



The effect of Geomorphological agents in the formation of human settlements of the Kohdasht County

Nobakht SOBHANI¹, Zargham GHOLAMREZAYEI², Somayeh RANJBARZADEH³,
Fatemeh SOORI^{4,*}

¹PhD Student In geography and urban Planning ,Islamic Azad University, Science and Research Branch of Tehran,Iran.

²Assistant Professor and faculty members of Lorestan University,Iran.

³M.Sc In Geography and urban Planning, Islamic Azad University, Rey, Iran.

⁴M.Sc In Geography and Urban Planning ,Shahid Beheshti University,Tehran ,Iran.

Received: 01.02.2015; Accepted: 06.06.2015

Abstract. Recognizing the role of environmental factors and their effectiveness in the determination of spatial position and in the formation of rural settlements are of great importance in geomorphology. The importance of geomorphology will become more apparent when the damages are enormous and beyond the human endurance, so to prevent this, detailed studies and subtle researches should be conducted. Kohdasht in the west of Lorestan province with an area of 4029.7 square kilometers, is an area that despite having favorable geomorphic factors for habitation, several rural areas are formed in it. The research methodology is on the basis of descriptive-analytical and statistical, and various tools such as, topography, geology and water resources maps as well as satellite images were applied to examine and analyze of research subject by use of various tools of ArcGIS software, AHP method and index overlay method. The results show that the most important geomorphic factors in the distribution and the establishment of the villages are slope and water resources. The most stable ecologic effective factor in distribution of villages, is the factor of slope, while the most unstable parameter, is the existence of natural hazards in the mentioned region. Study the natural hazards of Kohdasht County indicates that among the 354 villages, 7 of them are at a distance of less than 300 meters from the fault and 220 villages are located at a distance close to the river. In addition, study on the natural hazards map, shows that 120 villages are exposed to high risk of natural disasters, and these zones are mainly located in the south.

Keywords: Geomorphic factors, Natural hazards, Human settlements, Kohdasht County

1.INTRODUCTION

Nowadays, in comparison with the past, settlements have large dimensions; cities as well as villages have found a conspicuous size, and industrial facilities have been developed on the periphery of cities and villages. Choosing the right place, manner of the establishment of settlements and the development effect of each of them on landforms and around lands and so forth, are the topics that are studied by geomorphology (Ansari Lari, et al., 2010: 2). Geomorphology is one of the branches of the natural geography and is one of the fundamental basis of geographic sciences that by building a bridge and a gateway is linked to other majors of natural sciences. In general, those of natural phenomena of the Earth that are called geomorphology phenomena, include the greater part of the natural environment with geographical environment. Paying attention to nature and its forces, energy production resources and its impact on the Earth surface phenomena as well as an attempt to establish a rational and logical connection between all of the mentioned subjects, comprise the scope of the

* Corresponding author. Email address: f.soori547@gmail.com

geomorphology science. In this way, the significance of geomorphology will become apparent when the damages are enormous and beyond the endurance of human. Therefore, the slightest negligence and mistake may cause irreparable damages; hence before the establishment of the safe settlements, detailed studies and subtle researches should be conducted for selecting and choosing an appropriate location for the development of these settlements (Negaresh, 2003: 134). Determining an appropriate place for the establishment and human settlements in the form of city or village as well as specifying facilities and service facilities such as, stores, schools and so on, is one of the most important issues in urban and rural planning that usually are assessed regarding long term and comprehensive plans (Maleki, 2009: 13). In addition, the villages' physical tissue not only influence by the direct intervention of the society members, but also effect by environmental agents. The severity of the influenceability of these factors decreases by the human abilities, but always maintains its influence on this formation of body and spatial organization. In this regard, the body characteristics of the villages are formed under the influence of two general groups, which are related to the environment or nature and human (Malek Hoseini and Darghahi, 2011: 162). In principle, the establishment and development of a village more than anything else, is a function of environmental conditions and geographical location, since the effects and natural phenomena have a strong impact on site selection, distribution, sphere of influence, physical development, morphology of the village, etc., (Velayati et al., 2007: 46). Natural platforms provide the necessary conditions for the establishment of the rural settlements. Thus, platforms include slope, altitude from sea level, geological structure, water resources, soil and land capability (Velayati et al., 2007: 46). Without the belief in the determinism, it can be declared that there has always been a mutual relationship between man and geographical environment. Thus, while in the environmental studies, paying attention to the issues and social phenomena, political and economic has a great importance; however, in the studies and political and economic revolutions, the role of environmental factors and the geographic conditions of living places in a geographic environment is also conspicuous, because environmental elements have a fundamental role in social, economic and political structures. This article aims to examine the role of natural and geographic factors such as, elevation, slope, geological structure, water resources and so on, on rural settlements as well as their impact on the distribution and dispersion. Moreover, agent or factors that have a great role than the other factors should be determined, in order to more emphasis on superior agents in rural plannings. Especially, in the organizing plans and projects, integration and locating the villages, the result of such investigations can be used, and ensure the consolidation of villages as well. Given that the throngs of people of Kohdasht county are living in rural areas, so the necessity of recognizing the effective geomorphic agents in settling in rural areas and identifying the unfavorable position that may put rural areas at risk will be more clear. For this purpose, in this survey 354 rural areas of Kohdasht county in relation with geomorphic agents and natural hazards have been examined (Fig. 1).

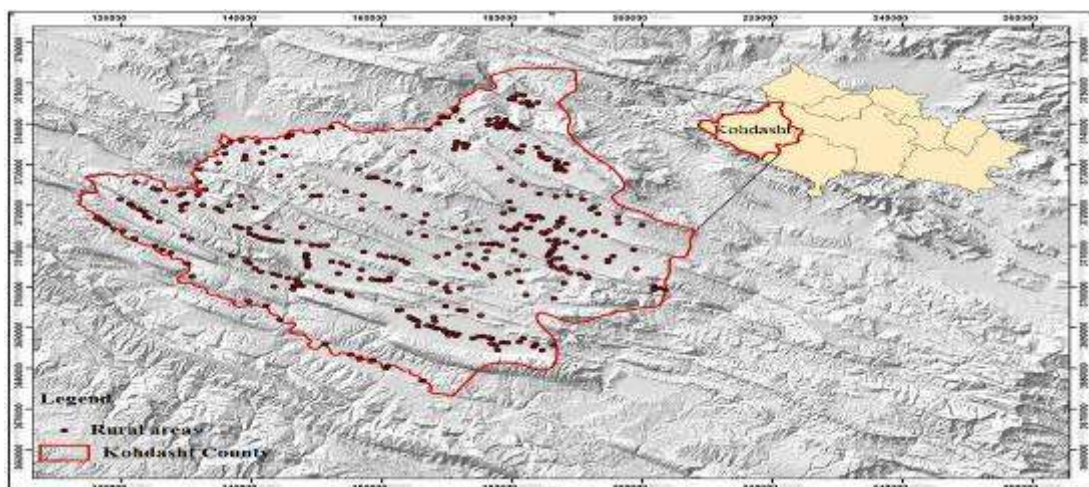


Figure 1. The position of study area in Lorestan province (Drawn by authors).

2. LITERATURE REVIEW

Due to existence of rural settlements across the country, many studies in conjunction with the significance of geomorphic agents in the formation, body structure, etc., of rural settlements have been implemented. In what follows some of them will be pointed out. Zaheri (2007) studied the role of topography in shaping the physical body of the rural dwellings and the amount of their desirability for East Azerbaijan. In a study, which was conducted by Hasani Mehr (2010), the role of natural factors, particularly climate, topography, vegetation, geology and water resources on the housing construction is undeniable. Shams Aldini et al., (2011), in their article about the villages of the Mamasani County in Fars Province were convinced that the type of livelihood plays an important and effective role in tissue, body and the shape of rural residential homes of the mentioned province. Asghari Moghaddam (2005) has studied the status of natural factors in rural planning. Namaki et al., (2008), examined environmental elements' role in the spatial arrangement of rural settlements of Mahabad's watershed.

3. MATERIALS AND METHODS

This article has been implemented by use of different tools and methods. Totally, the work style in the present research is applied-development, and the methodology is descriptive-analytic and statistical. In the first phase of this study, tools are as follows:

1:25,000 topographic maps (National Cartographic Center, 2006);

1:100,000 geological maps (Geological Survey of Iran, 2007);

Surface water resources with the scale of 1:50,000;

ETM satellite images, which were collected from different organizations;

In the second phase, the required layers were extracted from the above mentioned digital maps by using ArcGIS software, and then with the utilization of spatial analyze capability of ArcGIS, the distance map of each linear layer was prepared and rural points overlaid on them. Also, surface maps, such as slope and Digital Elevation Model were created from topographic maps. In the third phase, natural hazard zoning was carried out by using prepared layers and identifying contributing factor in the incidence of environmental hazards, with the use of assigning a weight to each of these conductive factors by expert opinion, and AHP Model. In the fourth phase, rural areas overlaid on natural hazards layer, and afterwards villages, which are at high risk of natural disasters, were carefully identified.

FINDINGS

To explanation and determination of environmental factors in the formation of rural settlements of Kohdasht county, each of these parameters have been assessed in detail, and finally natural hazards zoning have been accomplished by applying these parameters.

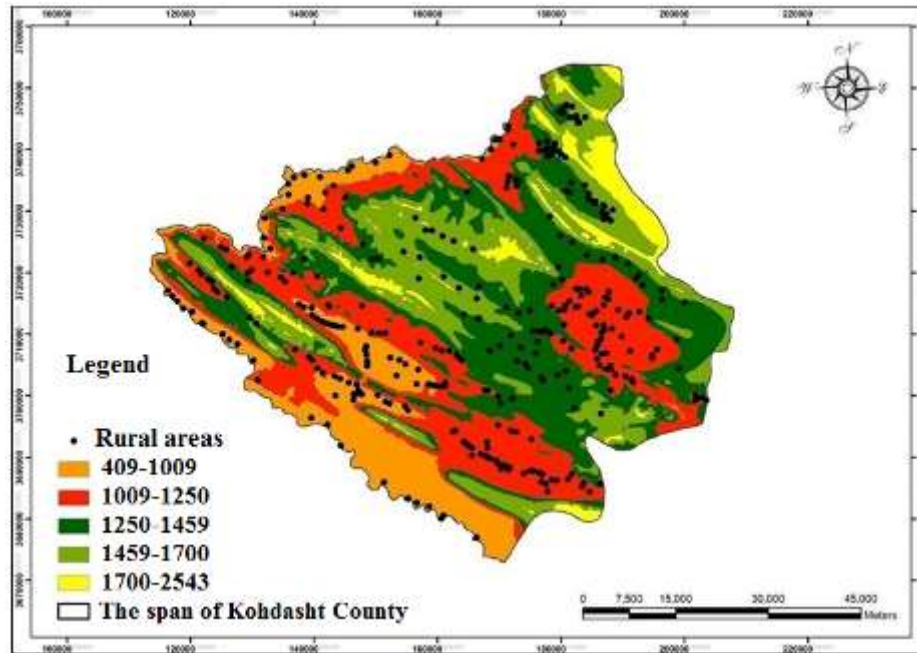
4.ELEVATION LAYERS

Regarding table 1, to describe the role of elevation in dispersion of the villages, stability and sustainability of rural settlements, Kohdasht county in terms of ups and downs has been divided to 5 elevation layers. Comparison between major groups and the ratio of the villages settled in each, provide a more explicit image of the relationship between altitude and distribution of rural settlements. From a total of 354 studied villages 85, 153, 84 and 32 of them are located at the altitude of 409 to 1009, 1009 to 1250 and 1250 to 1459, respectively, and there is no village at an altitude of more than 1700 meters (Fig. 2). Based on this figure the minimum and maximum altitude in Kohdasht county are 409 and 2543, respectively.

Table 1. The situation of rural settlements in terms of the elevation layers.

Elevation Layers	Number
409-1009	85
1009-1250	153
1250-1459	84
1459-1700	32
1700-2543	0
Total	354

Source: Authors' Calculations

**Figure 2.** The relationship between altitude and distribution (Drawn by authors).

SLOPE

One of the effective environmental agents in the distribution system of rural settlements, is the factor of slope. In this regard, the slope has been counted as one of the most important agents of changing and transformation of land surface roughness, therefore, affect the human's life directly or indirectly. Some of the human activities such as, farming in terraced lands or rain-fed agriculture, roads, power transmission lines, water supply projects in some rural settlements, were implemented on slopes (hillsides). Since these surfaces due to interference and domination of early processes (weathering and degradation), gravity and surface runoff, are very dynamic, so they would experience a variety of movements (falling, crawling, sliding and flow, etc.) (Zomorodian, 1995: 25). Lack of attention to the issue of proper slopes led to occurrence of landslides that cause both financial loss and fatality (Ghafari and Ashori, 1998 :91). In Kohdasht county, a large portion of the area is allocated to 0 to 10 percent slopes and the slopes with a slope of more than 48 percent coincided to the mountain belts (Fig. 3). Investigation of the relationship between rural settlements and slope demonstrates that out of a total of 354 villages of Kohdasht county, 294 villages are situated on the slope of 0 to 10, and similarly 52 and 8 villages are on the slope of 10 to 26 and 26 to 48 percent, respectively. Eventually, neither of the villages are on the slope of more that 48 percent (Table 2). Accordingly, villages are mainly located in low slope areas.

The effect of Geomorphological agents in the formation of human settlements of the Kohdasht County

Table 2. Distribution of rural settlements based on slope.

Slope(percent)	Surface	Number of Villages
0-10	Proper	294
10-26	Partially proper	52
26-48	Improper	8
48<	Completely improper	0
Total	-	354

Source: Authors' Calculations

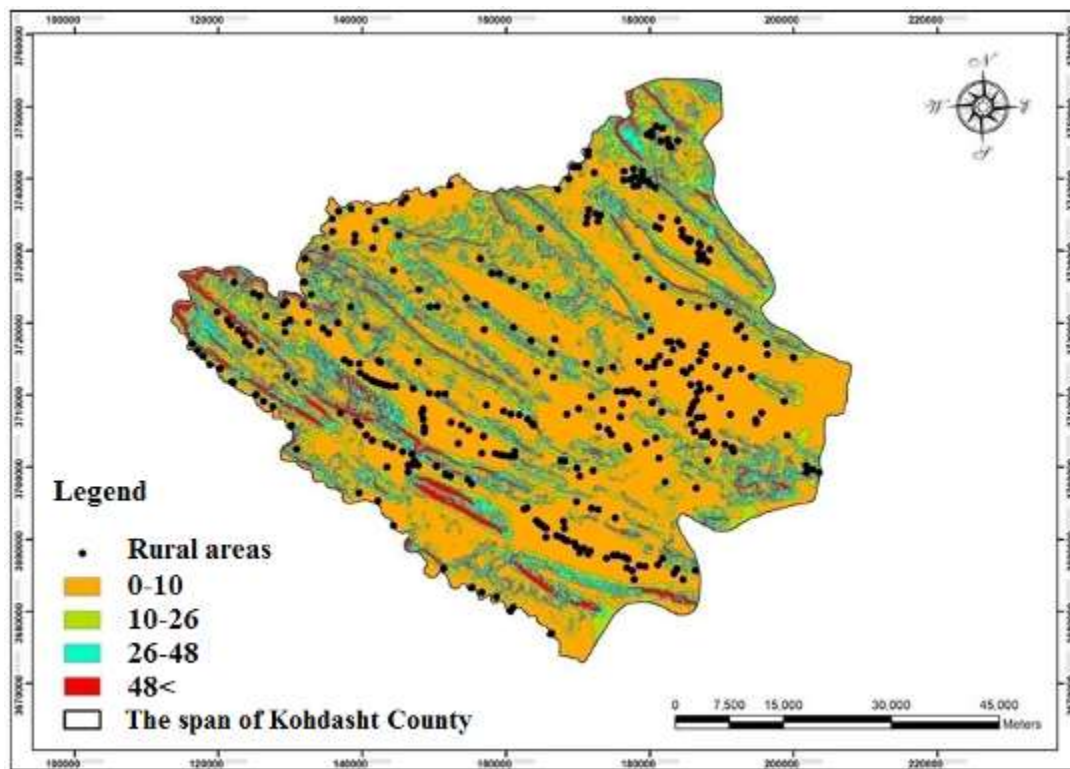


Fig. 3:

Slope and the distribution of rural settlements (Drawn by authors)

GEOLOGY

Overlaying the position of rural spots on the geological map illustrates that the maximum density of villages (256 villages) due to the low slope, fertile soil and availability of water resources can be seen in alluvial units (Fig. 4). The second geological unit that occupies more villages than the other units, is Gachsaran Formation (25 villages). Considering Asmari-Shahbazan limestone formations, on the southern and eastern line, 24 villages could be seen sporadically.

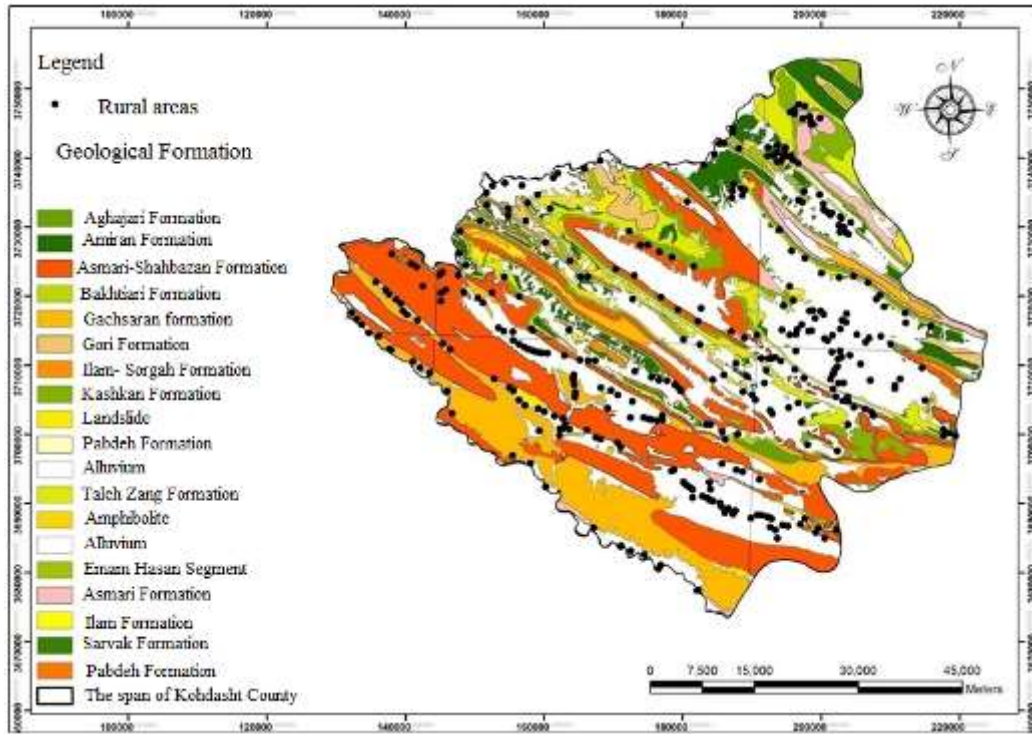


Figure 4. Distribution of villages on geological formations (Drawn by authors).

5.SURFACE WATER RESOURCES

Kohdasht county is fed by several rivers of Noorabad county and surrounding areas. Considering climatic conditions and the topography of the area, the flood of these rivers arise from rainfalls. Intense rainfalls of the area in all seasons of the year, especially during the spring can lead to flooding that in some cases cause damages to lands, gardens and even the residential areas. However, due to the importance of water in the life of the region’s villagers, the relatively large number of villages, are located on the margin of the river. The distances of villages from the river are indicated in table 3. As can be seen in this table, some of the villages are too close to the river that that located within the riparian zone of it.

RIPARIAN ZONE

According to table 3 and 5, at a distance of 0 to 716, 716 to 1617, 1617 to 2572, 2572 to 3978 and 3978 to 6762 from the riparian zone of the river, the number of villages are 220, 76, 29, 13 and 16, respectively. In this regard, at a distance of 0 to 716 meters there is the maximum number of villages, while the number of villages at a distance of more than 2500 meters from the river is the minimum. Actually, having access to water resources for both agricultural and drinking purposes, is the main reason of the establishment of the villages close to the river.

Table 3. Positions of the villages based on distance from the river.

Distance from the River	Number of Villages (meter)
0-716	220
716-1,617	76
1,617-2,572	29
2,572-3,978	13
3,978-6,762	16
Total	354

Source: Authors’ Calculations

The effect of Geomorphological agents in the formation of human settlements of the Kohdasht County

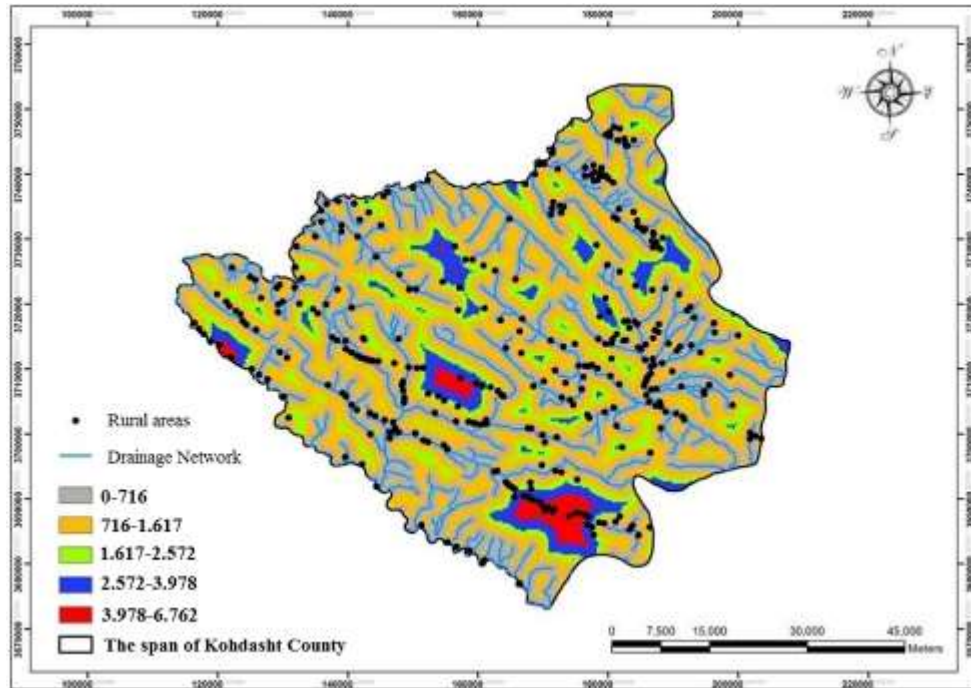


Figure 5. Distance of villages from the river (Drawn by authors).

GROUNDWATER RESOURCES

Groundwater resources appear in the form of spring and wells in the area under study. The distribution and the exploitation of them is different. In the northern parts of the region, the groundwater levels are low, and the further south we move, the more we will see the levels of the groundwater are mainly high (Fig. 6). In addition, the highest number of villages (141 villages), are located in the areas with high groundwater levels, while this number for the villages, which are in the areas with average level is 97. The number of villages in areas with low levels of groundwater is 116.

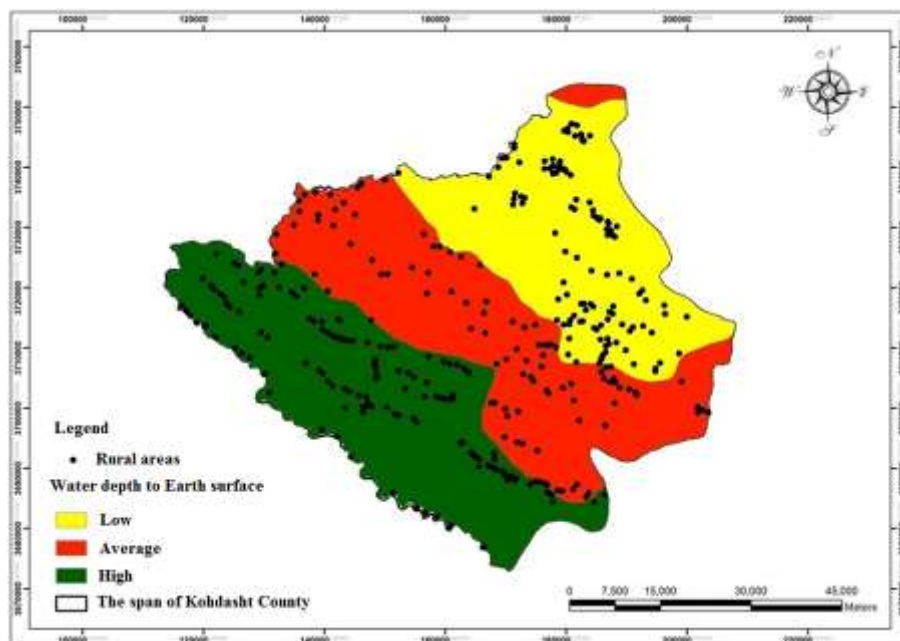


Figure 6. Distribution of villages to groundwater levels (Drawn by authors).

Table 4. Distribution of villages to groundwater levels.

Level	Number of Villages
Low	116
Average	97
High	141
Total	354

Source: Authors' Calculations

6.FAULTS

The magnitude of an earthquake has a direct correlation to the length of the part of the fault that rupture during the earthquake. In the areas where there exists a fault, in particular an active fault, because of the possibility of the earthquake, it is necessary to avoid the establishing of settlements in the vicinity of the faults. In Kohdasht county, there are no major faults, but a few minor faults in the east and north of the region can be seen. These faults do not possess the high potential of seismicity. An evidence for this claim is the regional seismicity records. By virtue of studies conducted in the rural settlements, settlements up to a distance less than 5 Km from the fault are in inappropriate area, and settlements with a distance of more than 5 Km are located in appropriate areas. Based on regulations of Housing and Urban Development, it is essential to consider fault zone of 1000 meters and 300 meters for major faults and minor faults, respectively. To determine the appropriate and inappropriate levels of the region in terms of distance from the fault and regarding the existence of minor faults, the fault zone has been considered 300 meters. On this basis, 6 villages are at a distance of less than 300 meters from the fault and the number of villages, which are located at a distance of more than 300 meters is 348 (Fig.7).

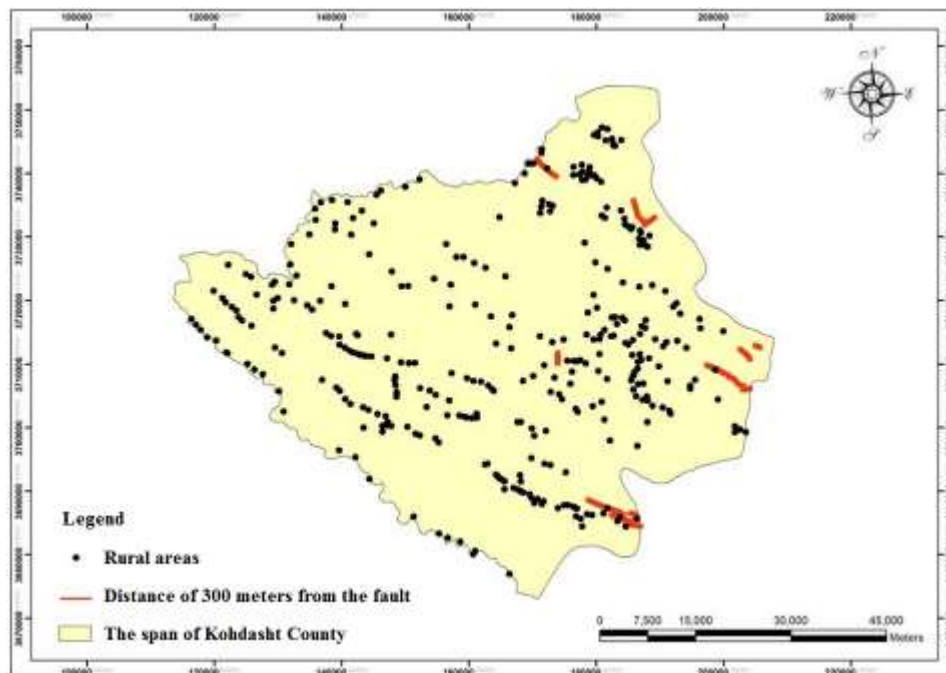


Figure 7. Distance from the fault and the distribution of rural settlements (Drawn by authors).

7.EARTHQUAKE HAZARDS

The earthquake is the reflection of a geologic event, which is received on the earth as a motion. The earthquake hazard is a danger that is expectable in all earthquake-prone areas, whether there exists civilization or structure in the region or not. Hence, the term of seismic hazard or earthquake hazard has a generic concept in this area. This hazard is as a result of the existence of known active faults, the fault zones, or of the historical seismicity records of the each region. The earthquake as a natural

The effect of Geomorphological agents in the formation of human settlements of the Kohdasht County

phenomenon, has continuously caused failures as well as the loss of the large number of human lives has been inevitable throughout the history. Proper planning has great importance for the preclusion or reduction of the destructive effects of this phenomenon, and identification and prediction of the way, in which it operates and the kind of its influence helps manager to have more precise planning from the trend of crisis and its control, and consequently, improve their performance speed in the control of crisis in very enhanced manner. The relation between rural settlements and seismic zoning of Kohdasht county can be investigated at three different levels (Fig. 8). The first level with a low risk that at this level the number of 175 villages are located, and includes south and southwest lines. The second level with average risk, embraces 79 villages in the eastern and northwest parts, and the third level with high risk have 100 villages in the northern part of the region (Table 5).

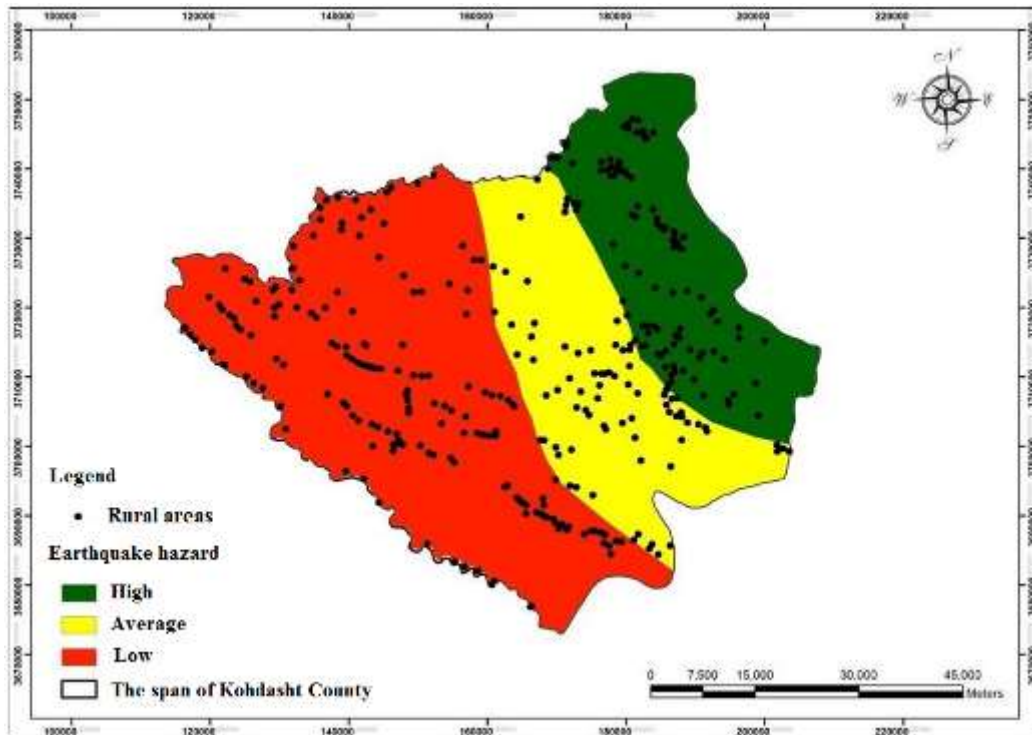


Figure 8. Distribution of rural settlements based on earthquake zoning (Drawn by authors).

Table 5. Distribution of rural settlements based on earthquake zoning.

Earthquake Hazard	Number of Villages
Low Hazard	175
Average Hazard	79
High Hazard	100
Total	354

Source: Authors' Calculations

8. NATURAL HAZARD ZONING

After surveying the rural areas associated with various geomorphic elements, the zoning of Kohdasht county from the perspective of natural hazards were analyzed. According to figure 9 and table 6, from the total of 354 villages in Kohdasht county, 78, 156 and 120 villages are situated in low risk, average risk and very high risk zones, respectively. Furthermore, low risk areas are mainly located in the northern parts, while high risk areas are in the southern parts of Kohdasht county. Besides, a wide range of area is in the category of average risk.

Table 6. Distribution of settlements based on natural hazard zoning

Hazard Level	Number of Villages
High	120
Average	156
Low	78
Total	354

Source: Authors' Calculations

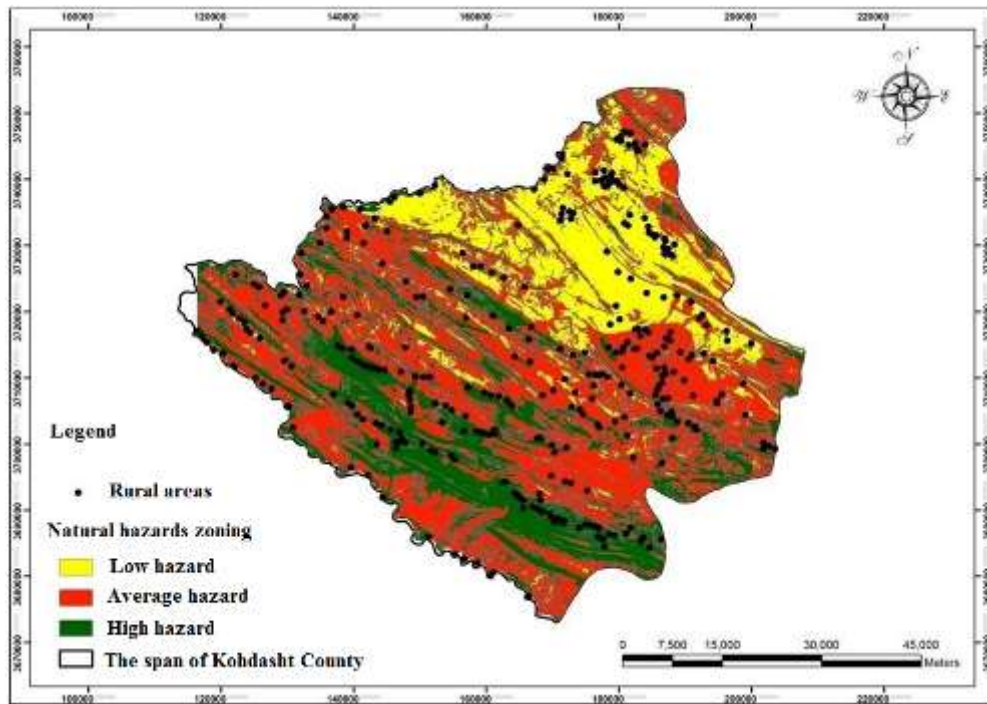


Figure 9. Distribution of villages to environmental hazards (Drawn by authors).

9.CONCLUSION

The study area is stable in most of environmental-ecological parameters that this issue also affects the distribution of rural settlements. The most sustainable ecologic factor of the area is slope, so from the total of 354 villages, approximately 220 villages formed on the slope of 0 to 10 percent. As this factor leads to the formation of fertile soils on the one hand, and supplies easy access to water resources; on the other hand, therefore it causes the development of agricultural activities. Study of the area's faults, indicates that there are no active and major faults in the region. Minor faults can be seen in the east and north of the area. At a distance of 300 meters from the faults, there are 7 villages, and the rest of the villages are located at a distance of more than 300 meters from the faults. Assessing the natural hazards of Kohdasht county shows that from the total of 354 villages of the study area, 120 villages are located in high risk areas. Since the region is flood-prone, so high risk zones are mainly located in the southern half of the region. 159 villages are in the zone with average risk. This zone comprises more surface area than the other zones, and can be seen sporadically throughout the study area. Low risk areas are mainly located in the northern half. 78 villages are in the low risk zone. Zones with low risk cannot be seen in the southern half.

REFERENCES

- [1] 1:100,000 geological maps of study area. (2007). Geological Survey of Iran.
- [2] 1:25,000 topographic maps of study area. (2006). National Cartographic Center.
- [3] Ansari Lari, A., Najafi, E., & Norbakhsh, S. F. (2010). Geomorphological capabilities and limitations of the physical development of the city of Ilam. *Logistics of Environment Quarterly*, No. 15, 1-16.
- [4] Asghari Moghaddam, M. (2005). Introduction to the position of studying natural factors in rural planning. Sara publications.
- [5] Bik Mohammadi, H. (2015). The role of geographical factors in the emergence of the first governmental centers of the Iranian plateau, The first National Conference of Iranian studies, *Articles of history and historical geography*, may 20, 2015, Meybod, 95-105.
- [6] Ghafari, M., & Ashori, A. (1998). Landslide as a one of natural disasters in the north of Khorasan. *Geographical Study Quarterly*, No. 51, 90-101.
- [7] Hasani Mehr, S. (2010). Assessing the structure of rural settlements in relation to geographical important factors in the villages of Astara. *Natural Geography Quarterly*, Vol 3, No. 9, 32-47.
- [8] Malek Hoseini, A., & Darghahi. M. M. (2011). Typology of worn out tissues in Iran. *Geography and Urban Planning of Zagros Perspective Quarterly*, Vol 3, No. 7, 159-184.
- [9] Maleki, A. (2009). Evaluation of spatial position of the rural areas' establishment in Kermanshah. *Human Geography Research Quarterly*, Vol 1, No. 3, 13-26.
- [10] Namaki, S. M., Akbari, A. A., Sharifi, E., & Giyasi, N. G. (2008). The role of environmental factors in the spatial arrangement of rural settlements, Case study: Mahabad's watershed. *Iranian Journal of Watershed Science and Engineering*, No. 5, 11-20.
- [11] Negaresh, H. (2003). Application of Geomorphology in city placement and its ramifications. *Journal of Geography and Development*, Vol1, No. 1, 133-150.
- [12] Shams Aldini, A et al. (2011). The effect of rural housing reconstruction in villagers' subsistence economy, Case study: the central part of Mamasani County. *Housing and Rural Environment Quarterly*, No. 135, 57-70.
- [13] Statistical Center of Iran. (2011). The results of general census of population and housing. Tehran.
- [14] Velayati, A., & Akbar Goli, F. (2007). The status of natural factors in the establishment of rural settlements, Case study: Rural settlements Koppeh Dagh- Hezar Masjed heights. *Iranian journal of Geographical Society*, Vol 5, No. 12 &13, 45-66.
- [15] Zaheri, M. (2007). The role of topography in the physical- body formation of rural housing and their desirability. *Geographical Space Quarterly*, Vol 7, No. 17, 73- 100.
- [16] Zomorodian, M. J. (1995). Application of natural geography in urban and rural planning. Payame Noor University publications.