

A Landscape Archaeological Approach to Sasanian Nomadic Settlements in Qasr e Shirin Region

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Abstract

The Qasr e Shirin region, located along the historic Khorasan trade route in western Iran, represents a significant cultural landscape that supported both sedentary agricultural communities and mobile pastoral groups during the Sasanian period. This study investigates the spatial organization, settlement patterns, and functional relationships of Sasanian-period sites within the Qasr e Shirin plain using a landscape archaeological approach that integrates Geographic Information Systems (GIS), remote sensing data, and archaeological survey evidence. Spatial analyses were conducted to examine the relationships between archaeological sites and environmental variables, including topography, land use, communication routes, water resources, and vegetation cover. The results indicate that the region was characterized by a dual settlement system consisting of a centralized administrative-agricultural complex and a network of dispersed pastoral settlements. Several sites display characteristics commonly associated with mobile pastoral lifeways, including ephemeral architectural remains, dry-stone constructions, extensive pottery scatters, and locations closely associated with seasonal grazing lands. GIS-based analyses further demonstrate that many of these settlements were located in elevated areas suitable for pastoral activities, whereas major administrative and agricultural centers were concentrated in the lower and more fertile sections of the plain. The distribution of sites, their proximity to communication routes, and their relationship to water resources suggest the presence of an integrated settlement network in which nomadic and sedentary communities interacted within a shared socio-economic landscape. This study argues that pastoral nomadic groups constituted an important component of the Sasanian cultural landscape of Qasr e Shirin and that their settlements formed part of a broader regional system closely connected to agricultural production, administrative authority, and long-distance communication networks. These findings contribute to a more comprehensive understanding of the diversity of settlement organization and human-environment interactions in the western Zagros during the Sasanian period.

Keywords: Landscape Archaeology, GIS; Remote Sensing, Pastoral Nomadism, Sasanian Period, Qasr e Shirin.

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Introduction

In recent decades, archaeological research has increasingly emphasized the complex relationships between human societies and their surrounding environments. Rather than viewing settlements as isolated entities, contemporary approaches seek to understand how social, economic, and political activities are embedded within broader landscapes. Landscape archaeology has emerged as a particularly valuable framework for investigating these interactions by examining the spatial organization of human activities and the ways in which communities utilized, modified, and perceived their environments over time (Gosden, 1999; Thomas, 1996; Tilley, 2006). Within this perspective, landscapes are understood as dynamic products of continuous interaction between people and the natural world. Human communities actively shape their surroundings through settlement construction, resource exploitation, mobility, and economic activities, while environmental conditions simultaneously influence patterns of habitation and land use. Consequently, the archaeological landscape preserves material traces of both cultural practices and environmental adaptations, providing an important source of information for reconstructing past lifeways.

The Zagros Mountains constitute one of the most significant ecological and cultural regions of the Iranian Plateau. Owing to their environmental diversity, abundant pasturelands, and varied topography, the Zagros have long supported multiple subsistence strategies, including both sedentary agriculture and mobile pastoralism. Throughout different historical periods, communities inhabiting this region adopted a variety of adaptive responses to environmental opportunities and constraints. Among these strategies, pastoral nomadism played a particularly important role in shaping settlement organization and patterns of land use (Gholami, 2024: 189). Pastoral nomadism is generally characterized by seasonal mobility, livestock husbandry, and the exploitation of geographically dispersed resources. Archaeological and ethnographic studies suggest that mobile pastoral lifeways emerged gradually during the Bronze Age and subsequently became a major component of social and economic systems throughout the Near East (Varjavand, 1965; Khazanov, 1986). In the Zagros region, pastoral communities developed highly flexible adaptive strategies that enabled them to utilize diverse ecological zones while maintaining economic relationships with sedentary agricultural populations. Consequently, sedentary and mobile populations should not be viewed as mutually exclusive social categories but rather as interconnected components of broader regional systems.

The Qasr e Shirin Plain, located in western Iran near the Iraqi border, provides an exceptional case study for examining these interactions. Situated along the historic Khorasan route—one of the principal communication corridors connecting Mesopotamia with the Iranian Plateau—the region occupied a strategic position throughout antiquity. Its geographical setting, characterized by river systems, fertile alluvial plains, extensive pasturelands, and access to major transportation routes, facilitated the development of

diverse settlement forms from prehistory through the Islamic period. Archaeological investigations have demonstrated that the Sasanian period represents one of the most significant phases in the cultural development of Qasr e Shirin. Monumental architectural complexes, hydraulic systems, military installations, and numerous smaller settlements attest to the importance of the region within the political and economic structure of the Sasanian Empire. Previous research has primarily focused on major architectural monuments, including the Palace of Khosrow, Chahār Qāpī, and associated hydraulic features. Comparatively little attention, however, has been devoted to understanding the role of smaller rural and potentially nomadic settlements within the broader regional landscape. Archaeological surveys conducted in Qasr e Shirin have identified a number of sites characterized by dispersed pottery scatters, ephemeral architectural remains, and dry stone constructions. These characteristics raise important questions concerning the existence and organization of pastoral nomadic communities during the Sasanian period. The spatial distribution of these sites suggests that they may have formed part of a wider settlement network closely connected to the region's administrative centers, agricultural zones, and communication routes.

This study employs a landscape archaeological approach combined with Geographic Information Systems (GIS), remote sensing data, and archaeological survey evidence to investigate the spatial organization of Sasanian period settlements in Qasr e Shirin. Particular attention is given to the relationships between archaeological sites and environmental variables, including topography, land use, vegetation cover, water resources, and transportation networks. The principal objective of this research is to evaluate whether a distinct system of pastoral nomadic settlement existed alongside the better known agricultural and administrative centers of the region during the Sasanian period. More broadly, the study seeks to contribute to ongoing discussions concerning human–environment interaction, mobility, and settlement organization in the western Zagros by examining how different modes of life coexisted and interacted within a shared cultural landscape.

Research Background

Qasr e Shirin has attracted the attention of historians, geographers, and travelers for centuries. From the third century AH onward, numerous Iranian and Arab scholars referred to the region and its architectural monuments in historical and geographical accounts. Among European travelers, Pietro Della Valle was the first to mention the ruins of the Qasr e Shirin complex during his travels in the seventeenth century. His observations were subsequently supplemented by those of Rich, Olivier, and Bayander, who also described the archaeological remains of the area. Systematic documentation of the monuments began in the late nineteenth century. In 1891, Jacques de Morgan recorded the principal architectural remains through detailed descriptions and architectural plans. This work was followed by Ernst Herzfeld's observations in 1910,

which provided additional information concerning the structure commonly known as the Palace of Khosrow. A significant contribution was made by Gertrude Bell in 1911, who not only documented the monuments architecturally but also prepared detailed plans and photographic records of the complex. Through comparison with Abbasid period architecture, particularly the Palace of al Ukhaider in Iraq, Bell suggested an early Islamic date for the complex. Although she did not assign a specific function to the Palace of Khosrow, she identified Chahār Qāpī as a Sasanian fire temple. Her photographs constitute some of the earliest visual records of the monuments and preserve valuable evidence of their condition prior to the extensive destruction of the twentieth century (Hozhabri, 2005: 102).

The first comprehensive technical study of the monuments was undertaken by Oscar Reuther in 1938. His work provided detailed architectural descriptions of the Palace of Khosrow and Chahār Qāpī and established an important foundation for subsequent research. During the same period, Bayander investigated the hydraulic infrastructure and water management systems of the region, highlighting the significance of water resources in the development of the settlement complex (Bayander, 1991: 384). Throughout the twentieth century, the monuments of Qasr e Shirin continued to receive scholarly attention and were discussed by a number of researchers, including: Vanden Berghe (1958), Gullini (1964), Shipman (1971), Kleiss (1974), Herrmann (1977), Lassner (1978), and Bier (1986). restoration work was undertaken at Chahār Qāpī. However, the monument suffered substantial damage during the Iran–Iraq War, resulting in the loss of many architectural features visible in earlier photographs. Archaeological excavations conducted in 1992 under the direction of Naser Nouroozadeh Chegini exposed portions of the monument and provided new information concerning its architectural layout. Later, in 2000, Yousef Moradi carried out a detailed investigation of the Sasanian remains of Qasr e Shirin, the results of which were partially published in *The Sasanian Complex of Qasr e Shirin*. A major advance in regional archaeological research occurred in 2005, when Ali Hozhabri directed a systematic archaeological survey of the entire Qasr e Shirin region under the supervision of the Cultural Heritage Organization of Kermanshah Province. This project documented major monuments, including the Palace of Khosrow, Chahār Qāpī, Bān Qal‘eh, and the associated hydraulic system. In addition, fifteen archaeological sites containing diagnostic Sasanian period materials were identified and recorded. Subsequent excavations conducted between 2005 and 2006 under the direction of Yousef Moradi further expanded archaeological knowledge of the Palace of Khosrow and its surrounding landscape. More recent research has shifted attention from individual monuments toward broader questions of landscape organization and settlement dynamics. Since 2017, investigations employing a landscape archaeological approach have examined the spatial relationships between settlements, environmental resources, communication routes, and patterns of land use within the Qasr e Shirin Plain. These studies have drawn attention to the possibility

that, alongside major administrative and agricultural centers, the region also supported a network of seasonal pastoral settlements during the Sasanian period. Such interpretations have benefited from broader studies of pastoral nomadism and mobile lifeways in Iran conducted by scholars including Abbas Alizadeh, Hossein Papoli Yazdi, Eskandar Amanollahi, and others. Nevertheless, the role of nomadic communities within the Sasanian cultural landscape of Qasr e Shirin remains insufficiently understood and constitutes the primary focus of the present study.

Geographical and Archaeological Setting

Located along the historic Khorasan route, Qasr e Shirin occupied a strategically important position as one of the principal gateways connecting Mesopotamia to the Iranian Plateau. The region is traversed by the Alvand River, the most significant watercourse in the area, which has played a fundamental role in shaping patterns of settlement and land use throughout history. The city developed on the northern bank of the river, from which it derived its primary water supply. Originating in the Qal'alan Highlands east of the Dasht e Zahab Plain, the Alvand River and its associated tributary system—historically known as the Hulwān River—contributed substantially to agricultural productivity and supported the extensive orchards for which the region became known.

Archaeological investigations have demonstrated the long term significance of this landscape. A systematic survey conducted by Ali Hozhabri in 2005 identified ninety two archaeological sites representing a broad chronological sequence extending from the Neolithic period to the Islamic era. These sites include evidence of Neolithic, Chalcolithic, Old Elamite, Protohistoric, Achaemenid, Parthian, Sasanian, and Islamic occupations, reflecting the continuous strategic and economic importance of the region over time.

Among the documented sites, fifteen contain diagnostic Sasanian period materials and constitute the primary focus of the present study. These include 'Emārat e Khosrow, Chahār Tāqī, Bān Qal'eh, Pol e Shirāzi, Qal'eh Gūrī Dār e Balūt, Tappeh Qalāy e Somār, Qal'eh Gūrī Fattāh Beg, Bābā Hādī, Hārūnī, Kūkū'ī, Tappeh Manba' e Āb, Masīl e Āb, Tappeh Khoshgīneh, Tappeh Zūleh, and the Seyyed Ayāz hydraulic system. The presence of diagnostic ceramic assemblages, together with associated cultural materials, indicates occupation during the Sasanian period, while evidence from several sites suggests continuity into the post Sasanian and Early Islamic periods (Hozhabri, 2005: 800).

Environmental conditions within the region have long favored pastoral activities. Extensive winter grazing grounds (qishlāq) surrounding the plain provided suitable conditions for seasonal livestock husbandry, making pastoral nomadism one of the dominant subsistence strategies in the area. Historical and archaeological evidence suggests that mobile pastoral communities formed an important component of the

regional economy and cultural landscape alongside sedentary agricultural populations (Table 1).

From a geomorphological perspective, the landscape is dominated by alluvial river plains characterized by gentle slopes, limited topographic variability, and generally low to moderate levels of erosion. These environmental conditions created favorable settings for both agricultural production and seasonal pastoral exploitation, contributing to the development of a diverse and interconnected settlement system during the Sasanian period ([Statistical Yearbooks of Kermanshah Province, 2011](#)).

Table 1: Names and geographical information of the areas and their breakdown by type of use (Authors, 2017).

Site Name	Time Interval	Functional Use	Site Features
Khosrow Fortress	Sasanian and Early Islamic	Administrative/Governmental Structure	Archaeological Evidence / Architectural Characteristics The governmental complex consisted of two sections: official and private sectors (Moradi, 2012: 323).
Chahar Qapi	Sasanian	Religious Structure (Fire Temple)	The structure demonstrates characteristic techniques of Sasanian religious architecture, including architectural units located on the eastern side of the chahartaq structure (Hozabari, 2012: 153).
Ban Qal'eh (Qal'eh-ye Khosrow)	Sasanian	Military Fortress	The structure was built upon a square platform, with six square towers positioned along each side of the platform (Moradi, 2005: 13). Architectural similarities with the Siraf Fortress have been noted (Hozabari, 2005: 175).
Darbalut Gabri Fortress	Sasanian	Probable Military Fortress	Architectural remains are present, and the plan of the structure resembles a chahartaq (Hozabari, 2005: 207). The site contains remains of pastoral architecture and temporary occupation features (Hozabari, 2005: 361).
Fattah Beg Guri Fortress	Sasanian	Probable Religious Structure	Poor architectural remains accompanied by a large quantity of pottery sherds. Pottery ranging from the Elamite to the Sasanian periods was identified, although no architectural remains were recorded.
Baba Hadi Site	Sasanian	Seasonal Pastoral Site	The site contains pastoral architectural remains (Hozabari, 2005: 361).
Haruni Site	Sasanian and Early Islamic	Seasonal Pastoral Site	characterized by rudimentary architecture and an abundant ceramic assemblage.
Kukuyi Site	Sasanian	Seasonal Pastoral Site	The surface evidence indicates a ceramic sequence dating from the Elamite through the Sasanian eras, inside a context lacking in situ architectural remains
Manba'-e Ab Mound	Sasanian		Numerous brick fragments consistent with Sasanian-period brick dimensions, along with abundant pottery sherds, were identified at the site (Hozabari, 2005: 637)
Pol-e Shirazi Site	Sasanian		The site is characterized by simple architectural remains and pastoral stone alignments/enclosures.
Watercourse Channel	Sasanian-Ashkani	Seasonal Pastoral Site	The archaeological evidence consists of dispersed Parthian and Sasanian ceramic sherds associated with pastoral stone-built structures and enclosures.
Qal'eh-ye Somar Mound	Sasanian		The site is characterized by simple architectural remains and pastoral stone alignments/enclosures.
Khashgineh Mound	Sasanian		The non-ceramic artifacts identified on the surface of the mound comprise iron slag, a stone door pivot, and a hand-operated millstone.
Zuleh Mound	Sasanian		Simple architectural remains and pastoral stone-built enclosures.

Archaeological Evidence for Nomadic Lifeways in Qasr e Shirin

The surviving Sasanian remains of Qasr e Shirin are situated among reed beds and palm groves along the northern outskirts of the city and on the banks of the Hulwān River (modern Alvand). This complex lies along a route that, during the medieval period, formed part of the Great Khorasan Road and later became known as the “Gateway to Asia” (Moradi, 2005: 1). During the Sasanian period, marked differences can be observed between alluvial plains and mountainous valleys in terms of ecological conditions and settlement patterns. Understanding the structure and dynamics of Sasanian society—and even earlier Parthian society—depends largely on our knowledge of how agriculturalists and pastoralists exploited upland zones and how these sectors were integrated and coordinated within the broader economic and political systems of the plains (Gholami, 2017: 16).

Archaeological surveys conducted in the Qasr e Shirin Plain indicate that most of the aforementioned sites consist of small rural settlements distributed across the plain and relatively poor in material culture. At many of these locations, including Tappeh Qalāy e Somār, the Pol e Shirāzi site, Tappeh Zūleh, Tappeh Khoshgīneh, Tappeh Manba‘ e Āb, and the Bābā Hādī site, architectural remains survive in the form of brick fragments or dry stone constructions. This architectural pattern is characteristic of pastoral occupation and may therefore be interpreted as reflecting a nomadic mode of life (Hozhabri, 2005: 98) (Fig. 1).

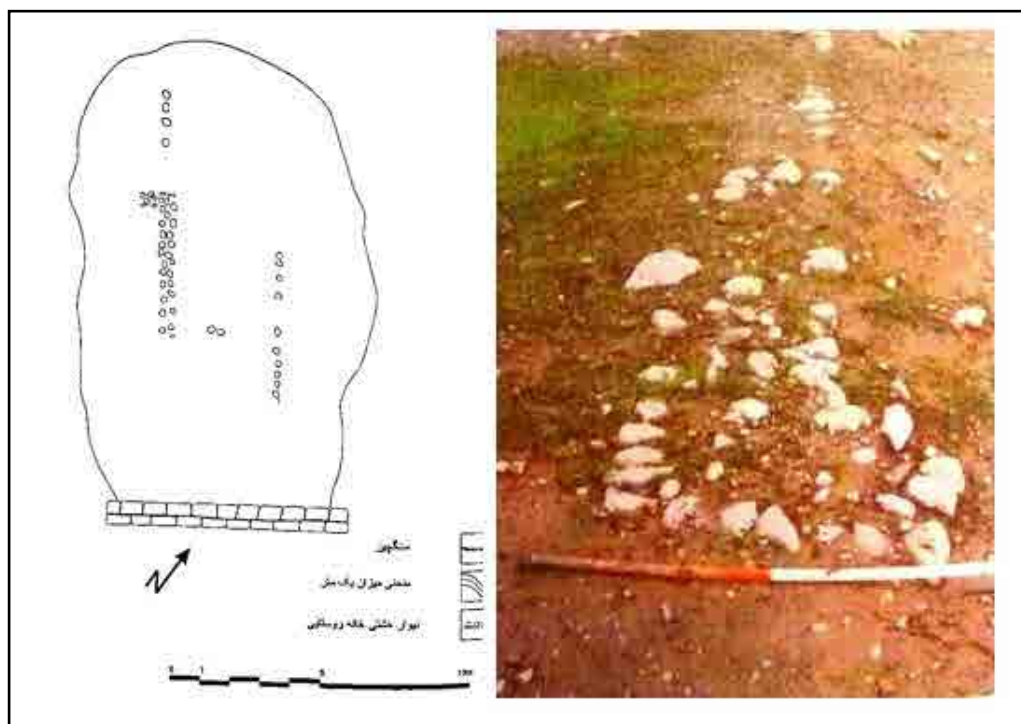


Fig. 1: Remains of dry-stone architectural structures (Hozhabri, 2005: 361).

A site such as Kūkū’ī, despite the abundance of pottery scattered across its surface, lacks any visible architectural remains. This type of depositional pattern reflects a

nomadic mode of life in which settlements lacked permanent architectural constructions, were seasonally occupied during winter, and were abandoned in summer. Consequently, for several months each year, these sites remained exposed to destructive environmental and erosional processes (Alizadeh, 2008: 46).

Based on architectural characteristics and associated cultural materials, the archaeological sites distributed across the Qasr e Shirin Plain may be classified into five categories. Approximately 6% consist of administrative or elite residential complexes ('Emārat e Khosrow); 13% represent military sites (Bān Qal'eh and Qal'eh Gabrī Dār e Balūt); 13% comprise religious sites (Chahār Qāpī Fire Temple and Qal'eh Gūrī Fattāh Beg); 13% correspond to service related structures such as dams and canals; and 53% consist of rural and nomadic settlements characterized by poor architectural remains and dry stone construction techniques (Bābā Hādī Site, Hārūnī Site, Kūkū'ī Site, Tappeh Manba' e Āb, Pol e Shirāzi Site, Masīl e Āb, Tappeh Qalāy e Somār, Tappeh Khoshgīneh, and Tappeh Zūleh). Some of these sites clearly reflect rural and/or nomadic lifeways (Gholami 2017: 265). Among these sites, evidence such as the extensive dry stone architectural remains at Tappeh Qalāy e Somār is particularly noteworthy. These remains became visible during the Iran–Iraq War, when trenches excavated for tank fortifications cut through parts of the mound and exposed underlying architectural features (Hozhabri, 2005: 861). At the Pol e Shirāzi Site, agricultural leveling operations revealed large quantities of displaced stone within embankments overlooking the river. The dry stone architectural style observed at the site is reminiscent of the masonry techniques employed in the Sasanian Shian Dam (Hozhabri, 2005: 818). At Tappeh Khoshgīneh, surface finds other than pottery include iron slag, stone door pivots, and grinding stones (Hozhabri, 2005: 683). At the remaining nomadic sites, poor architectural remains combined with dense pottery scatters constitute the primary archaeological evidence. Field surveys and direct observation further indicate that nomadic groups continue to use the region as winter pasturelands (qishlāq) to the present day. Two military fortresses are also present in Qasr e Shirin. Bān Qal'eh, situated at the center of the administrative complex, occupies a commanding strategic position overlooking the surrounding landscape (Hozhabri, 2005: 128). Qal'eh Gabrī Dār e Balūt, located near the final village of Qasr e Shirin toward Sarpol e Zahab, preserves the remains of another military fortress. In addition to architectural structures, other tangible evidence for the presence of nomadic communities in Sasanian period Qasr e Shirin includes pottery assemblages and iron slag deposits (Fig. 2).

Analysis of the Sasanian Sites in Relation to Geographical Factors Pastures and Land Use

Alongside various geographical factors, land use patterns and the degree of soil fertility constitute important variables for understanding and analyzing the regional landscape. In addition, the application of remote sensing techniques has become highly influential

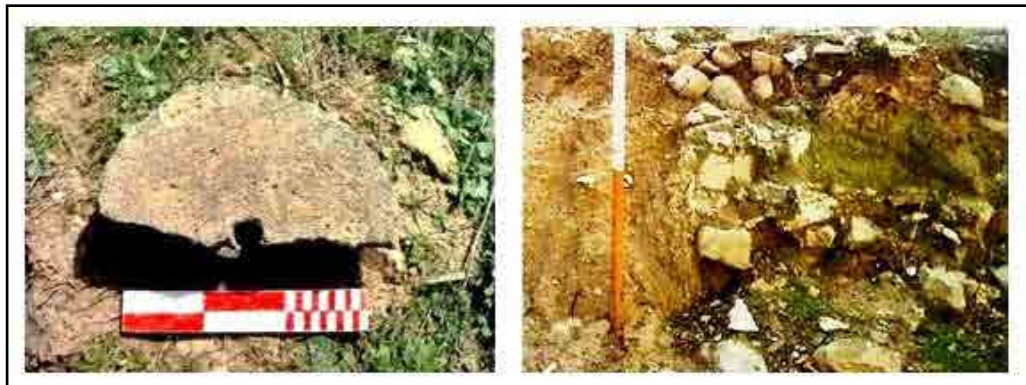


Fig. 2: Hand millstones associated with the remains of ephemeral pastoral structures (Hozhabri, 2005: 683, 810).

in the field of landscape archaeology. Subsistence strategies have always represented one of the most fundamental factors shaping human life and the organization of settlements. The climatic and ecological conditions of Kermanshah Province, particularly its moderate annual precipitation and relative humidity, have created an environment in which mountain slopes and plains are generally covered with forests and pasturelands, while some areas also contain irrigated and dry farming agricultural fields. Nevertheless, elevations above 1,800 meters primarily consist of high quality summer pastures (yaylāq), where forests and cultivated lands are less common. The regions of Qasr e Shirin, Sarpol e Zahab, Naft Shahr, and Somar, located within the western border zone, are generally characterized by a warm climate. The western highlands terminate abruptly beyond Kerend, descending steeply into the plains and border lowlands (Semi Detailed Soil Studies, 1976: 60). The terrain is generally characterized by gentle slopes, although moderate gradients occur along foothill zones. Most of the land exhibits low to moderate topographical variation. In the northern sector of Qasr e Shirin, a narrow strip of irrigated agricultural land and orchards is present. Evidence suggests that these environmental conditions were already recognized during the Sasanian period, when canal systems were constructed to regulate and improve water management. The archaeological sites identified in this region are situated within Class I, II, and III agricultural lands.

Class I lands are fully cultivable and suitable for irrigated agriculture without significant limitations; these lands cover approximately 3,150 hectares, representing 2.93% of the total land area. Class II lands are cultivable areas with minor limitations for irrigated agriculture and encompass approximately 48,400 hectares, or 44.85% of the total land area. Class III lands are moderately cultivable and present greater limitations for irrigated farming; they cover approximately 27,300 hectares, accounting for 25.30% of the total land area. Additional Sasanian period sites have also been identified within this latter land use category.

The Normalized Difference Vegetation Index (NDVI) is regarded as one of the most widely used vegetation indices and constitutes a valuable method for assessing vegetation health through remote sensing techniques. With the increasing annual

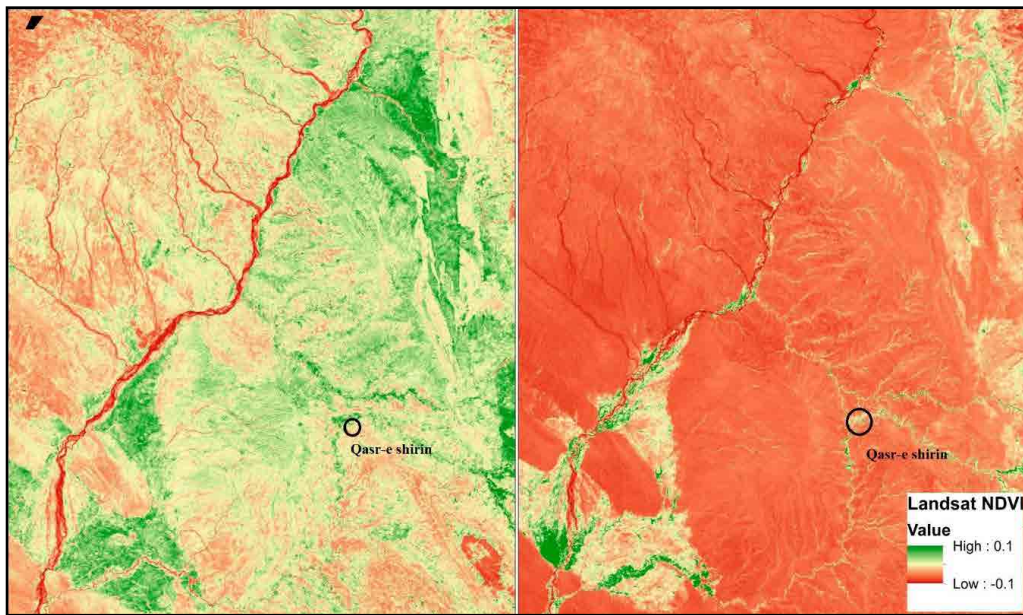


Fig. 3: Mean NDVI map of Qasr-e Shirin for spring 1985–2005 (left) and summer 1985–2005 (right) (Panahipour, 2019: 5).

availability of Earth Observation (EO) satellite imagery, practical indices such as NDVI have greatly facilitated the extraction and interpretation of environmental data. In such imagery, different types of vegetation cover can be clearly distinguished. More specifically, variations in vegetation growth or soil coloration observed in aerial and satellite imagery have long been employed to identify archaeological features (Wilson, 1982: 5).

In the Qasr e Shirin region, NDVI analyses indicate that areas lacking vegetation or subjected to environmental stress exhibit the lowest index values. Sparse vegetation, such as rangelands, corresponds to intermediate values, whereas dense vegetation cover—particularly cultivated agricultural fields—reflects the highest values. NDVI imagery reveals several important patterns related to agriculture and land use. In the northern part of the study area, small patches of level ground adjacent to larger streams or river branches appear suitable for cultivation. Higher NDVI values generally correspond to uncultivated natural vegetation. These zones lack clearly defined boundaries that would otherwise indicate extensive cultivable land.

Based on NDVI imagery, cultivated lands are concentrated in the lower sections of the plain, while the elevated steppe zones appear to have been used primarily as pastureland. Only narrow and relatively flat strips of land along streams or major tributaries were suitable for cultivation. Considering the regional topography, the scarcity of flat agricultural land, and the prevailing climatic conditions—particularly increased precipitation and lower temperatures—it may be inferred that large portions of the region functioned as non arable grazing lands rather than agricultural zones. Overall, the pastures of Kermanshah Province are traditionally divided into summer (yaylāq) and winter (qishlāq) grazing areas, a classification that also includes wooded rangelands

and forage producing forested territories. Extensive pasturelands cover the western parts of the province, including Sarpol e Zahab, Qasr e Shirin, Naft Shahr, Somar, and Gilan e Gharb ([Statistical Yearbooks of Kermanshah Province, 2010: 7](#)). In some areas influenced by the climatic conditions of the Iraqi plains, high evaporation rates, torrential rainfall, and insufficient vegetation cover have produced clear evidence of erosion and soil degradation. As illustrated in Fig. 4, the majority of the plain is covered by sparsely vegetated rangelands. Semi dense pastures are concentrated in the eastern parts of the plain, where they connect with the grazing lands of Gilan e Gharb. Interspersed among these pastures are areas characterized by sparse woodland vegetation. In northern Qasr e Shirin, where the greatest concentration of settlement is located, both sparse and semi dense pasturelands are present. The modern urban area of Qasr e Shirin is situated within the semi dense pasture zone. With the exception of the archaeological sites of Pol e Shirāzi, 'Emārat e Khosrow, Bān Qal'eh, and Chahār Tāqī, which are located within the urban area of Qasr e Shirin and fall within the semi dense pasture zone, all other archaeological sites are situated in areas characterized by sparse pasture cover (Map 2).

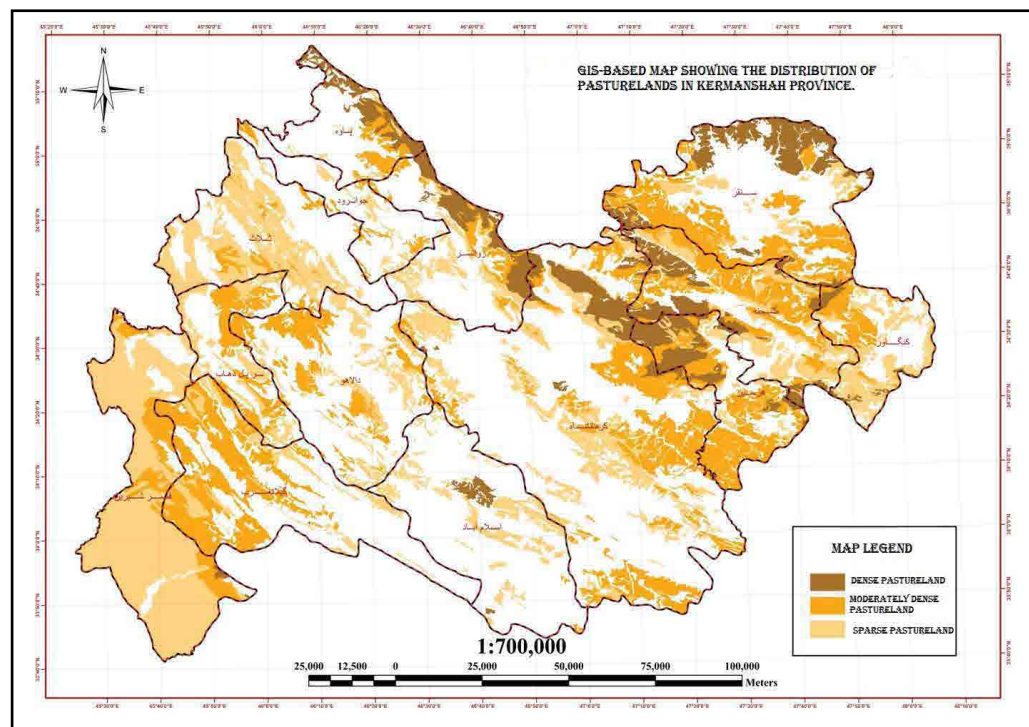


Fig. 4: GIS map of the pasturelands of Kermanshah Province (Authors, 2017).

Topography and Elevational Position of the Archaeological Sites

From a geomorphological perspective, Kermanshah Province may be divided into two principal zones. The first consists of a mountainous and elevated region characterized by folded anticlines and synclinal plains, encompassing the majority of the province's highlands. The second comprises a zone of eroded mountains and relatively level terrain situated between these uplands, including Qasr e Shirin, Naft Shahr, and Somar. Qasr e Shirin itself consists primarily of alluvial river plains characterized by gentle slopes,

limited topographical variation, and low to moderate erosion. Analyses derived from NDVI imagery (Fig. 3) and GIS based topographical mapping (Fig. 5) indicate that pasturelands and sites associated with evidence of nomadic occupation were generally located in the more elevated sectors of the landscape. This pattern suggests that nomadic communities tended to exploit higher altitude areas to secure grazing resources and sustain pastoral subsistence activities. Conversely, the lower portions of the plain were more likely utilized for sedentary agricultural lifeways and farming activities.

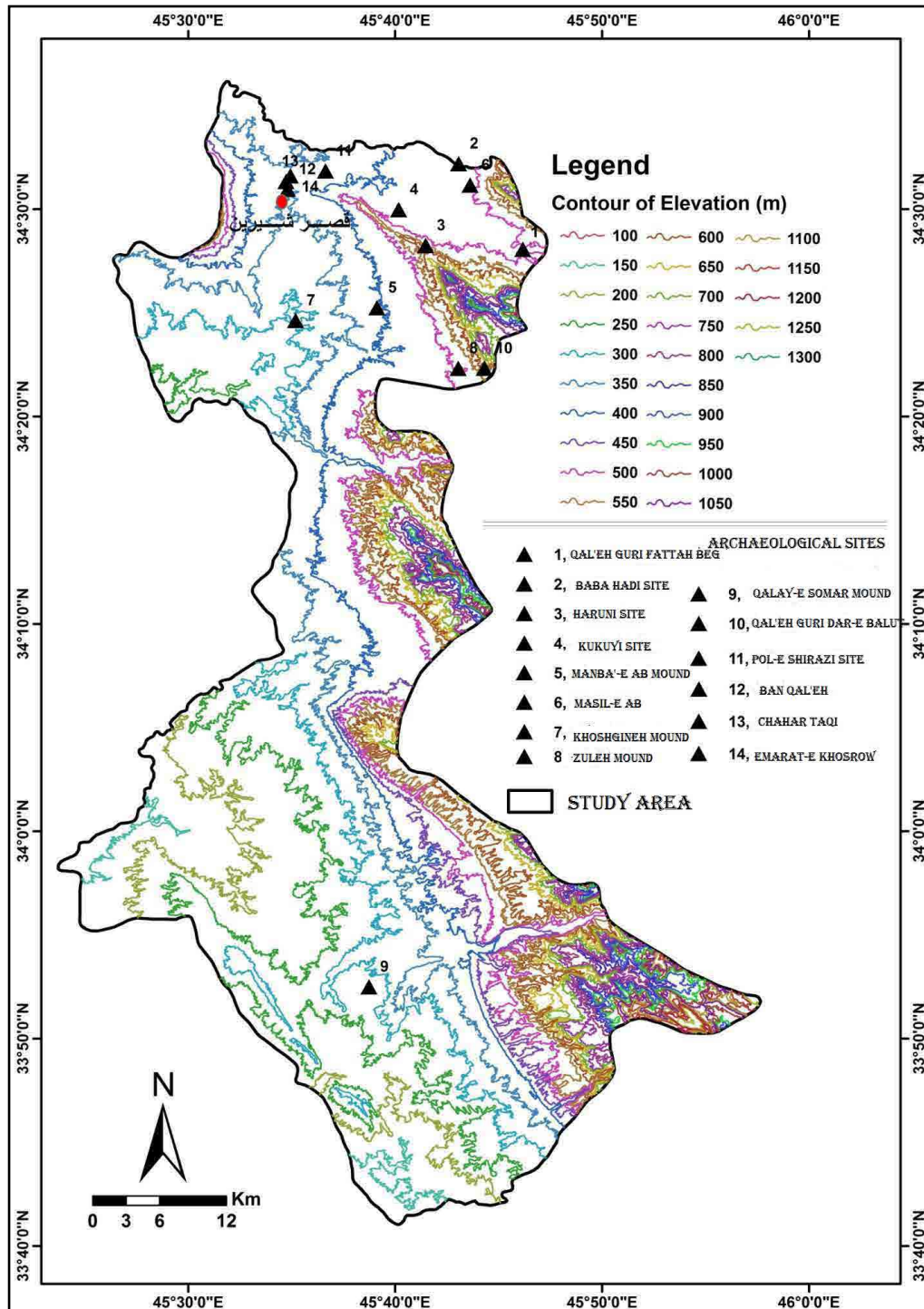


Fig. 5: GIS map of Sasanian settlements in relation to the topography of Qasr-e Shirin (Authors, 2017).

Figure 5 illustrates the spatial distribution of the archaeological sites in relation to elevation. The majority of the sites are situated at elevations between 300 and 400 meters above sea level, indicating relatively favorable environmental conditions, particularly the presence of sparse pasturelands in the northern sectors of the region. In northern Qasr e Shirin, small patches of level terrain are located adjacent to larger streams or river branches and possess potential for agricultural cultivation. The remaining areas primarily consist of natural and uncultivated vegetation cover. These zones lack clearly defined field boundaries that would indicate intensive agricultural activity. Overall, the evidence suggests that the elevated steppe zones were predominantly utilized as pasturelands.

Spatial Relationship of the Sites to Roads and Communication Routes

Map 6 illustrates the location and distribution of the archaeological sites in relation to the principal communication routes. Prior to the construction of modern transportation networks, interregional movement was possible primarily through natural corridors, particularly along river valleys and deep mountain passes ([Alizadeh, 1992: 30](#)). Because the present day main road still follows the course of the historic Khorasan route, all principal roads converge on the modern city of Qasr e Shirin, where the sites of Pol e Shirāzi, Bān Qal‘eh, ‘Emārat e Khosrow, and Chahār Tāqī are located. In other words, the routes connecting the dispersed sites across the plain ultimately lead toward the principal monumental complexes and settlements interpreted as administrative or governmental centers. Examination of this distribution pattern reveals an organized settlement network that may reflect communication routes linking nomadic and temporary encampments with administrative centers associated with sedentary agricultural lifeways. The existence of these routes, together with the close proximity of the two settlement systems to the major trade corridor, suggests the exchange of goods and products between nomadic pastoral communities and sedentary agricultural populations. Within nomadic systems, routes and communication corridors possessed significant political, cultural, and security related importance, as they connected cold upland zones with warm lowland regions. Local authorities therefore sought to maintain control over these routes and communication networks ([Talayi et al., 2014: 187](#)).

Spatial Relationship of the Sites to Rivers and Water Resources

According to Fig. 6, all of the archaeological sites are located in close proximity to water sources and river systems from which they derived their water supply. The rivers and their tributaries flow from the higher elevations—indicated in red on the map—toward the lower parts of the plain, represented in blue. One of the most significant observations concerning the Sasanian sites of Qasr e Shirin is that many of the settlements, despite having access to water resources, were situated in elevated areas and do not appear to have practiced irrigated agriculture. Instead, these sites were predominantly associated

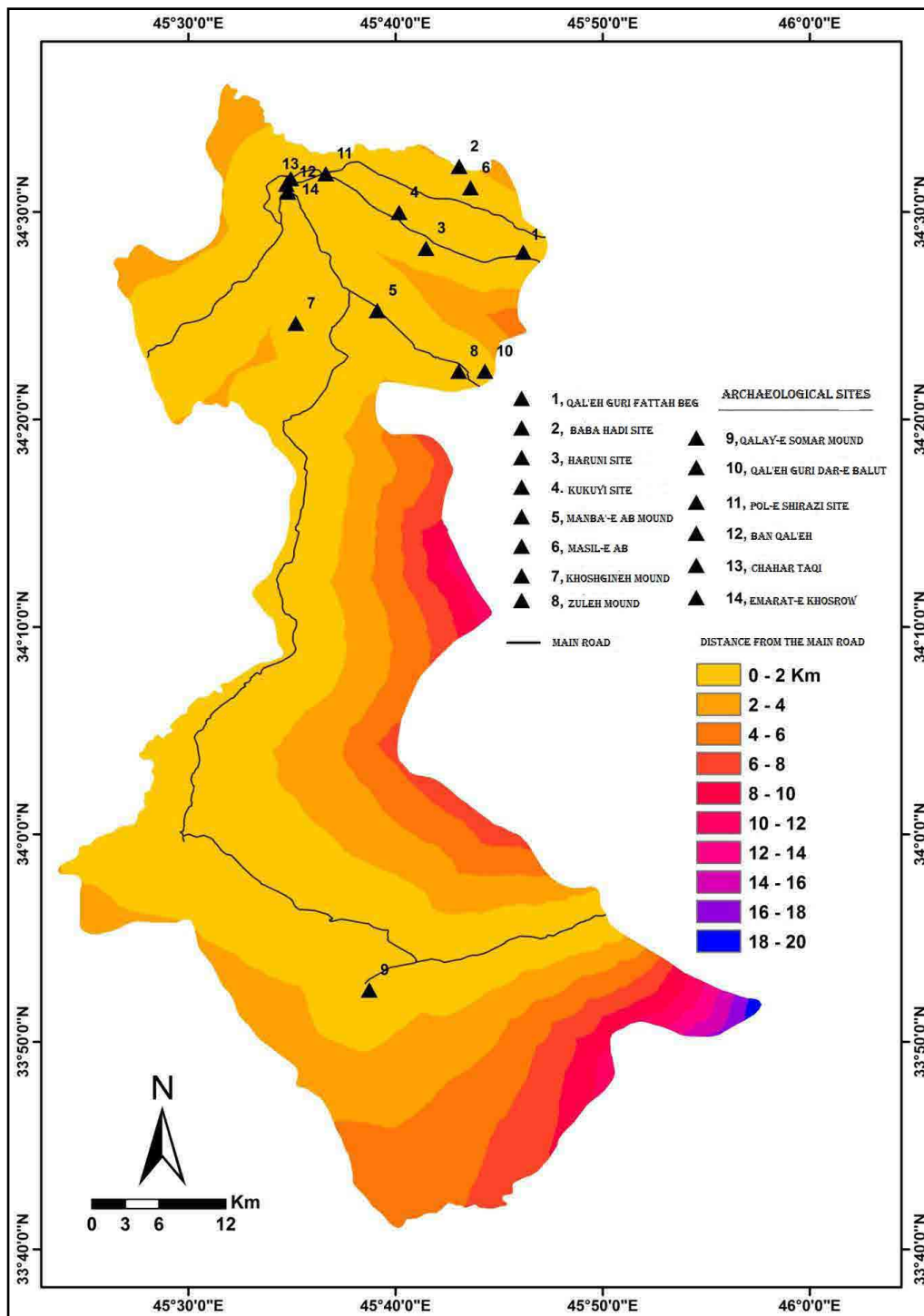


Fig. 6: GIS map of Sasanian settlements in relation to roads and communication routes (Authors, 2017).

with nomadic or mobile pastoral lifeways. Nomadic groups typically occupy lands that, due to limited rainfall or seasonal increases in temperature, are unsuitable for stable and permanent agricultural production. Consequently, they tend to select environmental settings incapable of supporting fixed agrarian communities with intensive subsistence systems (Hole, 2002: 262). In contrast, the settlement complex located near the Hulwān River and the Shāhgōdar hydraulic system—which includes the administrative and

governmental complex—was situated in the lower sections of the plain. These areas were well suited for orchard cultivation, as well as for both irrigated and dry farming practices.

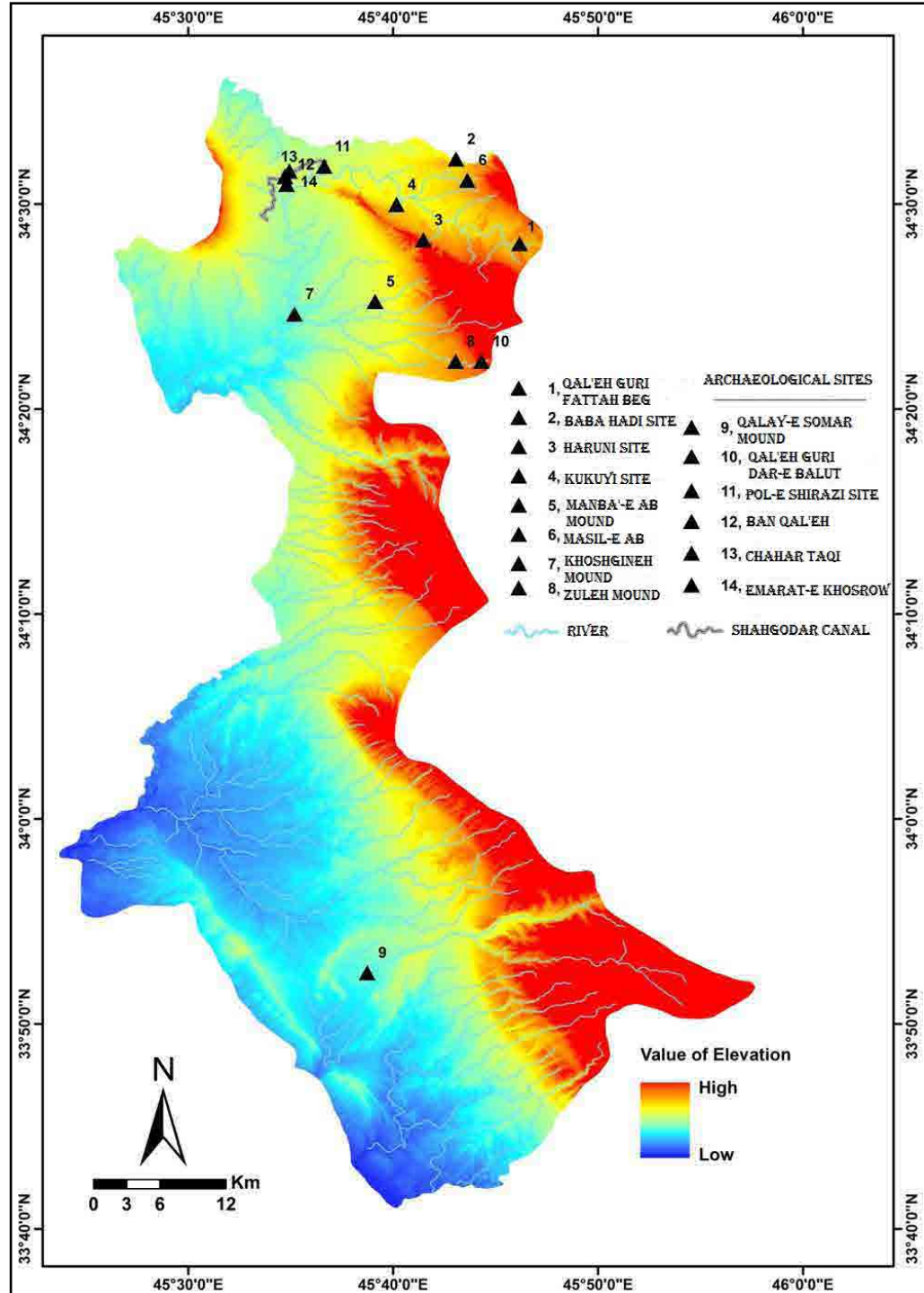


Fig. 7: GIS map of Sasanian settlements in relation to rivers and access to water resources (Authors, 2017).

Discussion of the Settlement Pattern Observed within the Landscape of Qasr e Shirin Pastoral Nomadism

Nomadism and mobile lifeways, alongside sedentary agricultural settlement,

may be understood as a second adaptive settlement pattern within the ecological landscape of Qasr e Shirin. Such a system enables the exploitation of spatially and temporally diverse resources—including water, pasturelands, and fertile soils—and takes advantage of environmental heterogeneity (Wendrich and Barnard, 2008: 89).

The spatial organization of each mobile pastoral settlement within a landscape generally follows a fundamental principle that can be defined through both spatial and temporal dimensions at every stage of the community's seasonal mobility cycle. The natural infrastructure of each settlement within the landscape—that is, its environmental setting—typically includes access to pasture and water (Dark, 2000: 146), appropriate elevation and slope to facilitate rainwater drainage, sheltered conditions that provide protection from wind, and adequate solar exposure to maximize heat retention during the winter months. Cultural and economic factors influencing settlement location include proximity to agricultural lands, economic and social interaction with nearby villages occupied during the summer season, issues of security, and social hierarchy. Such factors could, for example, lead to the establishment of settlements belonging to higher status groups in locations that differ from the dominant pattern of winter encampments (Aghaei et al., 2018: 25).

Both settlement systems observed within the region—agriculture based sedentism and nomadic pastoral lifeways (agro pastoralism)—may be interpreted as adaptive strategies responding to environmental and cultural conditions. While agricultural intensification could increase productivity, nomadic mobility enabled populations to exploit dispersed environmental resources. These two strategies, however, should not be regarded as mutually exclusive or fundamentally opposed. Rather, they could function in an integrated manner across a shared landscape and coexist simultaneously. Comparative case studies demonstrate that different forms of settlement organization may coexist contemporaneously within a single landscape. In the northern part of Qasr e Shirin, for example, approximately ten to twelve archaeological sites containing material evidence indicative of nomadic lifeways have been identified within a landscape that appears complementary and interconnected. Because nomadic lifeways depend on seasonal access to diverse micro environments, populations likely adopted this adaptive strategy in response to the ecological conditions of the region. The choice between sedentary and nomadic lifeways depended on both environmental and cultural contexts. It is important to emphasize, however, that when examining multiple land use strategies, the selection of one strategy over another—or the integration of several approaches—was not arbitrary. Rather, these were deliberate adaptations shaped by the specific environmental and socio cultural conditions of the time. Historical evidence further suggests that nomadic groups occasionally became sedentary either through pressure exerted by centralized political authorities or as a consequence of favorable climatic

and environmental conditions. Nevertheless, in many instances, when such groups were compelled toward reduced mobility, they returned to their traditional lifeways at the earliest opportunity. Conversely, under adverse environmental conditions, populations often preferred pastoralism over cultivation as a more reliable subsistence strategy (Cribb, 1991: 60).

In general, studies concerning transitions between different modes of subsistence and settlement organization must be analyzed alongside a precise understanding of local environmental conditions, as well as the broader socio political and economic circumstances of the period (Wossink, 2009: 148). The study area represents a dynamic ecosystem characterized by frequently fluctuating climatic conditions and a mosaic of micro environments. Although such conditions may have generated uncertainty and economic instability, they also encouraged the development of a mixed agro pastoral economy, thereby transforming the region into a zone of interaction between multiple modes of life.

Conclusion

Mobility and displacement represent adaptive strategies in response to topography, climate, livestock diversity, the quality of natural resources, interactions with other nomadic groups, local settlements, and broader socio economic and political forces. Within this framework, both environmental conditions and spatial distance play fundamental roles in shaping patterns of movement.

Nomadism and mobile lifeways, alongside sedentary agricultural subsistence, constituted a secondary mode of habitation within the ecological landscape of the Qasr e Shirin region. In nomadic systems, environmental diversity across micro regions renders particular locations seasonally accessible. Based on the data obtained through landscape analysis, and considering the hot and arid climatic conditions of Qasr e Shirin—including high temperatures and the prevalence of hot seasonal winds (samūm)—it may be inferred that the region functioned primarily as a seasonal and temporary habitation zone during the Sasanian and post Sasanian periods. Sasanian settlements in Qasr e Shirin are generally located adjacent to water resources and are characterized by relatively ephemeral and weak architectural remains. Consequently, it is plausible that these sites belonged to nomadic or semi nomadic communities. Furthermore, the presence of Sasanian and post Sasanian pottery and associated cultural materials, together with other environmental and archaeological indicators, reflects the existence of a nomadic mode of life within the region.

The establishment of the Sasanian administrative or governmental complex in the most favorable location within the plain, in terms of geographical and environmental factors, may have significantly influenced the formation and distribution of dispersed Sasanian settlements throughout the region. The study area possesses a dynamic

ecosystem characterized by fluctuating climatic conditions and a mosaic of micro environments. Although such environmental variability could have introduced uncertainty and instability into the local economy, it simultaneously encouraged the development of a mixed agro pastoral subsistence strategy, thereby creating a zone of interaction between different modes of life. Accordingly, it can be argued that all identified sites were located in close proximity to water sources and rivers from which they derived their water supply. The distributional pattern of dispersed sites across the plain appears to converge toward principal settlements and structures associated with administrative or governmental functions. Analysis of the spatial distribution map suggests the existence of communication routes linking sites characterized by nomadic or temporary occupation with more permanent, agriculturally based governmental centers.

Topographic analysis further demonstrates a correlation between site distribution and elevation. The majority of archaeological sites are situated between 300 and 400 meters above sea level, indicating relatively favorable environmental conditions, such as the presence of sparse pastures in the northern parts of the region. This pattern suggests that nomadic communities tended to utilize upland pastures and elevated zones for livestock grazing and subsistence purposes, whereas the lower sections of the plain were more suitable for sedentary agricultural lifeways. Most of the plain consists of sparse rangelands, while the eastern sectors contain semi dense pastures connected to the grazing lands of Gilan e Gharb. Interspersed among these pastures are areas with thin and open woodland vegetation. The northern parts of Qasr e Shirin, where the highest concentration of settlements has been identified, are likewise characterized by sparse and semi dense pasturelands. Moreover, NDVI imagery indicates that agriculturally suitable lands are primarily located in the lower portions of the plain, whereas elevated areas were predominantly exploited as pasturelands. Only narrow and relatively level strips of land along streams and principal water channels appear suitable for cultivation. Considering the regional topography, the scarcity of flat arable land, and the prevailing climatic conditions—particularly higher precipitation and lower temperatures in elevated zones—it may be concluded that large parts of the region consisted of non arable grazing lands that primarily served nomadic communities and seasonal patterns of occupation. Therefore, based on the available archaeological, environmental, and spatial evidence, it can be concluded that during the Sasanian period nomadic communities constituted an integral component of the cultural landscape of Qasr e Shirin.

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Author Contributions

This research is derived from the first author's M. A. Thesis. The primary data collection, encompassing all observational and analytical components, was conducted by the first author under the direct supervision and mentorship of the second and third authors.

Conflict of Interest

In adherence to ethical publication standards, the authors affirm that there are no conflicts of interest, either personal or financial, that could have influenced the content or conclusions presented in this research.

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نگاهی بر استقرارهای کوچ‌نشینی ساسانیان در قصرشیرین، با رهیافت منظر باستان‌شناسی

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چکیده

منظر باستان‌شناسی با مطالعه داده‌های مادی و فرهنگی چگونگی شکل‌گیری و سامان‌یافتن اقتصاد، جامعه، مذهب و فرایندهای فرهنگی انسان را بررسی می‌کند. به صورت کلی می‌توان گفت تحول فرهنگ‌ها، در رابطه ارگانیک با تکنولوژی و محیط‌زیست است. منطقه قصرشیرین بر سر شاهراه تجاری خراسان قرار گرفته است؛ دارای استقرارهای مبتنی بر زندگی کوچ‌نشینی و ثابت در دوران ساسانی و اوایل اسلام است. نحوه قرارگیری محوطه‌ها، پراکندگی آن‌ها در دشت قصرشیرین، به گونه‌ای است که نشان می‌دهد این منطقه مجموعه‌ای از استقرارهای کوچ‌نشینی را در دل خود در کنار یک مجموعه حاکمیتی، در دوره ساسانی، جا داده است. این پژوهش تلاش می‌کند که با مطالعه منظر باستان‌شناسی منطقه قصرشیرین و بررسی محوطه‌های ساسانی با استفاده از تصاویر ماهواره‌ای و تکنیک GIS نسبت به توپوگرافی دشت، راه‌های ارتباطی، بررسی منابع تأمین‌کننده آب، کاربری اراضی، پراکندگی و قرارگیری محوطه‌های باستانی به چگونگی شکل‌گیری استقرار در این منطقه در دوره ساسانی و کاربری و ارتباط محوطه‌ها با یک‌دیگر پی‌ببرد. قصرشیرین منطقه‌ای بسیار مستعد برای شکل‌گیری و توسعه جوامع انسانی با معیشت دام‌داری و کوچ‌نشینی است. در این منظر باستان‌شناسی دو الگوی زیستی مبتنی بر زندگی کوچ‌نشینی و دامداری و زندگی یکجانشین مبتنی بر کشاورزی وجود دارد. اطلاعات لازم برای این تحقیق براساس تحلیل بر مدل GIS و تصاویر ماهواره‌ای به دست آمده است. براساس مطالعات انجام شده بر روی اقلیم و عوامل جغرافیای منطقه مذکور، موقعیت جغرافیایی و پراکندگی محوطه‌های ساسانی در این منطقه چنین نتیجه گرفته شده است که در دوران ساسانی و اوایل اسلام منطقه قصرشیرین به جز آثار شاخص مجموعه ساسانی که مربوط به کشاورزی و یکجانشینی است و استقرارهای کوچ‌نشینی که محوریت پژوهش را تشکیل می‌دهد، در اطراف آثار شاخص این منطقه به عنوان یک اقامتگاه فصلی و موقت استفاده می‌شده است.

کلیدواژگان: مدل GIS، تصاویر ماهواره‌ای، منظر باستان‌شناسی، قصرشیرین، کوچ‌نشینی، دوره ساسانی.

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