
A Comparative Analysis of Natural Ecological Substrate Characteristics versus Trade-Communication Routes in Shaping the Historical Street Network of Kashan

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Extended Abstract

Introduction

The street network of the historic core of Kashan exhibits a complex and organic structure shaped through the gradual evolution of the urban fabric in close adaptation to its environmental setting. At the same time, numerous historical sources emphasize Kashan's strategic position along major north–south and east–west trade corridors, connecting Ray to Isfahan and Baghdad to Khorasan and Herat. This study investigates the relative influence of ecosystem-based adaptation and major trade routes on the formation and organization of Kashan's historic urban pathways. Evidence from the region's settlement history indicates that habitable conditions emerged through the interaction of western mountain ranges, low-lying alluvial plains, and the margins of the Central Iranian Desert. Moreover, the spatial distribution of ancient mounds, fortifications, settlements, and villages corresponds closely with springs, water depressions, and underground water channels. By tracing successive stages of urban growth, the study analyzes the evolution of Kashan's street network in relation to both environmental determinants and trade–communication routes.

Materials and Methods

This study adopts a descriptive, historical, and analytical research design grounded in an interpretive–historical approach. Given that the continued use of circulation routes often preserves the traces of former urban structures and land subdivisions, even after the disappearance of the original built fabric, the first stage of data collection consisted of an exploratory survey of all pathways within the study area, accompanied by systematic field observations.

The study area encompassed the urban extent of Kashan up to the late Qajar period and included a wide range of movement and circulation spaces within the historic city—such as streets, alleys, cul-de-sacs, the bazaar, local marketplaces, urban openings, mosque courtyards, shrine precincts, and building entrance spaces. In addition, the spatial locations of historic mosques, shrines, marketplaces, and water reservoirs situated along or adjacent to these routes were mapped in order to identify former residential clusters and urban nuclei. Throughout the field survey, analytical notes and observational records were systematically documented.

Field-based findings were subsequently compared with historical evidence concerning the formation and expansion of settlements in Kashan, as well as with historical maps and aerial imagery, which served as complementary sources of data. Concurrently, historical and archaeological studies were reviewed to examine Kashan's position within major trade routes and communication networks. The integration of these datasets enabled a comparative assessment of the relative influence of ecosystem-based adaptation and major trade routes on the configuration, orientation, and evolution of the street network and historic urban pathways of Kashan.

Research Findings

Analysis of Kashan's urban evolution indicated that the city expanded gradually from the west and southwest toward the east and northeast during successive historical periods. The earliest settlement nuclei were located in the northern part of the historic core of Kashan, while later developments emerged around these nuclei and progressively extended outward. Historical evidence and field observations suggested that settlement and agricultural activities in the Kashan Plain were historically organized around independent residential clusters and fortified compounds closely associated with local water resources. Traces preserved within the street network revealed curvilinear routes that appeared to correspond to the boundaries of former settlement nuclei and residential territories.

The natural setting of the Kashan Plain played a significant role in shaping this pattern. Situated between the western mountain ranges and the Central Iranian Desert, the plain functions as a basin where surface and subsurface water flows converge. Geological and hydrological studies similarly related settlement distribution to access to the water resources within low-lying alluvial areas. Field observations identified changes in elevation, slopes, depressions, stepped alleys, winding streets, and, in some cases, two-level passageways as distinctive features of Kashan's historic urban pathways. These characteristics indicated a strong adaptation of the circulation structure to local topography and groundwater accessibility, reflecting a long-term process of ecosystem-based adaptation.

Kashan also had a strategic position along major trade routes connecting northern and southern Iran as well as western and eastern regions of the Iranian Plateau. Historical sources identified the Ray–Isfahan corridor as one of the most important communication axes passing through the city. However, comparison between the orientation of these routes and the direction of urban growth revealed that the dominant alignment of the street network corresponded more closely to the natural slope of the terrain and the southwest–northeast direction of groundwater flow than to the north–south communication corridor.

The findings further demonstrated that Kashan did not develop linearly along a single transportation route. Rather, its growth was based on a series of interconnected settlement nuclei that gradually expanded and merged over time. Overall, both environmental conditions and major trade routes influenced the organization of the city. Nevertheless,

topography, land slope, prevailing winds, and access to groundwater appeared to have exerted the primary influence on the form and the orientation of the historic street network, while regional communication routes played a secondary but still significant role. The coexistence of two dominant orthogonal orientations within the urban fabric provided evidence of the interaction between these two formative forces.

Conclusion

The street network of the historic core of Kashan does not reflect a predetermined geometric plan; rather, it is the outcome of a long-term interaction between human settlement and the environmental conditions of the region. Curvilinear pathways, variations in street gradients, and a spatial structure, organized around settlement nuclei, and fortified residential–agricultural compounds demonstrate a gradual adaptation to topography, water resources, and the requirements of living in an arid environment. Although Kashan has a strategic position along major trade routes, these routes have become integrated into the pre-existing urban structure and adapted to its organic configuration. The findings indicated that two principal orientations were present within the historic urban pathways; however, the southwest–northeast axis, corresponding to land slope and groundwater flow, exerted the strongest influence on urban development. Consequently, ecosystem-based adaptation constitutes the primary driver of the street network's formation, while regional communication routes play a secondary but complementary role.

Keywords: historical core of Kashan, historical streets, major trade routes, communication network, ecological adaptation