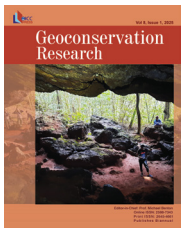

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Geotourism Potential in the Zagros Simply Folded Zone: Chaharmahal and Bakhtiari Province

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Abstract

The mountainous regions of Iran, particularly Chaharmahal and Bakhtiari Province, exhibit considerable potential for the development of geotourism. This study explores three main themes: (1) the geodiversity of the Central Zagros zone, located within Chaharmahal and Bakhtiari Province, based on existing literature and field investigations; (2) potential geo-educational sites in the region; and (3) ideas for developing geo-products that can enhance the local economy, while also identifying both tangible and intangible cultural heritage related to geosciences. Data were analyzed using observational and qualitative methods. The findings clearly demonstrate that Chaharmahal and Bakhtiari Province—particularly the Central Zagros zone—possesses high geological diversity, making it a strong candidate for geotourism promotion. Further analysis identified eleven geo-educational sites based on accessibility and educational value. Lastly, several proposals for developing geo-products were formulated, grounded in both the tangible and intangible cultural heritage of the region. In conclusion, the study affirms that Chaharmahal and Bakhtiari Province offers substantial potential for sustainable geotourism development.

Keywords: Chaharmahal and Bakhtiari Province, Geo-product, Geosites, Geotourism

Introduction

Geotourism, first introduced in England by Hose (1995), is a type of nature tourism that involves visiting natural or geological sites. These sites can include anything from mountains and volcanoes to hot springs and caves (Newson and Dowling 2018). Geotourism was publicly introduced in 2002 by the Travel Industry Association of America and the National Geographic Traveller Magazine. In July 2008, five U.S. government agencies joined the National Geographic Society to formally adopt the principles of geotourism (Moffet and Moody 2008). Geotourism is a great way to learn about the history and culture of a place while helping to preserve its unique geological heritage. Geotourism follows the principles of sustainable tourism that focus on geological sciences to protect and promote cultural, environmental, and geological heritage, and it is also economically

beneficial for locals (Newsome and Dowling 2006: 20).

In recent decades, geotourism, as a branch of sustainable tourism, seeks to introduce, preserve, and educate about geological heritage, while also promoting the local economy (Torabi Farsani *et al.* 2011). Nowadays, geotourism operates as one of the most recognized niche markets and pursues its goals by establishing networks such as the Global Geoparks Network, the European Geoparks Network, and the Asia Pacific Geoparks Network, etc. In Iran, the establishment of geoparks such as Qeshm (Hosseinzadeh *et al.* 2018), Tabas (Yahya Sheibani and Zamanian 2023), and Arasbaran is evidence of the prosperity of this niche tourism market in Iran. It is worth noting that the prosperity of geotourism is not limited to the geoparks' territory, while areas with geosites of educational and aesthetic value can also be a destination for geotourism prosperity (Khoshraftar and Torabi Farsani 2022).

One of the attractions that invites tourists to geotourism destinations is geodiversity. The term 'geodiversity' was first used in 1993 as the geological equivalent of biodiversity, to encompass the range of geological, geomorphological, and soil features (Gray 2008). Geodiversity refers to the types of materials, forms, and processes of the earth that partially and wholly constitute the earth (Quesada-Román *et al.* 2021). Serrano and Ruiz-Flaño (2007) noted that the geodiversity index links the different physical elements with processes in the soil, hydrology, and geomorphology, as well as with topographical factors (orientation, slope, and radiation).

Chaharmahal and Bakhtiari Province, especially the Central Zagros zone in Iran, has high geological diversity for geotourism, but little has been done beyond introducing a few geosites as geotourism destinations (Abaszadeh and Ebrahimi 2020). The present study strives to address the geotourism potential in the Central Zagros zone of this province through three main objectives: identifying the geodiversity; identifying suitable educational geosites to promote geotourism and increase public awareness; and identifying tangible and intangible cultural heritage related to earth sciences for the production of geoproducts and promoting the local economy. There is no academic research on geoproducts and geodiversity in this area from the geotourism viewpoint, and this new dimension is emphasized here. It is worth mentioning that diversifying the tourism market, entering emerging tourism markets, and developing scientific tourism at national and international levels by relying on geotourism attractions are among the macro-strategies and tourism development policies of the strategic document of the Ministry of Cultural Heritage, Tourism and Handicrafts.

Case Study

Chaharmahal and Bakhtiari Province (Fig. 1), located in the southwest of Iran, within the tectonic framework of the Central Zagros zone. The distance from Shahrekord (the provincial capital) to Tehran (the capital of Iran) is about 540 km. With an area of approximately 16,500 km^2, the province is recognized as one of the highland regions of the country, characterized by a diverse range of geological features, including active fault systems, extensive folding, deep valleys, karst phenomena, and mineral springs. Among its counties, Farsan stands out due to its significant geotourism potential from the exposure of Cenozoic formations, various caves, a rich abundance and diversity of fossils, tectonic structures such as folds and faults, and numerous springs and waterfalls.

The coexistence of these geomorphological and geological features, alongside unspoiled landscapes and the region's distinctive indigenous culture, creates a favorable environment for the

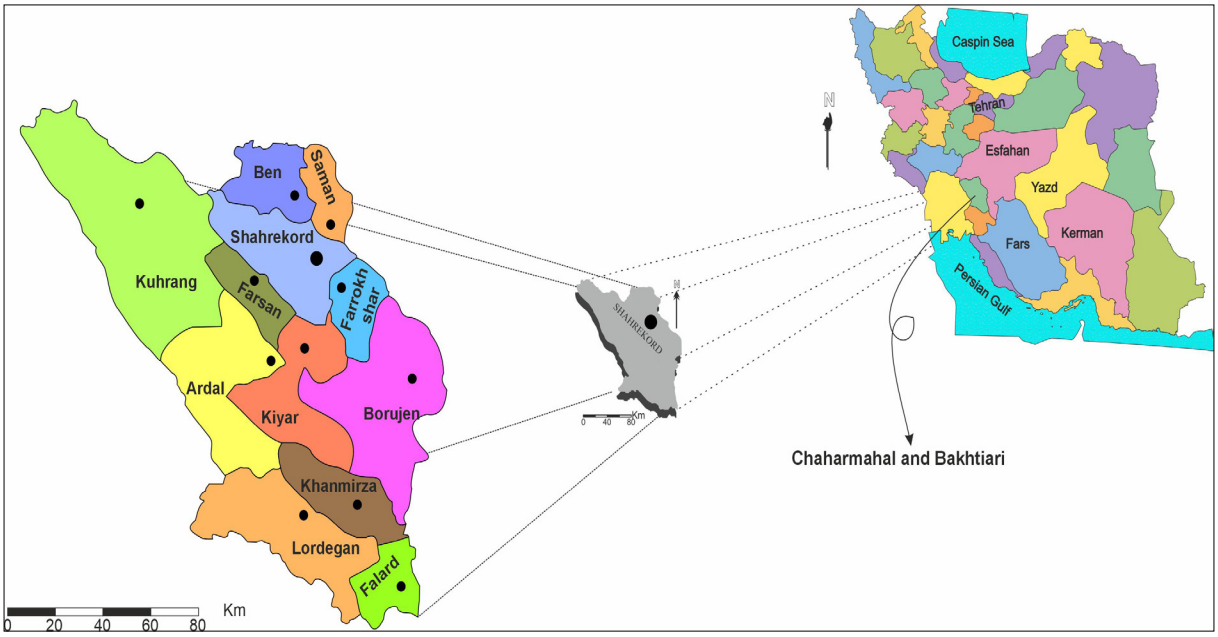

Figure 1. Geographical location of Chaharmahal and Bakhtiari province in Iran

development of geotourism. Geotourism is based on the scientific interpretation of geological phenomena and their communication to diverse audiences (Hose 2000). Therefore, the selection of Chaharmahal and Bakhtiari Province as the geographical focus of this study is intended to identify and assess its geotourism capabilities within the structural context of the Central Zagros.

Methodology

The data collection tools used in the present study included semi-structured interviews and a review of relevant scientific literature. Additionally, the observation method and a qualitative approach—specifically thematic analysis—were employed. Thematic analysis is a qualitative research method designed to identify, analyze, and report patterns and underlying concepts within data by categorizing qualitative data, thereby facilitating the discovery of key themes and concepts.

In line with the use of thematic analysis for data processing and interpretation, the study followed six operational stages: (1) familiarization with the data and generation of initial codes, (2) open and axial coding, (3) identification of selective codes (basic themes), (4) development of organizing themes, (5) definition and naming of main themes, and (6) construction of the final thematic network (Clarke and Braun 2017; Terry *et al.* 2017).

The target population consisted of three primary groups: experts in geology and geomorphology, tourism professionals, and local residents. Given the qualitative nature of the research and the need to access participants with substantial and relevant expertise, the snowball sampling technique was utilized. In this method, a few knowledgeable individuals were initially selected, and subsequent participants were identified through their referrals. Notably, data saturation was reached by the 19th interview.

Figure 2. Zardkuh spring, one of Iran's biggest karstic springs, originates from Zardkuh mountain in central Zagros (photo by the authors)

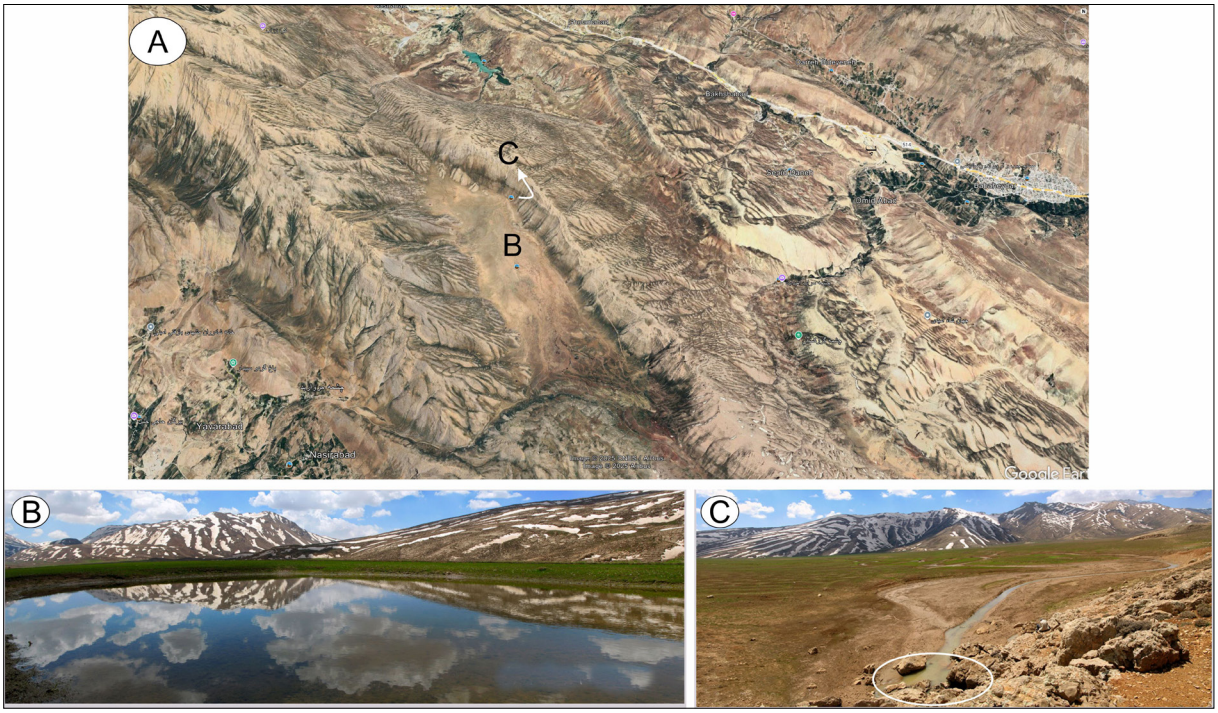

Figure 3. A: Satellite image of the Lagharak Plain in the west of the Baba-Heydar city. **B)** View of a karst lake. **C)** View of a Ponor in the Laghrak Plain (photo by the authors)

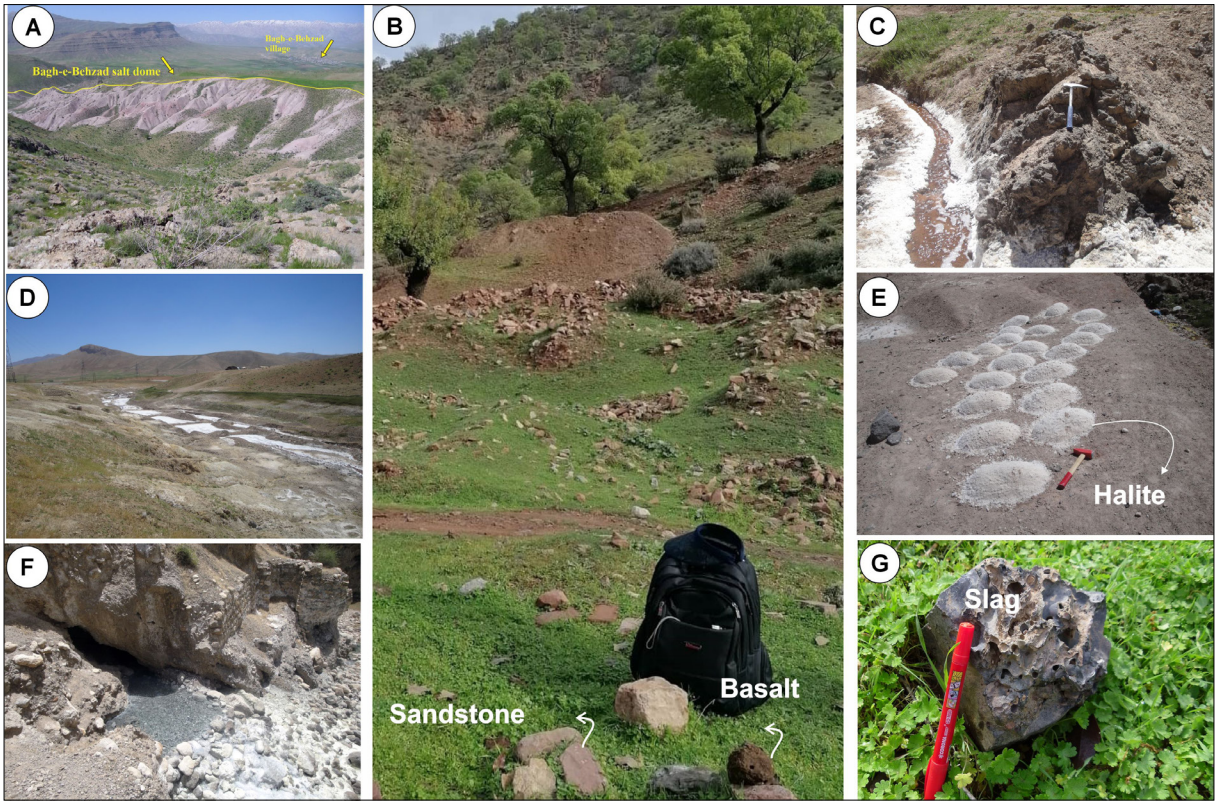

Figure 4. A) Bagh Behzad salt dome. **B)** Darreh Bid salt dome. **C)** Image of a salt spring along the salt dome of the Kuhrang salt dome. **D)** Salt collection ponds in the Kuhrang salt dome. **E)** Salt collected in the Kuhrang salt dome. **F)** Sulfur spring of mine salt dome. **G)** Old mining operations in the Kuhrang salt dome (photo by the authors)

Figure 5. Chama Ice Cave (photo by the authors)

Table 1. Geographical location of geodiversity sites in Chaharmahal and Bakhtiari Province

Geodiversity	Geological Features	Geographic location
Karst phenomena	Cave	Pir-e Ghar of Farsan; Sarab Cave of Baba Heydar
	Fountain/Spring	Zardkuh Spring, Dimeh Spring, Deh Cheshmeh, Ab-Sardeh of Ardal, Sardab of Ardal, Bagh-e Rostam of Darkesh Varkes
	Sinkhole	Pilgrimage of Hamzeh Ali – Dasht-e Lagharak
	Valley	Darreh-ye Eshq (Valley of Love) – Darkesh-Varkesh Valley
	Karst siphon spring (Fig. 2)	Vaght-o-Sa'at Spring of Khareji – Bazoft Springs
	Ponor (Fig. 3C)	Plain of Baba Heydar LagharakLagharak (Fig. 3A)
	Polje	Plain – Qezel Gol (Chiro Lake) in Lagharak .Mount Kala
Tectonic phenomena	Fault Lakes (Fig. 3B)	Ben Lagoon
	Fault-karst water system in the deep	Zardkuh Karst
	Valley and gorge	Darkesh–Varkesh Gorge (Behesht Abad), Located Between Junqan and Ardal
	Faults and fault mirrors	Farasan Road to the First Kuhrang Tunnel
	Waterfall	Major Waterfalls, such as the Multi-Tiered Atashgah Waterfalls in Lordegan, Zardlimeh, Sheikh Ali Khan, Karudit (Darkesh-Varkesh Gorge), Tang Zendan Lordegan, Darreh Eshgh, and Landi Shalil
	Anticline	Rig Koh – Khanmirza, Lordegan
	Syncline	Hezar-Gazi mountain, Sabz Kūh
	Spring Artesian	Barm Spring, Lordegan City
	Mountain	Jahanbin – South of Shahrekord
	Wetland	Chogha Khor – Gandoman – Sulgan – Aliabad
Salt dome (Fig. 4)	Lithological diversity	Ganjoon- Lordegan, Darreh Bid, Bagh Behzad
	Stratigraphy and diversity	Bazoft, Darreh Bid, Bagh Behzad
	Salt and sulfur springs	Nazi Saline Spring in Bazoft – Dehno Saline Spring in Kuhrang – Sulfur Spring in Ma'dan Village
Ancient Lithologies	Precambrian Metamorphic Rocks	Northern Region of Chaharmahal and Bakhtiari Province – From Sadeghabad to Garmdarreh
	Precambrian Igneous and Metamorphic Rocks	Northern Chaharmahal and Bakhtiari Province – From Pol-e Zaman Khan to Zayandeh Rud Dam

Geodiversity	Geological Features	Geographic location
Paleontological sites	Vertebrates' fossils	Fossil-Rich Aquatic Fauna of Baba Heydar Living Fossil: Triops cancriformis (Tadpole Shrimp) in the Paddy Fields of Lordegan Fossil Site of Kavanak Village Fossil Site of Nal Ashkanan Bridge Fossil Site of Dasht-e Zarrin
	Invertebrates' fossils	Hamzeh-Ali Region
	Plant fossils	Fossil Site of Kavanak Village Fossil Site of Nal Ashkanan Bridge
Stratigraphic sequences	Lithologic discontinuities	From Baba Heydar to Nal Ashkanan Pass: Observation of the Fossiliferous Formation (Fish, Foraminifera, and Algal Deposits) of Pabdeh Formation
	Relationships between tectonics and sedimentation	Nal Ashkanan Pass: Visible Boundary Between the Mesozoic and Cenozoic Eras
Erosional features	Beautiful green marl hills with Eagle Claw erosion	Lordegan
	Tafoni	Region between Boldaji and Gahro and Mount Hamzeh Ali are also important geographical features
	Meander	Zayandeh Rud River: The stretch between the regulating dam and Zaman Khan Bridge
Rock sequences	Rock sequences from the Precambrian to the Quaternary	Road along the Bazft River
River morphology	Meander	The section of the Zayandeh Rud River between the dam and Zaman Khan Bridge exhibits a deeply incised meandering pattern (increased meandering).
	Braided river	The Arterial River of Kouhrang in the Kuh-e-Karkonan – Sheikh Alikhan Region
Glacier	Glacial cirque	Zard Kuh mountain
	Glacier cave (Fig. 5)	Chama Ice Cave
Mining sites	Mines (Fig. 6)	Mashayekh Region, Ardal County
Geoarchaeology sites	Historical human settlement site	Zarrin Plain

Results

The results of field observations and literature review (Hamrsmid and Rogl 2000; Fathollahi *et al.* 2019; Orak *et al.* 2019; Iranmanesh *et al.* 2018; Jafari and Naseri 2020; Bosák *et al.* 1999) illustrate that the Zagros Simply Folded Zone in Chaharmahal and Bakhtiari Province possesses high geodiversity, which is highly favorable for promoting geotourism. This geodiversity includes karst landforms, tectonic zones, salt domes, ancient lithologies, paleontological sites, stratigraphic sequences, erosional features, rock sequences from the Precambrian to the Quaternary, river morphology, natural glaciers, geoarchaeology sites and mining sites (see Table 1).

The second purpose of this study is to identify potential geo-educational sites within the region. The results of interviews and field observations, based on accessibility and educational value, demonstrate that there are eleven geo-educational sites (see Table 2) that can offer educational activities to geotourists.

The last objective of this research is to explore ideas for the development of geo-products aimed at enhancing the local economy, as well as to identify both tangible and intangible cultural heritage related to geosciences. The interviews with local residents and tourism experts indicated that the area contains various tangible and intangible cultural heritages intricately connected to the geology of the Zagros region (Table 3). These heritages can be leveraged by geotourism as geo-products or geo-attractions.

Figure 6. Ma'dan Village-sulfur spring (photo by the authors)

Table 2. Geo-educational Sites in Chaharmahal and Bakhtiari Province

Geographic Location	Related Geological Education Aspects
Bazft Valley	Stratigraphy of Zagros formations; fluvial geomorphology of the Bazft River, particularly erosion and sedimentation
Kuhrang Spring	Largest karst spring in Iran (located downstream of Zardkuh); source of the Karun and Zayandeh Rood rivers
Darreh Eshq (Valley of Love)	Stratigraphy of Lower Paleozoic formations; Darreh Eshq waterfall
Farsan–Isa Abad Road	Observation of the Main Zagros Thrust (MZT); thrusting of Cretaceous limestone over Bakhtiari conglomerate
Ma'dan Village	Evidence of ancient mining activities; sulfur spring (Fig. 6)
Na'l Eshkenan Pass	Geological boundary between the Mesozoic and Cenozoic eras (approx. 66 million years ago)
Babaheydar	Fish fossils in the Pabdeh Formation (Paleocene–Eocene); presence of foraminifera and echinoids in the Asmari Formation
Sadeqabad	Observation of Iran's oldest rocks: coarse-crystalline augen gneiss (ca. 570 Ma) and metagranites (ca. 520 Ma)
Chelgerd	Braided river system (Shariyan River – a branch of Kuhrang)
Sheikh Ali Khan Waterfall	Observation of a beautiful, high-discharge waterfall with surrounding small tufa springs
Laghark Plain	A typical karstic polje with associated ponor (swallow hole) features

Table 3. Main and sub-themes of cultural heritage related to geosciences in Chaharmahal and Bakhtiari Province.

Main Themes	Sub-Themes	Geographic Location	Notes
Tangible Cultural Heritage	Bard Goori (Fig. 7)	These historical sites are located in the Miankouh, Dinaran, and Bazft regions	Bard Goori or stone tombs, refer to ancient graves dating from the Median period to the end of the Sassanian era. Due to the Zoroastrian belief in the sanctity of the soil, the deceased were buried in stone. More than 28 Bard Goori (stone tombs) have been identified in Chaharmahal and Bakhtiari Province, of which only five have been registered on the National Heritage List.
	Stepped architecture of Sar Aqa Seyyed village	Sar Aqa Seyyed (Fig. 8)	
	Production of salt soap (Fig. 9)	Sar Aqa Seyyed	Salt produced in Sar Aqa Seyyed village
	Production of small lion statue as souvenirs (Fig.10)	Hafshejan	Symbol of Bakhtiari culture
	Production of small stone mortars as souvenirs (Fig. 11)	Hafshejan	Souvenirs and handicraft of Hafshejan
	Designing souvenirs themed on the Bakhtiari rug and geology (Fig.12)	Chaharmahal and Bakhtiari Province	
Intangible Cultural Heritage	Stone almond	Chaharmahal and Bakhtiari Province	The hardness of the almond's shell likened to stone
	Local games played with stones	Chaharmahal and Bakhtiari Province	
	Baking local pastries and breads shaped like regional fossils	Chaharmahal and Bakhtiari Province	
	Skill of salt extraction from springs by women in Sar Aqa Seyyed village (Fig. 13)	Sar Aqa Seyyed	
	Mineral fruit juice	Dimeh spring water	Combination of spring water from Dimeh and local fruit juice
	Ceremony of Abkar Olya village, Lebd, Kuhrang	Lebd, Kuhrang	Disappeared in a landslide on Wednesday, April 1 1998; survivors gather annually to hold the ceremony

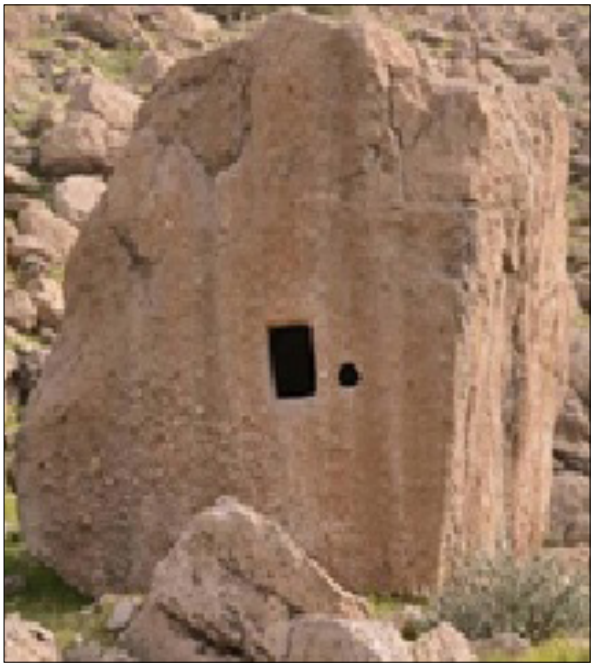

Figure 7. Bard Goori (Source: B2n.ir/sq5429)

Figure 8. Sar Aqa Seyyed village (Source: B2n.ir/w41305)

Figure 9. A sample of salt soap produced in Iran (Source: B2n.ir/m12358)

Figure 10. Lion statue that is a symbol of Bakhtiari culture (Source: B2n.ir/x51855)

Figure 11. Stone mortars as a handicrafts of Hafshejan

Figure 12. A sample design of souvenirs themed on the Bakhtiari rug and geology. (Source: Own construction)

Figure 13. Skill of salt extraction from springs by women in Sar Aqa Seyyed village (B2n.ir/j30399)

Conclusion

This study demonstrates that the Zagros Simply Folded Zone in Chaharmahal and Bakhtiari Province exhibits high geodiversity, offering significant potential for geotourism development. We identify 11 potential geo-educational sites based on accessibility and educational value, highlighting opportunities for educational activities targeted at geotourists.

In terms of cultural heritage, both tangible and intangible assets linked to geosciences have been proposed. Tangible heritage includes ancient stone tombs (Bard Goori), stepped architecture in local villages, and souvenirs inspired by Bakhtiari culture and motifs. Intangible heritage encompasses traditional ceremonies, local games involving stones, baking practices shaped like regional fossils, and indigenous salt extraction techniques practiced by local women. These cultural heritages are deeply intertwined with the geology of the Zagros and present valuable opportunities to be developed as geo-products or geo-attractions to foster local economic growth.

Lastly, the results suggest that the area has a high potential for promoting geotourism. It is noteworthy that, at present, essential protective and geotourism infrastructures—such as interpretive signage, directional and informational panels, local museums, and a regional geotourism map—are lacking, which poses a challenge to the sustainable development of geotourism in the area. In addition, training geotour guides, using VR and AR technologies, and installing interpretive panels in geo-educational sites will be key factors for promoting geotourism and geo-knowledge transfer.

It is recommended that integrated geotourism management programs be designed and implemented with active community participation, leveraging the scientific and cultural capacities of the region. In this regard, empowering local communities and establishing protective infrastructures should be considered a priority.

For future research, we suggest a study of cultural geomorphology and geomythology in the Zagros Simply Folded Zone, and the design of a self-guided geotour of the area.

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Authors' Contribution

Authors contributed equally to the conceptualization and writing of the article. It is noteworthy that the paper is an excerpt from the first author's thesis, and the second and third authors are the supervisors.

Conflict of Interest

Authors declared no conflict of interest.

References

Abaszadeh A, Ebrahimi A (2020). Assessing the potential of talented geosites in Chaharmahal and Bakhtiari Province using the Comanescu method. Geography and Human Relationships. 2(4): 400-412..20.1001.1.26453851.1399.2.4.26.4 (in Persian)

Bosák P, Bruthans J, Filippi M, Svoboda T, Šmíd J(1999). Karst and caves in salt diapirs, SE Zagros Mts.(Iran). Acta Carsologica. 28(2).41-75. https://doi.org/10.3986/ac.v28i2.484

Clarke V, Braun V (2017). Thematic analysis. The Journal of Positive Psychology. 12(3) 297-298. https://doi.org/10.1080/17439760.2016.1262613

Dowling, R.K, Newsome D (2006). Geotourism's issues and challenges. In Dowling RK, Newsome D (Eds.). Geotourism (pp. 242-254).

Routledge. ISBN: 9781136400940

Fathollahi M, Mahmoudi F, Ebrahimi H (2019). The first report on the observation of the living fossil Triops cancriformis in the rice fields of Lordegan, Chaharmahal and Bakhtiari. In 2nd National Conference on Natural Resources and Sustainable Development in the Zagros Region. Shahrekord University, Iran. Retrieved from https://civilica.com/doc/941680

Gray M (2008). Geodiversity: the origin and evolution of a paradigm. In Burek CV and Prosser CD (Eds.). The History of Geoconservation. Geological Society. London, Special Publications. London. UK. https://doi.org/10.1144/sp300.4

Hamrsmid B, Rögl F (2000). Biostratigraphie des Baba Heydar-Profils, Iran. Senckenbergiana lethaea. 80: 39-44. https://doi.org/10.1007/BF03043662

Hose TA (2000). European geotourism–geological interpretation and geoconservation promotion for tourists. In Barettino D, Wimbledon WAP & Gallego E (Eds.), Geological heritage: Its conservation and management (pp. 127–146). Instituto Tecnológico GeoMinero de España. Madrid, Spain.

Hose, T. A. (1995). Selling the story of Britain's stone. Environmental interpretation, 10(2):16-17. https://www.scirp.org/reference/ReferencesPapers?ReferenceID=952589

Hosseinzadeh MM, Khaleghi S, Maromi H Z, Sadough SH (2018). Geomorphosite assesment in Qeshm Geopark (Iran). Tourism: An International Interdisciplinary Journal. 66(4): 428-442.

Iranmanesh Y, Shirmardi HA, Jahanbazi Gujani H (2018). Choghakhor Wetland: A valuable reserve of biodiversity in Zagros. Iran Nature. 3(2): 78-83.(in Persian) https://doi.org/10.22092/irn.2018.116438

Jafari GH, Naseri F.(2020). Spatial Analysis of Zagros Karst Landforms Depending on Altitude and Tectonic Position. Geography and Development. 18(61): 227-246. doi: 10.22111/GDIJ.2021.5849. (In Persian)

Khoshraftar R, Farsani NT (2022). An introduction to geotourism of the Mahneshan county. Geoheritage. 14: 28. https://doi.org/10.1007/s12371-022-00671-2

Moffet B, Moody J (2008). US Agencies sign agreement to embrace geotourism, expanding conservation efforts. Retrieved from https://www. doi. gov/sites/doi.gov/files/archive/news/archive/08_News_Releases/080708.html.

Newsome D, Dowling R (2018). Geoheritage and geotourism. In Geoheritage (pp. 305-321). Elsevier. https://doi.org/10.1016/B978-0-12-809531-7.00017-4

Orak Z, Mirzaie Ataabadi M, Solgi A, Majidifard MR, Kostopoulos D (2019). First mammal fossil locality from the late Miocene of Zagros, Western Iran. Geopersia. 9(2): 367-379. Doi: 10.22059/geope.2019.270561.648436

Quesada-Román A, Torres-Bernhard L, Ruiz-Álvarez M A, Rodríguez-Maradiaga M, Velázquez-Espinoza G, Espinosa-Vega C, ... , Rodríguez-Bolaños H (2021). Geodiversity, geoconservation, and geotourism in Central America. Land 11(1): 48. https://doi.org/10.3390/land11010048

Serrano E, Ruiz-Flaño P (2007). Geodiversity: a theoretical and applied concept. Geographica Helvetica. 62(3) 140-147. https://doi.org/10.5194/gh-62-140-2007

Torabi Farsani N, Coelho C, Costa C (2011). Geotourism and geoparks as novel strategies for socio-economic development in rural areas. International Journal of Tourism Research. 13(1): 68-81. https://doi.org/10.1002/jtr.800

Terry G, Hayfield N, Clarke V, Braun V (2017). Thematic Analysis. In Willig C & Rogers

W S (Eds.), The SAGE Handbook of Qualitative Research in Psychology (pp. 17-36). SAGE Publications Ltd. https://doi.org/10.4135/9781526405555.n2

Yahya Sheibani V, Zamanian E (2023). Geodiversity and geological treasure of Tabas UNESCO global Geopark for geotourism development, new UGGp from Iran. Geoheritage. 15(3): 106 https://doi.org/10.1007/s12371-023-00873-2