



## Aspects of harmony of the built environment in Petra, Jordan

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### ABSTRACT:

This paper delves into the aspects of harmony of the built environment in Petra, Jordan. The ancient city of Petra demonstrates a profound harmony between the built environment and the natural landscape, making it an exemplary model for sustainable urban design. This study examines the key aspects of this harmony, focusing on architectural integration, cultural symbolism, environmental adaptation, and aesthetic considerations. Petra's iconic rock-cut architecture seamlessly blends with the surrounding sandstone cliffs, utilizing natural features to create stable and visually cohesive structures. The sophisticated water management systems reflect the Nabataeans' adaptation to the arid desert climate, showcasing an innovative approach to resource sustainability. Additionally, the city's diverse architectural influences, combining Nabataean, Hellenistic, and Roman elements, reflect cultural adaptability and a deep respect for the natural context. Together, these aspects highlight how Petra's builders achieved a remarkable balance between human creativity and environmental sensitivity, offering enduring lessons in the design of harmonious built environments.

### KEYWORDS:

cultural harmony; symbolism; sustainable design; environmental adaptation; visual harmony; aesthetic harmony; spatial planning; urban layout; integration with natural landscape

## 1. Introduction

Petra, known as the "Rose City" due to its distinctive pink sandstone cliffs, is an ancient Nabataean city located in southern Jordan. Renowned for its impressive rock-cut architecture, Petra is a UNESCO World Heritage Site and one of the New Seven Wonders of the World. Built over two millennia ago, the city exemplifies a unique harmony between its built environment and the natural landscape. The Nabataeans, the skilled builders of Petra, utilized the region's rugged terrain, carving monumental structures directly into the cliffs and ingeniously incorporating natural features into their architectural designs. This integration is evident in the city's complex system of paths, temples, tombs, and residences, which blend seamlessly with the surrounding geology. Moreover, the city's advanced water management system demonstrates a deep understanding of the arid desert environment, enabling the Nabataeans to sustain a thriving urban settlement despite the harsh climate. By exploring the aspects of architectural integration, environmental adaptation, and cultural symbolism, this study aims to highlight the ways in which Petra's built environment achieved a remarkable balance with its natural surroundings, making it a timeless example of sustainable and context-sensitive urban design [1, 2].

## 2. Integration with the natural landscape

**Rock-Cut Architecture:** One of Petra's most iconic features is its rock-cut architecture, where entire buildings, tombs, and temples are carved directly into the rose-red sandstone cliffs (Fig. 1).

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This technique harmonizes the structures with the natural color, texture, and shape of the rock, making them appear as extensions of the landscape rather than foreign additions [3].



**Fig. 1.** Deferent types of rock-cut façade formation in Petra (After haddad, 2013)  
<http://www.plan27.it/en/portfolio/khasneh-al-faroun/>

**Utilization of Topography:** Petra's architects skillfully used the natural topography of the rugged terrain. The city is nestled within a series of narrow gorges (like the Siq), which provided natural protection and a dramatic entrance. Structures are often built in natural alcoves, enhancing their stability and blending them with the surrounding cliffs [4].

### 3. Cultural harmony and symbolism

**Design Reflecting Nabataean Culture:** The architectural style of Petra is a blend of Nabataean, Hellenistic, and Roman influences, reflecting the city's role as a crossroads of cultures. This eclectic mix symbolizes the Nabataeans' openness and adaptability, harmonizing foreign styles with local traditions [5].

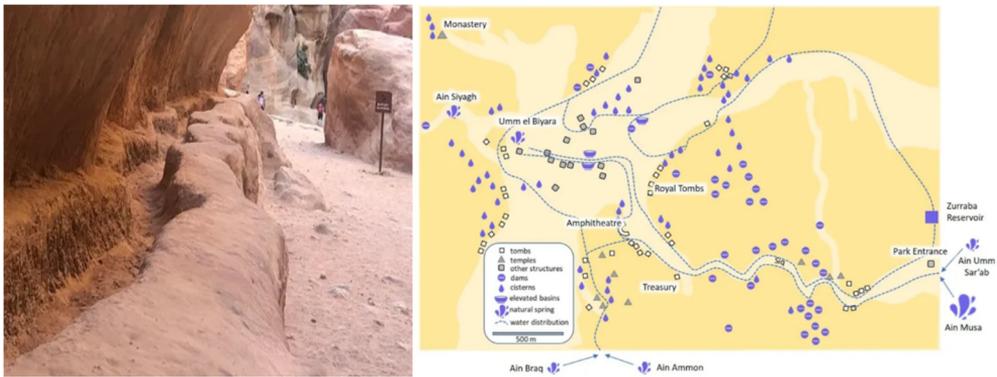


**Fig. 2.** View of Al-Siq and Al-Khazneh (Wikimedia by Jorge Láscar, 7 September 2012)  
[https://commons.wikimedia.org/wiki/Category:Al-Siq\\_\(Petra\)#](https://commons.wikimedia.org/wiki/Category:Al-Siq_(Petra)#)

**Religious Integration:** Many structures in Petra, such as the Treasury (Al-Khazneh) and the Monastery (Ad-Deir), are thought to have religious or ceremonial functions. Their monumental scale and grand façades blend the sacred with the natural, creating a spiritual harmony between the divine and the earthly landscape (Fig. 2) [6].

#### 4. Sustainable design and environmental adaptation

**Water Management Systems:** Petra's location in a desert required sophisticated water management, demonstrating harmony with the harsh environment. The Nabataeans developed intricate systems of channels, dams, and cisterns to collect, store, and distribute water. This sustainable approach not only ensured the city's survival but also allowed for agriculture and urban growth (Fig. 3) [7].



**Fig. 3.** Petra site features and water distribution systems by Dave Slaght (<https://traveltalesoflife.com/petra-water-system/>)

**Climate Adaptation:** The structures were designed to mitigate the extreme temperatures of the region. The use of rock-cut architecture provided natural insulation, keeping interiors cooler during the day and warmer at night [8].

#### 5. Visual and aesthetic harmony

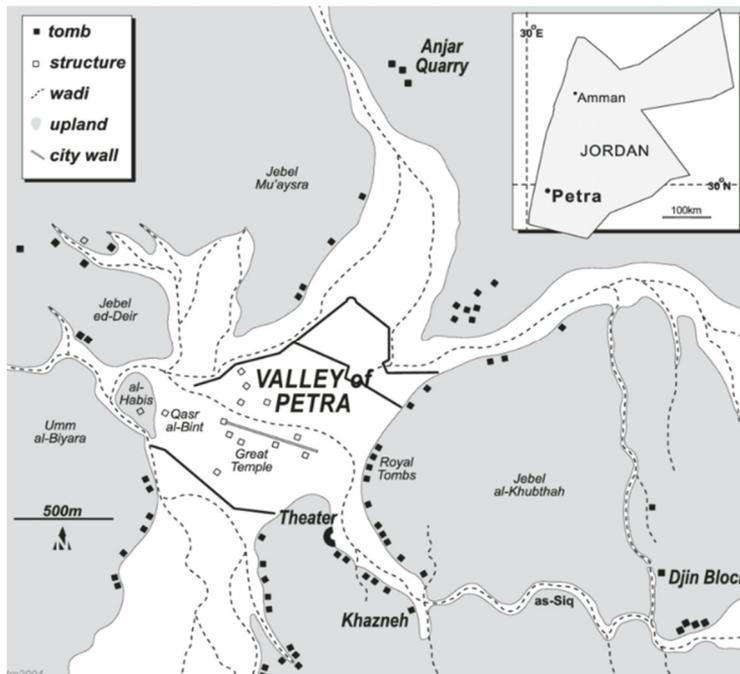
**Façade Design and Symmetry:** The façades of Petra's monuments, such as the Treasury and the Royal Tombs, feature highly detailed carvings with symmetrical designs that align well with the vertical and horizontal lines of the cliffs. This symmetry enhances the visual harmony and emphasizes the grandeur of the natural rock faces [4].

**Color Palette:** The use of local sandstone with its varying shades of pink, red, and yellow creates a cohesive color palette. As the sun changes position throughout the day, the structures take on different hues, enhancing their integration with the environment [3].

#### 6. Spatial planning and urban layout

**Functional Zoning:** Petra's layout reflects a thoughtful division of space. The residential areas, religious structures, and marketplaces are distributed in a way that respects the natural landscape. The city's core, near the Siq and the valley floor, was designed for maximum accessibility, while sacred and ceremonial sites were placed at higher elevations, enhancing their spiritual significance [6].

**Pathways and Circulation:** The pathways within Petra, such as the Siq, are naturally formed canyons that guide visitors through the landscape. This use of existing features minimized environmental disruption and created a dramatic experience for those entering the city (Fig. 4) [9].



**Fig. 4.** Map of the Valley of Petra, Jordan by Thomas R. Paradise  
 ([https://www.researchgate.net/figure/Map-of-the-Valley-of-Petra-Jordan\\_fig10\\_285265200](https://www.researchgate.net/figure/Map-of-the-Valley-of-Petra-Jordan_fig10_285265200))

## 7. Conclusions

The ancient city of Petra stands as a testament to the ingenuity and foresight of the Nabataeans, who created a built environment that is remarkably harmonious with its natural setting. The city's rock-cut architecture, which merges seamlessly with the rugged landscape, highlights a sophisticated understanding of geology and aesthetics. Rather than imposing their structures on the environment, the Nabataeans chose to carve their temples, tombs, and residences directly into the sandstone cliffs, making full use of the natural contours and colors of the landscape. This approach not only provided stability and insulation but also ensured that the buildings complemented the surrounding scenery, enhancing the visual unity of the city.

Culturally, Petra embodies a blend of influences from various civilizations, including Nabataean, Hellenistic, and Roman elements, reflecting its historical role as a major trade hub connecting the Arabian Peninsula with the Mediterranean world. The eclectic architectural styles found throughout Petra demonstrate the Nabataeans' adaptability and openness to external ideas, while still maintaining a distinct local character that is tied to the landscape. The grandeur of structures like Al-Khazneh (the Treasury) and Ad-Deir (the Monastery) not only impresses visitors with their scale and craftsmanship but also serves as a cultural bridge between the Nabataean heritage and the wider ancient world.

In essence, Petra's harmonious design exemplifies a sustainable and context-sensitive approach to urban development, offering valuable lessons for modern architects and city planners. By respecting the natural topography, adapting to environmental constraints, and incorporating diverse cultural elements, the Nabataeans created a city that was both functional and aesthetically cohesive. Today, Petra's enduring beauty and historical significance continues to captivate millions of visitors, standing as a symbol of the timeless relationship between human creativity and the natural world. This harmony is a key factor in Petra's designation as a UNESCO World

Heritage Site and its recognition as one of the New Seven Wonders of the World, ensuring its legacy as a masterpiece of ancient urban design.

## References

- [1] UNESCO World Heritage Site, Petra 2024.
- [2] Royal Jordanian Geographic Society, Exploring Petra, The Hidden City, Amman 2019.
- [3] Markoe G., Petra and the Nabataean Civilization, Thames & Hudson, New York 2003.
- [4] Auge C., Dentzer J.-M., Petra, The Rose-Red City, Harry N. Abrams, New York 2001.
- [5] Tait J.W., The Architecture of Petra, University of London, Institute of Archaeology, London 2006.
- [6] Clarke J., Roman and Nabataean architecture in Petra. Cultural synthesis and urban development, *The Journal of Roman Archaeology* 2008, 21, 85-102.
- [7] Kennedy D., Water management and hydrology of Petra, *Antiquity* 2012, 86(333), 337-351.
- [8] Kromer M.T.L., *The Nabataean Culture: Between the Desert and the Mediterranean*, Archaeopress, Oxford 2007.
- [9] Kennedy D., Zayadine F., Petra's water systems ancient hydrology in a desert city, *Antiquity* 2002, 76(291), 291-305.

## Aspekty harmonii środowiska budowlanego w Petrze, Jordania

### STRESZCZENIE:

Artykuł dotyczy aspektów harmonii środowiska zbudowanego w Petrze w Jordanii, starożytnym mieście, które prezentuje głęboką harmonię między środowiskiem zabudowanym a naturalnym krajobrazem, co czyni je wzorcowym modelem zrównoważonego projektowania urbanistycznego. W badaniach przeprowadzono analizę kluczowych aspektów tej harmonii, koncentrując się na integracji architektonicznej, symbolice kulturowej, adaptacji środowiskowej i względach estetycznych. Architektura wykutej w skale świątyni Petry płynnie łączy się z otaczającymi ją stromymi zboczami piaskowca, wykorzystując naturalne cechy do tworzenia stabilnych i spójnych wizualnie konstrukcji. Zaawansowane systemy gospodarki wodnej odzwierciedlają adaptację Nabatejczyków do suchego klimatu pustynnego, prezentując innowacyjne podejście do zrównoważonego rozwoju zasobów naturalnych. Ponadto różnorodne wpływy architektoniczne miasta, łączące elementy nabatejskie, hellenistyczne i rzymskie, odzwierciedlają zdolność adaptacji kulturowej i głęboki szacunek dla środowiska naturalnego. Wszystkie te aspekty pokazują, w jaki sposób budowniczowie Petry osiągnęli niezwykłą równowagę między ludzką kreatywnością a wrażliwością na środowisko naturalne, dając nieprzemijającą lekcję projektowania harmonijnych środowisk budowlanych.

### SŁOWA KLUCZOWE:

harmonia kulturowa; symbolika; zrównoważone projektowanie; adaptacja do środowiska; harmonia wizualna; harmonia estetyczna; planowanie przestrzenne; układ urbanistyczny; integracja z naturalnym krajobrazem