally complex phenomenon. According to the World Tourism Organization, the tourism capacity of a historical setting refers to the number of visitors a destination can accommodate within a specified period without generating unacceptable negative impacts on

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environmental, socio cultural, and economic conditions, as well as on visitors' perceptual and experiential quality (Faraji Rad & Aghajani, 2009). Within this context, Tourism Carrying Capacity (TCC)[1] is considered one of the key concepts in sustainable tourism management, referring to the maximum level of tourist presence that a destination can support. In practice, TCC serves as an applied quantitative technique grounded in sustainability indicators and the Limits of Acceptable Change (LAC)[2] framework, enabling the assessment of physical, real, and effective capacities in heritage settings, while offering a practical basis for their sustainable management (Farhoodi & Shurcheh, 2005). Determining and managing tourism carrying capacity aims to maintain a balance between tourism development and the protection of natural and cultural assets. It is a vital tool for preventing congestion, resource degradation, and declines in the quality of life of host communities. Carrying capacity is typically examined through multiple dimensions, including physical, environmental, socio cultural, economic, and perceptual aspects, each contributing to the improvement of destination management and the long term sustainability of tourism activities (Saveriades, 2000). Importantly, carrying capacity assessment involves more than determining a maximum number of visitors. A comprehensive TCC framework must also identify a minimum level of development required to sustain local communities. The World Tourism Organization defines carrying capacity as "the level of visitor use that an area can accommodate," although many scholars emphasize that the concept is fundamentally ecological, reflecting the relationship between population pressures and the natural environment (Abernethy, 2001). In Buckley's (1999) formulation, tourism carrying capacity refers to "the number of visitors that does not lead to irreversible ecological degradation within an ecosystem, or the maximum level of recreational use, expressed in visitor numbers and activities, that can be sustained without causing unacceptable or irreversible declines in ecological values".

In tourism development planning, two principal components of carrying capacity must be considered: the behavioral component, relating to the quality of visitor experience, and the biophysical component, which concerns the environmental and physical conditions of the destination as influenced by visitor activities (Rezaei & Ghahramanee, 2016). Based on the methodology introduced by the International Union for Conservation of Nature (IUCN), three primary categories of carrying capacity, physical, real, and effective, are typically evaluated for natural and heritage destinations (Pouryazdi & Malekian, 2013). Land use planning processes, particularly within tourism development studies, generally involve two stages. The first is an assessment of existing conditions, including land use types, topography, activity zones, and load distribution. The second stage focuses on analyzing current conditions, forecasting future land use needs, and developing proposed land use maps. This phase involves evaluating constraints (e.g., hazard prone areas, erosion zones, infrastructure buffer zones) and potentials (e.g., scenic viewpoints, suitable slopes, accessible corridors) in relation to the target market, host community, tourist typologies, and environmental capacities, ultimately leading to the identification of the most suitable land use alternatives (Ziyari, 2010).

The historical site examined in this study, located within the urban context of Tabriz and considered one of the most extensive intra urban heritage zones in Iran, remains accessible to the public only during the Nowruz holidays (Fig. 1). Throughout the rest of the year, the site is primarily occupied by archaeological excavations. Consequently, comprehensive analyses related to its tourism carrying capacity have not yet been undertaken. This research seeks to address a fundamental question: Given contemporary approaches to tourism management in heritage sites, what is the tourism carrying capacity of the Rabʿ e Rashidi historical complex in Tabriz? In other words, based on its current physical and managerial conditions, at what level of tourism carrying capacity does Rabʿ e Rashidi presently stand?

Literature Review

Only a limited number of domestic studies have addressed tourism carrying capacity in historical settings. For example, the assessment of the tourism carrying capacity of the Anahita Temple in Kangavar, Kermanshah Province, demonstrated that the current level of tourism

activity at the site is significantly lower than its potential carrying capacity (Farhudi & Shourcheh, 2004). In another study titled "Assessment of Urban Tourism Carrying Capacity and Modeling Sustainable Tourism Cities: The Case of District 12, Tehran", Shabani Fard et al. (2009) evaluated the district's tourism tolerance capacity. Their research employed carrying capacity analysis for tourism development planning and produced spatial maps illustrating the distribution of tourism attractions and facilities within District 12.

Tabibian and et al. (2007), in their study "A Review of Concepts and Methods for Quantitative Estimation of Carrying Capacity in Tourism Development: The Ecological Zone of Abbasabad Valley, Hamadan", identified conceptual challenges surrounding the application of carrying capacity while calculating the physical, real, and effective carrying capacities of the 40 hectare study area. Similarly, Taghizadeh & Azhari (2018), in their research on the tourism attractions of Ardabil and the quantitative estimation of carrying capacity for the Sheikh Safi al Din complex, demonstrated that the site's current level of tourism activity is considerably below its carrying capacity. Furthermore, Pouryazdi & Malekian (2013) estimated the physical, real, and effective carrying capacities of four urban parks in Qom, concluding that managerial capabilities play a critical role in shaping the level of tourism carrying capacity achieved in these parks.

Among international studies on tourism carrying capacity, several notable examples can be cited.

Fig. 1. The Rabʿ e Rashidi Historical Site during the Nowruz Holidays of 2025. Photo: Samineh Nikpour, 2025.

Manning et al. (2002) developed scientific frameworks for estimating the carrying capacity of the visitor attractions on Alcatraz Island. Another study presented a predictive model for determining the maximum daily visitation and its application to tourism management along two rivers in Puerto Rico. In an article titled The Concept of Capacity for Tourism Destination Management: Theory and Application for Venice (Massiani & Santoro, 2012), the authors proposed an alternative method for calculating the carrying capacity of Venice, incorporating indicators such as the number of residents, property owners, tourism facilities and establishments, and the tourist population. Their findings indicated that the current level of urban use exceeds the city's tolerable limits, highlighting the need for various strategies to regulate tourist numbers.

A synthesis of the literature and a comparative review of previous studies reveal that the dominant focus of existing research has been on high density destinations experiencing overtourism. By contrast, undertourism in inner city historical sites, particularly in developing countries, has received far less systematic attention. In many studies, low visitation levels are treated as a neutral or even unproblematic condition, and the implications of undertourism for heritage conservation, financial sustainability, and managerial resilience remain understudied (Brouder, 2017). Rabʿ e Rashidi historical complex exemplifies this research gap. Despite its exceptional historical, scientific, and architectural significance, the site faces persistently low visitation levels along with weaknesses in interpretation and tourism management systems, conditions that place it among destinations characterized by structural undertourism. Although such circumstances may shield the site from the pressures associated with overtourism, their persistence can gradually lead to reduced conservation funding, incremental physical deterioration, and diminished community engagement.

Theoretical Foundations

• The phenomenon of overtourism

"Overtourism" refers to a phenomenon in which the volume or intensity of tourist arrivals at a destination

exceeds its environmental, socio-cultural, infrastructural, or experiential carrying capacities, resulting in significant negative impacts (Goodwin, 2017). Effectively, overtourism emerges when the "success" of a destination, typically defined by a quantitative increase in visitor numbers, transforms into a threat to its long-term sustainability.

Overtourism is a multidimensional phenomenon whose impacts can be examined across several key dimensions:

1. Environmental: Degradation of ecosystems, soil erosion, air and water pollution, and the escalation of solid waste generation (Dodds & Butler, 2019).

2. Socio-cultural: The emergence of tensions between tourists and residents, the loss of cultural authenticity, and the alienation of host communities from their own living environments (Milano et al., 2019a).

3. Economic: The disproportionate concentration of investment, infrastructure, and support policies within the tourism sector can lead to the marginalization or gradual displacement of non-tourism local businesses, such as agriculture, traditional crafts, indigenous services, and small-scale production activities (Brouder, 2017).

Erosion is an inherent natural process affecting all phenomena; however, its mitigation is feasible and essential for extending the lifespan of urban contexts and spaces. To prevent excessive degradation, sustainability must be enhanced through urban restoration. Since restoration increases the durability and longevity of urban spaces, a direct correlation exists between erosion mitigation and sustainability (Habibi & Maghsoudi, 2007). Furthermore, given that sustainable development aims to meet the needs of the present generation without compromising the ability of future generations to meet their own, sustainability is recognized as a dynamic process geared toward enhancing the quality of life for all generations. In this context, sustainable conservation in historical sites seeks to reconcile the preservation of heritage values with contemporary development requirements. Initially, this development paradigm was primarily economic, serving as a basis for urban interventions in European cities such as Bath, Chester, and York. Concurrently, enlightenment initiatives in Europe emerged under various frameworks, including redevelopment, culture-led regeneration, and endogenous development, alongside other innovative approaches to historic urban landscapes (Hassanzadeh & Soltanzadeh, 2016). Economically, these trends have often led to rising property values and rents, as well as the displacement of indigenous businesses in favor of tourism-dependent activities (Koens et al., 2018). From the perspective of tourism experience quality, these challenges manifest as overcrowding, diminishing service quality, and declining visitor satisfaction. Prominent cultural heritage destinations, such as Barcelona, Venice, and Amsterdam (Fig. 2), serve as primary examples of overtourism (Gössling et al., 2018).

Natural destinations, including national parks in the United States and small islands, also suffer from this phenomenon. To manage and mitigate the impacts of overtourism, the following frameworks and strategies have been proposed: 1) Carrying capacity management, involving the establishment and enforcement of

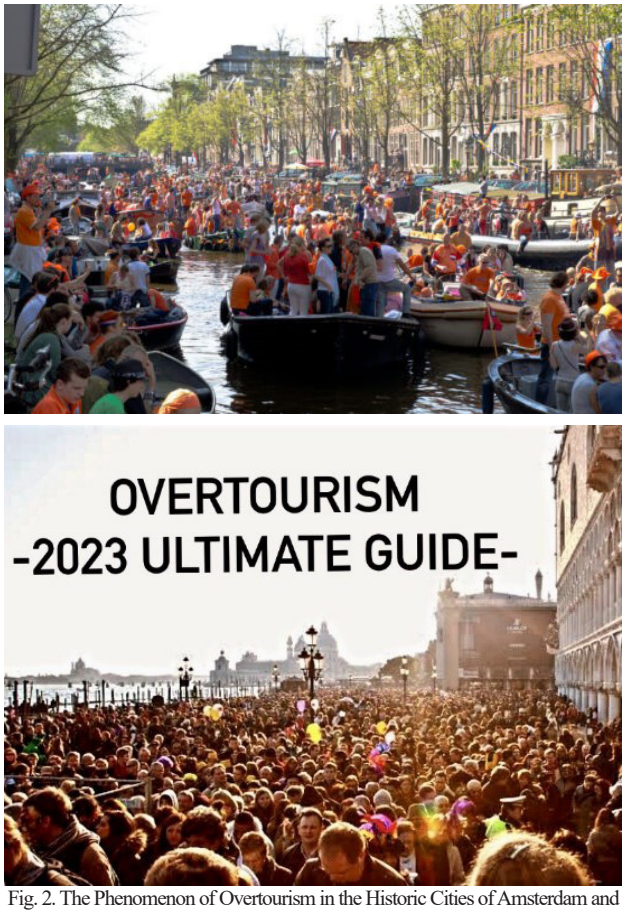

Fig. 2. The Phenomenon of Overtourism in the Historic Cities of Amsterdam and Venice, Italy. Source: Kuenen et al., 2023.

quantitative visitor limits (Coccossis & Mexa, 2004); 2) Spatial tourism planning, including the decentralization of high-density destinations and the geographic redistribution of visitor flows; and 3) Enhancing local community participation in decision-making processes (Milano et al., 2019a).

Since its conversion into a heritage tourism site, the Rabʿ e Rashidi historical complex has consistently faced the challenge of low visitation. Consequently, the following section provides an in-depth examination of the phenomenon of undertourism.

- **The phenomenon of Undertourism**

One of the systemic challenges often faced by historical sites is the issue of limited attractiveness, a problem that demands a thorough analytical approach and innovative, contemporary, and even future-oriented solutions. Motivations such as the pursuit of novelty, belonging, escapism, tranquility, pleasure, stimulation, and self-expression constitute the fundamental psychological forces behind all travel behavior. Studies on tourist typologies reveal that not all travelers are inherently interested in visiting archaeological complexes during their trips; some seek relaxation, others aim for exploration, and only a minority desire rejuvenation (Soydanbay, 2017). In essence, only a portion of museum visitors are genuinely fascinated by historical artifacts, while others perceive the visit as a mere obligation.

Conservation of historical sites encompasses all practical actions and decisions aimed at ensuring the continued vitality of a site. In other words, conservation refers to the process of maintaining a heritage object in its original and natural state, allowing it to meet the present needs of humanity, or, with minimal adaptive modifications, to continue its existence. Conservation is typically pursued to prevent both natural and human-induced deterioration, which may eventually lead to structural collapse. This definition aligns conservation with the notion of continuous renewal, wherein renewal signifies the reshaping and revaluation of urban spaces or ensembles through spatial-physical interventions (Habibi & Maghsoudi, 2007).Undertourism, conversely to the phenomenon of overtourism, refers to a condition in which a tourism destination, despite its considerable potential and available resources, experiences an insufficient number of visitors. Under such circumstances, visitation levels remain significantly below the threshold necessary to generate economic, social, and cultural benefits for the destination. This scenario may result in consequences such as economic stagnation, diminished social investment, and even the abandonment or neglect of certain areas.

Several factors contributing to the formation of undertourism include:

Inadequate Infrastructure: Deficiencies in transportation facilities, limitations in accommodation services, and a scarcity of supporting tourism services are among the factors that can hinder tourist attraction (Sharply & Telfer, 2017).

Marketing and Promotion Deficiencies: The absence of effective marketing strategies or a lack of access to target markets can lead to destinations with high potential remaining unknown (Brouder et al., 2020).

Negative Perception and Reputation: Security concerns, negative media portrayals, or a general lack of public awareness regarding a destination's attractions can impede the development of tourism demand (Avraham & Ketter, 2017).

Lack of Investment: Insufficient financial resources for heritage conservation, infrastructure enhancement, and the improvement of tourism services presents a barrier to sustainable tourism growth (Brouder, 2017).

Undertourism carries various repercussions. One significant consequence of undertourism is economic stagnation and the threat to employment. A reduction in the number of tourists diminishes direct and indirect tourism revenues, creating economic challenges for local businesses. Occupations within the tourism sector, particularly in small communities and rural areas, face the risk of reduction or elimination. Furthermore, decreased tourism income can lead to reduced investment in public services and social infrastructure, ultimately resulting in a decline in the quality of life. Environmental degradation is another potential outcome of undertourism. In some instances, a decrease in tourist presence can lead to the abandonment or reduced

attention towards the conservation of natural and cultural environments (Naqvi et al., 2023).

Notable examples of under-tourism can be observed in lesser-known national parks. Many natural parks, compared to their more renowned counterparts, experience significantly lower visitor levels. Small towns and villages situated off the main tourist routes also frequently grapple with insufficient tourism. Additionally, areas characterized by seasonal tourism witness a sharp decline in visitor numbers during the off-peak seasons (Table 1).

Research Methodology

The methodology of this study is based on a mixed method approach and the tourism carrying capacity assessment framework, applied across three levels of Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective or Managerial Carrying Capacity (ECC) for the Rabʿ e Rashidi Historical Site. In the first step, the Physical Carrying Capacity is estimated using spatial data, boundary and buffer zone maps, access patterns, visitable areas, and visitor dwell time. This estimation is conducted through standard calculations of spatial density and space circulation capacity. In the second step, the Real Carrying Capacity is determined by applying correction factors to the physical capacity based on conservation constraints, infrastructure conditions, managerial capability, archaeological sensitivity, and seasonal–climatic conditions. Subsequently, the Effective Carrying Capacity is assessed through the analysis of institutional indicators, site management performance, the status of destination interpretation and accessibility, and the level of actual tourism demand.Data were collected through analysis of aerial imagery, field observations, and tourism statistics. After calculating the physical, real, and effective levels of tourism carrying capacity, practical strategies for regulating and managing visitor numbers at the Rabʿ e Rashidi Historical Site are ultimately proposed.

Types of Tourism Carrying Capacity

In assessing the tourism carrying capacity of the Rabʿ e Rashidi Historical Site, this study employs multiple complementary components of the carrying capacity framework. The three principal types, Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective or Managerial Carrying Capacity (ECC),

Table 1. Comparison of Undertourism and Overtourism Phenomena. Source: Milano et al., 2019a.

Dimensions of Comparison	Undertourism	Overtourism
Definition	Attracting a very small number of tourists relative to the destination's available capacity and resources.	Receiving an excessively large number of tourists beyond the destination's carrying capacity.
Resources	Underuse or insufficient utilization of natural, cultural, and infrastructural resources.	Excessive pressure on natural, cultural, infrastructural, and social resources.
Economic Impacts	Economic stagnation, reduced income for local businesses, and declines in employment opportunities.	Inflation, rising property prices, and disruptions in the local market.
SocioCultural Impacts	Reduced social investment and the gradual decline of public service infrastructure.	Tensions between tourists and local communities, and the erosion of cultural identity.
Environmental Impacts	Neglect of natural and cultural areas and reduced attention to resource conservation and maintenance.	Ecosystem degradation, pollution, and excessive pressure on environmentally sensitive areas.
Tourist Experience	Limited and incomplete visitor experience due to insufficient services and facilities.	Overcrowding, reduced quality of the visitor experience, and increased tourist dissatisfaction.
Main Contributing Factors	Weak marketing, inadequate infrastructure, negative destination image, and insufficient investment.	Excessive marketing, inadequate capacity management, and unbalanced or uncontrolled tourism growth.
Management and Recommended Policies	Enhancing marketing efforts, improving infrastructure, and diversifying tourism products.	Implementing visitornumber restrictions, managing carrying capacity, and decentralizing tourism flows.
Core Challenge	Activating latent potentials and attracting more visitors to lesserknown destinations.	Controlling and mitigating tourism pressure on local resources and host communities.
Opportunities	Sustainable economic growth, revitalization of local communities, and resource conservation through visitor engagement.	Achieving balanced and sustainable tourism by redistributing visitor flows.
Common Examples	Lesserknown national parks, small towns and villages, and offseason destinations.	Venice, Barcelona, Amsterdam, Dubrovnik.

differ substantially from one another. In tourism studies, the carrying capacity assessment is widely recognized as a key tool for the sustainable management of destinations and is typically conceptualized at these three fundamental levels:

Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC) and Effective or Managerial Carrying Capacity (ECC).

Physical Carrying Capacity (PCC) refers to the maximum number of visitors that can be physically accommodated within a destination during a specified time period, without considering environmental or managerial constraints. This measure serves as the starting point for carrying capacity calculations and is based on quantitative parameters such as the total area of the site and the amount of space allocated per visitor (Skiniti et al., 2024). In contrast, Real Carrying Capacity (RCC) offers a more realistic estimate of the acceptable number of visitors by incorporating environmental, climatic, and infrastructural limitations. In other words, RCC reflects the level of use that a site can tolerate while maintaining ecological integrity and preserving the quality of its cultural and natural resources (Matos et al., 2023).

Finally, the Effective or Managerial Carrying Capacity (ECC) represents the most practical and operational level of assessment. ECC indicates the number of visitors that can be safely and adequately managed under existing administrative conditions while maintaining an acceptable quality of experience and preserving the site's heritage values. Managerial factors, such as the availability of trained personnel, financial resources, the level of conservation, and the adequacy of service infrastructure, play a decisive role in determining this capacity (Aldalbahi, 2025). Understanding the distinctions among these three levels of carrying capacity is crucial for designing effective visitor management policies, developing heritage conservation programs, and preventing challenges associated with both excessive and insufficient tourism activity (Table 2).

Historical and Cultural Significance of Rabʿ e Rashidi

Rabʿ e Rashidi, founded in the early eighth century AH by the eminent Ilkhanid vizier Rashid al Din Fazlallah Hamadani on the outskirts of historical Tabriz, represents one of the most remarkable examples of academic–urban complexes in the medieval Islamic world. Far from being a mere educational center, it functioned as a multi purpose waqf based urban enclave encompassing schools, libraries, a hospital (dār al shifāʾ), workshops, and residential quarters for scholars and students. The entire complex operated within a highly organized administrative framework. Historical documents and waqf deeds indicate that Rabʿ e Rashidi was established as a knowledge driven institution with educational,

Table 2. Comparative Assessment of Physical, Real, and Effective Tourism Carrying Capacities. Source: Coccossis & Mexa, 2004.

Feature/ Criterion	Physical Carrying Capacity (PCC)	Real Carrying Capacity (RCC)	Effective/ Managerial Carrying Capacity (ECC)
Definition	The maximum number of visitors that can physically be present at a site at the same time	Number of visitors that can be accommodated within the environmental, climatic, and infrastructural constraints	Number of visitors that can be sustainably and safely managed under existing managerial and protective conditions
Approach	Quantitative (physical and spatial)	Ecological–infrastructural	Managerial–organizational–social
Key Influencing Factors	Site area, space required per visitor, average visit duration	Climatic conditions, infrastructure quality, and environmental sensitivity	Managerial capacity, number of staff, level of conservation, financial resources
Practical Objective	Calculate the initial maximum capacity based on physical space	Adjust the initial capacity according to real environmental conditions	Determine the final operational capacity manageable by the responsible authorities
Nature of the Resulting Value	Maximum	Adjusted	Optimal
Types of Constraints Considered	No constraints (space only)	Environmental and infrastructural constraints	Managerial and social constraints
Application in Tourism Planning	Starting point for carrying capacity calculations	Providing a more realistic estimate of permissible visitation	Determining the operational capacity for sustainable tourism management
Risks if ignored	Overcrowding and physical stress on the site	Environmental degradation and infrastructure damage	Visitor dissatisfaction, managerial failure, and decline in experience quality

research, and social functions financed through endowed resources, and that it played a pivotal role, aligned with the Ilkhanid cultural policies, in the production, translation, and dissemination of knowledge across regions. Consequently, some scholars have identified it as one of the earliest prototypes of a "knowledge city" in the history of Islamic civilization (Tajik et al., 2025).

From historical, cultural, and social perspectives, Rabʿ e Rashidi holds exceptional value as an institutional infrastructure that facilitated scholarly exchange, fostered cultural capital, and reinforced the urban identity of Tabriz during the Ilkhanid era. By attracting scholars, scribes, and artisans from diverse regions, the complex became a hub for cross cultural interaction and scientific development, while its waqf based administrative system provided a sustainable model for cultural governance and the financial support of educational institutions. Its social importance is also reflected in its deep integration into the urban and economic context of Tabriz, where it functioned as an academic–social pole contributing to the city's prominence as one of the major cultural centers of the Islamic world (Melville, 2012).Contemporary studies likewise highlight the outstanding value of this site as a unique scientific–historical heritage complex requiring sustained preservation and management, particularly given that its surviving remnants represent one of the most sophisticated educational and waqf institutions in the history of Iran and the broader Islamic world. Rabʿ e Rashidi embodies a historical moment in which Iran was not merely a consumer of knowledge but an active center for its production, organization, and dissemination. Recontextualizing this legacy for contemporary Iranian audiences plays a crucial role in strengthening historical identity, enhancing cultural self awareness, and reconnecting present day society with the intellectual and architectural heritage of their land.

Current Status of Tourism Activity at the Rabʿ e Rashidi

Until recent years, tourism activity at the Rabʿ e Rashidi archaeological site was largely limited to the Nowruz holidays. According to field reports, due to the ongoing archaeological excavations over the past two decades, public access to the interior of the site has remained prohibited during the rest of the year. As admission to the site is free of charge and no electronic visitor counting system is installed, estimating the number of visitors relied on two sources: (1) the aggregated statistics released by the Cultural Heritage Administration for the Nowruz period, and (2) field observations and manual visitor count conducted during selected time intervals. The authors, as on site resident researchers during Nowruz 1404 (March 2025), carried out a complete tally of visitors.

Since 2017 (1396 SH), the construction of visitor infrastructure and circulation paths has been undertaken with the primary aim of preventing damage to the subsurface archaeological layers of Rabʿ e Rashidi (۳۷ میلیارد تومان..., 2020), and this process has continued to the present. For example, a designated wooden walkway for visitors was established, and the renovation and completion of several routes continued until August 2022 (Mordad 1401), after which new pathways facilitating access to different parts of the site were opened to the public.

One of the main constraints on visitation is the simultaneous operation of conservation and excavation workshops in several sections of the site. Consequently, current tourism activity has a research oriented character, and public visits are permitted only in areas where conservation work has been completed. Additionally, given the presence of the tile and ceramic repository in the western sector of the archaeological complex, entry to that area is strictly prohibited and is considered one of the major limitations on visitor circulation.

Regarding tourism development plans, several proposals have been formulated, including the creation of a landscaped park, a parking facility for group tours, temporary visitor amenities, and nighttime lighting and beautification schemes, all designed to avoid any impact on the site's underground structures. Implementation of these plans is contingent upon the availability of stable and sufficient funding.

Analysis of Tourist Accessible Areas within the Historical Site of Rabʿ e Rashidi

The Rabʿ e Rashidi complex, which dates back to the Ilkhanid period (approximately 800 years ago), is today

largely buried beneath the ground surface. Except for several archaeological test trenches (Fig. 3), limited excavation areas, and the 2019 geophysical survey map, the original structures are not directly visible. The areas currently accessible to visitors on the archaeological site can be classified into three categories: (1) archaeological test trenches that lead toward the historical remains, (2) visible historical structures located on the surface of the site, and (3) contemporary built masses and added architectural forms. Additionally, key points were grouped and connected based on their elevation levels and spatial proximity, forming coherent visitor circulation routes.

As illustrated in Fig. 4, the tourist accessible zones over the archaeological site have been divided into four sections:

• Zone 1: The northern area of the archaeological site, including the Rashidiyya Citadel.

• Zone 2: The area surrounding the large southern tower.

• Zone 3: The restricted zone allocated to the tile and ceramic repository.

• Zone 4: The area adjacent to the main access route.

Based on the estimated length of the visitor pathways marked by lighting installations across the Rabʿ e Rashidi site, a total of approximately 2,900 meters of visitable routes were identified (Table 3).

The original extent of the Rabʿ e Rashidi complex, according to historical documents, exceeded 90 hectares. However, at present, only about 13 hectares of the site possess the potential for rehabilitation and development. The interventions undertaken include the conservation and organization of the historical precinct, the construction of visitor pathways compatible with the archaeological site, the installation of directional and interpretive signage, and structural stabilization studies for the surrounding towers. These efforts aim to facilitate tourist visitation and to restore the scientific and cultural significance of Rabʿ e Rashidi.

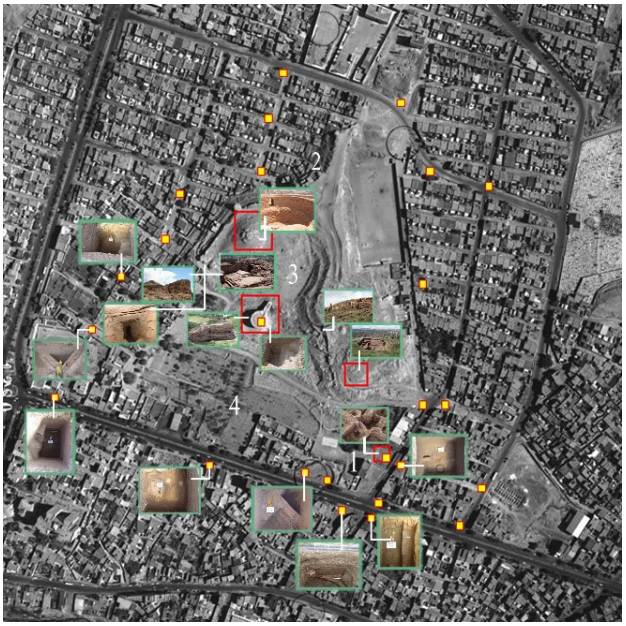

Fig. 3. Test trenches leading to the historical structure within the historical site of Rabʿ e Rashidi. Source: Authors.

Based on field observations, an average of 200 visitors per day have toured the historical site. Considering the 13 day holiday period during which visits are permitted, this equates to approximately 2,600 visitors per year.

Findings and Discussion

• Assessment of the Tourism Carrying Capacity of the Rabʿ e Rashidi Historical Site

Each tourist destination possesses its own specific characteristics and indicators. For example, sustainability indicators in a coastal area differ significantly from those of a historical site or from urban and rural areas, and each tourism destination requires its own particular priorities. Therefore, by employing quantitative techniques and modeling approaches that are more appropriate and aligned with the realities of tourism activities in each specific location, it is possible to take steps toward making tourism sustainability models more practical and applicable. Based on internationally standardized formulas for Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC), the maximum number of visitors, considering limiting coefficients such as managerial factors, environmental factors, and others, will be estimated for the historical site of Rab'e Rashidi (Coccossis & Mexa, 2004).

Physical Carrying Capacity (PCC) = (A / B) × R

Recoverable area (A): According to reports, out of the more than 90 hectares of the original area of Rab'e Rashidi, currently less than 13 hectares are recoverable.

Required space per tourist (B): According to tourism standards for archaeological sites, it is usually considered between 2 and 4 square meters. Visitor rotation factor

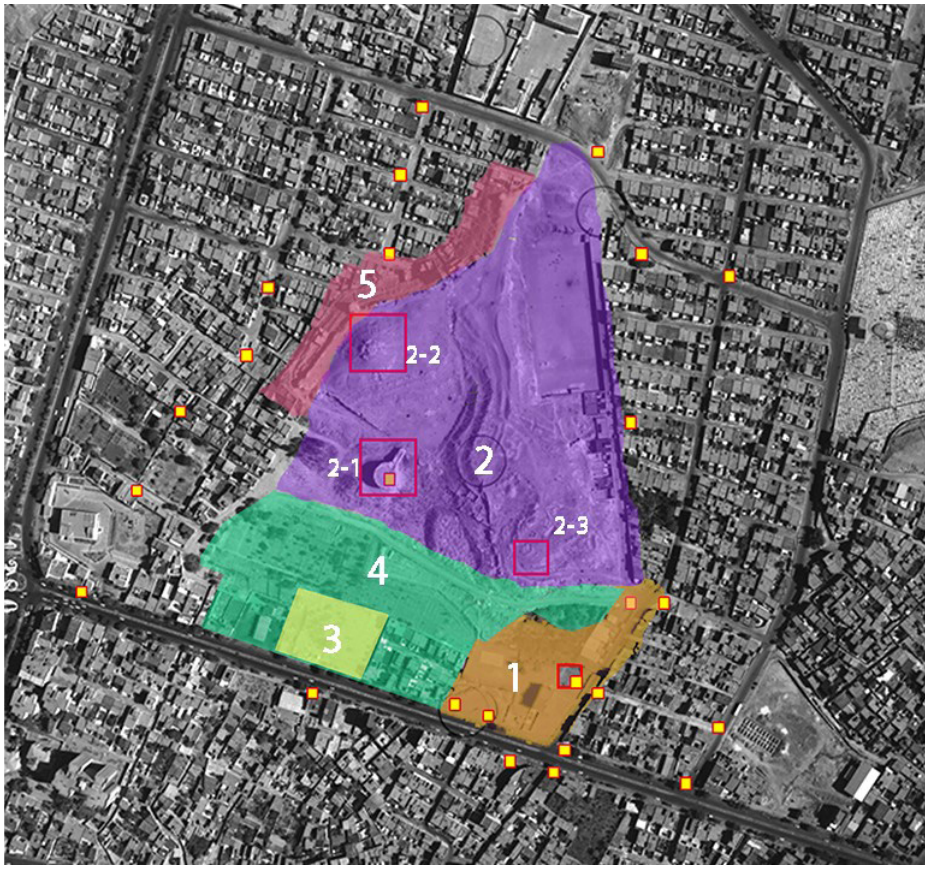

Fig. 4. Map of the Core and Buffer Zones, Tourist Areas, and Visitor Routes across the Archaeological Site of Rab' e Rashidi. Source: Authors.

Table 3. Length and Estimated Time Required for Visiting the Tourist Routes of the Rab' e Rashidi Site. Source: Authors .

Route Name Approximate Length Estimated Visiting Time	Route Name Approximate Length Estimated Visiting Time	Route Name Approximate Length Estimated Visiting Time
1. Saqāyeh Courtyard Route (Ochre Color)	Approximately 500 meters	10–15 minutes
2. Rashidiyya Citadel Route (Purple Color)	Approximately 1,250 meters	30–40 minutes
3. Southern Area Including the Tile and Ceramic Repository (Light Green)	Approximately 500 meters	15–20 minutes
4. Main Access and Collective Area Route (Dark Green)	Approximately 690 meters	30–40 minutes
5. Exterior Viewing Route toward the Preserved Towers and Ramparts (Pink)	Approximately 200 meters	10–15 minutes

(R): Depending on visiting hours and the average duration of each visitor's stay, this coefficient can be considered between 3 and 5.

Assuming A = 13 hectares, B = 3 square meters (average), and R = 4 (average):

$PCC = 130{,}000 \times (1 / 3) \times 4 = 173{,}333$ visitors per day.

This figure represents the theoretical capacity and, in practice, it must be adjusted by considering managerial, environmental, and conservation factors. Since the Real Carrying Capacity (RCC) and the Effective Carrying Capacity (ECC), which take into account environmental and managerial limitations, will be lower than PCC, determining these capacities more accurately requires more detailed data, including visiting hours, existing infrastructure, and management programs (Zacarias et al., 2011).

$Real\ Carrying\ Capacity\ (RCC) = PCC \times (1 - \sum CF_x)$

In this equation, the previously calculated Physical Carrying Capacity (PCC) is adjusted using correction factors (CF_x) such as environmental, managerial, and social factors. To determine RCC more precisely, field data and specialized studies on the specific limiting factors of Rab'-e Rashidi are required. This calculation helps tourism managers determine the optimal number of visitors and prevent the degradation of cultural and natural resources (Matos et al., 2023).

Limiting factors (CF_x): This coefficient accounts for the influence of factors such as weather conditions,

seasonal restrictions, visiting hours, and other environmental variables. In other words, CF_x represents the percentage impact of each limiting factor on the Physical Carrying Capacity. These factors may include:

• Environmental factors: such as soil erosion, land slope, or natural hazards

• Managerial factors: such as insufficient staff or inadequate infrastructure

• Social factors: such as overcrowding or conflicts with local communities (Coccossis & Mexa, 2004).

CFx=1−Lm\Tm

• Lm — the actual value of the limiting factor (e.g., hours during which the site is closed, the percentage of unusable land, or the number of rainy days).

• Tm — the total or maximum possible value for the same parameter.

• CF_x — the correction factor representing the degree to which the carrying capacity is reduced due to that specific factor. In summary, the greater the limitation, the smaller the value of CF_x becomes, leading to a reduction in the real carrying capacity.

Proposed coefficients based on the current conditions of Rab'-e Rashidi in Tabriz:

• Weather (CF_weather) ≈ 0.849 — approximately 55 unsuitable days per year

• Slope/terrain irregularity (CF_slope) = 0.90 — 10% of the area is unusable

• Erosion / natural risk (CF_erosion) = 0.95 — 5% periodic limitation

• Visiting hours (CF_hours) = 0.667 — 8 hours available within a 12-hour daytime period

• Human resources (CF_staff) = 0.80 — 80% of the optimal staffing level

• Infrastructure/ services (CF_facilities) = 0.85

• Social crowding (CF_crowding) = 0.75

• Community sensitivity/ local considerations (CF_community) = 0.95

Practical formula:

RCC = PCC × CF_total

Total correction factor (CF_total) = product of all coefficients ≈ 0.235.

For example, if the correction factor is considered to be 0.2, the Real Carrying Capacity of Rab'-e Rashidi is calculated as follows:

RCC = 173,333 × 0.2 = 34,666 visitors per day.

However, considering that the archaeological site of Rab'-e Rashidi is currently accessible only during the Nowruz holidays, the effective value becomes significantly lower. Since the holiday period accounts for approximately 1/30 of the year, the correction factor decreases to less than 0.006, which corresponds to roughly 1,000 visitors per year. This situation places Rab'e Rashidi within the category of minimal tourism activity.

Effective Carrying Capacity (ECC) = RCC × MC

In this equation, RCC represents the Real Carrying Capacity, while MC refers to the management coefficient, which reflects the capacity of management and the availability of existing infrastructure (Zacarias et al., 2011).

- Assessing the Management Capacity Coefficient (MC)

The management capacity coefficient is calculated by considering various factors such as infrastructure, facilities and equipment, human resources, and budget. One of the common methods for calculating MC is as follows: MC = (amc / imc) × 100%

Where: amc represents the number of existing staff and available managerial resources and imc represents the ideal number of staff and managerial resources required for effective site management.

This formula indicates that if the available managerial resources are lower than the ideal level, the MC coefficient will be less than 1, and consequently, the Effective Carrying Capacity (ECC) will decrease (Sayan & Atik, 2011).

Assuming: RCC = 34,000 visitors per day (calculated by considering environmental and managerial factors), amc = 3 existing managerial staff, and imc = 20 required managerial staff, the calculation would be:

ECC = 34,000 × 0.15 = 5,100 visitors per day.

This means that with the current managerial resources, a maximum of 5,100 visitors per day can visit the Rab'-e Rashidi complex without negatively affecting the quality of the visitor experience or the preservation and maintenance of the site.

Considering the globally recognized frameworks in the management of archaeological sites and the protection of endangered heritage, it becomes evident how far the Rab'-e Rashidi site is from the standards observed in many historical sites around the world. Among the key aspects that require attention today regarding Rab'-e Rashidi in Tabriz are the provision of adequate funding, appropriate equipment, sufficient managerial personnel, and suitable infrastructure.

Conclusion

An assessment of the current state of tourism activity within the historical fabric of Rabʿ-e Rashidi indicates that the existing level of visitation is significantly lower than its carrying capacity. The Rabʿ-e Rashidi archaeological complex, one of Iran's most valuable cultural heritage sites and a symbol of intellectual and artistic flourishing during the Ilkhanid era, faces multifaceted challenges in tourism management. On the one hand, the absence of effective planning and adequate infrastructure has resulted in the site receiving far less attention from tourists than its actual potential would allow. On the other hand, any sudden increase in visitor flows, without scientific and managerial considerations, would expose this fragile site to overtourism and irreversible damage. In this context, the three-tiered assessment of tourism carrying capacity, Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC), provides an efficient framework for the sustainable management of visitors at Rabʿ-e Rashidi.

Among the most important research conducted on tourism carrying capacity are studies focusing on the archaeological sites of Pompeii in Italy and Machu Picchu in Peru. These two sites are prominent examples of overtourism within World Heritage destinations, a phenomenon that has led to physical erosion of structures, pressure on conservation systems, and socio-economic impacts on local communities (Milano et al., 2019a). In the case of Pompeii, the central issue is not merely the high number of visitors but rather the structural mismatch between physical carrying capacity and real carrying capacity. In other words, the physical capacity of the site has not aligned with institutional capability, protective infrastructure, or monitoring and control systems, an imbalance that has intensified the site's vulnerability. In contrast, at Machu Picchu, beyond physical pressures, the effective carrying capacity within the socio-economic dimension has become a critical challenge. Tensions between preservation requirements, the local community's economic dependence on tourism, and national tourism development policies have complicated efforts toward the site's sustainable management (Sharpley, 2020).

These examples illustrate that the concept of tourism carrying capacity has often been applied reactively—after overtourism has already emerged. As a result, historically under-visited sites (such as Rabʿ-e Rashidi) have received limited systematic attention in the existing literature. From this perspective, assessing carrying capacity under conditions of undertourism is not only a preventive measure against future overtourism but also a mechanism for designing balanced development pathways, strengthening sustainable conservation, and avoiding degradation caused by managerial neglect.

For the sustainable management of tourism at the Rabʿ-e Rashidi archaeological site, it is recommended that an integrated model based on continuous monitoring and assessment of carrying capacity at three levels, PCC, RCC, and ECC, be developed and implemented. This model should include defining a maximum allowable daily visitation, scheduling visiting hours, promoting nighttime tourism, employing smart technologies for monitoring visitor flows, and ensuring active participation of the local community in tourism management. Moreover, improving protective and service infrastructure and strengthening human resources will play a crucial role in the model's success. Such an approach can ensure a balance between preserving the heritage values of Rabʿ-e Rashidi and enhancing the quality of the visitor experience, thereby preventing problems arising from both excessive and insufficient tourism activity.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Endnotes

1. Tourism Carrying Capacity
2. Limits of Acceptable Changes

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