IJSRM
INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY
An Official Publication of Human Journals

Human Journals
Review Article
March 2017 Vol.:6, Issue:1

An Investigation in Troglodytic Architecture of Sahand Mountain Area Seasonal Thermal System

IJSRM
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Submission: 3 March 2017
Accepted: 7 March 2017
Published: 25 March 2017

Keywords: Sahand, troglodytic villages, warmer system, cooler system.

ABSTRACT

Sahand volcano is among octet units of northwestern Iran that covered of pastures with pharmaceutical herbs and hot springs, lakes and rivers, where prepare fields for pastoralists with dense villages on volcanic hillsides. Since earliest times people tried to adapt to mountainous climates and enjoy plenteous sources, using different strategies, among them were location of villages at rocky hillsides and constructing tunnels and rocky chambers juxtaposition to residential areas. The spaces work as cooler at hot seasons and warmer at cold seasons to protect rural communities with their herds and harvests. They have generally irregular plans, for irregular rock forms; however, they have, in some cases, common elements including thresholds with staircase ceilings, conical light openings, and long vaulted tunnels, which commonly used across mountainous region of Sahand. There have been various samples following archaeological investigations, and covers, in some cases, more than two hectares. Here, there is an attempt to introduce several rocky villages of Sahand area, then relevant architecture and function of rocky villages, and how they played significant role in rural communities.

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1. INTRODUCTION

Holiness of space is among myths of various territories, where some elements are more prominent than the other spaces ([1], p. 121). Mythically, sacred mountain in ancient cultures is assembly of gods or manifestation of sacred. Sacred mountains in different regions indicate holy glory and symbolic manifestation, which is center of the cosmos and connect heaven and earth ([2], p. 106). Some religions believe that the mountain is source of sacred water, while the others sign it as location of spirits, and sanctuary ([3], p. 128). Some religious rites were on summits because mountains were the closest place to heavens, throne of gods. Living at mountains indicates separation of worldly concerns and absorption toward heavenly concerns; furthermore, it signs humbleness against God ([1], p. 121). Human knowledge of nature caused to distinguish rocky textures to dig. The chosen layers were softer than rock and harder than soil, and because of stability, the texture commonly accepted as material of structure. On the other hand, thermal comfort of natural contexts provided pleasant temperature for residents and protected them against hot summers, cold winters, and predators. The architectural type varies in different historical periods, cultural forms, and geographical area, considering natural context and various functions.

2. Geographical location

Northwestern Iran is located in a region between Caspian Sea, southern Caucasia, eastern Anatolia, and northern Zagros, to where they interconnected. As part of Iran-Turkey Plateau, it is one of two major plateau of Himalaya-Alep system. Sahand and Sabalan are among important summits of Azerbaijan (Figure1). Sahand volcano consists of three juxtaposed summits, which highest height is "Jam Daghi" at 3710 m height as result of volcanic activities at Pleistocene [4-5]. Tabriz, at north, Maragheh and Hashtrud, at south, Bostan Abad, at east, and Azer Shahr, Ajabshir and Osku at green western hillsides were populated more than three millions. There are scarce summits as past volcanos topographically play various roles ([6], p. 123). The mountainous mass covers near 8000 Km^2 and consist of many main and derivative valleys ([7], p. 106).

Sahand volcano had erupted since mid-Miocene until 140,000 years ago. Volcanic ashes and tuffs from long distances indicate severe volcanic activities of Sahand. Sahand volcanic mass is at the center of low Uremia basin, Tabriz plain, and MiandoAb low plain, where Alborz and Zagros ranges interconnected [8-9]. Sahand permanently covered with snow, which is considerable reservoir to feed various rivers that radiate from Sahand toward hillsides and

lower regions. Sahand hillsides, ideally, absorb cloud masses and provide water sources for urban and rural centers, whit considerable vegetation especially pastures. There are radiated valleys carved by water streams from springs and snow, for example, Kəndovan valley and Sufi Chay are among flourished and most beautiful ones ([10], p. 49).

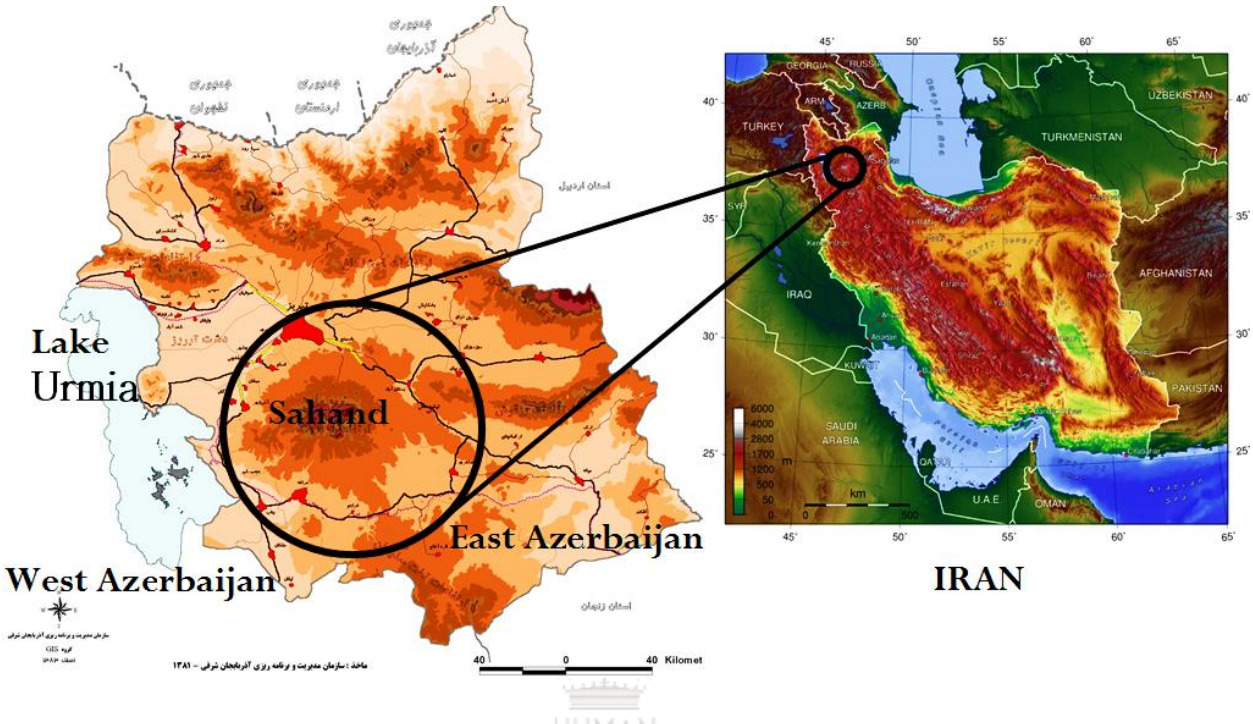

Figure 1. Location of Sahand Mountain.

3. Petrology[1]

Regional igneous rocks vary a lot and include pyroclastic and Epiclastic rocks, and tuffs that are as lava domes or stratovolcanoes ([11], p. 6). At the time of eruption, tuffs, ashes, and lava mix to water of melted snow and heavy floods that result to mixed masses of mud with fine and coarse cobbles. The flow is known in geology as "Lahar". Complex of Lahar and Ignimbrite, usually white, is known locally as "Kiran" or "Karān". Complex of lahar and Ignimbrite with tuffs filled ancient valleys and pits, and then created especial regional morphology ([8], p.59).

1. Petrology provides Mineralogical information, dimension and forms of minerals, distribution of fine cracks and so on. The most common method of research is thin microscopic sections.

4. Etymology

Troglodytic remains of various regions of Iran named differently in every given region. Geographical etymology of northwestern Iran indicates that formation of few villages relate to troglodytic architecture that confirms following archeological field surveys; for example, Köhül, in Turkish language means cave and underground residence ([12], p. 916), as a manmade place, or natural holes in mountainous areas; among the other Turkish same terms are "Zagheh", "Daam", "Maghara", and "Kaha". In Sahand cold region, Köhül is among necessities of every village, to where is mixed many names of villages ([13], p.168).

5. Troglodytic architecture and villages of Sahand area

There are various reasons for formation of troglodytic architecture, including geographical and climatic, human, religious-ritual, defensive and shelter; among them, climatic factors are most effective reasons in formation of troglodytic architecture as a passive defense, on the other hand, climate is basis of physical formation of troglodytic formation and passive defense. Regional natural position and topography are among basic facilities of human settlements; therefore, troglodytic architecture firstly emerged in the regions with hard and dense rocky textures.

Architectural elements and functions controlled by climatic factors, whereas two "temperature" and wind" play major roles. Nature usually provides climatic homogenous material for humankind. Generally, an architectural complex should plan following principles against climatic forces including temperature fluctuations, humidity change, heavy rainfall and snow, freeze, wind, and pressure. Optimum temperature and ventilation in the structures are among architectural concerns ([14], p. 2).

Cold and rough climate of Azerbaijan at Sahand area caused ancient people harbored in troglodytic structures to secure against long thermal fluctuations, and then the structures mainly functioned as residence and shelter. They are sometimes as rural complexes including Kəndovān and Hiləvər at Osku, Səvər at Bonab, Khətəb, Varjoi (Varevi), Chavān and Köhülnovu at Maragheh, Kənd Dərəsi, Aq bulāgh, Qumbār, and Diznāb at Bostan Abad, and sometimes as single structures at different regions. Here, there is an introduction to some rocky villages.

5.1. Kəndovan[2]

Is located at 37°47'42" and 46°14'56", west of Sahand Mountain, 22 Km away from Osku County and 62 Km from Tabriz ([8], p. 489). Rocks of the village appeared when Kəndovan Lake basin withdrew as horizontal, columnar, conical, and pyramid outgrowths resulted following erosions (Figure 2).

There are scenarios about emergence of the village ([15], p. 5), mainly mythical, which is not involved here. Rocky residences of Kəndovan, generally, storied in two or in few cases three or four floors, which used even today by locals (Figure 3). In most of the cases, first floor is corral, whereas 2nd and 3rd floors usually are private residential areas with a store at 4th floor. Residences and floors interconnect by pathways, stone or wooden bridges, and ladders (Figure 4), where include threshold, kitchen, store, and so on. Characteristically, internal spaces are small, with low height and light ([16], p. 71) (Figure 5).

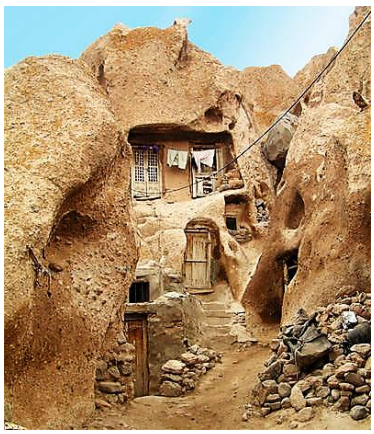

Figure 2. View of Kəndovan village. **Figure 3. View of a three-storied home at Kəndovan.**

2 - It is known "Gündoğan" among natives and means born of the sun.

Figure 4. View of a wooden bridge.

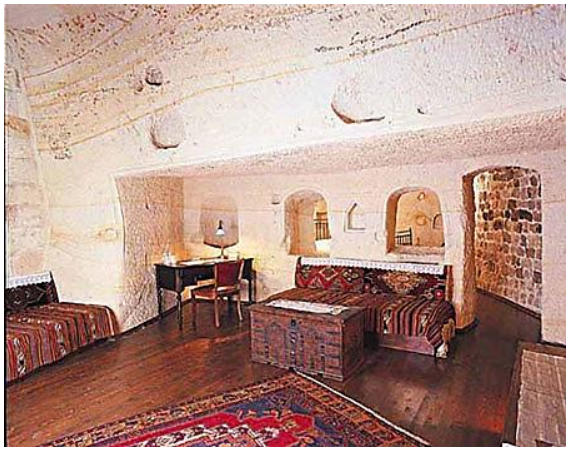

Figure 5. Internal view of a home.

5.2. Səvər Bonab

Səvər village is located at 37°31'22" and 46°09'49" at BonabCounty as an underground rocky village ([17], p. 131). Today, about 25-30 household currently live in the village. Səvər is the highest village of the region, in parallel ranges with relatively open valleys from east to north that deposited from tertiary period at Qala Chay to AqAtlı valleys. Generally, various factors including geological developments of 3rd period, volcanic activities, and transformations of 4th period affected regional topography. Rocky installations of Səvər divided to two eastern and western parts by Aqatlı Valley that makes a secure and impenetrable biological complex, considering planning and secure condition. The installation has no outline, and their crescent threshold is under rocky breakages and covered by the same slabs. It gives homogeneity to the complex and impossibility to enter ([18], p. 270). Internal spaces of caverns consist of various parts with unique structure including threshold, storage, corral, dining spaces, and undergrounds. In some cases, there are columns in the middle of home to carry, as buttress, burden of ceiling (Figure 6), and openings for lights. Thresholds are usually tight that connect to underground by few staircases (Figure 7).

Homes usually are two storied and founded on rocks with sequential texture. Lower floor that is a troglodytic structure, known as "Dakhmeh", functionally is storage, corral, cold storage, and probably in earlier times, shelter. Upper floor that supplemented to first floor by stone and mortar used as residential area. Contrary to Kəndovan, the way that Səvər complex planned and constructed made it invisible from distances, which is securely significant.

Figure 6. Internal view of home.

Figure 7. View of stair entrance of home.

5.3. Khətəb

It is located at 37°27'83 and 46°20'28", 9.5 Km away from north of Maragheh County ([19], p. 264); an underground troglodytic village (Figure 8). It abandoned for lack of water resources. It is at the vertical connection of two valleys, on three mounds around valley, with 40 to 50 troglodytic spaces. Here, homes are two stories, where a troglodytic underground structure is first floor and stone and mortar construct upper floor. Today, upper floors partially remained and beams of ceiling completely ruined.

Troglodytic spaces are lower and terminal parts of homes, where are accessible through a tight staircase threshold, roofed or vaulted, and with moderate slope. In some cases, threshold outlined and separated from underground, using peripheral revetment (Figure 9). Internal troglodytic spaces usually consist of various parts including storage of animal feedstuffs, corral, cold storage, and dining spaces with, in most of cases, a column to support walls or buttressed niches. Most of the spaces interconnect by tight corridors. There are mangers to feed animals (Figure 10). According local people, 2nd floors have constructed in recent times in order to separate living spaces to animal spaces; earlier spaces used as residential areas, to which openings for lights, windows, and niches support.

Figure 8. View of Khətəb village.

Figure 9. View of a threshold, Khətəb.

Figure 10. Internal view of a home, Khətəb.

5.4. Hiləvər

Hiləvər village, troglodytic underground residence, is at 37°48'36" and 46°13'49", 2 Km northwest of Kəndovan and 2 Km south of Osku County. Today, for lack of security facilities, it is abandoned and gradually ruined (Figure 11). The village uniquely constructed as beautiful troglodytic huts, in fine style and camouflaged. There are more than 100 huts (underground) generally similar to complexes at Khətəb and Səvər; however, they are one

storied and constructed under rocks, without any second, or more, floors. Internal spaces consist of various spaces with similar functions of earlier complexes. There are sloped stair revetments at thresholds (Figures 12, 13).

Figure 11. View of Hiləvər.

Figure 12. View of a threshold, Hiləvər.

Figure 13. Internal view, Hiləvər

5.5. Aq Bulagh

As underground rocky village, it is located at 37°42'50" and 46°36'53", 45 Km southwest of Bostan Abad County (Figure 14). Troglodytic remains of the village called "Qumbar", domical, and "Köhül", tunnel-like, (Figures 15, 16). Qumbars are square, elliptic, and circular, but Köhüls are similar to long tunnels without any deviations. According local people, these more than 30 troglodytic structures used until a hundred years earlier, then functionally changed to storage, corral, and cold storage. Their threshold is similar to the other troglodytic villages of Sahand area, constructed and stabled of slabs and revetments (Figure 17).

Figure 14. View of Aq Bulagh village.

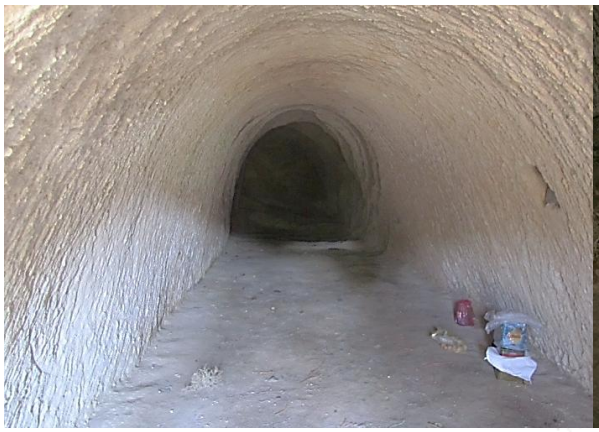

Figure 15. View of threshold, Aq Bulagh.

Figure 16. View of internal space, Aq Bulagh.

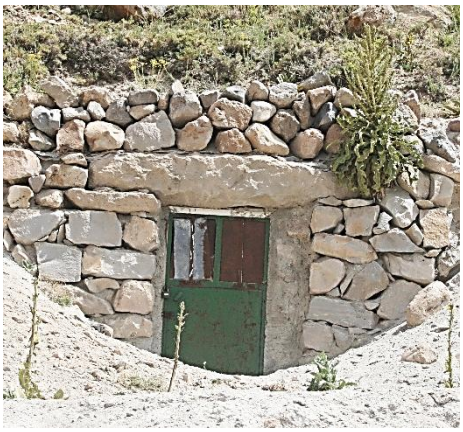

Figure 17. View of threshold, Aq Bulagh

6. CONCLUSIONS

Dating beginning of the rocky architecture is a hard task; however, it emerged in regions with lower stability of rocks, where people could construct residence with few facilities. Climate is among effective factors in architectural formation. Climate is an effective factor in position, space organization, form, interior and exterior elements, material and structure of traditional

architecture. Climate and architecture are among significant issues in investigating compatibility of climatic factors and residential type, which usually apply to Iranian traditional architecture, and local rural and residential areas.

Researchers in troglodytic architecture of northwestern Iran (Azerbaijan) indicate that architects construct the buildings against cold weather and climatic conditions; in architectural science, it is called "climatic designing". Climatic design consists of scientific and applicable basics that conclude to optimized spaces, from easement and providence of energy view. Considering major achievements of climatic designing in various regions, while predicting effective factors to reach the goals, cause compatibility between structures and climatic condition, and providence in energy and identification of the architecture.

Following human scientific progression, he reached to the point that he could formulate spaces in environmental condition; then architecture emerged, as the richest cultural achievement, to play role in responding various human requirements. Local architecture means architectural complexes, based on traditions, principles, and tastes of peripheral culture and behavior. It was the reason that human had to construct buildings not only compatible with climatic condition but cope with climatic factors to provide easement. It seems that before fossil energy constructions highly considered climatic conditions.

Settling troglodytic architecture dates to earlier prehistoric times, however, it is even functional today and appropriately used in different geographical areas. Construction with soil and stone contexts potentially provide heat, as a method to economize energy consumption, with optimum thermal facilities through summer and winter. However, harmony of structures and nature, aesthetically, is surprising. Troglodytic architectures never impose burden to nature, whereas in most of the cases, fade to natural environment and create beautiful harmony with landscape.

Troglodytic architecture of northwestern Iran indicates how environmental factors affect rural context. Except for Kəndovan, the other troglodytic villages were underground constructions. There is homogeneity in constructions, dug in limestone, few thresholds and windows with small dimension, relatively thick wall as thermal insulator, next to water sources including springs, or rivers. Homes and corrals juxtaposed, or even they separated using a thin revetment. It was a strategy to use body temperature, expiration of human and the other creatures, against thermal fluctuation.

Chronology of troglodytic structures is among technical problems to date them; they solve following excavation, sampling, interdisciplinary researchers. Unfortunately, lack of laboratory investigations prevents absolute dating of troglodytic structures, while archaeological investigations make certainty about past life of the regional people.

Author Contributions

All authors have contributed equally to this paper.

Conflicts of Interest

The authors declare no conflict of interest

REFERENCES

1. Rashed Mohassel, M. Behnamfar, M. Zamanipoor, M. "Epiphany of the mountain in ancient Persia and look at the effects of that". *Journal of Iranian Studies* 21 (1391): 119-146.
2. Sattari, J. *Entries mystical cryptology*, Tehran: Center, 1372.
3. Sedqeh, J. "The mountain in ancient mythology, tr Mohammad Reza Torki". *poetry magazine* 25 (1378): 126-131.
4. Khayyam, M. "Sahand volcano Plio Pleistocene and morphological changes in the Quaternary". *Journal of Faculty of Literature and Humanities University of Mashhad* 1 & 2 (1369): 202-221.
5. Khayyam, M. "Floors of morphogenes and analysis of natural environment of Sahand Mountain". *Journal of Geographical Studies* 27 (1370): 7 - 24.
6. Moein Vaziri, H. *Magmatism history of Iran*, Tehran: Tarbiat Moallem University, 1375.
7. Rajabi, M. and Bayati Khatibi, M. "Studied landforms glacial valleys (Case Study: glacial valleys Sahand Mountain)". *Journal of Geographical Studies* 64 (1387): 105 - 122.
8. Khamachi, B. *Culture and Geography of East Azerbaijan*, Tehran: Soroush, 1370.
9. Hoveyda, R. *The natural geography of Azerbaijan*, Tabriz: Tabriz University Press, 1352.
10. Rezvani, M. *Development of rural tourism*, Tehran: Tehran University Press, 1387.
11. Pirmohammadi, F. Ameri, A. Jahangir, A. Mojtahedi/ M. Chang, H. Keskin, M. "Mineralogy, Petrology and Petrogenesis of Sahand, North West of Iran". *Irananin Journal of Crystallography and Mineralogy* 1 (1390): 83- 102.
12. Behzadi, B. *Dictionary of Azerbaijani to Persian*, Tehran: Farhang-e Moaser, 1388.
13. Khamachi, B. *Tawaf-e Sahand*, Tabriz: Zoq, 1368.
14. Fathi, A. The role of climate and passive defense in formation of sustainable architecture, Case study: Troglodytic Architecture of Noosh Abad-Iran and Derin Kuyu-Turkey, *8th Symposium on Advances in Science & Technology*, Mashha, Iran, 1392.
15. Georgi, M.J. and Sanaei E. "Compatible Architecture Survey with Kandovan Village Climate", *Housing And Rural Environment* 29 (1389): 2, 19.
16. Shahbazi, H. "Rock architecture, Organic and paradoxical context in nature with the approach of stable architecture". *International Road & Structure Monthly magazine* 71 (1381): 53-61.
17. Sadraei, A. *Archaeology Survey of Bonab Area*, Tehran: Ganjineh Honar, 1384.
18. Babak., H. *Physiognomy of Bonab*. Tabriz: Hamazar, 1384.
19. Panahian, M. *National Geographic culture of the Turks of Iran*, C 3, Tehran: Setad-e Artesh, 1351.