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Original Article

Assessment of Rural Landscape Aesthetics on the Basis of the Values of the Natural Environment (Case Study: Selected Villages in North Khorasan Province)

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Abstract

Purpose- This study aims to evaluate the natural rural landscapes of North Khorasan Province by examining their environmental, ecological, and socio-cultural characteristics. Rural natural landscapes and cultural heritage are increasingly and inevitably influenced by global environmental changes such as climate change, depletion of natural resources, and biodiversity loss. These transformations diminish aesthetic, ecological, and symbolic values, gradually weakening residents' emotional attachment, identity, and sense of place within rural communities.

Design/methodology/approach- A mixed-method approach was employed, integrating questionnaires, structured and semi-structured interviews, and qualitative field observations to investigate villagers' perceptions, attitudes, and experiences concerning their surrounding natural environments and everyday landscapes. The selected rural landscapes were analyzed based on three key indicators: landscape diversity, perceived naturalness, and sense of place, which together reflect both the ecological integrity and perceptual dimensions of the rural setting.

Finding- The findings reveal that conserving natural elements—such as vegetation, water resources, landforms, and traditional architectural patterns—significantly enhances people's sense of belonging, identity, and overall quality of life. Conversely, landscape degradation contributes to social alienation, cultural erosion, and reduced environmental satisfaction. The chosen villages were selected according to settlement characteristics (density, size, and spatial distribution), ecological and landscape diversity (climate, land use, and accessibility), and socio-economic and cultural indicators representing population scale, livelihood structure, and heritage context.

Practical implications- Identifying priority areas for conservation not only supports sustainable rural development but also provides a scientific foundation for long-term landscape management. Through the active participation of local communities in planning and decision-making, this approach establishes a practical and adaptable framework for preserving natural and cultural heritage while enhancing the well-being of rural societies across North Khorasan Province.

Keywords- Rural landscape assessment, Landscape diversity, Perceived naturalness, Sense of place, North Khorasan Province.

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1. Introduction

Rural landscapes contain a range of ecological, cultural, and social values that require integrated assessment and protection for their safeguarding and sustainable development. The purpose of this study is to further investigate the usefulness of rural landscape assessment in improving sustainable planning practices by drawing on various scientific sources.

At the global level, demographic change, structural transformation, and ecological deterioration are identified by the International Council of Monuments and Sites (ICOMOS, 2017) as the root causes of numerous challenges currently faced by rural landscapes. These challenges pose threats not only to the physical integrity of rural landscapes, but also to their cultural heritage and long-term continuity (Abbaszadegan, 2017). In this regard, Pentz and Albert (2023) note that many cultural and historical habitats in rural landscapes have been erased in recent years and argue that proactive habitat conservation is necessary. Furthermore, landscape assessment can serve as a significant tool for recognizing and conserving the distinctive natural and cultural aspects that define rural landscapes (Pentz & Albert, 2023).

International frameworks have also emphasized the importance of systematic landscape appraisal and preservation. The European Landscape Convention (2000) and the 1964 Wilderness Act place strong focus on systematic landscape appraisal and conservation. However, Swetnam et al. (2017) argue that developing a comprehensive framework for the appraisal of both subjective and objective aspects of rural landscapes remains an important research gap. While such international frameworks provide valuable guidance, national strategies in Iran also play a crucial role in promoting sustainable landscape management.

Within Iran, the preservation of multiple values in rural landscapes faces several challenges. According to experts in Iran, these issues can be related to the invasion of urban culture into villages, climate change and other environmental pressures, changes in livelihoods and socio-economic approaches, and shortcomings in the residential context of villages (Rezaei, 2024; Naseri, 2021; Jahangirpour and Bakhshoodeh, 2010). These conditions indicate that rural landscape assessment in Iran should consider both the natural environmental values of villages and the perceptions and experiences of local residents.

At the national level, Iran has developed several policy frameworks that address spatial equity, environmental protection, and rural sustainability. The National Spatial Planning Document (Supreme Council for Urban Planning and Architecture of Iran, 2020) provides the overarching vision for balanced regional development. The Comprehensive Rural Development Bill (Center for Development and Foresight Studies, 2023) emphasizes strengthening rural identity and integrating socio-cultural and environmental values into rural planning. In addition, the National Strategy and Policy Framework for Biodiversity Conservation in Iran (Department of Environment of Iran, 2020) highlights the importance of conserving natural diversity and ecosystem services. Together, these frameworks outline Iran's growing commitment to sustainable rural landscape management and correspond closely with the conceptual objectives of this study.

This research examines rural landscape evaluation by integrating objective measures of environmental values, such as land cover types and natural landscape elements, with subjective measures of landscape preference. Landscape preference can play a pivotal role in determining the direction of rural development and planning. Following the postulates of evolutionary psychology and social science, scholars such as Ulrich (1993), Dutton (2003), Fry et al. (2009), Özgüner (2011), Kaplan and Kaplan (1989), and Buijs et al. (2009) have explained the complex coexistence of global and cultural dimensions of landscape preference, which are conditioned by individual and cultural contexts and shaped by both aesthetic and value-based dimensions.

In this regard, the three key concepts of naturalness, diversity, and sense of place have been emphasized to better explain the ecological, cultural, and historical values of rural landscapes—concepts that have been widely recognized in numerous studies as fundamental dimensions of rural landscape assessment (Kalinauskas et al., 2021; Keong & Onuma, 2021; Hermes et al., 2018; Tenerelli et al., 2017; Frank et al., 2012; Ode et al., 2009; Erikstad et al., 2008; Ode et al., 2008; Tveit et al., 2006). In this study, diversity refers to the spatial and visual heterogeneity of landscape elements such as vegetation, land cover, and built forms, reflecting

both ecological richness and human land-use variety (Tveit et al., 2006; Ode et al., 2008). Perceived naturalness represents the degree to which the landscape appears to be free from human disturbance and maintains its ecological integrity and authentic natural character (Ode et al., 2009; Hermes et al., 2018). Sense of place denotes the emotional and symbolic attachment that individuals develop toward their living environment, shaped through identity, dependence, and experience (Williams & Vaske, 2003; Brown & Raymond, 2007).

With an emphasis on the significance of naturalness, diversity, and sense of place, this study attempts to evaluate how people in rural areas view and assess their surrounding landscapes in order to explore the interaction processes that underlie landscape preference. To move from the general discussion of rural landscape assessment to a specific local context, this research focuses on ten selected villages in North Khorasan Province, Iran. The province provides a suitable case because its rural landscapes include different environmental settings, such as mountain, forest, and plain villages, in which natural environmental values, settlement patterns, and residents' sense of place can be compared. In order to accomplish this, data were collected from ten villages in North Khorasan Province and analyzed using SPSS software.

In particular, this study aims to respond to the following research questions:

(1) Which components and indicators can be used to assess rural landscape aesthetics on the basis of natural environmental values?

(2) How do residents of the selected villages in North Khorasan Province evaluate diversity, perceived naturalness, and sense of place within their surrounding rural landscapes?

(3) Which villages and environmental settings show stronger or weaker aesthetic and place-based values, and how can these findings contribute to more sustainable and conservation-oriented rural planning strategies?

This paper outlines a pathway for improving our comprehension of rural landscapes at high-resolution scales by combining objective data with subjective landscape assessments. This approach can ultimately support more sustainable and context-sensitive planning strategies that protect the environmental and archaeological integrity of rural settlements.

2. Research Theoretical Literature

2.1. Literature Review

Domestic studies- Domestic research on rural landscape, rural development, and place-based planning in Iran has increasingly emphasized the interaction between physical form, cultural identity, environmental resources, and local livelihood systems. In the Journal of Research and Rural Planning, Faezi et al. (2018) examined the impact of rural housing rehabilitation on rural landscape and showed that physical interventions can influence aesthetic, functional, and environmental indicators. Hosieni et al. (2019) investigated landscape identity components in tourist villages with valuable textures and emphasized visual, historical, cultural, environmental, and semantic dimensions of rural identity. Ghorbanzadeh and Niloufar (2019) classified villages in North Khorasan in terms of entrepreneurial ecotourism indicators, confirming the importance of environmental and cultural capacities in village differentiation. Einali et al. (2019) demonstrated the role of creative tourism in sustainable development of historic-cultural villages, while Anabestani et al. (2022) highlighted the challenges of physical planning in Iranian villages, especially in relation to Hadi plans. These studies show that rural landscape aesthetics cannot be separated from identity, livelihood, physical planning, and environmental capacity.

International studies- Internationally, rural landscape assessment has moved from purely biophysical description toward integrated approaches that combine ecological quality, visual perception, cultural ecosystem services, and public participation. Studies on landscape character assessment, perceived naturalness, landscape diversity, and place attachment indicate that aesthetic value is produced through both measurable landscape attributes and lived human experience (Tveit et al., 2006; Ode et al., 2008; Ode et al., 2009; Frank et al., 2012; Hermes et al., 2018; Kalinauskas et al., 2021). This body of work supports the use of diversity, perceived naturalness, and sense of place as three complementary dimensions for evaluating rural landscape aesthetics on the basis of natural environmental values.

Research gap- Although previous domestic and international studies have examined rural development, landscape identity, naturalness, and ecosystem-service-related aesthetics, fewer studies have integrated residents' perception of natural

environmental values with village-level comparison across mountain, forest, and plain settings. The present study addresses this gap by applying a mixed-method and perception-based framework to selected villages in North Khorasan Province and by linking the results to practical rural landscape planning and conservation.

2.2. Theoretical Framework

Within this study, we built a theoretical framework for rural landscape appraisal on the basis of natural environmental values. Although other authors have taken into account the qualitative nature of these values, we have made the effort of taking it yet one step higher through the utilization of advanced interactions between ecosystem services and cultural environment values with quantitative analysis.

We applied the cultural ecosystem services approach in bridging landscape aesthetic and environmental values and benefits. We applied indicators of naturalness, diversity, and sense of place, all of which are from landscape aesthetics within cultural ecosystem services. In the course of this activity, through strategic planning, we wish to know more about natural environmental values under rural landscape appraisal (see Figure 1).

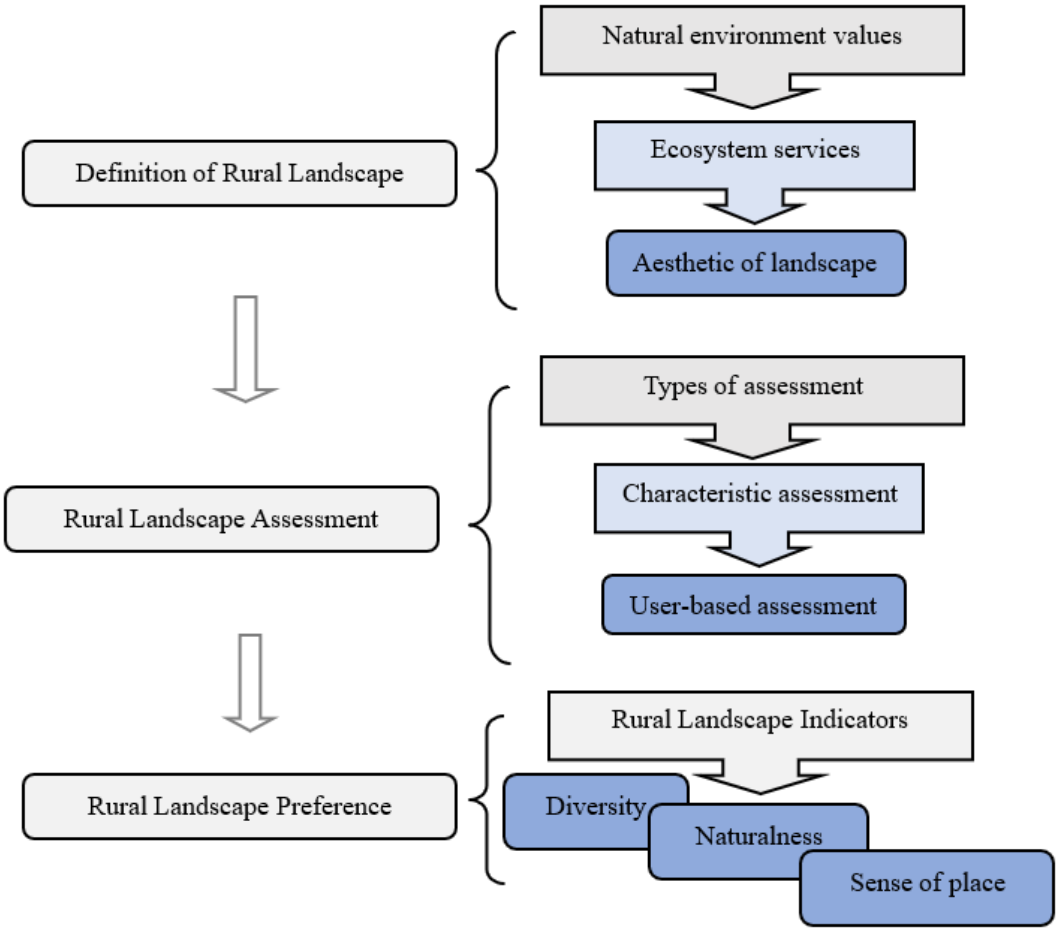

Figure 1. Theoretical Framework of Rural Landscape Assessment. Source: Authors' own construction

2.2.1. Rural landscape concept

Rural Landscape Research (RLR) has changed fundamentally, transforming from reductionist one-dimensional theories based on geography and ecology to adopting multidisciplinary studies. This has been marked by paradigm shift towards dynamic conceptualizations acknowledging rural landscapes as multi-faceted cultural ecosystems. Notably, European landscape policies like the Common Agricultural Policy (CAP) and the

European Landscape Convention (ELC) have helped shape the direction of RLR, directing research agendas into six wide directions: quantifying ecosystem cultural services, protecting ecosystem integrity, advancing landscape design to reconcile with natural environments, evaluating the effects of landscape structure on biodiversity, examining the implications of intensified agricultural land use intensity on biodiversity, and applying Geographic Information Systems (GIS) and other emerging geographic technologies to evidence-based decision-making and management (Plieninger et al., 2016; Gottero & Cassatella, 2017; Xie et al., 2022).

Rural landscape is according to the European Landscape Convention (2000), an active correlation of human exploitation and nature process that shapes such sites. Porteous (2013) describes rural landscapes as "middle landscapes," residing between the wilds and urbanized sites in holding objective and subjective aspects in collaboration to further make their value inherent. With regard to increasing pressures and population demands, the need for wise land use practices becomes ever more evident, as put forth by Salvati and Zitti (2012). Rural and environmental planners emphasize a comprehensive concept of rural landscapes, including nature, man-made structures, and human activity, all of which play a part in defining and function in characteristic ways in such systems (Šťastná & Vaishar, 2020). Being natural, environmental, and cultural reservoirs which are non-replaceable, rural landscapes occupy a pivotal role in biodiversity conservation and soil conservation against the hazards of the modern world (Balestrieri, 2015).

Rural landscape function- By thorough observation of rural landscape resources, it is evident that the rural landscape serves three various functions: cultural landscape, ecological landscape, and productive landscape, each with its own contribution and implication (Ghorbanzadeh et al, 2023; Xie et al, 2022). The cultural landscape is not just a question of maintaining historic heritage (Mahmoodi et al., 2016) but also creating a deep sense of place at the local, regional, and national levels, frequently generating significant tourism rewards for the local community. Conversely, the ecological landscape is geared more towards preserving ecosystems and their functions for maintaining biodiversity, as well as human health, with large trade-offs and synergies to the productive landscape (Law et al., 2021). The productive landscape, however, is crucial to food security and government, agricultural revenue support, and rural employment. Since these varied landscape functions have synergies, effective landscape planning requires a shift toward holistic management practices, promoting effective strategies to take advantage of the multifunctionality of rural landscapes (Badiani et al., 2017; Israel & Wynberg, 2018).

Rural landscape assessment- Rural landscape assessment comprises diverse paradigms and techniques from science disciplines such as geology, ecology, geography, history, archaeology, and landscape architecture that emphasize different elements of the landscape at specific scales in space and time (Wascher, 2005; Mücher et al., 2010; Sayer et al., 2013). These methods have typically been identified as natural science-based and art- and humanities-based methods (Simensen et al., 2018). Spatial evaluations of landscapes are typically categorized into two categories: user-dependent subjective opinions and user-independent formal opinions (Lothian, 1999; Daniel, 2001; Tveit et al., 2006). Subjective methods, which are based on local user preferences and opinions, include approaches such as interviews, questionnaires, and observations, whereas formal measurements rely on public preferences and expert opinions (Hermes et al., 2018). Contemporary landscape studies still make a difference between biophysical evaluations in line with natural science and landscape character evaluations in line with art and human sciences (Simensen et al., 2018). Whereas the former focuses on physical landscape structures, which employ statistical analysis more frequently (Bastian, 2008), the latter focuses on human interpretation and sociocultural relations with the landscape (Jones et al., 2007; Erikstad et al., 2015). In parallel, recent research has increasingly applied machine learning algorithms—such as Random Forest, Support Vector Machines, and deep learning models—to analyze demographic dynamics, structural transformations, and ecological changes in land-use patterns (Sedighkia & Datta, 2023; Ul Din & Mak 2021; Malinić et al., 2025; Otieno et al., 2025). While these data-driven approaches provide valuable quantitative insights, the present study

emphasizes the perceptual and participatory dimensions of landscape evaluation.

The landscape character assessment (LCA) method was chosen for this study because it has been proven to integrate effectively in landscape planning, design, and management, especially in relation to the provisions of the European Landscape Convention (ELC). The process that defines specific landscape identities and enables public involvement in environmental decision-making is known as a decision-making framework (European Landscape Convention, 2000; Teh et al., 2018). Landscape day–to-day rhythms in places provided will be charted to allow stakeholders to actively participate in decision-making that affects their local environment (Teh et al., 2018). This alternative emphasizes the potential of integrated landscape analysis in enhancing sustainable landscape management practices and encouraging the participation of people (Fagerholm et al., 2012).

Consequently, landscape character assessment is now a conventional practice in the development of landscape policy. Created in the 1990s, the process was introduced as a way of describing and classifying landscapes (Swanwick, 2002; Tudor, 2014). This process emphasizes the values of the landscape and contrasts one landscape's values with those of another landscape. Originally quantitatively oriented, it subsequently included qualitative and perceptual approaches, emphasizing landscape values and their comparison across landscapes. The aim of landscape character assessment is to identify and define the elements that constitute the uniqueness of a landscape, emphasizing the variety of landscape characteristics and evaluating landscapes at different scales (Alparslan et al., 2019; Zhuang et al., 2022). The main uses of landscape character assessment include biodiversity conservation, habitat quality analysis, urban landscape pattern analysis, water quality estimation, landscape aesthetic evaluation, and management planning (Statuto et al., 2018; Zhuang et al., 2022).

2.2.2. Natural environmental values in rural landscapes

The term "values" for individuals and the environment has increased in momentum in environmental management, from research to policy (Tadaki et al., 2017). This is echoed in global debates around biodiversity and ecosystem services, urging the need to make values clear to inform environmental policies and management plans (Diaz-Christiansen et al., 2016). Value assessment provides for essential natural and cultural heritage management processes such as land use planning, environmental impact appraisals, and site selection, which require standardization and calibration of assessment indicators to ensure reproducibility and reliability across appraisals (Erikstad, 1997; Erikstad et al., 2008). It is important to value the multidimensional character of environmental values with multiple origins and meanings (Reser & Bentrupperbäumer, 2005). Brown et al. (2005) developed a landscape value model that comprises environmental, cultural, spiritual, educational, scientific, and entertainment values, all of which are inextricably intertwined with human-landscape connections. Like ecological value, environmental value is a major indicator of the conservation of landscapes (Erikstad et al., 2008). O'Neill et al. (2008) also grouped environmental values into ecological, historical, cultural, economic, ethical, and aesthetic values, illustrating the intricate way in which people perceive and interact with their environment. These values, from subjective experience to objective measurement, shape people's relationships with and perceptions of the environment (Reser & Bentrupperbäumer, 2005; Erikstad et al., 2008). This value typology has been utilized by researchers in all planning disciplines, under such headings as ecosystem values, environmental values, or social values (Brown & Brabyn, 2012).

Landscape values are the perceived attributes of a landscape, which arise from complex human–environment relationships (Brown et al, 2005). People engage with landscapes in an active manner, giving meaning and value to certain locations through their ideas, feelings, and actions. As humans use and view landscapes, they receive information, which results in the attribution of varied values, although there is variation among people in their structure and harmony (Brown & Weber, 2012). Rural environments also have a distinct value system, which is a component of a

place's character and is shaped by cultural forces (Šťastná & Vaishar, 2020). Although traditional rural values are predominantly associated with agriculture, modern rural environments have a more extensive value system encompassing postproduction lifestyles, tourism, beauty, diversity, etc., all combined to create the character of the place (Šťastná & Vaishar, 2020). Environmental value appraisal in rural settings is closely aligned with protection and conservation goals, with a focus on value appraisal as essential to the management of cultural and natural heritage. Its importance lies in the application of such an appraisal for intelligent decision-making within land use planning, environmental assessment, and site selection (Erikstad et al., 2008; De Groot et al., 2010).

2.2.3. Aesthetic Values in Landscape Assessment: Integrating Environmental and Ecosystem Perspectives

In landscape geographical research, environment landscape architecture, and environmental science, intrinsic and aesthetic landscapes have been widely studied, which has broadened our understanding of their environmental value (Tveit et al., 2006; Ode et al., 2009; Hermes et al., 2018; Kalinauskas et al., 2021). Zhuang et al. (2022) view aesthetics as an integral part of the landscape character that becomes increasingly important over time.

In addition, the human value of nature's beauty from genetic or biological sources guides behavior and attitudes toward nature and underscores the inherent interconnections among aesthetics, human well-being, and environmental stewardship (Swaffield & McWilliam, 2013; Cooper et al., 2016).

There is ongoing international literature that has connected landscape assessment more closely with ecosystem services, identifying the central contribution of landscape features to providing such services (Šťastná & Vaishar, 2020; Pinto-Correia et al., 2016; Frank et al., 2012; De Groot et al., 2010).Of interest for this study, Ridding et al. (2018) pointed to the role of landscape features in maintaining the cultural services of ecosystems that are vital to human well-being and survival. Although intangible, cultural ecosystem services such as aesthetics have significant effects on land management decisions and human health, attempts still grapple with measurements and integrate them into resource management policy and spatial planning (Milcu et al., 2013; Kalinauskas et al., 2021; Hermes et al., 2018). The incorporation of aesthetic values into measurement systems of ecosystem services can take a long way toward achieving and sustaining such valuable landscape elements. The study in this instance uses an all-embracing theoretical framework for the objective as well as subjective environmental value aspects of aesthetic theory on which Tveit et al. (2006), Ode et al. (2008), and cultural ecosystem services are built.

2.2.4. Aesthetic indicators for rural landscape assessment

As mentioned above, environmental values, the aesthetic value of a landscape is not only determined by its objective attributes but also by subjective experience, where the former involves physical attributes and the latter involves human experience and interpretation. The aesthetic value of a landscape has been proven by several studies to be very much correlated with the configuration, composition and land cover types. In addition, Fry et al. (2009) highlight the strong relationship between visual and environmental landscape elements, emphasizing how these interconnected features contribute to the complexity of landscape aesthetics. Similarly, Frank et al. (2012) support this view by demonstrating that aesthetic appreciation is influenced by both visual perception and ecological characteristics.

Naturalness, diversity and sense of place are found to be good determinants that affects landscape aesthetic by several research studies (e.g. Tveit et al., 2006; Tenerelli et al., 2017; Keong & Onuma, 2021). The choice of these indicators in this study is predicated on two broad criteria: their applicability across the objective and subjective elements of the landscape and their conformity with the aesthetic elements inherent in the definition of cultural ecosystem services (Ode et al., 2009; Kalinauskas et al., 2021). In addition, their widespread focus across the literature serves to highlight their significance, a reflection of the growing recognition of the aesthetic value of landscapes. The current study attempts to offer a holistic method to rural

landscape assessment based on naturalness, diversity and sense of place as chief indicators. This by providing indicators that are both physical as well as perceptual in kind.

Diversity- Diversity in the pattern, form, and layout of landscape characteristics is an outcome of ecosystem processes driven by natural forces such as climate and socioeconomic drivers (Ode et al., 2008). Consequently, under the Biophilia hypothesis, which emphasizes the diversity of nature, the same holds true for species and landscape categories (Kellert & Wilson, 1993; Green et al., 2006). In particular, landscape diversity can be described as the number of land cover classes within a landscape, usually measured via intensive land cover mapping methods (Ramezani, 2019).

In addition to ecological factors, landscape diversity strongly influences human preferences and perceptions (van Zanten et al., 2016; Hermes et al., 2018). The diversity of vegetation interpreted through classification facilitates the capture of landscape change and enhances appreciation, particularly in agricultural landscapes (Herbst et al., 2009). In addition, the presence of water bodies is of particular utility in landscape beauty (Palmer, 2004). Operationally, diversity in this study was assessed through the number and variety of land cover classes, vegetation types, and spatial configurations observed in each village. This approach, adapted from Ode et al. (2008) and van Zanten et al. (2016), was refined to reflect the ecological and visual characteristics of rural landscapes in North Khorasan Province, capturing both natural and human-induced heterogeneity perceived by residents.

Naturalness- Naturalness describes the extent to which a landscape is free from the impression of human intervention and the closer its resemblance is to natural states. Naturalness as a term used in studies of landscape preference is essential for gauging how much a landscape fulfills perceptions of naturalness (Ode et al., 2009) and are not the same as ecological naturalness (Tveit et al., 2006). Ecological aesthetes and environmental psychologists concur that naturalness is an important component of visual quality (Tveit et al., 2006).

Evidence indicates that the interaction between naturalness and preference may not be necessarily direct, where perceived naturalness is a prevalent factor in affecting visual preferences, especially with vegetation (Purcell & Lamb, 1998; Tveit et al., 2006). Research repeatedly indicates a preference for natural over constructed environments (Kaplan & Kaplan, 1989), although the comparison between them could be limited by context and scope of settings researched. Perceived natural environments are greatly prized for their beauty and recreational value (Hermes et al., 2018).

The examination of naturalness often involves subindicators such as perceived land cover naturalness, which measures the degree of human alteration in landscapes via the Hemeroby index (cf. Walz and Stein, 2014; Rüdisser et al., 2012). Originally used in ecological research, the Hemeroby index is currently a common indicator in landscape aesthetic quality evaluation (Frank et al., 2013; Paracchini et al., 2014). This method takes human perception of naturalness into account instead of its ecological significance, where deciduous forests are usually perceived as more natural than coniferous forests or mixed forests are, and surface waters are given the second highest score (Walz and Stein, 2014).

The naturalness evaluation in this research is conducted through classification on the basis of the Hemeroby index, with emphasis on natural features such as vegetation, water bodies, and features of both natural and constructed environments. This scientific method of classification not only provides a scientific way of assessing naturalness but also enables us to better comprehend human perception from various cultures.

Operationally, perceived naturalness was evaluated using residents' ratings of landscape authenticity and degree of human alteration. The assessment followed sub-indicators such as vegetation cover, presence of water bodies, and use of vernacular architectural materials, adapted from Tveit et al. (2006) and Walz & Stein (2014) to fit the rural environmental context of North Khorasan Province.

Sense of Place- The sense of place has long been a focus of geographical and environmental psychology studies and refers to the attachment or emotional connection that people develop toward a

specific location, or the meanings they attribute to it (Williams & Vaske, 2003; Brown & Raymond, 2007). Attachment to a place, as proposed by environmental psychologists, is considered equivalent to geographers' interpretation of sense of place. The place attachment scale developed by Williams and Vaske (2003) is among the first validated instruments designed to measure this construct across different land-use contexts, structured around two core dimensions: place identity and place dependence (Brown & Raymond, 2007). According to Tuan (1977), individuals who are rooted in a place tend to act responsibly toward their environment (Kudryavtsev et al., 2012). Moreover, people in communities with stronger place attachments enjoy a higher quality of life and more readily identify landscape values and distinctive features within their communities (Brown et al., 2005; Mohammad-Moradi et al., 2022).

In the Iranian context, several studies have applied and validated this theoretical framework, confirming its cultural relevance and adaptability within local socio-spatial conditions (e.g., Falahat, 2006; Mohammad-Moradi et al., 2022; Samadpour shahrak et al., 2020). These works demonstrate that the constructs proposed by Williams and Vaske can be effectively operationalized in both urban and rural Iranian environments. Accordingly, the present study builds upon the original theoretical model of Williams and Vaske, integrating insights from its localized validation to ensure conceptual consistency and cultural appropriateness for North Khorasan's rural communities.

Place attachment, or the human–place bond (Altman & Low, 2012), has been widely discussed in academic discourse since the 1990s, and its application across different contexts and cultures continues to expand (Falahat, 2006; Montazerolhodjah & Sharifnejad, 2023). However, the psychometric properties of the scale have not always been assessed in proportion to its widespread use. Some authors (e.g., Williams & Vaske, 2003; Budruk, 2010) emphasize that contextual factors are essential for understanding and measuring individuals' place attachment, and that more research is needed to examine conceptual equivalence and measurement reliability across cultural and environmental settings (Wynveen et al., 2018). The assumption of item equivalency, as noted by Budruk (2010), may pose challenges when comparing data collected from different socio-physical contexts. Place conceptualization varies among individuals with diverse experiences and cultural backgrounds (Kyle & Johnson, 2008; Trentelman, 2009), and minor differences in local practices or meanings may not always be captured by standardized scales (Wynveen et al., 2018).

Operationally, sense of place was measured through residents' responses to items capturing place identity, place dependence, and emotional attachment, adapted from the validated scale of Williams & Vaske (2003) and related studies (Brown & Raymond, 2007). These measures were contextualized to reflect the sociocultural characteristics of Iranian rural communities, enabling a culturally relevant understanding of residents' emotional and functional bonds with their landscape.

2.2.5. Landscape preference

Landscape preferences are usually conceived of as predominantly being based on precognitive, affective responses to the physical environment related to feelings of liking or disliking. They are often defined as the aesthetic or evaluative response elicited by visual encounters with real or simulated natural settings (Buijs et al., 2009).

Landscape preferences have been extensively studied in the past. On the basis of evolutionary theories, many studies have focused on interpersonal agreement on landscape preferences (such as preferences for trees and water) (Ulrich, 1993).

Lothian (1999) suggested that landscape perceptions are formed by the two factors of inherent environmental characteristics and people's interpretations of these characteristics (Taghvaei et al., 2017; Huai & Van, 2022). From the perspective of evolutionary psychology, there are some innate and common understandings of landscapes irrespective of their cultural background (Dutton, 2003; Fry et al., 2009; Özgüner, 2011; Tveit et al., 2006). Other studies have shown that preferences for wild or more managed landscapes may differ significantly between social groups (Kaplan and Kaplan, 1989; Buijs et al., 2009). People with different sociocultural backgrounds may have

different preferences for urban parks (Hägerhäll et al., 2018; Elsadek et al., 2019). Nevertheless, comparative research between different cultural backgrounds can reveal some generally applicable preferences and local variances (Madureira et al., 2015). Consequently, more evidence on the cultural understanding of landscape perceptions and landscape preferences is needed to expand insights into which landscape features influence landscape perceptions that are universally applicable or culturally driven (Swapan et al., 2017; Ruegaard Petersen, 2024).

3. Research Methodology

3.1 Geographical Scope of the Research

In terms of geographical position between 37 degrees north latitude and 55 degrees east longitude, North Khorasan Province is placed in an intermediate geographic position in Iran's geography (Jafari et al., 2012). In terms of geographical size, measuring 28,434 square kilometers, or 1.7% of the country's geographical size, North Khorasan is a middle-sized province in geographical terms. (See Figure 2)

Geographically, North Khorasan comprises mountain and plain areas, where mountain areas dominate the landscape of the province. Structural and alluvial processes control the fertility of the plains in the province, which results in fertile farming fields along with less fertile farming fields. The climate of the province is highly variable, with mountainous conditions being the most prevalent condition because of extensive mountain ranges. Desert and semidesert climates prevail in the southern regions at the peripheries of the central desert, and the higher parts have a cold mountain climate. Rainfall is the source of water, and surface water resources depend on local precipitation patterns. Groundwater, used as springs, aqueducts, and wells, is a substantial source of water, although it is marred by issues of both quantity and quality by virtue of being overexploited and insufficiently replenished.

The vegetation in North Khorasan thrives on the basis of its climate, soil, and altitudinal gradient diversity, which is a very lovely phenomenon in the province. Forests, which constitute 3.3% of the national forest cover, and pastures, which constitute 51% of the natural cover, directly account for diversifying biodiversity in the province.

Despite North Khorasan being heaven on earth for nature, desertification is fought because of unauthorized animal grazing, cutting down trees, practicing unsuitable farming methods, and wasteful irrigation. Desertification has encroached infinitely over the past decades, and up to 20% of the province has already become desert, on the basis of provincial data provided by the Department of Natural Resources. The North Khorasan Province was selected because of its strong environmental potential, rich cultural and historical background, and varied climatic conditions.

Figure 2. Map of Iran with two zoomed views—an overview of North Khorasan Province (research area) and a detailed view of the selected study villages within the province. ● Mountain villages ● Forest villages ● Plain villages. Source: Authors' own construction.

Its diverse geography, including water bodies, fertile plains, and high plateaus, is an appropriate location for studying environmental dynamics. Moreover, researchers' acquaintance with the area makes it easier to collect data from government agencies at a faster rate, allowing efficient research.

This research tends to specify the relative features of the village environment in North Khorasan in relation to different landscapes to obtain a complete understanding. The natural conditions of North Khorasan villages vary and can be broken down into three categories: plains, mountain or valley areas, and forests. The variation enables the general rural model of evaluation to cover a wide range of local climates. In incorporating villages of different natural conditions, the research is now applicable for generalization for villages that share the same climates, and its overall use and scope are thus increased.

3.2. Criteria for Village Selection in the Study

The selection of villages in this study followed a systematic, multi-stage process to ensure analytical representation of North Khorasan's environmental and social diversity. The procedure was designed according to clearly defined criteria and relied on official datasets and classifications provided by provincial authorities (see Table 1 and Figure 3).

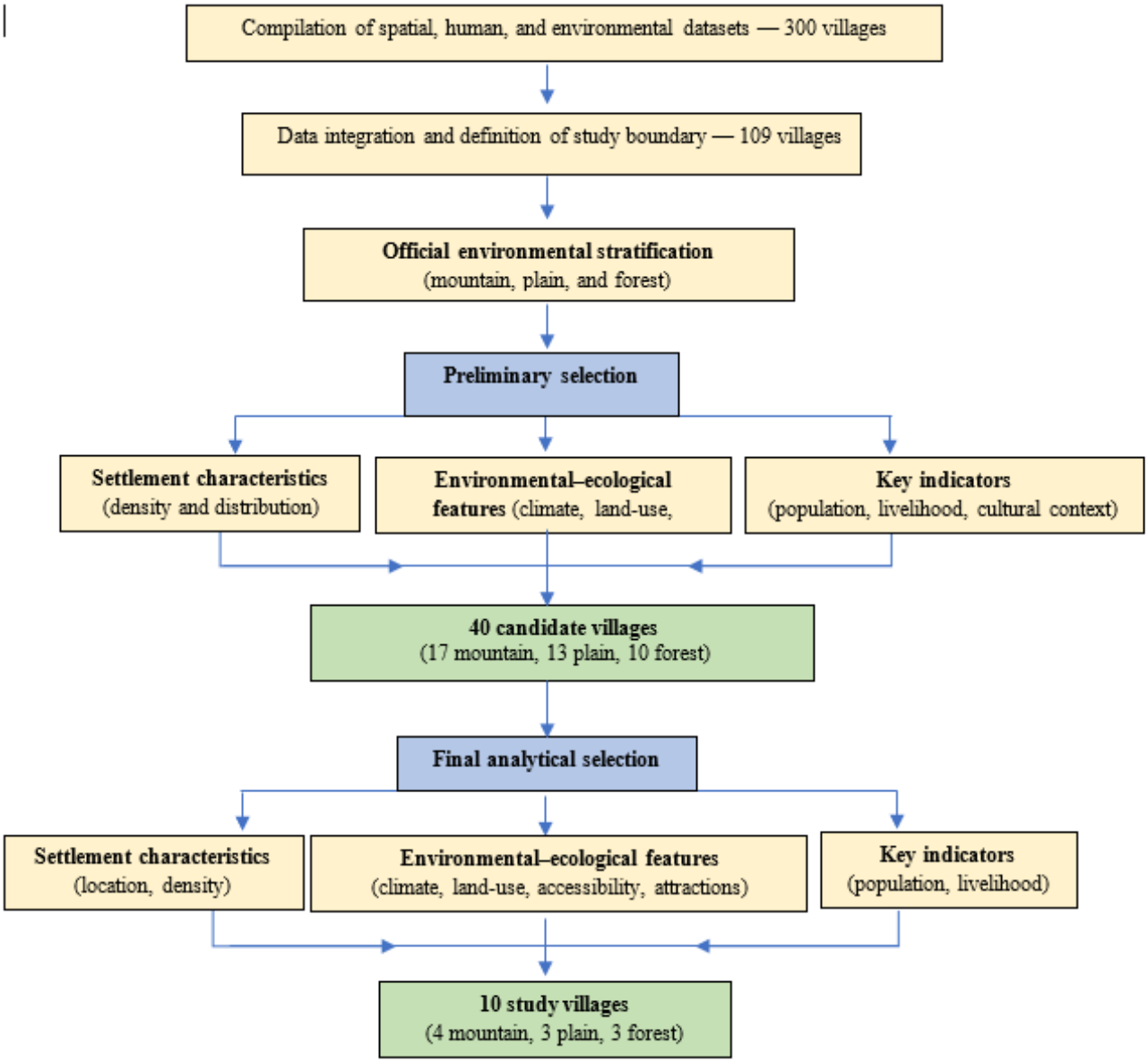

Figure 3. Process of village selection. Source: Authors' own construction.

Table 1. Multi-stage process of village selection and key evaluation

Stage	Purpose	Core criteria applied	Output
1. Data compilation	Identify villages with reliable and updated baseline data	Villages possessing valid *Haadi* plans (after 2009) and complete spatial, human, and environmental datasets from official agencies (Housing Foundation, Natural Resources Organization)	300 villages extracted from 720 inhabited settlements
2. Data integration and study boundary	Focus the research on areas with comprehensive and overlapping datasets	Spatial overlap between *Housing Foundation* and *Natural Resources* layers to ensure completeness and accuracy	109 villages identified within the defined study boundary (central and eastern zones of the province)
3. Official environmental stratification	Establish an environmental framework consistent with official classifications	National/Provincial Management and Planning Organization's typology based on natural siting: mountain, plain, and forest	81 mountain, 15 plain, and 13 forest villages identified
4. Preliminary selection	Capture environmental, spatial, and social diversity within each stratum	Settlement characteristics (density and distribution), ecological and landscape diversity (climate, land-use, accessibility), and key indicators (population, livelihood, cultural context)	40 candidate villages (17 mountain, 13 plain, 10 forest)
5. Final analytical selection	Choose the most representative villages in each environmental stratum through detailed multi-criteria evaluation	Based on the three main criteria and their sub-factors: • Settlement characteristics – geographical setting, density, and spatial distribution balance. • Environmental–ecological features – climate diversity, land-use extent, accessibility, and natural/historical attractions. • Key indicators–livelihood structure (agriculture, husbandry, mixed) and population scale (below/above 1,000).	10 final study villages: 4 mountain, 3 plain, and 3 forest
6. Validation and generalization	Ensure analytical representativeness at the provincial level	Coverage of all three official strata and internal heterogeneity in population, livelihood, and land-use	Enables analytic generalization across the North Khorasan Province

In the first stage, spatial, human, and environmental data were compiled from the Housing Foundation of Iran (rural guide plan after 2009) and the Natural Resources and Watershed Organization. These official sources provided reliable and up-to-date datasets covering 720 populated villages across the province. From this list, 300 villages with complete and verified baseline data were identified.

In the second stage, the two datasets were integrated through spatial overlay analysis to locate areas with comprehensive and overlapping information. The central and eastern corridors of North Khorasan, containing 109 villages, demonstrated the highest data completeness and were therefore defined as the study boundary (see Figure 4). This map shows the merged spatial coverage of human and environmental data layers and the boundary used for subsequent analysis.

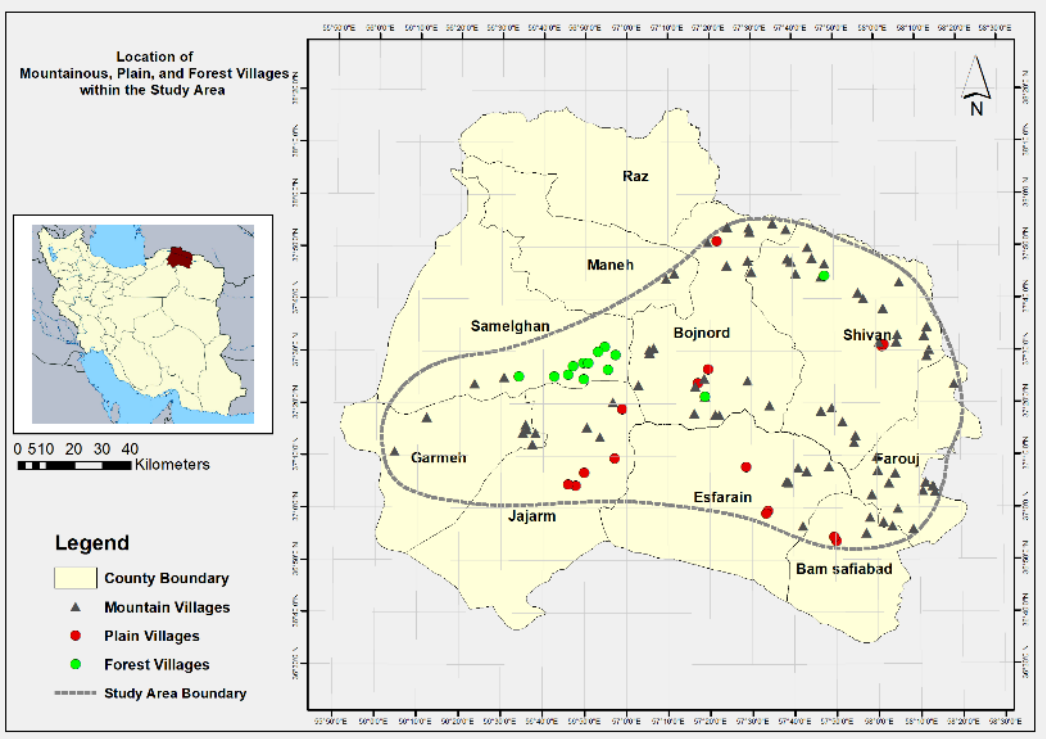

Figure 4. Study boundary and distribution of 109 villages with complete datasets in North Khorasan Province. Source: Authors' own construction.

The third stage involved official environmental stratification of these 109 villages, following the classification system used by the national and provincial Management and Planning Organization. Based on natural siting, villages were categorized into mountain, plain, and forest strata—81, 15, and 13 villages respectively. This typology, officially applied in regional planning, established a consistent environmental framework for comparison and ensured coverage of all major ecological settings in the province.

In the fourth stage, a preliminary selection was carried out within each stratum to capture environmental, spatial, and social diversity. Villages were evaluated according to three main criteria:

(1) Settlement characteristics – geographical location, density, and spatial distribution;

(2) Environmental–ecological features – climate, land-use pattern, accessibility, and the presence or absence of natural/historical attractions; and

(3) Key indicators– population class, livelihood type, and cultural context.

Applying these criteria resulted in 40 candidate villages (17 mountain, 13 plain, and 10 forest) representing a wide range of physical and social conditions within the study area.

During the fifth stage, a final analytical selection was performed using a refined multi-criteria evaluation based on the same three main criteria and their sub-factors. Under Settlement characteristics, attention was paid to geographical setting, density, and balance of spatial distribution. The Environmental–ecological features included climate diversity, extent of farmland and rangeland, accessibility, and natural/historical attractions. The Key indicators (sense of place) accounted for livelihood structure (agriculture, husbandry, or mixed) and population scale (below/above 1,000 inhabitants). This process identified ten representative villages—Khosravieh, Esfidan, Borzelan, and Rein (mountain); Jooshqan, Chukanlu, and Jorbat (plain); and Darkesh, Keshanak, and Roien (forest)—as the final study cases (see Figure 5), which illustrates their geographical distribution across the three environmental strata.

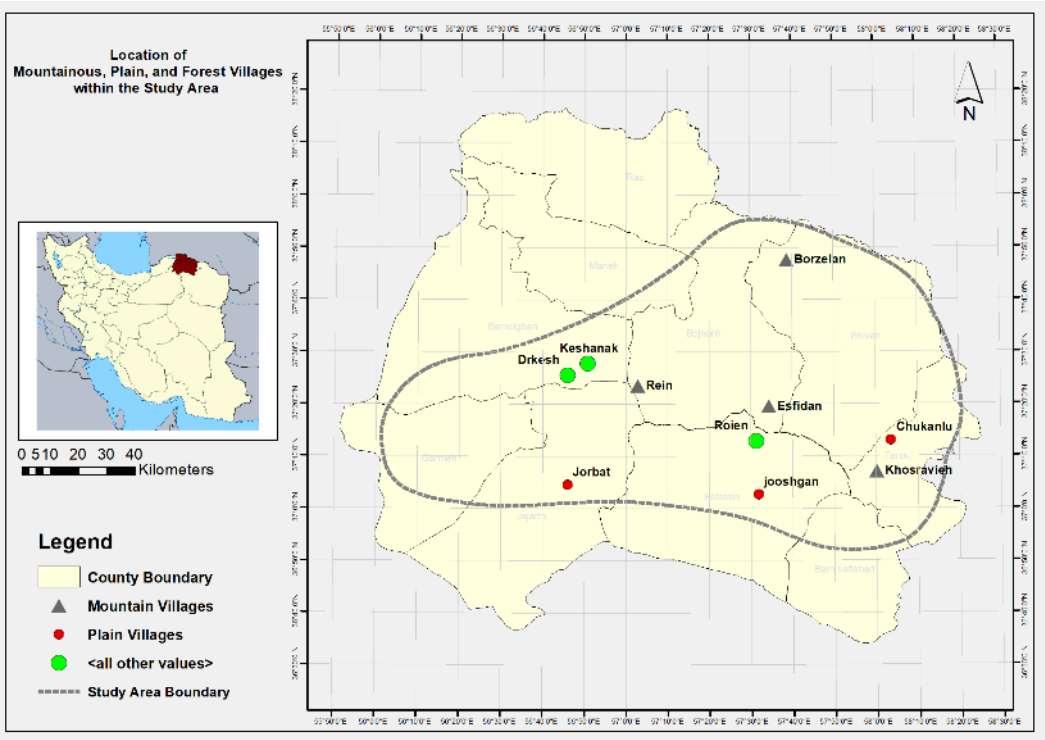

Figure 5. Location of the 10 final selected villages by environmental strata (mountain, plain, forest)

Finally, the sixth stage involved validation and generalization. The selected villages were cross-checked against official environmental and demographic typologies to confirm that all three strata were represented and that intra-stratum heterogeneity (in population, livelihood, and land-use) was maintained. This design supports analytical generalization at the provincial scale, allowing for meaningful comparison among the three environmental settings rather than statistical estimation of province-wide proportions.

Overall, this structured, criteria-based procedure clarifies how ten villages can effectively represent the environmental and social diversity of North Khorasan Province. The balanced stratification across mountain, plain, and forest settings, combined with systematic evaluation under the three main criteria—settlement characteristics, environmental–ecological features, and key indicators—ensures both representativeness and analytical rigor for subsequent landscape assessment.

3.3. Natural and human characteristics of villages

The mountain villages[1]**-** Esfidan is a mountain village in Bojnord County. Esfidan village has a semiarid and cold climate and approximately 1371 individuals according to the 2016 census. Esfidan is a stepped village and has beautiful natural landscapes such as green gardens, different waterfalls, and two very old cypress trees aged 500 years. Esfidan is a stepped village and possesses cultural heritage. Khosravieh village lies in Shah Jahan city in the Farouj region at 1800 m in elevation and has a semiarid and cold climate. The population in the 2015 census was approximately 662 inhabitants. Fish ponds have been constructed in rivers and many springs within this village.

1 All information related to the natural and human characteristics of North Khorasan province, including statistical information, maps, tables... from the study sources of the General office of Natural Resources and Watershed Management of North Khorasan Province, the Department of Natural Resources and Watershed Management of Shirvan City, Housing Foundation of Islamic Revolution, North Khorasan Province Management and Planning Organization, North Khorasan Agriculture Jehad, The Governorate of North Khorasan, Administration of Cultural Heritage, Handicrafts and Tourism Organization of North Khorasan has been taken.

Kalakan Glacier, the local location, is located 5 kilometers southeast of the village. Borzelan village is within the Qoshkhaneh rural district, 122 km northwest of Bojnord, between mountainous areas with elevations ranging from 1,300 to 1,890 meters. A semiarid climate prevails here, and springs and rivers are the sources of water for the village. The population included 498 people in 142 families according to the 2016 census. Despite being a mountainous village, Borzelan village has no specific natural or historical attractions. (For a better understanding of the mountainous character of the villages, see Image 1 and 2.)

Figure 5. Left; Aerial photo of Darkesh village, right; General view of Darkesh village

Figure 6. Left, Aerial photo of Khosravieh village, right; The general view of Khosravieh village.

The forest villages- Here, we analyze the conditions of the Roien, Darkesh, and Keshanak villages in North Khorasan Province by measuring their natural and sociocultural features. Roien village, located at an altitude of 1670 m above sea level, has a semiarid and cold climate. Roien, whose beautiful landscape is dotted with fruit trees and stone gorges, has a diverse ecosystem due to its numerous springs and the Roien River, which flows perennially. The population of the village is 2123. Beautiful architectural features such as houses along slopes have made Roien culturally attractive. Similarly, the location of Darkesh village explains yet another facet of life in the forest village. The elevation is 990 m above sea level. The climate of the area is mountainous and temperate. Darkesh is renowned for its dense oak woodlands, extensive gardens, and lush valleys. A total of 1027 people live in the village. Keshanak village is 27 kilometers southwest of Ashkhaneh, which is a half-arid forest area. The village elevation is between 870 and 1720 meters. The forest area is 880 hectares, the agricultural land area is 1020 hectares, and the garden area is 1020 hectares. It had 2807 people as of the 2016 census. The village is blessed with all sorts of natural attractions, such as mountains, valleys, waterfalls, hot springs, lakes, rivers, and forests. In addition, Golzar Imamzadeh, dating back 200 years, is located on the Keshanak heights of green hills. It is a resort spot for visitors. These three forest villages embody the complex relationship between natural scenery and cultural heritage and are therefore attractive sites for an integrated assessment of the rural landscape. (For a better understanding of the forest setting of the villages, refer to Image 3 and 4.)

Figure 7. Left; Aerial photo of Roien village, right; General view of the village

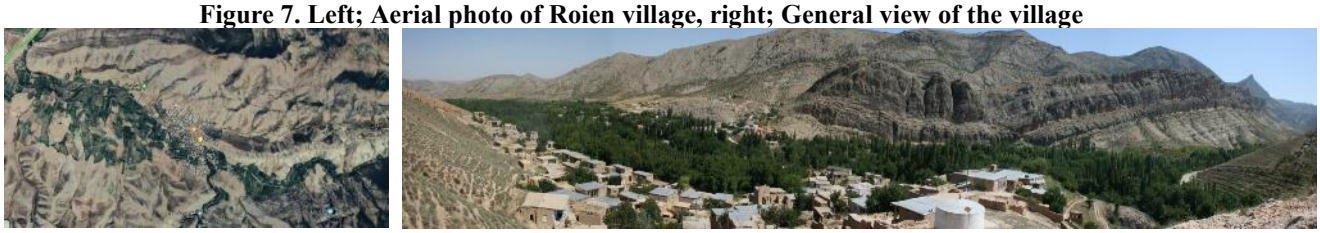

Figure 8. Left; Aerial photo of Darkesh village, right; General view of Darkesh village

The plain villages- Chukanlu village is situated in Farouj County and is 1,400 m in altitude. Chukanlu village is flatland, has a semiarid climate, is cold, and relies on deep wells to access irrigation water reservoirs. It has a population of 1,730 in the 2016 census and is flat and broad in dimension, so it is one of a kind in terms of identity. Jooshqan village is located 4 kilometers west of Esfarain. Jooshqan is situated at sea level (1,250 m) and is a plain village. Jooshqan village, similar to Chukanlu village, also relies on deep wells as agricultural water sources. Jooshqan village has residential lands of 747 hectares and orchard lands of 11 hectares and over 930 inhabitants according to the 2016 census. Jorbat village is situated 40 km east of Jajarm. It is a plain village by nature and is 940 m in elevation above sea level. The weather in the investigated area is cold and climatically arid. Qanats are village water sources used in agriculture. 120 hectares is irrigated cultivated land, and the number of pastures is 3699 hectares. The population of the village was 527 individuals according to the 2016 census. One notable monument of Jorbat village is the Jorbat petroglyph site, which is situated 8 kilometers east of Jorbat village and is registered among Iran's national monuments. (For a clearer view of the locations of the villages on the plains, see Image 5 and 6.)

Figure 9. Left; Aerial photo of Jooshqan village Right; General view of Jooshqan village

3.4. Research Design, Data Collection Methods, and Sampling Strategy

This research considers rural landscape assessments with three important indicators: "diversity," "perceived naturalness," and "sense of place." These have served as the building blocks upon which quantitative and qualitative studies have been conducted. A case study was undertaken with sample villages from North Khorasan Province via a qualitative study methodology to gain a better picture of more intricate landscapes of beauty.

Qualitative analysis was performed in phase one with the expertise of landscape architects, rural study experts, and environmental appraisers. Their preferences and rankings of the selected indicators were ascertained via an email questionnaire. The outcomes of phase one formed the basis for constructing a validated questionnaire that would be administered in phase two.

For the second stage, direct interviews and surveys were used to examine the perceptions and attitudes of the sample village residents toward beauty in the landscape and the sense of place-related factors. The data gathered were processed via data analysis software and yielded findings that provided a general vision of the countryside landscape, paving the way for final evaluation model development.

Participants- Expert Group: The expert group consisted of experts and elites in the fields of landscape architecture, rural studies, and environmental appraisal. Experts were selected using purposive sampling based on their academic background, professional experience, and direct expertise in rural landscape assessment, environmental appraisal, and landscape planning. These experts were responsible for validating and calibrating the questionnaire prior to its distribution among residents. In total, 25 questionnaires were emailed to the experts, of which 18 were completed. This expert consultation was designed to assess content validity and consistency of the questionnaire items rather than for inferential statistical analysis. According to methodological recommendations (Hinkin, 1998; Lynn, 1986), a panel of 15–20 experts is considered sufficient for content validation in interdisciplinary research. Therefore, the 18 completed expert questionnaires meet the recommended threshold and were sufficient to ensure the scientific validity of the research instrument and to enhance the reliability of the findings.

The non-response (7 experts) did not introduce systematic bias, as the non-respondents shared similar academic and professional backgrounds with the respondents. The participating experts represented a balanced mix of academic and professional perspectives, which strengthened the validity of the instrument.

Local Residents Group: The local residents group consisted of participants from ten selected villages in North Khorasan Province, chosen to reflect the province's geographical, cultural, and economic diversity. These ten villages, representing mountain, plain, and forest environments, have a total population of 12,698. To ensure comprehensive coverage of socio-environmental variation, a three-level cluster sampling strategy was employed. In the first stage, villages were identified according to the official environmental stratification framework. In the second stage, household clusters were established within each village, and in the third stage, individual respondents were randomly selected across different times of day and locations such as village centers, workplaces, and public spaces. This approach captured the full range of social and occupational diversity within the communities.

A total of 330 individuals (approximately 2.36% of the total population) were initially targeted, and 274 valid questionnaires were ultimately obtained due to field conditions. This sample size is considered statistically adequate for comparative rural studies and aligns with established sampling frameworks in rural sociological research (Dillman et al., 2014; Bernard, 2017). For a 50/50 proportion, $n = 274$ provides an estimated ±5.9% margin of error under simple random sampling, and an effective precision of ±7–8% when accounting for clustering effects. This level of accuracy is consistent with accepted thresholds for rank-based nonparametric analyses (Kruskal–Wallis and Spearman) used in this study.

Because the ten study villages were selected through the official environmental stratification (mountain, plain, and forest), covering all major ecological and social contexts of North Khorasan Province, the design allows for analytical generalization at the provincial level. Within these strata, the residents' sample provides sufficient statistical power to identify meaningful differences in perceived landscape preferences. All surveys were conducted face-to-face and through random

encounters, ensuring that a wide spectrum of perspectives on landscape beauty and sense of place was captured among respondents (see Table 2).

The validated data from expert and resident inputs established a reliable basis for developing an integrated framework for assessing rural landscape aesthetics in the region's diverse environmental and social contexts.

Table 2: Profiles of the respondents engaged in the survey questionnaire.

Geographical location of the village	village name	Number of respondents	Mean age	Female	Male
mountain type	Esfidan	25	39.7	10	15
	Khosravieh	14	41.7	5	9
	Rein	18	40	11	7
	Borzelan	14	42.1	4	10
forest type	Roien	50	40	28	22
	Darkesh	25	33.5	7	18
	Keshanak	56	42.3	29	27
plain type	Chukanlu	26	42.9	8	18
	Jooshqan	32	36.7	9	23
	Jorbat	14	42.6	6	8
Total	-	274	-	117	157

Explanation of Questionnaire Structure- The residents' survey used in this research was designed to test the residents' views about three rural scenery essentials: naturalness, diversity, and sense of place. The residents' questionnaire was designed not only to collect perception-based data but also to foster active participation by local people in the assessment process, reflecting the participatory spirit of citizen science in a community-based research context (see, for example, Fritz et al., 2019).

The sense of place section of the questionnaire was structured based on the two-dimensional framework of place identity and place dependence proposed by Williams and Vaske (2003). This framework has been previously applied and validated in Iranian studies, confirming its cultural appropriateness and psychometric reliability within both urban and rural contexts (Falahat, 2006; Mohammad-Moradi et al., 2022; Samadpourshahrak et al., 2020). For the present research, the questionnaire items were slightly adapted linguistically and contextually to reflect the local realities of North Khorasan villages, such as traditional architecture, community rituals, and agricultural livelihoods, ensuring that respondents could interpret and answer each item naturally within their cultural setting.

Two independent sets of residents' and experts' surveys were conducted, and 36 questions in total contained 5 diversity questions, 3 foundational and 8 secondary naturalness questions, 12 foundational and 7 secondary senses of place questions, and 5 demographic questions. Demographic variables such as age, education, and occupation were collected only for descriptive infographic purposes and were not analyzed as predictors of sense of place. The questionnaire was designed on the basis of past research, such as that conducted by 117. Zhuang et al. (2022) in China and Ólafsdóttir and Sæþórsdóttir (2020). The questionnaire also included Hemeroby index (Walz & Stein, 2014) to measure diversity and naturalness (Jorgensen & Stedman, 2001; Mohammad-Moradi et al., 2022). Field surveys were carried out to increase the accuracy of rural landscape variable measurements in Iran, especially in villages in North Khorasan. From these studies, some of the landscape features peculiar to the area, i.e., vineyards, fish ponds, and beehives, were part of the set of components that were evaluated, with detailed tables provided in the research findings chapter. Furthermore, the questionnaire was designed to also reflect temporal and cultural aspects influencing people's aesthetic perception. Items related to seasonal color changes and traditional or religious events were included so that both environmental seasonality and local cultural

practices were represented in the assessment of rural landscape aesthetics and sense of place.

In the initial phase, the expert survey was created on the Porsline site and conducted online with the participants. It consists of 15 7-point Likert scale questions (1 = very low, 7 = very high) and then 3 open-ended questions on the completion of every section to enable experts to provide more detailed explanations of their opinions. Following the scrutiny of the first set of expert answers, a few questions were made simpler or eliminated, and a resident-friendly questionnaire was developed.

In the second phase, the resident questionnaire was completed in a sample of 10 selected villages. Owing to the complexity of some of the specialized terms, e.g., diversity and naturalness, this term was put in less complex words, and its Likert scale was reduced from 7 points to 5 points (1 = very low to 5 = very high). The respondents were administered the questionnaire via a face–to–face interview and through direct contact with each respondent. The respondents were interviewed one by one by a survey administrator with clarifications provided, if necessary, while responses were carefully taken. To ensure consistent understanding between experts and residents, short and clear definitions of the three main concepts—*diversity*, *naturalness*, and *sense of place*—were presented at the beginning of the questionnaire. During the face-to-face interviews, these definitions were briefly explained by the interviewer to make sure that all respondents interpreted the questions based on a shared conceptual framework. The data derived are summarized in Table 3 of the article. The complete version of the residents' questionnaire, including all items related to diversity, perceived naturalness, and sense of place, is provided in Appendix A to ensure transparency and replicability of the data collection process.

Table 3. Summary of naturalness and diversity questionnaire framework

Indicator	The primary focus of the survey questions	Sub-indicator
Landscape Diversity	- Assessing the Impact of Diversity Factors on Village's Aesthetics	- Seasonal Colors - Topographical Diversity - Plain Landscape - the Integration of Stepped Architecture Next to the Orcahards - Pathways
Landscape Naturalness	- Influence of Natural and Cultivated Features on the Village's Aesthetics	- Forest - Orchards - Farmland - pastures - The mountains around the village - Water resources (Spring and river) - Salmon fountain pools - Colored beehives - Natural Sounds' Influence - Vernacular material of architecture
Sense of place Components of Sense of place	- Place identity - Place attachment - Place dependence - How much does each of the following things make you feel a sense of belonging to this village - Specify your level of satisfaction with each of the following items	- This village mirrors my essence. - I feel truly myself here. - This village reflects who I am. - This village is a part of me. - Feeling calm in this village. - Feeling happy in this village. - This village is my favorite place. - Missing this village when away. - This village meets my needs best. - Entertainment here suits my age. - Perfect place for my interests. - Nowhere else compares for my work. - Valuable historical monuments - Signs of traditional village architecture - Organizing cultural, religious, and ritual events - Well-being and comfort (economic welfare) - Infrastructure and services - Cleanliness and garbage collection

Data Analysis- Statistical analysis was conducted using IBM SPSS 29 to validate and compare three aesthetic indicators—diversity, perceived naturalness, and sense of place—across ten rural respondent groups in North Khorasan Province. Descriptive statistics were first calculated for each village and each sub-indicator. The normality of the indicators was then examined using the Kolmogorov–Smirnov test for the pooled sample and for the village-level groups. Because the p-values were below 0.05 in almost all cases, the assumption of normality was rejected and nonparametric procedures were adopted. The Kruskal–Wallis H test was used to identify significant differences among the ten villages, and Spearman correlation analysis was used to examine associations among diversity, perceived naturalness, components of sense of place, and overall sense of place. In this analytical framework, sense of place was treated as the main perceptual outcome, while diversity, perceived naturalness, and sense-of-place components were examined in relation to it. Before presenting the statistical results, the validity and reliability of the measurement instruments were evaluated to ensure the robustness of the analytical framework.

In the first stage, content validity was assessed through the expert questionnaire previously introduced in the Methodology section (Section 4.3.1). In this phase, 18 Iranian experts in landscape architecture and environmental design evaluated the indicators of diversity, naturalness, and sense of place regarding their alignment with the environmental, cultural, and aesthetic characteristics of Iran's rural landscapes. Their feedback was used to refine wording, simplify items, and improve conceptual clarity to ensure that the questionnaire was both theoretically coherent and locally adapted to the real conditions of rural Iran.

Moreover, the conceptual framework of this study has been further supported in a complementary comparative publication (Ghorbanzadeh et al., 2025), which demonstrates that while these three indicators possess general conceptual validity, their interpretation and relative importance vary across different cultural settings. This comparative insight reinforces the theoretical foundation of the present research but does not replace the content validation conducted by Iranian experts.

In the second stage, construct validity was examined through confirmatory factor analysis (CFA) performed in LISREL software, which is widely used for advanced statistical analyses such as structural equation modeling and factor analysis. All factor loadings were above 0.40, and the average variance extracted (AVE) for each construct exceeded 0.50 (AVE_diversity = 0.52; AVE_naturalness = 0.51; AVE_sense of place = 0.67), indicating satisfactory convergent validity. Model-fit indices ($\chi^2/df < 5$, RMSEA < 0.08, P > 0.05) also confirmed an acceptable model fit. As shown in Figure 6, the CFA model verified the significant correlations between the observed variables and their corresponding latent constructs, confirming the adequacy of the measurement model.

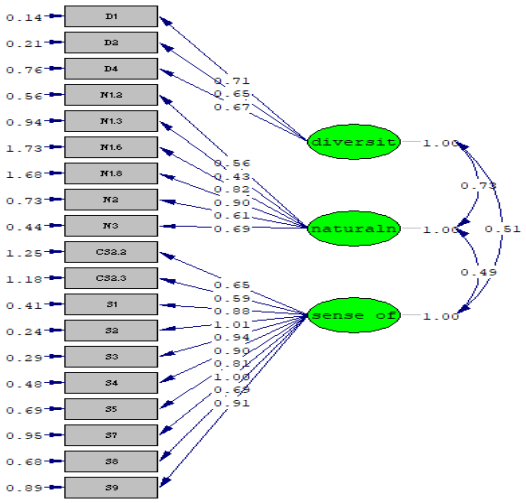

Figure 10. Measurement model (CFA) for the indicators of diversity, naturalness, and sense of place.

Discriminant validity was verified using the HTMT criterion (values < 0.9), and reliability was confirmed through Cronbach's alpha coefficients exceeding 0.70 for all constructs. Altogether, these results confirm that the three-dimensional framework—comprising diversity, naturalness, and sense of place—is conceptually rooted in the Iranian context, statistically validated, and theoretically consistent with broader international approaches to rural landscape assessment. The outcomes of these tests are presented in Table 4.

Table 4. Tests for rural landscape assessment for three indicators across ten respondent rural groups.

Indicators	Test Group	N	Analysis Method
- Experience of landscape diversity - Experience of naturalness - components of the sense of place - Sense of place	10 villages	274	Kolmogorov–Smirnov Test Kruskal–Wallis H Test Spearman-Brown correlation Test Correlation

4. Research Findings

This section presents the findings of the empirical analysis as a separate results section. The analysis is organized in three steps. First, the mean ranks of diversity, perceived naturalness, components of sense of place, and overall sense of place are compared across the ten selected villages. Second, the statistical relationships among the main indicators are interpreted through nonparametric correlation analysis. Third, the villages are compared within their environmental settings—mountain, forest, and plain—to identify how natural environmental values and social–cultural factors jointly shape rural landscape aesthetics.

4.1. Comparison of the Rankings of Landscape Aesthetic Indicators

Following onsite interviews and questionnaire administration among local residents, the survey results are presented in Table 5 as mean ranks for diversity, perceived naturalness, components of sense of place, and overall sense of place. The ranking procedure is important because the indicators were measured through ordinal Likert-scale responses and the distribution of scores was non-normal. The mean ranks therefore provide a comparable basis for identifying which villages are perceived as aesthetically stronger or weaker in relation to natural environmental values.

Because the purpose of the study is to evaluate the values of the natural environment in rural landscape aesthetics, natural and environmental factors such as village location, vegetation, water resources, landforms, and land-use patterns are emphasized as the primary components of interpretation. Social and cultural attributes are not treated as independent demographic predictors; instead, they are integrated under the components affecting sense of place, including valuable historical monuments, traditional architecture, cultural and religious events, welfare and comfort, collective memories, and satisfaction with local services.

Table 5. Mean Rank of Diversity, Naturalness, and Sense of place in villages

Geographical location of the village	village_name	N Participants	Mean Rank Diversity	Mean Rank Naturalness	Mean Rank components of sense of place	Mean Rank sense of place
mountain type	Esfidan	25	143.18	146.20	127.38	123.86
	Khosravieh	14	122.71	177.53	114.39	126.60
	Rein	18	59.55	141.41	165.88	235.47
	Borzelan	14	42.42	27.00	53.71	99.35
forest type	Roien	50	205.16	222.56	198.10	167.83
	Darkesh	25	203.86	164.28	114.62	122.29
	Keshanak	56	178.30	118.11	117.33	137.86
plain type	Chukanlu	26	115.90	86.59	109.55	116.09
	Jooshqan	32	110.46	131.07	187.67	122.28
	Jorbat	14	94.53	22.53	124.28	119.10

Significant correlation between aesthetic and perceptual variables in rural landscapes- In addition to ranking the indicators, correlation analysis was used to clarify how the aesthetic and perceptual variables interact. The Kruskal–Wallis test indicated statistically significant differences among the ten village groups in vegetation diversity, perceived naturalness, components of sense of place, and overall sense of place ($p < 0.001$). This confirms that residents' preferences are not homogeneous across North Khorasan; rather, they vary according to the environmental, ecological, and socio-cultural characteristics of each village.

According to the nonparametric Spearman correlation test, diversity was positively associated with perceived naturalness ($r = 0.539$, $p = 0.001$), indicating that landscapes with greater vegetation and land-cover diversity were more likely to be perceived as natural. Components of sense of place were also strongly associated with overall sense of place ($r = 0.595$, $p = 0.001$), showing that belonging, satisfaction, cultural memory, and local identity play an important role in strengthening residents' attachment to their village. Perceived naturalness was moderately associated with sense of place ($r = 0.477$, $p = 0.001$), suggesting that natural environments contribute to residents' emotional and cognitive connection with place. By contrast, the relationship between diversity and sense of place was weaker ($r = 0.322$, $p = 0.001$), indicating that landscape diversity alone has a secondary role in shaping place attachment. (see Table 6).

Table 6. Correlation Analysis Results Between Diversity, Naturalness, and Sense of Place

Variables	Correlation Coefficient (r)	Significance Level (p)	Relationship and Importance
Diversity ↔ Naturalness	0.539	0.001	Strong positive correlation; increased diversity is associated with higher naturalness.
Sense of Place Components ↔ Overall Sense of Place	0.595	0.001	Sense of place components have a significant impact on overall place perception.
Naturalness ↔ Sense of Place	0.477	0.001	Natural environments play a crucial role in strengthening the sense of place.
Diversity ↔ Sense of Place	0.322	0.001	Weaker correlation compared to naturalness; diversity plays a secondary role in shaping the sense of place.

Overall, the results indicate that diversity and perceived naturalness reinforce each other, but they do not automatically generate a strong sense of place unless they are supported by social, cultural, and livelihood-related conditions. Villages with abundant vegetation, water resources, and distinctive landforms generally received higher aesthetic evaluations; however, villages with weaker ecological conditions could still maintain place attachment when residents reported stronger cultural identity, collective memory, or satisfaction with everyday life. Therefore, rural landscape aesthetics in North Khorasan should be understood as a combined environmental and perceptual phenomenon rather than as a purely visual or ecological attribute.

Ranking of Indicators in Mountainous Villages- In the mountain villages, the mean-rank results show that environmental richness and social attachment do not always coincide (Figure 7). Esfidan obtained relatively high ranks for diversity (143.18) and naturalness (146.20), reflecting its orchards, stepped form, and surrounding landforms; however, its sense of place was moderate (123.86), suggesting that aesthetic quality alone is insufficient without stronger socio-economic and cultural support. Khosravieh also recorded a relatively high rank for naturalness (177.53), but its

sense of place remained moderate (126.60), indicating that natural features may support landscape appreciation but do not necessarily generate strong place attachment in the absence of sufficient social and livelihood-related factors. Rein showed the highest overall sense of place (235.47), despite moderate naturalness (141.41), which highlights the importance of social bonds, livelihood continuity, and daily dependence on the village environment. By contrast, Borzelan recorded low ranks across diversity (42.42), naturalness (27.00), and sense of place (99.35), demonstrating the cumulative effect of weak environmental resources and limited socio-economic vitality on residents' place attachment.

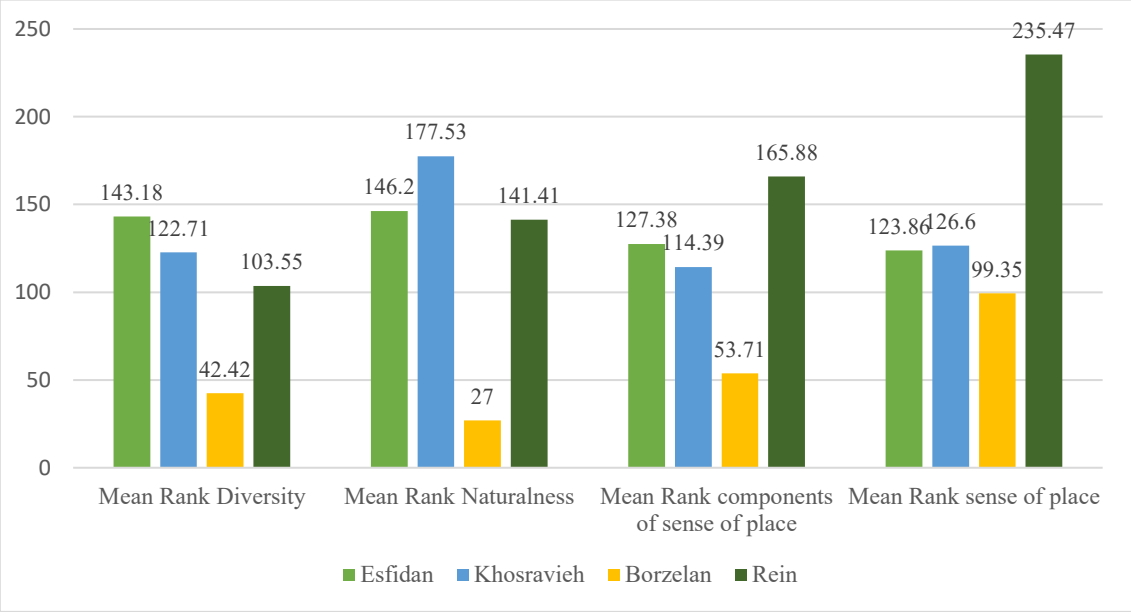

Figure 11. Comparison of Diversity, Naturalness, and Sense of Place Indicators for Mountain Villages

Ranking of Indicators in Forest Villages- In the forest villages, Roien ranked highest in naturalness (222.56), diversity (205.16), and sense of place (167.83), showing that ecological richness, water resources, orchards, and cultural identity can jointly create strong rural landscape aesthetics (Figure 8). Darkesh also recorded high diversity (203.86) and naturalness (164.28), but its lower sense of place (122.29) indicates that ecological value alone does not guarantee emotional attachment when social or economic conditions are less supportive. Keshanak, with moderate naturalness (118.11) and high diversity (178.30), maintained a relatively stronger sense of place than Darkesh (137.86), suggesting that cultural and social supports can partly compensate for uneven ecological advantages.

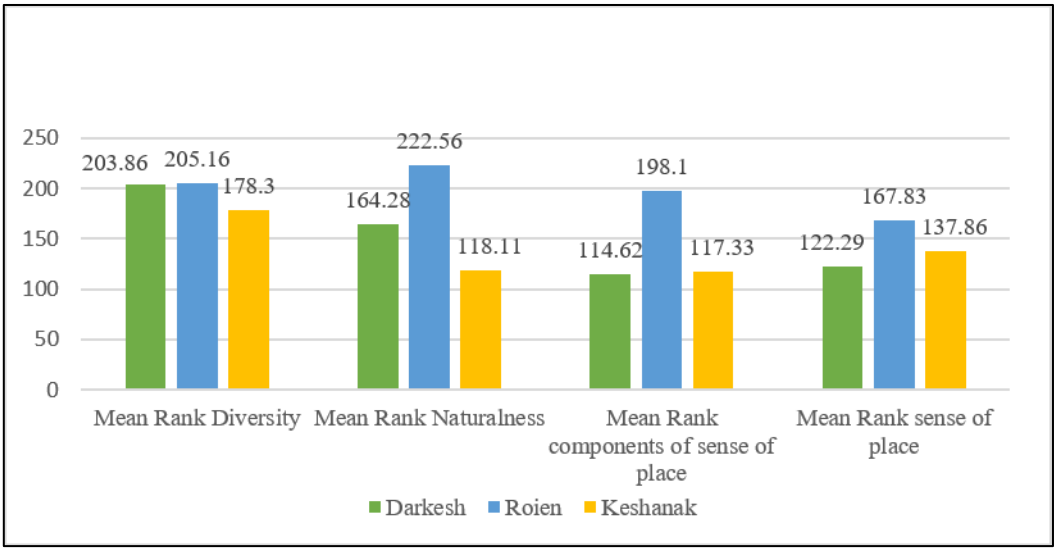

Figure 12. Comparison of Diversity, Naturalness, and Sense of Place Indicators for Forest Villages

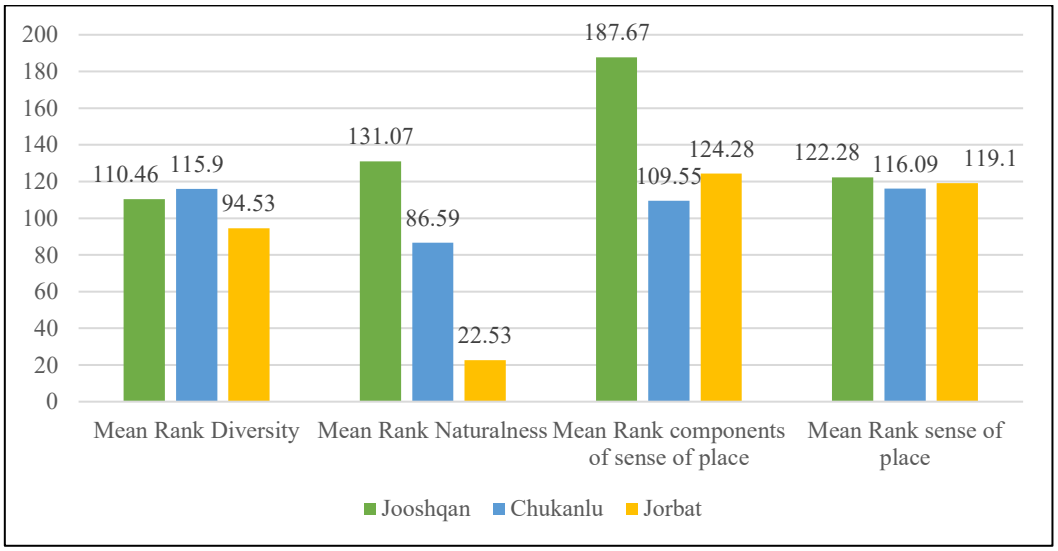

Figure 13. Comparison of Diversity, Naturalness, and Sense of Place Indicators for Plain Villages

Ranking of Indicators in Plain Villages- In the plain villages, the findings show that sense of place is shaped more strongly by cultural, livelihood, and satisfaction-related factors than by naturalness alone (Figure 9). Jooshqan recorded the highest rank for components of sense of place (187.67), together with moderate diversity (110.46) and naturalness (131.07), indicating the importance of social and cultural resources in sustaining residents' attachment to the village. Chukanlu showed moderate levels across the indicators, including diversity (115.90), naturalness (86.59), components of sense of place (109.55), and overall sense of place (116.09), suggesting a relatively balanced but improvable landscape condition. Jorbat, despite its cultural and historical value, recorded very low naturalness (22.53), mainly because of limited water resources and arid conditions, while maintaining a moderate level of sense of place (119.10). These results suggest that plain villages require targeted environmental restoration and landscape-management measures to strengthen their aesthetic and place-based values.

4.2. Analysis of Local Residents' Survey

Impact of Environmental and Economic Factors on Sense of Place Creation- The results confirm

that rural landscape aesthetics are shaped by a combination of environmental, perceptual, and livelihood-related variables. Residents' attachment to their village is influenced not only by visible natural features but also by the extent to which these features support daily life, agricultural productivity, cultural practices, and long-term community stability. Table 7 summarizes the variables identified through the local survey and shows how specific landscape and socio-economic factors strengthen or weaken sense of place.

Among the naturalness attributes, fruit orchards (N2), agricultural lands (N3), and water resources such as springs and rivers (N6) had the strongest influence on residents' sense of place. Water availability is particularly important because it directly affects agricultural productivity, orchard maintenance, landscape vitality, and household welfare. When water resources decline, cultivated land and garden landscapes lose their visual and functional quality, which in turn weakens livelihood security, environmental satisfaction, and emotional attachment to the village.

For example, Borzelan and Jorbat, where water resources were limited or under pressure, recorded low scores for water resources (N6) (1.92 and 1.78, respectively). These conditions were also reflected in economic welfare (CS2.1) (3.35 and 3.71, respectively) and in the sense-of-place item indicating that the village is incomparable to any other place (S12) (2.64 and 2.71, respectively). This suggests that environmental decline, particularly water scarcity, can indirectly weaken place attachment by reducing agricultural productivity, landscape vitality, and residents' satisfaction with local living conditions.

The findings also show that ecological richness must be accompanied by social and economic viability. Some villages with high naturalness and diversity, such as Darkesh, did not record equally high sense-of-place scores, which suggests that unequal access to resources, limited economic opportunities, or insufficient local services can weaken residents' attachment. Conversely, villages with moderate environmental conditions can maintain a stronger sense of place when cultural identity, social interaction, and welfare conditions are relatively stable.

The analysis reveals that ecological and economic conditions jointly shape residents' attachment to their environment. Water availability, agricultural productivity, and local infrastructure are decisive factors influencing both livelihood stability and the formation of sense of place. Among socio-economic variables, only economic welfare (CS2.1) was statistically analyzed as a contextual sub-indicator of sense of place, as it directly reflects residents' material well-being and local infrastructure conditions. Other demographic factors, including age, education, and occupation, were collected for descriptive purposes only and were not included in the analytical model, as the study primarily focused on perceptual and environmental dimensions of landscape preference. Villages suffering from water scarcity or declining agricultural outputs, such as Borzelan and Jorbat, display weaker place attachment and lower environmental satisfaction, while those with more stable ecological and social systems, such as Rein and Roien, maintain stronger emotional and functional ties to their surroundings.

These findings highlight that sense of place emerges not only from environmental qualities such as naturalness and diversity but also from the social and economic context in which people live. Economic welfare, fairness in resource access, and everyday social interactions reinforce people's identification with their landscape and sustain community well-being. Conversely, economic decline or environmental degradation undermines these bonds and reduces local participation in collective activities.

Hence, sense of place should be viewed as an integrative social–ecological construct that bridges environmental perception, cultural continuity, and community resilience. Strengthening this linkage—through supporting local livelihoods, preserving traditional knowledge, and promoting participatory landscape management—can enhance both environmental sustainability and rural quality of life. This perspective provides a conceptual bridge to the following section, where the influence of geographical and environmental contexts on sense of place is further explored.

Table 7. Factors Affecting the Strengthening or Weakening of Sense of Place from the Residents' Perspective.

Geographical location of the village	village_name	Naturalness			components of sense of place	sense of place			
		N2	N3	N6	CS2.1	S5	S6	S7	S12
mountain type	Esfidan	4.08	2.92	4.80	3.24	3.96	3.20	3.08	2.96
	Khosravieh	4.64	4.21	4.50	3.57	4.57	3.07	2.64	2.85
	Rein	4.33	4.27	4.88	4.72	4.77	4.72	4.55	4.83
	Borzelan	3.42	3.28	1.92	3.35	2.78	2.42	2.35	2.64
forest type	Roien	4.90	4.12	4.78	4.88	4.36	3.42	3.68	3.46
	Darkesh	3.60	3.40	4.68	2.64	3.68	3.00	2.84	2.72
	Keshanak	4.39	4.41	4.78	2.39	3.35	3.30	3.44	2.89
plain type	Chukanlu	4.34	4.11	3.73	3.30	4.00	2.92	3.11	2.88
	Jooshqan	3.62	3.87	3.53	3.71	3.71	3.21	3.31	2.87
	Jorbat	2.92	2.85	1.78	3.71	2.85	3.21	3.14	2.71
	Total	4.17	3.88	3.60	3.51	3.82	3.27	3.31	3.08

N2: Fruit orchards; N3: Agricultural lands; N6: Water resources (spring and river); CS2.1: Economic welfare and comfort; S5: Sense of tranquility in the village; S6: Sense of happiness in the village; S7: The village is the preferred place to live; S12: The village is incomparable to any other place.

Impact of Geographical Location on Sense of Place- Figure 14 compares diversity, perceived naturalness, components of sense of place, and overall sense of place across the three geographical settings. Forest villages recorded the highest average ranks for diversity and naturalness, confirming the importance of dense vegetation, water resources, and varied landforms in shaping aesthetic appreciation. However, the comparison also shows that the highest ecological value does not always lead to the highest sense of place, because residents' attachment is mediated by economic welfare, cultural continuity, and satisfaction with the living environment.

Mountain villages such as Rein and Esfidan demonstrate that sense of place can be strengthened when moderate or high naturalness is combined with social cohesion, traditional architecture, agricultural continuity, and cultural practices. These villages may not always match forest villages in ecological richness, but their distinctive topography, stepped settlement patterns, water sources, and collective memories provide important foundations for place attachment.

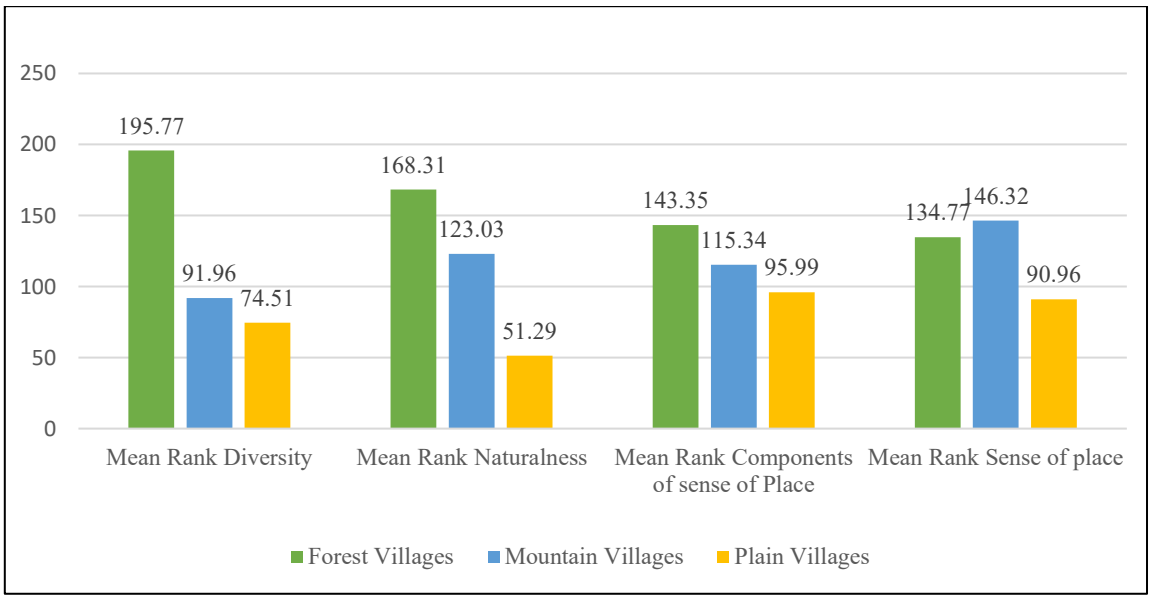

Figure 14. Comparison of mean ranks of diversity, naturalness, sense of place components, and sense of place among forest, mountain, and plain villages

Plain villages such as Jooshqan, Chukanlu, and Jorbat reveal a different pattern. Because naturalness and diversity are generally lower in the plain setting, components of sense of place—such as cultural heritage, social relations, satisfaction with services, and livelihood continuity—play a compensatory role. Nevertheless, the low naturalness scores in some plain villages indicate the need for targeted environmental restoration, water-resource management, and landscape-sensitive planning to prevent further weakening of place attachment.Figure 11 illustrates the mean ranks of the indicators for the ten villages.

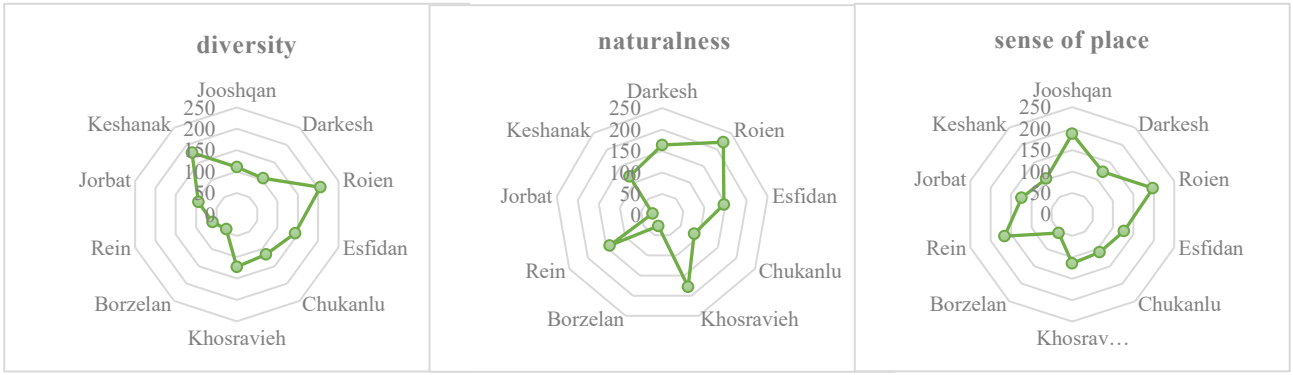

Figure 15. Comparison of mean ranks for diversity, naturalness, and sense of place across ten villages

5. Discussion and Conclusion

This study provides descriptive insights into the aesthetic quality of rural landscapes in North Khorasan Province and confirms the key role of perceived naturalness, structural diversity, and sense of place in shaping residents' perception and attachment to their living environment.

Nevertheless, certain methodological limitations should be acknowledged, including possible response bias, observer bias during fieldwork, and limited survey coverage due to the number of sampled villages. These constraints do not undermine the validity of the findings but can be minimized in future work through larger and multi-seasonal datasets.

The results highlight that sense of place constitutes the central ethical and functional bridge linking naturalness and landscape diversity in the pursuit of sustainable rural landscape management. Reinforcing this human–environment relationship enhances not only the ecological and aesthetic integrity of the countryside but also residents' emotional attachment, collective identity, and sense of belonging. Therefore, rural planning and policy should explicitly prioritize the cultivation of sense of place—through cultural continuity, social participation, and environmental stewardship—to achieve development that is both ecologically balanced and socially cohesive.

Although the present research is cross-sectional, based on the 2016 census and one-time surveys, it provides a valuable spatial understanding of rural landscape aesthetics and sense of place. Incorporating historical and longitudinal data—such as past land cover maps, satellite imagery, or repeated surveys—would help reveal how environmental and socio-economic changes have influenced aesthetic values and place attachment over time, clarifying whether the low sense of place observed in some villages (e.g., Borzelan) is a recent phenomenon or a long-term trend.

The analytical framework developed here offers a replicable model for analytical generalization across North Khorasan's three environmental settings (mountain, forest, and plain). Its adaptation to other provinces with distinct ecological and cultural contexts requires external validation to confirm the robustness and applicability of the indicators.

By extending these analytical and comparative perspectives, the outcomes of this research can meaningfully contribute to rural landscape

evaluation practices that remain adaptive and relevant to both current and future environmental and social conditions.

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Authors' contributions

The authors equally contributed to the preparation of this article. This research was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. The study involved interviews with adult residents from ten villages in North Khorasan Province, Iran. All participants provided informed consent to participate in the study prior to the interviews.

Conflict of interest

The authors declare no conflict of interest.

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Original Article

ارزیابی زیبایی‌شناسی منظر روستایی بر اساس ارزش‌های محیط طبیعی (مطالعه موردی: روستاهای منتخب استان خراسان شمالی)

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چکیده مبسوط

۱. مقدمه

مناظر روستایی به‌عنوان مخازنی از ارزش‌های بوم‌شناختی، فرهنگی و اجتماعی، نقشی حیاتی در هویت و پایداری جوامع محلی ایفا می‌کنند. بااین‌حال، تغییرات جهانی نظیر تغییر اقلیم، تخریب منابع طبیعی و تحولات ساختاری، این مناظر را با تهدیدات جدی مواجه ساخته است. از دست رفتن ارزش‌های زیبایی‌شناختی و پیوندهای عاطفی ساکنان با محیط، نه‌تنها به کاهش حس تعلق منجر می‌شود، بلکه زمینه‌ساز گسست فرهنگی و زیست‌محیطی در نواحی روستایی خواهد بود. در ایران، علیرغم وجود اسناد بالادستی، ارزیابی یکپارچه از مناظر روستایی مبتنی بر ادراک ساکنان و ارزش‌های محیط طبیعی کمتر مورد توجه قرار گرفته است. پژوهش حاضر با هدف پر کردن این شکاف، به ارزیابی زیبایی‌شناسی منظر روستایی بر اساس سه شاخص کلیدی «تنوع منظر»، «طبیعی‌بودن ادراک‌شده» و «حس مکان» در روستاهای منتخب استان خراسان شمالی می‌پردازد و در پی پاسخ به سه سؤال اصلی است: ۱) مؤلفه‌های ارزیابی زیبایی‌شناسی منظر روستایی بر اساس ارزش‌های محیط طبیعی کدام‌اند؟ ۲) ساکنان روستاهای منتخب، شاخص‌های مذکور را چگونه ارزیابی می‌کنند؟ ۳) کدام روستاها و بسترهای محیطی از ارزش‌های زیبایی‌شناختی قوی‌تر برخوردارند و این یافته‌ها چگونه به برنامه‌ریزی پایدار روستایی کمک می‌کند؟

۲. مبانی نظری تحقیق

چارچوب نظری پژوهش بر تلفیق رویکردهای عینی و ذهنی در ارزیابی منظر روستایی استوار است. بر اساس کنوانسیون اروپایی منظر و رویکرد خدمات بوم‌سازگان فرهنگی، زیبایی‌شناسی منظر نه‌تنها وابسته به ویژگی‌های فیزیکی (نظیر پوشش گیاهی، عوارض زمین و منابع آب) است، بلکه از طریق ادراک و تجربه انسانی معنا می‌یابد. سه شاخص «تنوع» (ناشی از تنوع پوشش‌های زمین و الگوهای فضایی)، «طبیعی‌بودن ادراک‌شده» (میزان دوری از دخالت انسانی بر اساس شاخص هِمِروبی) و «حس مکان» (شامل هویت مکان، وابستگی و دلبستگی عاطفی بر اساس مدل ویلیامز وواسک) به‌عنوان مهم‌ترین مؤلفه‌های ارزیابی زیبایی‌شناسی منظر روستایی شناسایی شدند. این شاخص‌ها در پژوهش‌های داخلی نیز بومی‌سازی شده‌اند. با وجود غنای پژوهش‌های داخلی در حوزه توسعه روستایی، کمتر مطالعه‌ای به مقایسه روستاها در بسترهای محیطی متفاوت (کوهستانی، جنگلی و دشتی) با تأکید بر ادراک ساکنان پرداخته است. از این رو، پژوهش حاضر با بهره‌گیری از روش‌های ترکیبی، تلاش دارد تا پیوند میان ارزش‌های طبیعی و ادراک زیبایی‌شناختی را در قالب یک مدل تحلیلی بومی ارائه دهد.

۳. روش تحقیق

پژوهش حاضر با رویکرد آمیخته (کمی-کیفی) در ده روستای منتخب از استان خراسان شمالی شامل چهار روستای کوهستانی (اسفیدن، خسرویه، رئین و برزلان) ، سه روستای جنگلی (روئین، درکش و کشنک) و سه روستای دشتی (چوکانلو، جوشقان و جربت) انجام شد. انتخاب روستاها طی فرآیندی چندمرحله‌ای و بر اساس سه معیار اصلی «ویژگی‌های سکونتگاهی»، «ویژگی‌های بوم‌شناختی-محیطی» و «شاخص‌های کلیدی اقتصادی-اجتماعی» صورت گرفت. ابزار اصلی گردآوری داده‌ها، پرسشنامه‌ای ساخت‌یافته بود که روایی محتوایی آن توسط ۱۸ نفر از متخصصان تأیید و پایایی آن با آلفای کرونباخ بالای ۰/۷۰ احراز شد. روایی سازه با تحلیل عاملی تأییدی در نرم‌افزار LISREL بررسی و برازش مدل تأیید گردید. حجم نمونه شامل ۲۷۴ نفر از ساکنان بود که با روش نمونه‌گیری خوشه‌ای تصادفی انتخاب شدند. داده‌ها با استفاده از آزمون‌های ناپارامتریک کروسکال-والیس و همبستگی اسپیرمن در نرم‌افزار SPSS تحلیل شدند. مشاهده میدانی و مصاحبه‌های نیمه‌ساختاریافته نیز برای غنی‌سازی یافته‌ها به‌کار گرفته شد.

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۴ .یافته‌های تحقیق

یافته‌های آزمون کروسکال-والیس نشان داد که تفاوت معناداری بین ده روستا از نظر هر سه شاخص وجود دارد (p>۰/۰۰۱). در روستاهای کوهستانی، رئین با میانگین رتبه ۲۳۵/۴۷ بالاترین حس مکان را داشت که علی‌رغم طبیعی‌بودن نسبتاً متوسط، به دلیل پیوندهای اجتماعی قوی و تداوم معیشت حاصل شده است. در مقابل، برزلان با میانگین رتبه ۲۷/۰۰ در طبیعی‌بودن و ۹۹/۳۵ در حس مکان، ضعیف‌ترین وضعیت را نشان داد که ناشی از کمبود منابع آب و فرسایش اقتصادی-اجتماعی است. در روستاهای جنگلی، روئین با کسب بالاترین رتبه در تنوع (۲۰۵/۱۶) و طبیعی‌بودن (۲۲۲/۵۶) و حس مکان قوی (۱۶۷/۸۳)، نمونهٔ موفق از تلفیق غنای بوم‌شناختی و هویت فرهنگی است. در مقابل، درکش با وجود طبیعی‌بودن قابل‌قبول، حس مکان پایین‌تری داشت که نشان می‌دهد ارزش‌های طبیعی به‌تنهایی کافی نیستند. در روستاهای دشتی، جوشقان با میانگین رتبه ۱۸۷/۶۷ در مؤلفه‌های حس مکان، بالاترین امتیاز را کسب کرد که حاکی از نقش جبرانی مؤلفه‌های فرهنگی و اجتماعی در شرایط طبیعیِ ضعیف‌تر است. نتایج همبستگی اسپیرمن نشان داد که طبیعی‌بودن با حس مکان (r=۰/۴۷۷) و مؤلفه‌های حس مکان با حس مکان کلی (r=۰/۵۹۵) همبستگی مثبت و معناداری دارند (p>۰/۰۰۱)، در حالی که ارتباط تنوع با حس مکان ضعیف‌تر بود (r =۰/۳۲۲). تحلیل پرسشنامه ساکنان نشان داد که باغ‌های میوه، زمین‌های کشاورزی و منابع آب بیشترین تأثیر را بر حس مکان دارند و در روستاهایی با کمبود آب، رضایت از رفاه اقتصادی و دلبستگی به مکان به‌شدت کاهش یافته است.

۵ .بحث و نتیجه‌گیری

نتایج نشان می‌دهد ارزیابی زیبایی‌شناسی منظر روستایی در خراسان شمالی یک پدیدهٔ ترکیبیِ زیست‌محیطی-ادراکی است و نمی‌توان آن را به ویژگی‌های طبیعی یا بصری تقلیل داد. حس مکان به‌عنوان پل اخلاقی و کارکردی میان طبیعی‌بودن، تنوع و پایداری اجتماعی عمل می‌کند و زمانی تقویت می‌شود که ارزش‌های طبیعی با رفاه اقتصادی، تداوم فرهنگی و مشارکت اجتماعی همراه گردند. روستاهای با غنای بوم‌شناختی بالا لزوماً بالاترین حس مکان را ندارند و عواملی نظیر عدالت در دسترسی به منابع، کیفیت خدمات و سرمایه اجتماعی، نقش تعدیل‌کننده‌ای در دلبستگی ساکنان ایفا می‌کنند. این امر ضرورت بازنگری در برنامه‌های توسعه روستایی را آشکار می‌سازد و تأکید می‌کند که مداخلات باید با توانمندسازی اقتصادی، حفظ دانش بومی و مشارکت جوامع محلی همراه شوند. تفاوت آشکار بین بسترهای محیطی نشان می‌دهد که راهبردهای حفاظت و برنامه‌ریزی منظر باید متناسب با شرایط هر بستر تدوین شوند؛ به‌طوری که در روستاهای دشتی، اقدامات احیای محیطی و مدیریت منابع آب در اولویت باشد و در روستاهای کوهستانی، بر تقویت سرمایه اجتماعی و تنوع‌بخشی معیشتی تأکید شود. این پژوهش، با ارائه یک مدل تحلیلی قابل‌تکرار، چارچوبی عملیاتی برای برنامه‌ریزی منظر روستایی مبتنی بر ارزش‌های محیط طبیعی و ادراک ساکنان فراهم می‌کند که می‌تواند الگویی برای سایر استان‌های ایران باشد. انجام پژوهش‌های طولی و چندفصلی برای پایش تغییرات حس مکان، به‌عنوان پیشنهاد برای تحقیقات آتی مطرح می‌شود.

کلیدواژه‌ها: ارزیابی منظر روستایی، تنوع منظر، طبیعی‌بودن ادراک‌شده، تعلق مکانی، استان خراسان شمالی.

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