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REVIEW ARTICLE

Conservation Management of Geotourism Attractions in Tourism Destinations

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Abstract

Over the past 14 years, several geosites have been identified as geotourism all over Iran, and it seems the time has come to define and implement systematic mechanisms in order to conserve this valuable geoheritage. Therefore, using a combined approach, this study aims to answer the question about the conceptual model of conservation management of geotourism attractions. The required data were collected using the archival method; in the following, it is attempted to discover and identify the conceptual model of conservation management of geotourism attractions through reviewing and analyzing the related theories and texts using logical reasoning method. Content validity ratio and one-sample *t* test have been used to validate the conceptual model. The research findings resulted in the conceptual model of conservation management of geotourism attraction in the form of mutual relationship between three layers of geotourism attraction, people, and government. In the layer of geotourism attraction, the significance of geotourism attraction is indicated by instrumental and intrinsic values. Meanwhile, the integrity of geotourism attractions is in itself an effective factor in attributing instrumental and intrinsic values to geotourism attractions. If the integrity of geotourism attractions is weakened by natural and human threats, naturally it leads to reduced values of geotourism attractions. In the people layer, the values attributed to geotourism attractions are affected by contextual and personal factor of people. However, the analysis of the factors, which cause the demonstration and decrease inconsistency between people's behavior and belief toward values, is so effective on conservation of geotourism attractions. In the government layer, the government makes an agenda for conserving attractions and their values based on the interaction of people with geotourism attractions through planning, organizing, guiding, and supervising. The results of the conceptual model validation demonstrated that content validity ratio was higher than the acceptable level for all components. Moreover, content validity ratio was 0.92 for the entire model, and 0.94, 0.83, and 1.00 for the three dimensions of geotourism attraction, people, and government, respectively. This indicates the entire model and its dimensions are confirmed by 15 experts. Accordingly, utility hypothesis for the research conceptual model has been confirmed by the experts based on the results of one-sample *T* test.

Keywords Geotourism attraction · Geoheritage management · Conservation · Natural heritage · Geoheritage · Geoconservation

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Introduction

Geotourism was first recognized in the late 1990s in the Great Britain and in the first national conference in Belfast (Dowling and Newsome 2010). The first published definition of geotourism was stated by Hose (1995). He defined geotourism as "provision of interpretive and service facilities to enable tourists to acquire knowledge and understanding of the geology and geomorphology of a site (including its contribution to the development of the Earth sciences) beyond the level of mere aesthetic appreciation" (Hose 1995). The National Geographic Society suggested that geotourism be defined as geographical tourism that sustains or enhances the distinctive geographical character of a place (i.e., its culture, esthetics, heritage, environment, and the wellbeing of its residents) (Stueve et al. 2002). However, Dowling and Newsome (2010) defined geotourism as 'a form of tourism that specifically focuses on geology and landscape'. In addition, Dowling (2013) defined geotourism as promoting tourism to geosites, the conservation of geodiversity, and an understanding of the Earth sciences through appreciation and learning. Newsome and Dowling (2018) later defined geotourism as "tourism which focuses on an area's geology and landscape as the basis of fostering sustainable tourism development'.

Meanwhile, many researchers (Hose 2011; Hose and Vasiljević 2012; Ólafsdóttir and Dowling 2014), due to knowing that this type of tourism cannot function without sustainable geoheritage management, put emphasis on geoconservation in geotourism. Geoconservation indicates how much humans accept their responsibility toward natural phenomena and their conservation or plans to conserve geosites, geodiversity, geomorphological and geological processes, and phenomena and their changes (Sharples 2002; Hose 2003; Schutte 2009). However, geoconservation (abiotic nature) has received less attention compared to biotic nature. Although there is a direct relationship between the two kinds of biotic nature (biodiversity) and abiotic nature (geodiversity), the main part of nature conservation at the moment is focused on biotic nature, including flora and fauna, based on traditional viewpoints (Brilha 2002). Therefore, the concept of geoconservation is not understood by the public the same as conservation of biodiversity (Gonggrijp 1994; Schutte 2009). This factor is considered as a significant threat to conservation of such an important heritage, especially in developing countries.

Significant measures have been taken to conserve geoheritage and geotourism attractions in some countries such as England and the USA, including delineation of important sites in England (Mc Keever et al. 2006) and developing and conserving national parks in the USA (Gates 2006). The Irish Geological Heritage (IGH) Programme, including 16 geological subjects, was developed to play an important role in the conservation of geodiversity (Parkes and Morris 2001). Of course, geoconservation has a long time history such as protection of the cave Baumannshole in Germany in 1668 (Grube 1994), the legal action to prevent the quarrying of stone from Salisbury Crags in order to conserve the city landscape in Edinburgh, Scotland in 1819 (McMillan et al. 1999), and conservation of such small mountains, as Drachenfels (protected in 1836), Totenstein (protected in 1844), and Teufelsmauer (protected in 1852) in Germany (Erikstad 2008). Moreover, in recent years, several initiatives have been developed at the international level. Some examples are as follows: Holding the international symposium of the earth heritage conservation in Dijon, France, in 1991 (Pemberton 2007); the Declaration of the Earth's Rights by scientists in Digne-les-Bains in 1994 (Martini 1994); the establishment of the European Geoparks Network in 2000 (Zouros 2004); forming a special group by International Association of Geomorphologists (IAG) in the fifth international conference of geomorphology in Kyoto, Japan, in order to present solutions for assessment, conservation, and promotion of geomorphosites in 2001; and the UNESCO initiation to develop geoparks in 2003. Gray (2004), in his book titled "Geodiversity: valuing and conserving abiotic nature" raised the subject in terms of geodiversity of phenomena. All of these measures are promising the researchers' and planners' attention to the importance of geodiversity along with biodiversity, which results in awareness about various aspects of abiotic nature and its influence on both biodiversity and cultural diversity (Reynard and Coratza 2007).

There has been an increasing focus on geotourism as a means of realizing sustainable development through enhancing financial power (Hose 1995), on the one hand, and environment conservation, on the other. The foundation of geotourism is based on geodiversity (Gray 2004). He has stated that geodiversity should be conserved for two reasons: First, geodiversity is valuable, and it is validated by many methods. Second, geodiversity is threatened by various major activities of human beings. However, it is not possible to conserve all parts of geodiversity due to the requirements of the modern society for soils, aggregates, metals, fuel, and other ground resources to socio-economic growth and development (Kubalíková 2013). Moreover, this concept is so extensive and cannot be understood by the public (Andrasanu 2009). According to Cleal (2007), an effective method of conservation is to preserve and support valuable geotourism areas in the form of geosites and geomorphosites. Each geosite requires special methods of conservation and management based on its environment (Yazdi et al. 2014a). At the same time, they have common features which cause that learning from a geosite can be transferrable to other geosites and the basic guidance for their conservation can be provided. It seems that developing a legal framework for geoconservation is much effective along with increasing published awareness about the importance of conservation of geoheritage (Reynard

and Coratza 2003). However, the mere enactment of regulation is not sufficient for the conservation of geological heritage; rather effective cultural measures are required to be taken constantly so that the public understand the necessity of changing the perspective toward geoheritage (Khoshraftar 2009a). In other words, although developing a protected area and regulation and imposing penalty are considered a conservational method, it cannot secure their sustainability in long term for the following reasons. The possibility of violation of the law, the extent and dispersion of geotourism attractions, supervisory problems, and so forth. Thus, it should be noted that the conservation methods leading to mere physical conservation of geotourism attraction are outdated. Therefore, the present study seeks to find the conceptual model of conservation management of geotourism attractions. Finding the answer to this question will provide the officials with required mechanisms of decision making and policy making in order to conserve the geoheritage and geotourism attractions.

Geoheritage and Geotourism in Iran

Iran has a rich culture and civilization as well as an outstanding natural environment. Its natural and cultural diversity specifications have caused it to be listed as one of the top ten tourist countries in the world and its archeological, cultural, and natural attractions form an excellent basis for developing geotourism. While Iran has a great range of geological phenomena, geotourism is just emerging and taking its first developmental steps (Amrikazemi and Mehrpooya 2006). In Iran, measures have been taken within the last two decades regarding geotourism attractions and geoheritage. Some examples can be mentioned as organizing the first geotourism conference in Geology Organization and National Geoscience Database of Iran in 1998, publishing Geotourism Atlas of Qeshm (Amrikazemi 2005), registering Qeshm Geopark in the list of UNESCO Global Geoparks (UGGs) in 2007; holding the first conference of Geopark in Qeshm at the end of 2008; providing provincial geotourism reports, and preparing Tehran Geotourism Map and Geological Atlas of Routes by the National Geoscience Database of Iran (Mokhtari 2012, 2017).

Iran's geomorphic features lend themselves to geotourism, thanks to the size and diversity of their landforms and related processes. These include features related to mountains, volcanoes, water, and other factors. There are many mountainous features in Iran, including mountains (e.g., Mount Damavand, Alamkuh, Sabalan, and Taftan), canyons (e.g., in the southeast of Fars Province, the north of the Alborz Mountain range, and the southeast region of Iran), and landslides (e.g., in the west of Iran at the foot of Mount Kabirkûh). Furthermore, there are many volcanic features in Iran, including lava flows (e.g., at Maku City), lava rivers (e.g., basaltic flows of Mount Ararat in Maku area), basaltic columns (e.g., near Maku City, Ploor Town, and Birjand), craters (e.g., in Rayen region), and volcanic villages (e.g., Kandovan village at the foot of Mount Sahand, and Meymand village at the foot of Mount Mozahem). Plus, there are many water features in Iran, including lakes (e.g., Lake Gahar, Lake Uromiyeh, and the Caspian Sea), waterfalls (e.g., Bisheh, Shevie (Talezang), and Margoon waterfalls in Lorestan Province) and mineral springs (e.g., in Meshkin Shahr region, Sarein region, Larijan, Geno, and Ramsar). There are a range of other landforms with geotourism potential in Iran. They include mud volcanoes (e.g., in Chahbahar region near the Oman Sea, and in the surroundings of Bandar-e-Tourkmen, near the Caspian Sea), salt domes (e.g., the salt domes in three islands in the Persian Gulf on Qeshm, Larak, and Hormoz Islands), caves (e.g., the Kataleh Khor Cave is located about 150 km from Zanjan, Alisadr Cave is located in the vicinity of Hamadan, and Karaftoo Cave is located between Takab and Divandareh), sinkholes (e.g., in Rafsanjan region), deserts (e.g., Lut Kavir and Great Kavir), and chimney rocks (e.g., in Mahneshan region) (Amrikazemi and Mehrpooya 2006).

Generally, Iran has many geological interests and considerable geotourism potential. It should be noted that developing geotourism activities without conservation measures can lead to gradual destruction or rapid loss of attractions and setting the ground for erosive factors, degradation of soil texture due to footfall and hence susceptibility to erosion, which can create a critical condition in geotourism regions and threaten the environmental sustainability of the region. Several cases can be mentioned in various points of Iran, which are threatened and destructed due to weak management and conservation. For example, Basaltic Pillows geosites in Zemidan village, located in Lahijan, are totally lost due to lack of awareness about this national heritage as local people have extracted them instead of ballast and placed them in foundation of their buildings (Nekouei Sadri 2009). Hormoz Island is known as the natural museum of mineralogy in Iran, which is constantly exposed to destruction and loss of natural minerals due to visitors' easy access to minerals and colored soils (Yazdi et al. 2014b). Moreover, easy access by visitors to some geosites of Qeshm geopark, such as Salt Cave, Valley of Stars, and Chahkooh Canyon have faced geosites with the risk of destruction (Yazdi and Ashja Ardalan 2014). Destruction of Asiab Waterfall and Qom Tappeh in East Azerbaijan, destruction of Jolfa-Hadishahr plain due to the extensive excavation for construction (Mokhtari 2017; Mokhtari 2012), as well as removing Qeshm geopark from the list of UNESCO Global Geoparks in 2002 due to the weak management, and also destruction of Badab-e Surt in Sari due to negligent behavior of tourists are some examples of destruction of geoheritage in Iran due to lack of supervision in geotourism sites.

Table 1 Examples of international studies in the field of geotourism and geoheritage

Number	Author/year	Research title	Research subject
1	Hose (1995)	Selling the story of Britain's stone	Description and evaluation of geoheritage
2	Dixon (1996)	Geoconservation: an international review and strategy for Tasmania	Conservation and management of geoheritage
3	Campbell et al. (1996)	An introduction to the geological conservation review	Conservation and management of geoheritage
4	Hose (1997)	Geotourism – selling the earth to Europe.	Description and evaluation of geoheritage
5	Burek and France (1998)	NEWRIGS uses a steam train and town geological trail to raise public awareness in Llangollen, North Wales	Description and evaluation of geoheritage
6	Parkes and Morris (1999)	The Irish Geological Heritage Programme	Description and evaluation of geoheritage
7	Hose (2000)	European geotourism – geological interpretation and geoconservation promotion for tourists	Conservation and management of geoheritage
8	Stanley (2000)	Earth heritage	Description and evaluation of geoheritage
9	Chen (2001)	Geomorphologic resources in perspective of tourism in Taihang Mountains	Description and evaluation of geoheritage
10	Sharples (2002)	Concepts and principles of geoconservation	Conservation and management of geoheritage
11	Reynard and Coratza (2003)	Report of the administrative meetings of working group geomorphological sites	Conservation and management of geoheritage
12	Gray (2004)	Geodiversity: valuing and conserving abiotic nature	Description and evaluation of geoheritage
13	Smith (2005)	Management challenges at a complex geosite: the Giant's Causeway World Heritage Site, Northern Ireland	Conservation and management of geoheritage
14	Thomas (2005)	The palaeobotanical beginnings of geological conservation with case studies from the USA, Canada, and Great Britain	Conservation and management of geoheritage
15	Serrano and González-Trueba (2005)	Assessment of geomorphosites in natural protected areas: the Picos de Europa National Park (Spain)	Conservation and management of geoheritage
16	Jianjun et al. (2006)	Geological heritage in China	Description and evaluation of geoheritage
Number	Author/Year	Research Title	Research Subject
17	Reynard et al. (2007a)	A method for assessing the scientific and additional values of geomorphosites	Description and evaluation of geoheritage
18	Tosatti (2008)	Slope instability affecting the Canossa geosite (northern Apennines, Italy)	Description and evaluation of geoheritage
19	Prosser (2008)	The history of geoconservation in England: legislative and policy milestones	Conservation and management of geoheritage
20	Doughty (2008)	How things began: the origins of geological conservation	Conservation and management of geoheritage
21	Ellis (2008)	A history of the geological conservation review	Conservation and management of geoheritage
22	Josan and Ilies (2009)	Geosite-geomorphosites and relief	Description and evaluation of geoheritage
23	Hadžić et al. (2010)	A dynamical model for assessing tourism market attractiveness of a geosite	Description and evaluation of geoheritage
24	Prosser et al. (2010)	Conserving geodiversity sites in a changing climate: management challenges and responses	Conservation and management of geoheritage
25	Conway (2010)	A soil trail?—a case study from Anglesey, Wales, UK	Description and evaluation of geoheritage
26	Hose et al. (2011)	Preliminary geosite assessment model (GAM) and its application on Fruska Gora Mountain potential geotourism	Description and evaluation of geoheritage
27	Henriques et al. (2011)	Geoconservation as an emerging geoscience	Conservation and management of geoheritage
28	Prosser (2011)	Principles and practice of geoconservation: lessons and case law arising from a legal challenge to site-based conservation on an eroding coast in Eastern England, UK	Conservation and management of geoheritage
29	Newsome et al. (2012)	The nature and management of geotourism: a case study of two established iconic geotourism destinations	Conservation and management of geoheritage
30	Hose and Vasiljević (2012)	Defining the nature and purpose of modern geotourism with particular reference to the UK and South-East Europe	Description and evaluation of geoheritage

Table 1 (continued)

Number	Author/year	Research title	Research subject
31	Burek (2012)	The role of LGAPs (local geodiversity action plans) and Welsh RIGS as local drivers for geoconservation within geotourism in Wales	Conservation and management of geoheritage
32	Kiernan (2012)	Impacts of war on geodiversity and geoheritage: case studies of Karst caves from Northern Laos	Conservation and management of geoheritage
33	Gao et al. (2013)	Geological and geomorphological value of the monogenetic volcanoes in Wudalianchi National Park, NE China	Description and evaluation of geoheritage
34	García-Ortiz et al. (2014)	Concepts and terminology for the risk of degradation of geological heritage sites: fragility and natural vulnerability, a case study	Conservation and management of geoheritage
35	Farsani et al. (2014)	Geo-knowledge management and geoconservation via geoparks and geotourism	Conservation and management of geoheritage
36	Matthews (2014)	Integrating geoconservation and biodiversity conservation: theoretical foundations and conservation recommendations in a European Union context	Conservation and management of geoheritage
37	Tavares et al. (2015)	Community involvement in geoconservation: a conceptual approach based on the geoheritage of South Angola	Conservation and management of geoheritage
38	Chakraborty et al. (2015)	Geosystems as a framework for geoconservation: the case of Japan's Izu Peninsula Geopark	Conservation and management of geoheritage
39	Zhizhong et al. (2015)	Geoparks in China	Description and evaluation of geoheritage
40	Qiu et al. (2015)	Petrology and spectroscopy studies on Danxia geoheritage in Southeast Sichuan Area, China: implications for Danxia surveying and monitoring	Description and evaluation of geoheritage
41	Geremia et al. (2015)	Environmental geology applied to geoconservation in the interaction between geosites and linear infrastructures in South-Eastern Italy	Conservation and management of geoheritage
42	Fuertes-Gutiérrez et al. (2016)	Anthropic threats to geological heritage: characterization and management: a case study in the dinosaur tracksites of La Rioja (Spain)	Conservation and management of geoheritage
43	Fuming et al. (2016)	A study on classification and zoning of Chinese geoheritage resources in national geoparks	Description and evaluation of geoheritage
44	Valjarević et al. (2017)	Evaluation of the tourist potential and natural attraction of the Lukovska Spa	Description and evaluation of geoheritage
45	Brilha et al. (2018)	Geodiversity: an integrative review as a contribution to the sustainable management of the whole of nature	Conservation and management of geoheritage
46	Wignall et al. (2018)	A qualitative risk assessment for the impacts of climate change on nationally and internationally important geoheritage sites in Scotland	Conservation and management of geoheritage
47	Habibi et al. (2018)	Urban geoheritage complexity: evidence of a unique natural resource from Shiraz city in Iran	Description and evaluation of geoheritage
48	Han et al. (2018)	From geopark to sustainable development: heritage conservation and geotourism promotion in the Huangshan UNESCO Global Geopark (China)	Conservation and management of geoheritage
49	Prosser (2018)	Geoconservation, quarrying and mining: Opportunities and challenges illustrated through working in partnership with the mineral extraction industry in England	Description and evaluation of geoheritage
50	Gordon et al. (2018)	Enhancing the role of geoconservation in protected area management and nature conservation	Conservation and management of geoheritage
51	Gordon (2018)	Geoheritage, geotourism, and the cultural landscape: enhancing the visitor experience and promoting geoconservation	Conservation and management of geoheritage
52	Guo and Chung (2019)	Using tourism carrying capacity to strengthen UNESCO Global Geopark management in Hong Kong	Conservation and management of geoheritage
53	Roberts (2019)		Conservation and management of geoheritage

Table 1 (continued)

Number	Author/year	Research title	Research subject
		Brymbo fossil forest: a sustainable management of natural resources (SMNR)approach to geoconservation and geotourism	
54	Cai et al. (2019)	Geoheritage and sustainable development in Yimengshan Geopark	Description and evaluation of geoheritage
55	Shekhar et al. (2019)	Conservation and sustainable development of geoheritage, geopark, and geotourism: a case study of Cenozoic successions of Western Kutch, India	Conservation and management of geoheritage
56	Price and Ronck (2019)	Quarrying for world heritage designation: slate tourism in North Wales	Description and evaluation of geoheritage
57	Pescatore et al. (2019)	Geomorphosites: versatile tools in geoheritage cultural dissemination	Description and evaluation of geoheritage

Research Background

In this part, international and Iranian studies on conservation and management of geoheritage are investigated. Accordingly, by searching for the keywords in geoconversion, geoheritage, geotourism, geopark, and geodiversity, in the title and keywords, in scientific databases of Iran (Magiran, and Noormags) and international scientific databases (Web of Science and Scopus), 129 and 894 papers were prepared respectively. The search was carried out from 1995 to 2019. A total of 57 examples of international studies within the past 25 years (1995–2019) and also 21 examples of Iranian studies within the past 14 years (2006–2019) are mentioned in Tables 1 and 2.

Many Iranian and international studies have been carried out so far in geotourism and geoheritage areas. The trend of international studies indicates that their scope of subject is gradually moving from "description and analysis of geoheritage" to focusing on "conservation and management of geoheritage," while Iranian studies have been stopped in description and analysis of geoheritage using various models within the past 14 years, and almost no comprehensive study of conservation and management of geoheritage can be found (Fig. 1).

Given that during the past years several geosites have been identified and put into tourism operation in Iran, it is the appropriate time to define and enforce systematic mechanisms to conserve this valuable heritage. Accordingly, it is essential to identify effective factors on conservation management of geotourism attractions and provide the respective framework.

Methodology

The current research has a descriptive-analytical nature and is regarded as applied in terms of purpose. This study aims to define a conceptual model for conservation management of geotourism attractions. This research is carried out in both qualitative and quantitative sections. Accordingly, in the first section (qualitative), the required data are collected through archival resources. The strategy used in this research is logical reasoning for data analysis in order to define a conceptual model. Any research based on logical reasoning is holistic research. Accordingly, the researchers offer his interpretation of the subject in the form of a theory. In this way, the researchers try to provide the context for persuading the audience logically and rationally in terms of face and content. Therefore, such research (analytical research) can be introduced as holistic, interpretive, and persuasive (Mirjani 2011). The strategy of logical reasoning is more comprehensive than other research strategies as each model requires logical integrity. Moreover, the strategy of logical reasoning can help codifying extensive theoretical literature into a theoretical framework. Documents, theories, and scripts related to the subject are reviewed and investigated in order to answer the research question regarding the quality of the model of conservation management of geotourism attractions. With respect to the nature of the data in the first section (qualitative), the theoretical texts are analyzed qualitatively to achieve the conceptual model of the study. Finally, in the second section of the study (quantitative), content validity ratio is used to validate the conceptual model of the study. Accordingly, in the second section, the required data are collected through the questionnaire. The statistical population in the second section is the experts in management and conservation of geotourism attractions. The purposeful and snowball sampling methods are used to select 15 experts. In order to determine the validity of the questionnaire, content validity has been utilized in the present study. In doing so, the questionnaire's items were approved by several experts in management and conservation of geotourism attractions. Moreover, the validity of the questionnaire is evaluated by means of average variance extracted

Table 2 examples of Iranian researches in the field of geotourism and geoheritage

Number	Author/year	Research title	Subject of research
1	Servati and Kazazi (2006)	Investigating the geotourism in Hamedan Province	Description and analysis of geoheritage
2	Maghsoudi and Nekouei Sadri (2007)	Goetourims, a novel window to Iran tourism development	Description and analysis of geoheritage
3	Ahrari Rudi and Shahrokhi Khargerdi (2008)	Investigating the role of geomorphologic forms in attracting tourist in Chabahar	Description and analysis of geoheritage
4	Khoshraftar (2009b)	Geotourism in Zanjan Province	Description and analysis of geoheritage
5	Mokhtari (2010)	Evaluating ecotourism potential of geomorphic sites of drainage basin of Asiab Kharabe in north west of Iran	Description and analysis of geoheritage
6	Ghanbari et al. (2011)	Evaluating geotourism potential of geomorphologic sites in Kandovan	Description and analysis of geoheritage
7	Yazdi (2012)	Investigating of geosites and potential geoparks in Iran as the development basis of geotourism	Description and analysis of geoheritage
8	Fakhri et al. (2013)	Evaluating the potential of geomorphosites in tourism development in Maranjab	Description and analysis of geoheritage
9	Omidzadeh et al. (2014)	Evaluating the geomorphotourism capabilities and priorities in Lorestan	Description and analysis of geoheritage
10	Yamani et al. (2014)	Evaluating geoclimate of mountain context in order to identify winter geotourism sites in Lorestan	Description and analysis of geoheritage
11	Mokhtari (2014)	Axioms of geomorphology and geotourism status	Description and analysis of geoheritage
12	Yazdi and Dabiri (2015)	An introduction of geodiversity as a basis of geotourism development	Description and analysis of geoheritage
13	Yarahmadi and Sharafi (2016)	Investigating the potential and geotourism attraction of Shirz Canyon in Lorestan	Description and analysis of geoheritage
14	Taghavi Goodarzi et al. (2016)	Prioritization of areas with potential of being geopark in Lorestan province	Description and analysis of geoheritage
15	Mohammadi Aragh et al. (2016)	Identifying and evaluating geoheritage of Takht-e Soleiman in west Azerbaijan	Description and analysis of geoheritage
16	Jadidi et al. (2017)	Role of geoparks in tourism considerations of land use planning (case study of establishment of geopark in Lorestan province)	Description and analysis of geoheritage
17	Mokhtari (2017)	Introducing geosites in north west of Iran and expression of their roles in organizing capabilities of local community	Description and analysis of geoheritage
18	Goli Mokhtari et al. (2018)	A comparative study of geotourism potentials of Aleshtar city in Lorestan province	Description and analysis of geoheritage
19	Zanganeh Asadi et al. (2018)	Evaluation of geomorphosites of proposed geoparks in west Khorasan Razavi	Description and analysis of geoheritage
20	Vaezi et al. (2019)	The status of geotourism in public policies in the context of Iran policy agenda setting approach	Description and analysis of geoheritage
21	Pourfaraj et al. (2019)	Analyzing vulnerability of geotouristic attractions in tourism destinations	Description and analysis of geoheritage

(AVE). The reliability of the questionnaire is also assessed through the use of composite reliability (CR). Finally, the one sample *t* test is used to measure the equality of the mean of the statistical sample with the mean of the statistical population.

Theoretical Background of the Study

Conservation is always achieved by considering the triple relationship between conservator, heritage, and audience (Basiri et al. 2014). Accordingly, it should be noted that analysis of any mutual interaction and relationship requires a mutual recognition of the relationship, communication flow, and type of relationship at both sides (Jomehpour 2017). Therefore, heritage is inclusive of meanings; conservator plays the role of the facilitator of understanding the heritage (Basiri et al. 2014), and audience is anyone who understands the meaning of heritage. Worboys et al. (2010) considered connectivity conservation management based on a mutual relationship between people, management, and nature. They considered the nature as the main driver of initiating this conservation, which cannot be effective on its own; rather, it interacts with people dynamically. People are the basic factor in achieving conservation management since they live in the protected area and exploit it in order to meet their financial, cultural, social, and political needs. Therefore, natural lands have spiritual, cultural, and

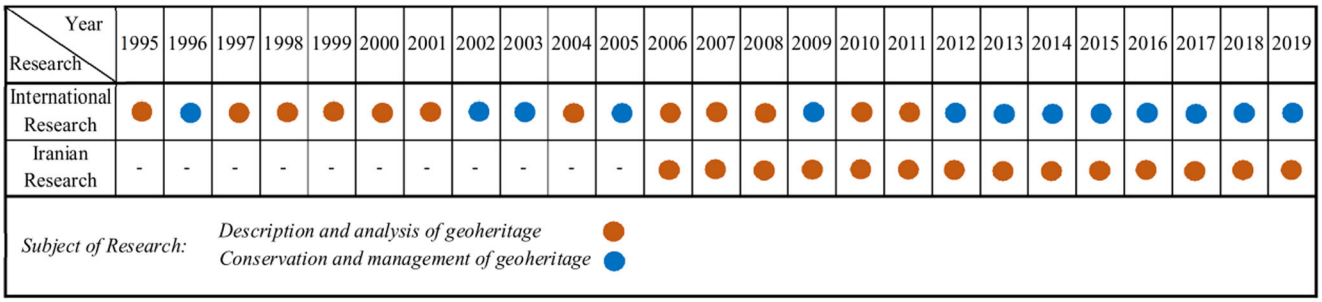

Fig. 1 The trend of international studies indicates that the scope of subject of the studies is gradually moving from "description and analysis of geoheritage" to focusing on "conservation and management of geoheritage", while Iranian studies have been stopped in "description and analysis of geoheritage"

social value for people while they are faced with threats by people at the same time. Management refers to treaties, contracts, agreements, policies, legislation, and plans that influence and direct conservation. It can be said that generally conservation management of geotourism attractions is dependent on surveying the mutual relationship between "geotourism attraction," "people," and "government," which are the basis of conceptual model of the present study.

Sale (2002) defines conservation management as adjustment of human activities in order to minimize the direct and indirect negative effects on valuable sites. Therefore, conservation of geotourism attractions should be investigated from the management perspective. So far, various definitions have been presented for management, some of which are as follows: The art of arranging the tasks to be done by others; a process by which decision making in organization takes place; accomplishing the tasks related to planning, organizing, guidance, coordination, and control; the art and knowledge of coordinating efforts and cooperation of members and using the resources to achieve organizational goals, playing the role of leader, informational source, decision maker, and the interface for organization's members (Alvani 2003). Fayol (1949) has introduced five managerial tasks, including planning, organizing, leadership, coordination, and controlling. In recent articles, however, the main tasks of managers are considered to be planning, organizing, leadership, recruitment, and controlling (Koontz et al. 2001). Some references have removed recruitment from the above-mentioned list (Rezaeian 2004). Generally, most researchers state managers' general tasks in the form of a four-component framework as planning, organizing, leadership, and controlling (Worboys et al. 2010; Daft 2010; Robbins 2017). Conservation management of geotourism attraction can be defined as the process of "planning," "organizing," "leadership," and "supervising" the mutual relationship of "geotourism attraction,", "people," and "government" (Fig. 2).

Dixon (1991) has introduced "significance" as the fundamental concept of geoconservation. He has referred to the range and extent of features and systems that should be managed for geoconservation and determining which features are important. Accordingly, Burra Charter has stated that conservation of sites is the conservation of all cultural and natural aspects without unjustifiably compromising each value for the sake of others (ICOMOS 1999). Today, successful conservation measures are those which can preserve the values of heritage (Hazen 2009). Recognition of values defines a path in which the significance of heritage is defined. Hence, the conservation of heritage values in protecting historical monuments has been one of the most important concerns in forming charters of modern conservation in the recent decades. It should be noted that value is among factors determining the significance and validity in topics related to conservation science (Mason et al. 2002; Matero 2000) (Fig. 3), which plays a critical role in developing conservation policies. Generally, each conservation activity is taken place when the object or place is determined to be significant, and hence decision making about its restoration and manipulation will be subject to this significance (Mason et al. 2002). The significance of place is a set of values of cultural and natural heritage associated with place (English Heritage 2008). Heritage structures, sites, and regions in various scales, from a single building to urban and natural landscapes, gain their own distinguished features and significance from social, spiritual, historical, artistic, esthetic, natural, scientific, or other cultural values (ICOMOS 2005). In other words, value is a manifestation of significance, which is associated by people to quality of places (English Heritage 2008). The Getty Conservation Institute (2005) has introduced value-based management as an organized and coordinated operation of heritage place with the primary goal of conserving the significance of the place. Moreover, according to ICOMOS New Zealand Charter (2010), conservation management of sites should be based on a comprehensive recognition of tangible and intangible values of heritage. As a result, conservation activities, based on value, will guarantee maintaining the significance.

Alexander (2013) believes that the entire life has intrinsic value irrespective of its value to people. Humans are not detached from non-human life; the world is a network of phenomena which are essentially interconnected and interdependent. Instrumental values are human-centered values. For

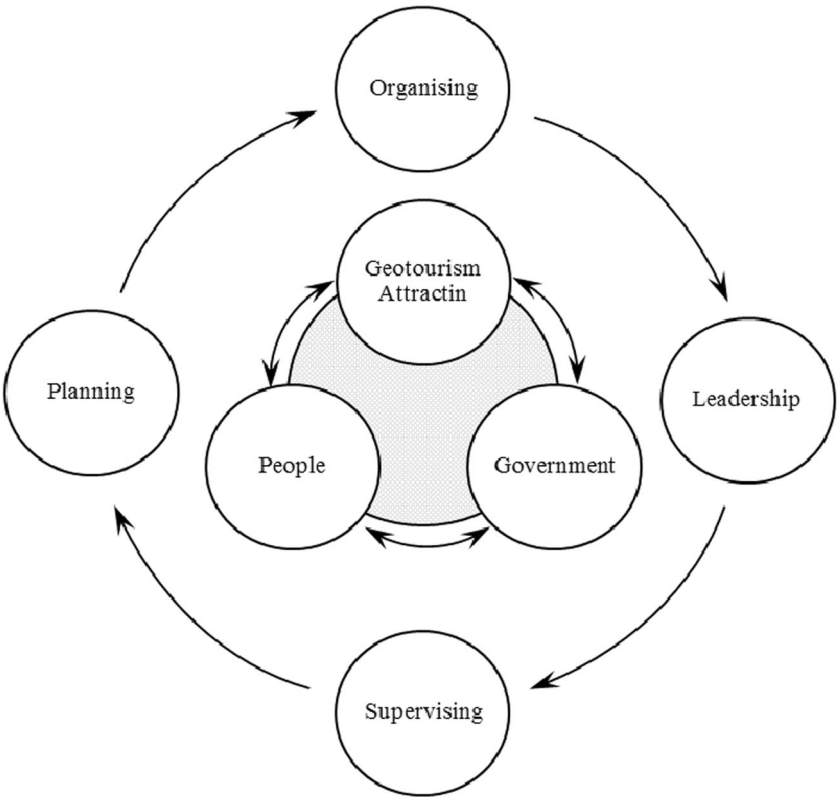

Fig. 2 Conservation management of geotourism attraction can be defined as the process of "planning," "organizing," "leadership," and "supervising" the mutual relationship of "geotourism attraction," "people" and "government"

example, nature is valuable only when it is useful for people (Alexander 2013). Unlike intrinsic value, instrumental value of an object is dependent on another object or purpose (Fahimi and Mashhadi 2009). Geology scientists have attributed various values (such as esthetic, scientific, cultural-historical, economical, ecological, and educational) to geoheritage with the aim of conserving geological phenomena (Bruschi and Cendrero 2005; Coratza and Giusti 2005; Serrano & Gonzales-Trueba 2005; Pralong 2005; Reynard et al. 2007b; Zouros 2007; Pereira et al. 2007; De Lima et al. 2010; Hadžić et al. 2010; Vujičić et al. 2011; Comanescu et al. 2011; Fassoulas et al. 2012; Kubalíková 2013; Rocha et al. 2014; Warowna et al. 2014; Kubalíková and Kirchner 2016; Brilha 2016). It is possible to attribute geotourism attractions to the two concepts of "intrinsic value" and "instrumental value" (Pourfaraj et al. 2019; Ferdowsi 2020) (Fig. 4).

Integrity is another concept in conservation management of geoheritage, which is addressed in this study. According to article 2 of the World Cultural and Natural Heritage convention, natural geological and geographical compositions and the totally determined areas of animal habitat and plant growth, which are endangered and considered as qualified for outstanding universal value, are referred to as "natural heritage." Based on the above-mentioned convention, in relation to geoheritage, the purpose of places with outstanding universal value is a significant object, which indicates major stages of the earth history, including the life history on it or geological processes that were constantly influencing the evolution of its features or indicates the major features of natural geography and appearance of the earth. Such places are considered as natural heritage with outstanding universal value providing that in addition to qualifying the above-mentioned conditions, they have the "integrity" feature and have a system of conservation and management to secure their conservation (World Heritage Committee 2008). In fact, in the process of selecting the natural heritage to be registered in the world

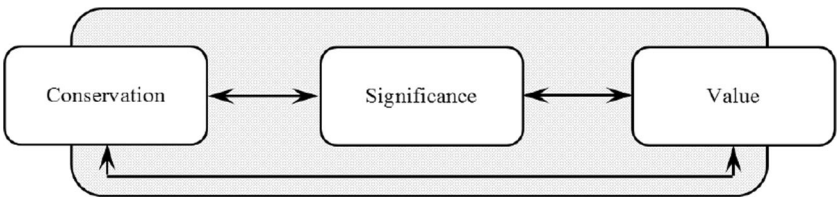

Fig. 3 "Significance" is the fundamental concept of geoconservation. Values are the determining factor for the "significance" of sites. Hence, recognition of "values" defines a path in which the "significance" of heritage is defined. As a result, "conservation" activities, based on "value," will guarantee maintaining the "significance" of site

heritage list, they are evaluated for in terms of integrity in relation to the concepts of "physical integrity," "functional integrity," and "visual integrity" (Basiri et al. 2014). The concept of "integrity" can be regarded as the basis of development of conservation management and a guarantee to prevent from reducing the values of a heritage (Jokilehto 2006). This concept can help our understanding of heritage and its value aspects by audience (Shirvani et al. 2016). Therefore, "integrity" of geotourism attractions leads to conservation of their values and influences how the audience perceives the value (Fig. 5).

Originally, integrity is a scale of perfection of the heritage. Evaluating the integrity requires investigation of a wide area in which the heritage has undergone some effects due to development or ignorance. Therefore, integrity is associated with a valuable quality, which is the most available in distinguished objects (Basiri et al. 2014); hence, "undermined integrity leads to destruction of heritage values". Geological values are constantly threatened by natural and human threats (Glasser 2001; Gordon and MacFadyen 2001). In this respect, the level of "sensitivity" of geosites is raised, which is a fundamental factor in their impressionability from natural and human threats (Werritty and Brazier 1992; Gordon et al. 2001; Sharples 2002; Werritty and Leys 2001; Haynes et al. 2001). Harrison and Kirkpatrick (2001) believe that separating human and natural threats is difficult in most cases. However, Gordon and MacFadyen (2001) consider human-related factors threatening the values of geoheritage. Mineral extraction (e.g., Doerr & Guernsey 1956), landfill and quarry restoration (see, e.g., Prosser 2003), land development and urban expansion (e.g., Gupta and Ahmad 1999; Gibbons and McDonald 2001), coastal erosion and protection (e.g., Regnauld et al. 1998), river management and hydrology and engineering (e.g., Bartley and Rutherfurd 2001; Brandt 2000), forestry and vegetation growth and removal (e.g., Larwood 2003), agriculture (e.g., O'Halloran 1990; Hardwick and Gunn 1994; Gunn 1995), other land management changes (e.g., cutting, filling, dumping, spreading, or discharging materials) (e.g., Aust and Sustrac 1992), recreation/tourism pressures (e.g., Catto 2002; Qiang 2006), removal of geological specimens (e.g., Clarkson 2001; Gomez 1991; Swart 1994), climate and sea-level change (e.g., French and Spencer 2001; Wignall et al. 2018; Prosser et al. 2010), fire, military activity (e.g., Kiernan 2012), and lack of information/education (e.g., Joyce 1999) are some examples of such factors (Gordon and MacFadyen 2001). Factors such as stagnant surface water, watercourses, freeze–thaw cycle, plants, animals (García-Ortiz et al. 2014) volcanic eruption, earthquake, tsunami/storm wave, landslide, debris flow, rockfalls, ground subsidence, floods, soil erosion (e.g., Koch et al. 2002), and sand storm are natural hazards that threaten the geoheritage (Migoń and Pijet-Migoń 2019). Therefore, human threats and natural threats can threaten the integrity of geotourism attractions (Fig. 6).

Recognition of the conservation and provisioning an approach to conserve historical heritage is directly associated with recognition of components which are effective on perceiving the heritage value (Moradi 2011). Jokilehto (2006) stated that some valuable features are related to intrinsic aspects (material, structure, etc.), while other values are subject to location and how the heritage is in relationship with the surrounding environment. It is very difficult to provide a single definition of "value" due to the presence of several factors (Lip 1984), and this concept varies based on the environment of communities (Pantem 2006). Value is subject to the law of relativism and has a dynamic meaning, which is determined based on geographical location, validity, and experience (Nejad Ebrahimi et al. 2013). Generally, it can be said that value varies from one society to another (Hojat 2001). Therefore, in addition to the importance of focusing on value regarding conservation and necessity of recognition, and its classification in communities, identifying effective factors in explaining values is another important factor in conservation area. Identifying such factors can lead to other discussions regarding conservation, which can lead to different prioritization of values in societies (Shirvani et al. 2016). By discovering the effective factors on explaining the values of geotourism attractions, it is possible to achieve methods to conserve the value. This is the final goal of each conservation approach. Generally "personal factors" and "contextual factors" are effective on explaining the value of geotourism attractions by audience (Fig. 7).

Blanchard and O'Connor (1997) believe that policy making, decisions, and operation are guided based on values and accordingly the approach of "management by values" (MBV) is introduced. Generally, management by values attempts to identify the gap between what you say you believe and what you do practically. Festinger (1957) introduced the concept of cognitive dissonance in theory for the first time by publishing a book entitled "theory of cognitive dissonance" (To get acquainted with the examples of employing cognitive dissonance for conservation purposes, see Taylor et al. 2017; Kantola et al. 1984; Dickerson et al. 1992). According to

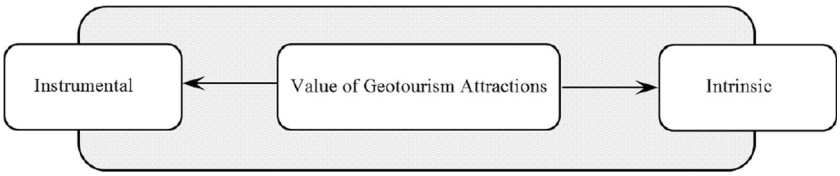

Fig. 4 It is possible to attribute geotourism attractions to the two concepts of "intrinsic value" and "instrumental value"

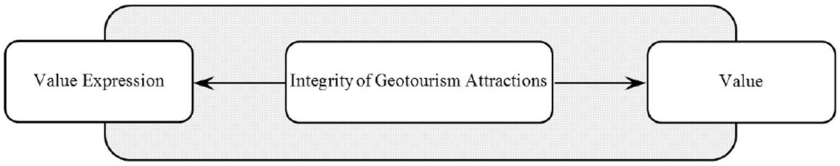

Fig. 5 The concept of "integrity" can be regarded as the basis of development of conservation management and a guarantee to prevent from reducing the values of a heritage. "Integrity" of geotourism attractions leads to conservation of their "values" and influences how the "value expression" by the audience

Festinger (1957), the basis of this theory is the belief that human always attempts to maintain internal harmony and integrity between values, attitudes, and beliefs. In other words, there is a trend toward consistency between recognitions (Festinger 1957). He believes that conflict between two cognitive factors occurs when one denies the other, meaning that when the individual has converse beliefs or even different attitude and behavior (Graham 2007). Cognitive dissonance occurs in three states: First, a logical inconsistency can lead to cognitive dissonance. Second, it occurs when an individual observes an inconsistency between his/her behavior and attitude or between the two behaviors. Third, when an individual's high expectations are not met, it is possible that cognitive dissonance occurs (Loudon and Della Bitta 2002). For instance, if individuals feel inconsistency between beliefs (e.g., a geotourism attraction is valuable) and real conclusions (e.g., they cannot gain an acceptable benefit from geotourism attractions), they will attempt to change their beliefs in order to decrease the inconsistency.

Therefore, it is especially important to create a balance between "social needs and requirements" and "policies and methods of conservation of heritages" (Ercan 2010). If there is an inconsistency between the mentioned indices, such disorders that lead to social conflicts in conservation will occur. It seems that the condition should be provided for meeting the social needs related to the conservation of heritage along with trust building and clarification (Dahlberg and Burlando 2009). Therefore, in perspective of management by values, conservation of geotourism attractions requires identification of "factors leading to dissonance" and "factors decreasing the dissonance" in audience (Fig. 8).

Today, conservation of function and values of a heritage is considered as an important principle of introducing heritages (Hua 2010). In the contemporary theory of conservation, two viewpoints of functional conservation and value-led conservation, whose expression and attitude regarding conservation is a little different, are raised (Vestheim et al. 2001). The issue of functional conservation and value-led conservation were first introduced by Avarmi in 2000 (Munoz-Vinas 2012). In the functional viewpoint, the focus is on physical and tangible features of heritage, which are noted by the conservator (Vestheim et al. 2001), while in the value-led viewpoint, the communicative perspective is considered based on the heritage values. Identifying the heritage values by the people is central idea in the value-led conservation (Avrami et al. 2000). Dimensions of conservation of geotourism attractions can be defined from two physical and value-led dimensions in a way that the value-led conservation is based on conserving the values and intangible features of heritage, while physical conservation is based on conserving physical and tangible features of heritage (Fig. 9).

The Research Conceptual Model

What is inferred from the existing literature is that conservation management of geotourism attractions can be defined in a framework of mutual relationship between "geotourism attraction," "people," and "government." The conservation of geotourism attractions gains importance with respect to their significance. In other words, conservation is justified by the concept of "significance" as a multi-dimensional content. In fact, significance is a fundamental concept to geoconservation (Dixon 1991). Therefore, the significance of geotourism attractions is the basis and foundation of conservation and any kind of decision and policy taken to improve and maintain this significance. Conservation of geotourism attractions must be based on features leading to the significance of the phenomena. Consistent with the literature, the features indicating the significance of the phenomena are introduced under the concept of "value." Value is a representation of significance which is attributed to the quality of places by people (English Heritage 2008). In fact, attributing value to geotourism phenomena indicates their significance. Conservation of geotourism attractions should be based on

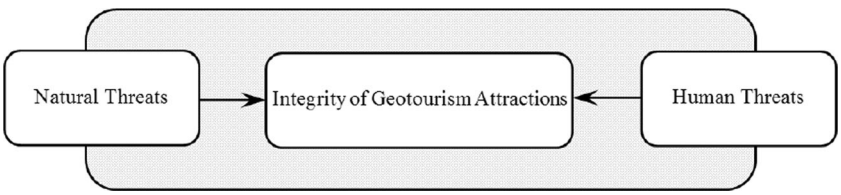

Fig. 6 Undermined integrity leads to destruction of values of heritage. Human threats and natural threats can threaten the integrity of geotourism attractions

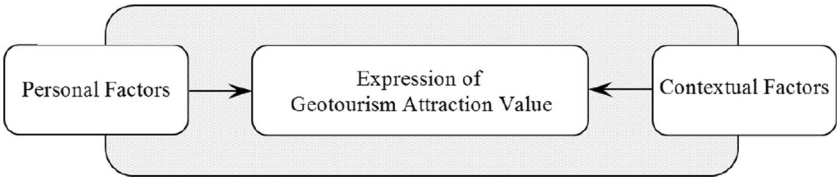

Fig. 7 Conserving the heritage is directly associated with recognition of factors, which are effective on perceiving the value of heritage. "Personal factors" and "Contextual factors" are effective on explaining the value of geotourism attractions by audience

conserving their values so that finally it can lead to conservation of their significance. The set of values attributed to geotourism attractions can be defined in two groups of "intrinsic and instrumental values". Instrumental values are human-based values and intrinsic values are independent of human (Alexander 2013). Scientific values of a geotourism attraction are considered as its intrinsic value; other values such as esthetic, cultural, and financial values are expressed as instrumental values as well. In the legal framework, the World Cultural and Natural Heritage convention has considered geological valuable phenomena as natural heritage providing that they qualify as being "integrated". Integrity is the scale of perfection of heritage (Basiri et al. 2014). Integrity influences how values of phenomena are expressed by audience and secure the sustainability of its values. As integrity of geotourism attractions is undermined, their values are threatened; integrity is undermined by "human and natural threats", which finally influence the quality of geotourism attraction values.

People play a significant role in the process of conservation management of geotourism attraction. Factors, which set the condition for development of values, should be identified to conserve them. In the literature, it is stated that generally "personal factors" in audience and his/her "contextual factors" influences how values of a phenomenon are expressed. Conservation of geotourism attraction requires identification and investigating the above-mentioned factors. Identifying the personal and contextual factors, which affect the expression of values, determines the methods of conserving geotourism attractions. Some observations indicate that although audiences believe that geotourism attractions are valuable, they do not behave the same way practically. This happens when individuals have conflicting beliefs or even conflicting attitudes and behavior (Graham 2007). In other words, inconsistency between belief and behavior of the audience is the factor that threatens the geotourism attraction. Therefore, in addition to investigation of personal and contextual factors which influence expression the geotourism attractions values, investigating the "factors leading to dissonance" and also "factors reducing the dissonance" is the key issue in the conservation of geotourism attractions.

As the proctor of the conservation and management, government plays the role of policy making and decision making through awareness of the interaction of people and geotourism attractions. A review of the literature indicates that conservation of geological phenomena as natural heritage, especially geotourism attractions, requires consideration of both conservations: "physical and value-led conservation". Physical conservation is to conserve the material and tangible features of a heritage (Vestheim et al. 2001), while value-led conservation is conserving the intangible values a heritage based on people's view (Avrami et al. 2000). It can be said that value-led conservation and physical conservation are complementing each other and secure the conservation of geotourism attraction against threats since physical conservation leads to conservation of integrity and value of the phenomena against natural threats, while value-led conservation helps the phenomena to be conserved against human threats. Finally, a process, which can facilitate the conservation in the form of effective factors, is essential along with awareness about components of conservation. Therefore, the role of government in the form of managerial principles (i.e., "planning," "organizing," "leadership," and "supervising") is expressed in a mutual relationship between people and geotourism attraction, which forms the conservation management of geotourism attractions. Figure 10 indicates the suggested conceptual model in order to manage the conservation of geotourism attractions in the form of three complementary layers, including geotourism

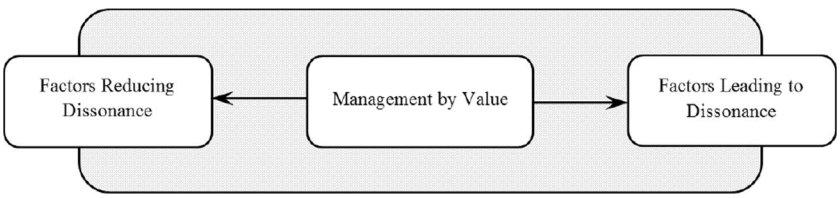

Fig. 8 Management by values attempts to identify the gap between what you say you believe and what you do practically. These gaps are called dissonance and occur when the individual has converse beliefs or even different attitude and behavior. In perspective of management by values, conservation of geotourism attractions requires identification of "factors leading to dissonance" and "factors decreasing the dissonance" in audience

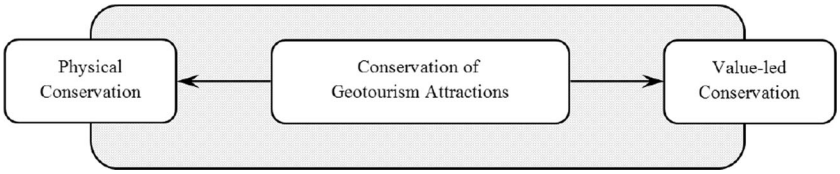

Fig. 9 Dimensions of conservation of geotourism attractions can be defined from two physical and value-led dimensions in a way that value-led conservation is based on conserving the values and intangible features of heritage while physical conservation is based on conserving physical and tangible features of heritage

attraction, people, and government. Each layer includes factors whose identification and investigation in mutual relationship with each other secures the conservation of geotourism attractions.

Validation of Research Conceptual Model

Dai (as cited in Bitaab et al. 2012) has referred to four features for a model: (a) To be easily understood and evaluated; (b) to be based on reality so that practical evidence can be provided for it; (c) to be able to provide a proper framework for the assessment of the present theories; (d) its structure should have coherence and be justifiable and its general configurations should be logically defendable. In addition to supporting Dai's approach in validation of theoretical models, Weinex (as cited in Bitaab et al. 2012) believes that the value of each theory or model is based on its content and structural validity. As he mentions qualitative methods used to confirm the content of theoretic models, he points to "contextual analysis panel" introduced by Lawshe (1975) as one of the most efficient methods of content analysis (Bitaab et al. 2012). In his article entitled as "A quantitative approach to content validity", Lawshe (1975) explains his suggested method as follows. In order to judge the generality of a model and its details, a number of experts in an area should be selected and asked to choose one of the following options regarding the general and details of model: (a) Insignificant/impractical; (b) can be present but not essential; and (c) significant/very useful. In the following, content validity ratio must be calculated for each option separately and reported using Eq. (1):

$$\text{Content Validity Ratio} = \frac{\left(n_e - \frac{N}{2}\right)}{\frac{N}{2}} \quad (1)$$

where, N is the total number of participants in the panel, and n_e is the number of individuals who selected the option "significant/very useful." Therefore, if more than half of the participants select the second option, the content validity ratio index will become negative. If all participants select the third option, it would be content validity ratio = 1, and if only half of the participants choose the third option, it would be content validity ratio = 0. Therefore, if more than half of the participants and less than all of the participants choose the third option, content validity ratio will be a value between 0 and 1 (Lawshe 1975). Generally, content validity ratio is between +1 (totally agree) and − 1 (totally disagree). The minimum acceptable to confirm the model content will be dependent on the number of participants in the panel based on Table 3. If content validity ratio obtained for each question is equal to or higher than the minimum suggested in the Table, the content of that component is confirmed; otherwise, it is not confirmed.

Hence, the content analysis panel is used in this paper to validate the conceptual model. In this section, a questionnaire, including 23 items in two parts is designed. In order to determine the validity of the questionnaire, content validity has been utilized in the present study. In doing so, the questionnaire's items were approved by several experts in management and conservation of geotourism attractions. Moreover, the validity of the questionnaire was evaluated by means of average variance extracted (AVE). In the end, the calculated validity for the first and second part of the questionnaire was 0.789, and 0.817, respectively. The obtained results showed the acceptable validity of the questionnaire. The reliability of the questionnaire was also assessed through the use of composite reliability (CR), in a way that the calculated reliability for the first and second part of the questionnaire was 0.862 and 0.821 respectively. The obtained results indicated the acceptable reliability of the questionnaire.

The first part of the questionnaire includes 15 items allocated to receiving experts' attitude regarding agreement or disagreement with the model's components through "content analysis panel". These fifteen items are as follows: (1). What is your opinion about "intrinsic value" in the proposed research model?; (2). What is your opinion about "instrumental value" in the proposed research model?; (3). What is your opinion about "integrity" in the proposed research model?; (4). What is your opinion about "natural threats" in the proposed research model?; (5). What is your opinion about "human threats" in the proposed research model?; (6). What is your opinion about "contextual factors" in the proposed research model?; (7). What is your opinion about "personal factors" in the proposed research model?; (8). What is your opinion about "factors leading to dissonance" in the proposed research model?; (9). What is your opinion about "factors

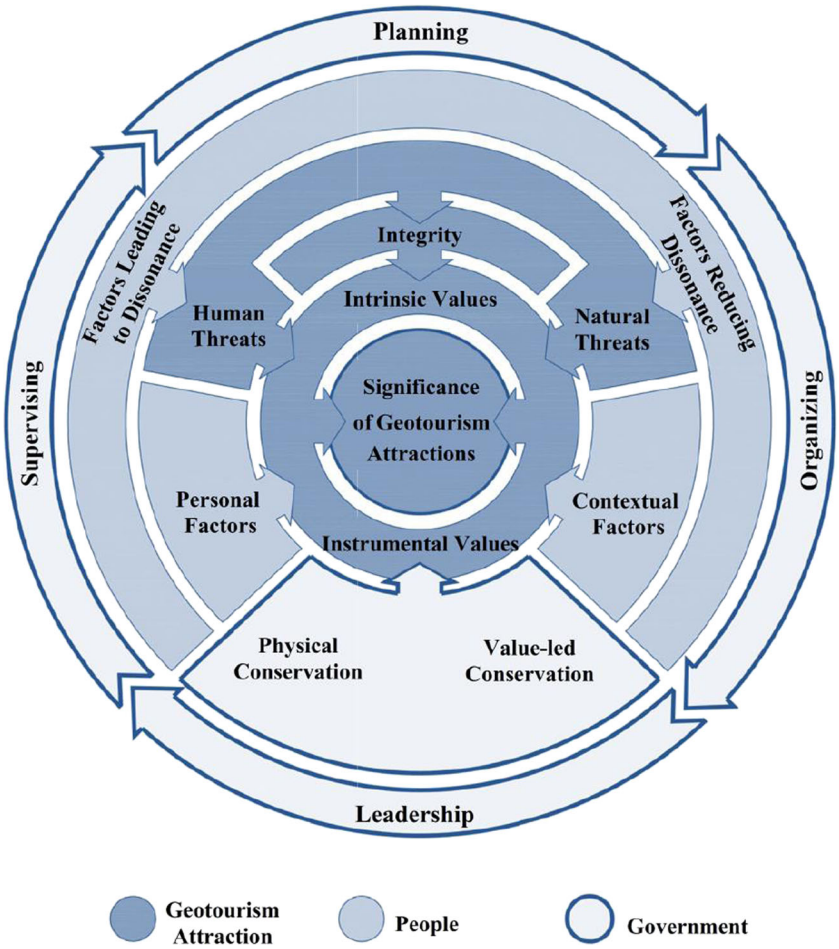

Fig. 10 Conceptual model of conservation management of geotourism attractions: Conservation management of geotourism attractions can be defined in a framework of mutual relationship between "geotourism attraction," "people," and "government." The "significance of geotourism attractions" is the basis and foundation of conservation and any kind of decision and policy taken to improve and maintain this significance. "Value" is a representation of significance with is attributed to quality of places by people. Conservation of geotourism attractions should be based on conserving their values. The set of values attributed to geotourism attractions can be defined in two groups of "intrinsic and instrumental values". "Integrity" influences how values of phenomena are expressed by audience and secure the sustainability of its values. As integrity of geotourism attractions is undermined, their values are threatened; integrity is undermined by "human and natural threats" which finally influence the quality of geotourism attraction values. Identifying the audience' personal and contextual factors affecting on expression of values, determines the methods of conserving geotourism attarctions. Inconsistency between belief and behavior of the audience is the factor which threatens the geotourism attraction. Investigating the "factors leading to dissonance" and also "factors reducing the dissonance" are key issues in conservation of geotourism attractions. Conservation of geotourism attractions requires consideration of both conservations including "physical and value-led conservation". The role of government in the form of managerial principles, i.e., "planning," "organizing," "leadership," and "supervising" is expressed in a mutual relationship between people and geotourism attraction which forms the conservation management of geotourism attractions

Table 3 The minimum content validity ratio (CVR) acceptable to confirm the model content (Lawshe 1975)

The number of experts participating in the panel	Acceptable minimum ratio	The number of experts participating in the panel	Acceptable minimum ratio
5–7	1.00	14	0.51
8	0.78	15	0.49
9	0.75	20	0.42
10	0.62	25	0.37
11	0.59	30	0.33
12	0.56	35	0.31
13	0.54	40	0.29

Table 4 Experts' attitude to validate the conceptual model of conservation management of geotourism attractions

Dimension	Components		Average	Expert CVR	Ne (N)	Acceptable minimum of CVR	Status (confirmed /not confirmed)
Geotourism attraction	Significance	Intrinsic value	2.00	1.00	15 (15)	0.49	Confirmed
		Instrumental value	2.00	1.00	15 (15)	0.49	Confirmed
	Integrity		1.93	0.86	14 (15)	0.49	Confirmed
	Natural threats		1.93	0.86	14 (15)	0.49	Confirmed
	Human threats		2.00	1.00	15 (15)	0.49	Confirmed
	Average CVR		–	0.94		0.49	Confirmed
People	Contextual factors		2.00	1.00	15 (15)	0.49	Confirmed
	Personal factors		1.93	0.86	14 (15)	0.49	Confirmed
	Dissonance	Factors leading to dissonance	1.86	0.73	13 (15)	0.49	Confirmed
		Factors reducing dissonance	1.86	0.73	13 (15)	0.49	Confirmed
	Average CVR		–	0.83		0.49	Confirmed
Government	Conservation	Value-led conservation	2.00	1.00	15 (15)	0.49	Confirmed
		Physical conservation	2.00	1.00	15 (15)	0.49	Confirmed
	Management	Planning	2.00	1.00	15 (15)	0.49	Confirmed
		Organizing	2.00	1.00	15 (15)	0.49	Confirmed
		Leadership	2.00	1.00	15 (15)	0.49	Confirmed
		Supervising	2.00	1.00	15 (15)	0.49	Confirmed
	Average CVR		–	1.00		0.49	Confirmed
Total CVR			–	0.92		0.49	Confirmed

reducing dissonance" in the proposed research model?; (10). What is your opinion about "value-led conservation" in the proposed research model?; 11. What is your opinion about "physical conservation" in the proposed research model?; (12). What is your opinion about "planning" in the proposed research model?; (13). What is your opinion about "organizing" in the proposed research model?; (14). What is your opinion about "leadership" in the proposed research model?; and (15). What is your opinion about "supervising" in the proposed research model?. Three options are defined for each item: (a) It is confirmed (2 points); (b) it is good but not essential (1 point); and (c) it is not confirmed (0 points). Then a panel of 15 experts in management and conservation of geotourism attractions is formed and in addition to the presentation of the research, some questions are raised. After analyzing the questionnaire, the results are presented in Table 4.

According to Table 4, content validity ratio is higher than the acceptable minimum for all components. In addition, the calculated content validity ratio for the triple dimensions of geotourism attractions, people, and government are 0.94, 0.83, and 1.00, respectively. This indicates that the mentioned dimensions are confirmed. It should be mentioned that content validity ratio for the entire model is 0.92, which shows the entire model is confirmed. Therefore, all dimensions and components of the research conceptual model are confirmed by experts according to the results of Table 4.

The second section in the questionnaire includes 8 items to confirm the validity of a proper model by receiving experts' attitudes toward this issue. The eight items are as follows: (1). How do you assess the model's comprehensiveness?; (2). How do you assess the cohesion of components in each dimension of the model?; (3). How do you assess the uniqueness of the

Table 5 Characteristics of the experts

Affiliation	Education	Affiliation	Education
Kharazmi University	PhD in Geomorphology	University of Tehran	PhD in Geology
University of Tehran	PhD in Geomorphology	University of Tabriz	PhD in Geology
Payame Noor University	PhD in Geomorphology	Islamic Azad University	PhD in Geography
University of Tabriz	PhD in Geomorphology	Kharazmi University	PhD in Geography
Islamic Azad University	PhD in Geomorphology	Payame Noor University	PhD in Geography
Shahid Beheshti University	PhD in Geomorphology	Allameh Tabataba'i University	PhD in Tourism
University of Zanjan	PhD in Geology	Allameh Tabataba'i University	PhD in Tourism
Payame Noor University	PhD in Geology	–	–

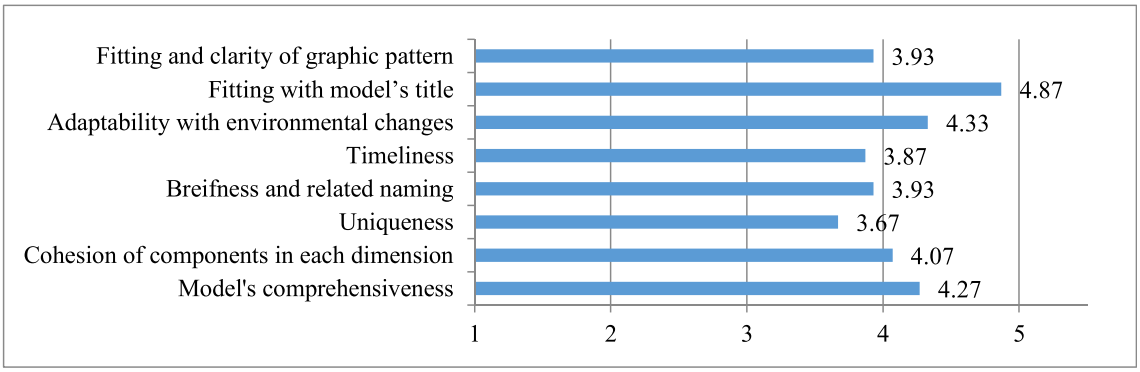

Fig. 11 Average rating of the model components obtained from the experts' point of view

model?;(4). How do you assess the briefness and related naming on dimensions of the model?; (5). How do you assess the timeliness of the model?; (6). How do you assess the adaptability of the model with environmental changes?; (7). How do you assess the fit of the model with the model's title?; and (8). How do you assess the fitting and clarity of the model's graphic pattern? (Zahedi and Sheikh 2010; Bandarian et al. 2012; Kianfar 2018). For this purpose, a five-point likert scale (Likert 1932) (very little (1 points) to very much (5 points)) is considered to evaluate the experts' agreement with each item. Then a panel of 15 experts (Table 5) in management and conservation of geotourism attraction was held and the questions were raised. According to Fig. 11, the statistical mean for all questions is higher than the theoretical mean (3).

In addition, one-sample *t* test is used to study the 8 items, and the results are presented in Table 6.

According to the results of one-sample *t* test in Table 6, given the error level of 0.05 and significance level of 0.000, the obtained value for t is higher than 1.96 for all the items. This indicates the statement that "the model is acceptable" is confirmed by the experts.

Conclusion

The present study has been carried out with the aim of providing a conceptual model of conservation management of geotourism attractions. Some components of this conceptual model are consistent with some components introduced by Worboys et al. (2010) for connectivity conservation management and also by Hanachi et al. (2017) for the management of historical-cultural sites. Accordingly, the conceptual model of conservation of geotourism sites is defined in the form of mutual relationship between the three layers represented by geotourism attraction, people, and government. In geotourism attraction layer, the significance of attraction is indicated by intrinsic and instrumental values. Meanwhile, integrity of geotourism attractions is itself an effective factor in attributing instrumental and intrinsic values to geotourism attractions. If the integrity of geotourism attractions is weakened by natural and human threats, naturally it leads to reduced values. In the layer of people, as audience of geotourism attractions, people attribute values to attractions which are influenced by their personal and contextual factors. Therefore, recognition of personal factors, especially contextual factors influencing the expression of values by people, set the required ground for conservation of geotourism attractions values. Although people consider the geotourism attractions by attributing values to them, observations show that usually people threats the geotourism attractions unlike their beliefs regarding the value and significance of geotourism attractions. Therefore, it is important to investigate the factors, which lead to such dissonance and factors that reduce the dissonance in order to conserve geotourism attractions. Regarding the layer

Table 6 Assessment of the model's acceptability

Index	*T*	df	ignificance level	Mean	Mean variance
Model's comprehensiveness	26.687	14	0.000	4.27	1.27
Cohesion of components in each dimension	23.231	14	0.00	4.07	1.07
Uniqueness	17.214	14	0.00	3.67	0.67
Briefness and related naming	20.412	14	0.00	3.93	0.93
Timeliness	19.167	14	0.00	3.87	0.87
Adaptability with environmental changes	29.432	14	0.00	4.33	1.33
Fitting with model's title	35.524	14	0.00	4.87	1.87
Fitting and clarity of graphic pattern	20.412	14	0.00	3.93	0.93

of government, it is the proctor of management and conservation of geotourism sites. Government should make an agenda for the conservation of geotourism attractions based on people's interaction with them and manage the conservation through planning, organizing, leadership, and supervising.

The results of the validation of the conceptual model indicated that content validity ratio for the entire model is 0.92, and it is 0.94, 0.83, and 1.00 for the three dimensions of geotourism attraction, people, and government, respectively. This indicates that the entire model and the three dimensions are confirmed. Content validity ratio for all the components of the model has been higher than the acceptable minimum of content validity ratio. Therefore, all dimensions and components of the conceptual model are confirmed by the experts. According to the results of one-sample *t* test, the conceptual model's acceptability is evaluated, and based on the error level of 0.05 and significance level of 0.000, the *t* value obtained for all the items has been higher than 1.96. Therefore, the hypothesis of the acceptability of the conceptual model is confirmed by the experts.

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