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# Functional role of natural structures in forming Bishapur Archeological City- Iran

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**Abstract:** From the past, the various ecological structure of Iran has provided human inhabitants in valleys, mountains and plains. Recognizing the Connection between these structures and peoples over the time, guide the researchers to find the destruction reasons and guide them for best conservation. Bishapur archeological city had been one of the ancient economic and artistic centers of Iran. This city by possessing the long cultural record has various natural and cultural landscapes. In this research interdisciplinary information including: geology, botany, hydrology and hydrogeology, tectonics, history and etc. are provided in order to recognize the ecological and natural specifications of the region and the role and influence of these structures in forming city. For doing this process, we used landsat satellite images “ETM+”, “SPOT” and “Quickbird” for preparing information layers respectively. Satellite data processing and image analysis in different scales have been also utilized besides field studies and environmental interpretations together with different scientific data and prepared database in GIS in process of this research. Corresponding of these informational layers leads to new results as structural relations and the characteristics of natural-historical landscape and the role of water and mountain structure in creation of Bishapur.

**Key words:** conservation, Bishapur, interdisciplinary, satellite images, natural-historical landscape

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## 1 INTRODUCTION

Ancient city of Bishapur has been made along Shahi archeological road which has been one of the most important routes of the Persian Empire in 3000 years ago. This route in the time of Achaemenid Dynasty 550-330 B.C. would connect Persepolis and Estakhr (Two important cities in Ancient Persia) to the ancient city of Shoush and in Sassanid Dynasty would connect the Goor archeological city of Firouzabad to Tisphoon, the center of Sassanid Empire. There has been a route from this city alongside the Persian Gulf coasts. These strategic routes had also been main routes for trading and the connection of various tribes. This shows the significance of Bishapur area even after Arab's attack to the Persia (J. Savagheb, 2006).

Studying the corresponding documents about geography of Fars and the strategic routes of the area demonstrate the cultural, social and economic influence of Bishapur and its role in formation of Sassanid Empire 224-651 B.C. (Demorini 1996, Feray, 1996).

In ancient time, Bishapur had been one of the famous cities of Persia and also one of the economic and artistic centers of Iran. According to the available relics, the greatest cultural period of this area is Sassanid which started in the year 224 B.C and continued until 651B.C. Whatever remains from this important period leads us to a magnificent time from the artistic, architectural, political and economic point of views which its relics and remnants as well as its art and culture still exist in the current life of people in around this archeological city (R. Faray, 1996) (Fig. 1).



Fig.1 General View of the remnants of Bishapur city in the Shaper's plain and along the Shaper's

Along the time, there are several villages in Bishapur plain. A river passes through the plain and the area is surrounded by mountain from three sides and there is a vast desert to the South West of the other side of the river. All over the desert toward Bishapur and even some kilometers after that, there are all buildings, edifices and Sassanid's fire temples. It's obvious that in the past there had been a big and elegant city in the area. Some of the ancient villages of the Bishapur city are located in one side of the river and some of them are on the other side. One of the branches of the above mentioned river passes

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through the North East of the narrow plain (A. Nahjiri, 1997).

Based on archeologists' studies and research, the current Bishapur expands 2x1 kilometer and is one of the first ancient cities having written history of urbanism. This history is a tablet on a memorial column of Bishapur city in two Achaean and Sassanid languages (Fig. 2)

According to historians and explorers' ideas and considering the particular geographical situation of Bishapur, especially Bishapur River and its valley named Tange Chugan, the city has been the unrivaled city among others during Sassanid Dynasty (Fig . 3).



Fig.2 In the inscription of the memorial columns of ancient Bishapur city, the formation and construction of the city is described (Ghiashman, 1976)



Fig.3 the remnants of the tower and ramparts of ancient Bishapur in Bishapur plain (Sassanid Dynasty)

Before this research, few of the Bishapur relics were explored and a firm idea towards the real limitation of the city and how the buildings were distributed is available. But with a glance in some of the former research, we could recognize that the most of the remaining relics of Sassanid's era are

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located in the Northern part of the city\ and it expanded towards the Southern part in Islamic period. In other word, the relics located in the Northern part of the city such as Anahita Oracle, Service Hall and the remnants of the tower and rampart, traces back to Sassanid Dynasty. While the Southern relics such as the remnant of mosque is the eloquent of the Islamic era (Figs. 4 and 5), (Irani Behbahani et al., 2009).



Fig.4 The Northern landscape of the ancient city belonging to Sassanid Empire



Fig.5 the Southern landscape of the ancient city, built in the Islamic era

## **2 INTERACTION BETWEEN NATURE, CULTURE AND HISTORY ON THE BISHAPUR**

Since ancient time, the natural shape of Iran with various specifications has provided human inhabitants in valleys, mountains, plains and river banks. Studying the historical geography and the relationship between civilization with capabilities, potential and the resources of each country shows that ancient people have acquired their initial information from nature and have applied their adopted



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knowledge in designing and making their own shelter (Beck, 2001).

The outcome of doing and other parallel research carried out by researchers, show the formation of ancient cities in Iran is in line with natural specification and constant environmental factors. What is common in all of the research is the engineering of the occupancies based on constant modern development. Undoubtedly, the experience of ancient people based on the sacredness of nature and potential of natural environment as well as their respect to these factors, has been the basis for the thoughts and ideas which made them to create garden in desert, dam in mountain and cultural and economic strategic roads and finally would make their occupancies in complete accordance with nature from mountain to plain (Irani Behbahani et al., 2010).

The current ecological structure of Bishapur plain has been under destruction less than other historical-natural areas in Iran. By the advent of the age of technology, making the modern roads, impetuous construction without feasibility studies, modern agricultural patterns, making several deep and semi deep wells, creating different dams on the way of main rivers, using fertilizers and changing the structure of earth and the quality of soil, contamination of river basin, destroying different species of native plants (native forests and plains) along with irregular grazing of cattle, providing fuel and constructive materials out of trees and etc. is the basis of the idea how modern human beings have important roles in destruction of their occupancies, valuable natural resources for preparing food and developing industry and ecological environment which have been the main elements for designing the ancient cities for centuries. There is any sign of destruction left in the ecology of the ancient cities even in the course of time and yet they could be valuable natural resources for the occupancy of human beings. The state of how the changes in the constant ecology of the area in ancient time has caused the accurate formation of civilization in nature, has led the environment to a rapid destruction. For sure, with the presence of human and consequently his changes in the natural resource of Bishapur area, the ecological intrusion has started (Irani Behbahani et al., 2010).

Although the survival of the remnants in Bishapur relics which signifies a part of the glory, culture and power of the area relies on the survival of the environmental resources but recognizing the environmental structures and natural potential impacts of the area as well as the ecological changes of this structure for protecting the cultural landscapes is also a matter of great importance in formation of Bishapur city.

In fact, cultural landscapes grow and survive in the range of time and place. Human construction in nature has been under the influence of the process in development of social life, natural and historical events that lead to cultural landscapes. These landscapes connect the former natural – historical issues to the future ages and are presented by their universal distinctive features (UNESCO, 2006).

## **2 MATERIAL AND METHODS**

Recognizing the environmental specifications of Bishapur area based on its geographical location in a wide range of various mountains, plains, native forest of chestnut, seasonal streams and constant flows,

lagoons, aqueducts and springs all over the plain and foot of mountains, quality and thickness of soil, agricultural lands and pastures and other ecological specifications are very important. Therefore, this area by possessing the long cultural record has various natural and cultural potentials. The above mentioned area is located from a wide plain to the surrounding mountains (Irani Behbahani et al., 2010).

Applying the different methods of studying, analyzing data, categorizing and deduction of findings in a complementary process leads to simulation of natural environment and ancient occupancy. In modern methods of studying natural – historical landscapes, they utilize satellite analytical system in various environmental specialties. They also use the modern technology of telemetry for preparing database in GIS in process of this research (Rences, 1999).

By expanding interdisciplinary methods and development of technology, software facilities have been at the service of scientific research. In the meantime, using radiometric telemetry and spectrum in researches related to natural – historical landscapes has a great importance in all over the world (Iannone, 2002).

Considering the location of the majority of historical occupancies in natural landscapes and with their unique specifications and their wide range of studies from the view point of accessing to the ecological and geomorphologic structure as well as perceiving the mutual correlation between the parts of the environment in shaping and identifying the whole natural – historical collection, is essential for doing inter-disciplined studies in different fields and scales. Utilizing satellite analytical and evaluating system in completing the professional studies is absolutely necessary. In ancient cities where in spite of evacuation of modern population the stream of life still exists, reaching for an accurate model of living and nonliving of intersystem correlation lead the researchers to the causes of how these occupancies have formed. Moreover, these categorized and précised information which has usually been gathered by using the modern software systems and database will be analyzed and studied by experts in various scientific specialties (Kruckman, 1987).

Connection between different structures, guide the researchers to a path that finally make them find the destruction reasons of the occupancies through comparing the available information and cultural and historical documents together with introducing a cultural view of the past. This also will lead them to remove the secret shroud and complication of the previous centuries and find reasonable answers for most of questions. In the above mentioned research, landsat satellite images “TM and ETM<sup>+</sup>” were utilized for studying the area in 1,50000 and 1,25000 scales, also satellite database “SPOT” in 1,5000 scale and satellite database “Quickbird” were also prepared and used to study Bishapur city and preparing information layers respectively (Fig. 6 and 7) (Irani Behbahani et al., 2010).

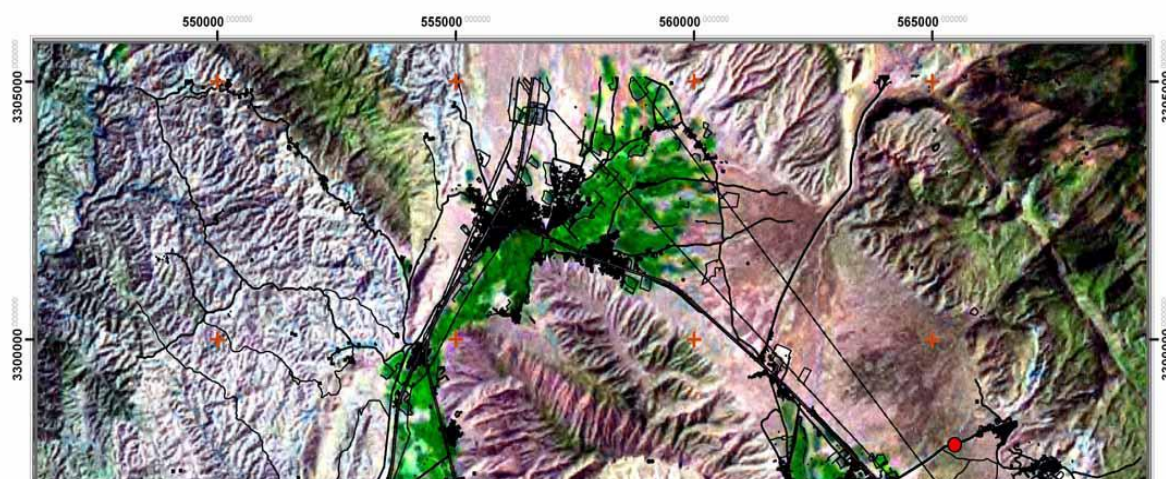




Fig.6 Natural structure of Bishapur plain

Generally, this method changes the analyzed database in order to get to the spectrum or texture units. Analyzing database consists of radiometer correction, omission of discordant features, geometrical correction, giving geographical coordinates, calibration of database and providing topical pictures. The combinations of (red, green and blue) strips are used for different spectrums, proportions and main indicator in colored pictures. Various filtrations are the main features in disclosing the details. Natural views are combination of texture, form, tonality, resemblance, affiliation, pattern, and silhouette. Based on analytical knowledge, they are interpreted and explained. Recognizing environment and available natural – artificial impacts encompasses the remnants of occupancies, routes, areas of the city, modern constructions and changes based on similarities and contrasts (T. J. Wilkinson, 2003).

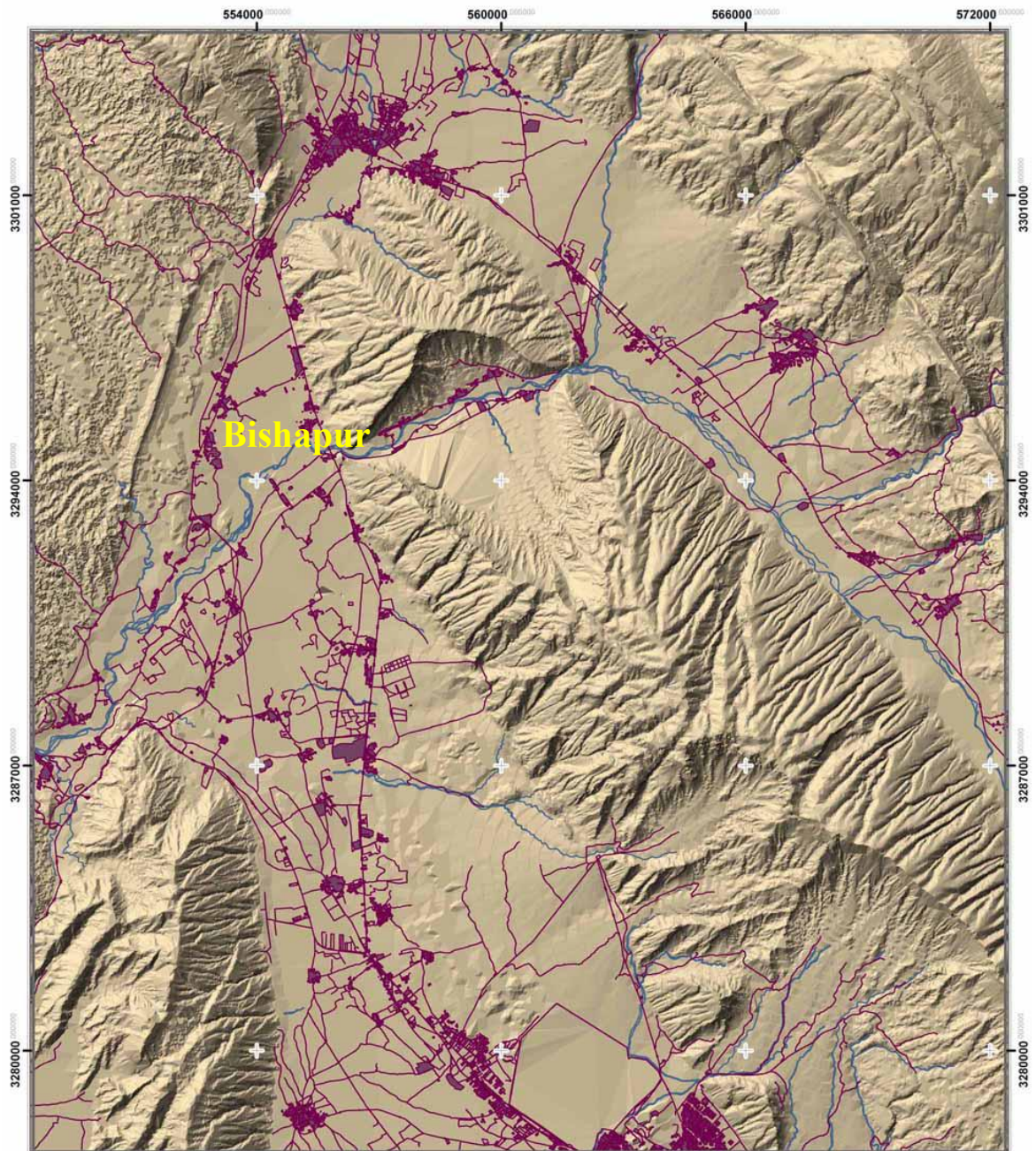
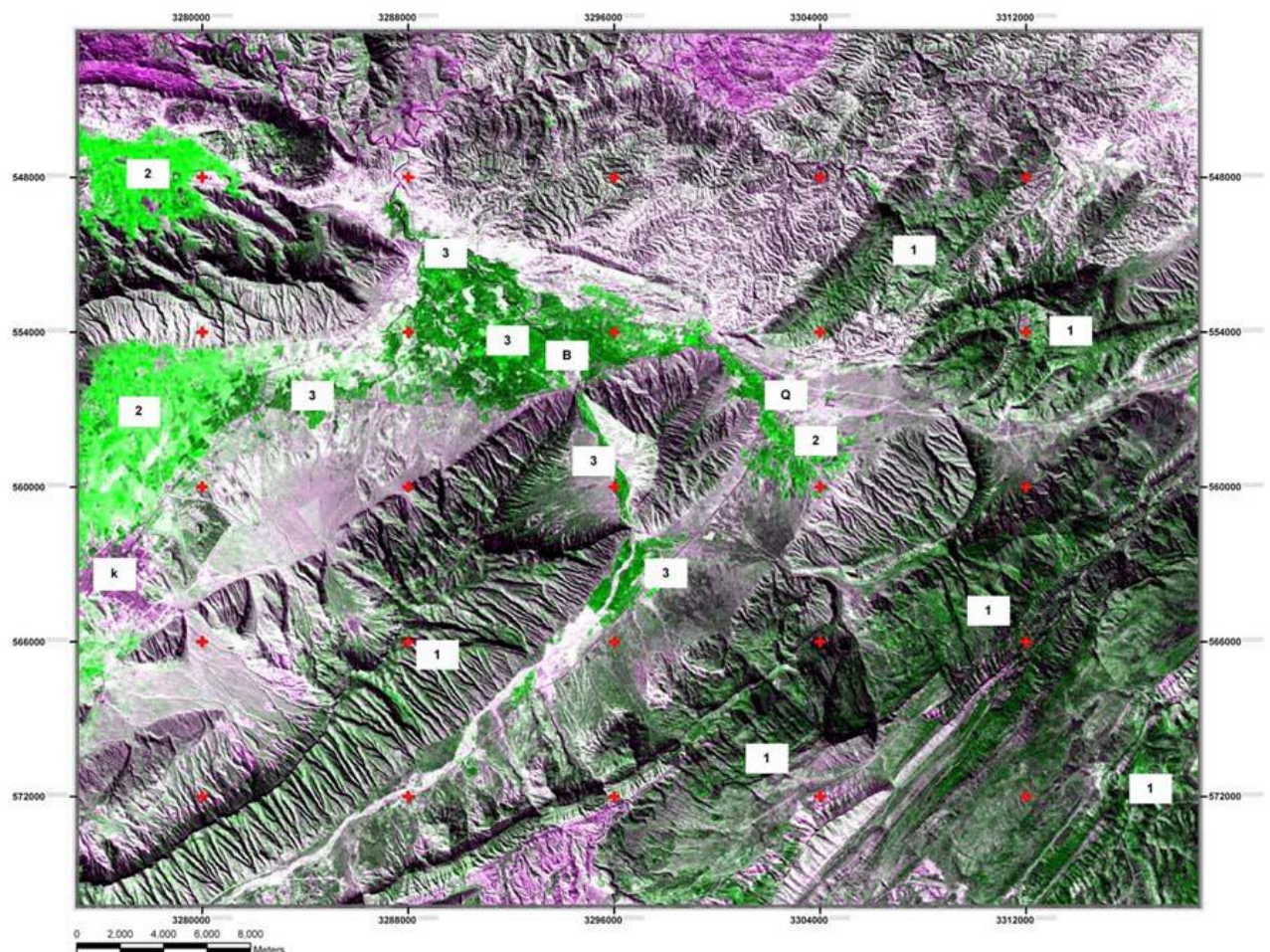




Fig.7 Regional villages and main roads

Despite of segregation in pixels, as the least units on data and pictures taken by satellite, with specific dimensions and different degrees of light kind of tonality is created based on various environmental elements such as soil's quality, surface impacts, vegetation and changes made by human in old time. These colorful imbalance or light background made by high disruption and changes in mineralogy of the remnants from previous centuries (Fig. 8) (B. Samani, 2002).

In this research, different information including geology, pedology, botany, hydrology and hydrogeology, tectonics, region and ... are provided in order to recognize the ecological specifications and natural structure of the area as well as identifying the role and influence of these structures in formation of human occupancies. Corresponding of these informational layers leads to new results for structural relation. The relation between the environmental components causes potentialities that interprets and justifies the formation of human civilizations and his occupancies as ancient cities (Irani Behbahani et al., 2008).





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Fig.8 Map of geomorphology

### 3 RESULTS AND DISCUSSIONS

#### 3.1. General introduction of the characteristics of region's natural landscape

The ancient city of Bishapur has been located in natural – historical area of Bishapur and Tange Chugan and in green fertile plain of Bishapur. Studies done in this research are the eloquent of a long cultural record with various natural and cultural potential. The above mentioned area has been placed in a massive plain and spread to the surrounding mountains. Whatever mentioned below is a satellite analyzed data which depicts natural structure of the area in a large scale.

Based on what is inferred from the satellite analyzed data of the area, natural structure specifications of the area could be divided as follows:

- Structural diversity from the view point of mountain topography from the height of 3700 meter of Eastern mountain ranges to the mountains overlooking the plain.
- Structural diversity in stream flows (Bishapur Main River) and Parishan Lake, subterranean streams and ancient springs (Sassan Spring) and aqueducts.
- Structural diversity in vegetation from natural forest of turpentine tress and chestnuts from heights to plain, fruit gardens and lots of palm trees, summer crop, vegetable, etc. in Bishapur fertile plain and also special herbs of the area which spread in height and plains.
- Structural diversity in cultural and native communities of urban and rural areas.
- The historical process from the eras before civilization (12000 years ago) until now.

In this historical – natural area, cultural and natural diversity have presented a complicated structure. In this structure the natural and historical layers have been mingled together and prepared a suitable condition for creation of human occupancies in previous historical eras.

Bishapur area and the South of Zagros Mountains due to geological, ecological, topography specifications, possess limited subterranean water resources and surface water of the area because of

passing through the saline formations and stones containing evaporated materials such as Hormoz, Gachsaran Sazand, Mishan and Aghajari formations that are commonly contaminated with compounds of saline and brine and as a result loses its wholesomeness and not usable anymore while passing from the Alborz heights to Persian Gulf. The result of the area's hydrological studies (hydrology and hydrogeology) demonstrates that fresh water resources have a significant role in this area and has attracted inhabitants' attention or even has made residency of different tribes before formation of Bishapur until now.

Plains and prairies of the area are commonly made of clay formations and erosive and mostly are without potential of subterranean water (Water formation) and couldn't make water reservoirs. In such condition the main water reservoirs in alluvial foothill and quaternary loose. These water reservoirs were usable by digging aqueduct (in the past) and deep and semi deep wells in modern time (Fig. 9).

### 3.2. The role of water structure in creation of Bishapur city

The origin of thought and ruling system in Pars region has been military – political based, which had possessed various positive points. The most important ones are as follow:

- The existence of suitable water reservoirs
- The existence of plains and pastures
- The existence of fortifications and natural deterrents for security

Water has been the main feature of formation in Bishapur and the role of plains and pastures as well as natural deterrents have been less significant. Therefore, the former pioneers of the city and its surrounding civilization in providing the two above mentioned features have had optimum use of water reservoirs and could remove any deficiencies by appropriate mechanism (Fig. 10).

Fresh water springs are the major reservoirs of drinking water and use for cultivation in Zagros area. Because of the volume of water, its freshness and also the beautiful view, this area has always been admired by people and has been the main attraction for the inhabitants and considered as a wonderful and admirable phenomenon in the middle of a warm, dry land.

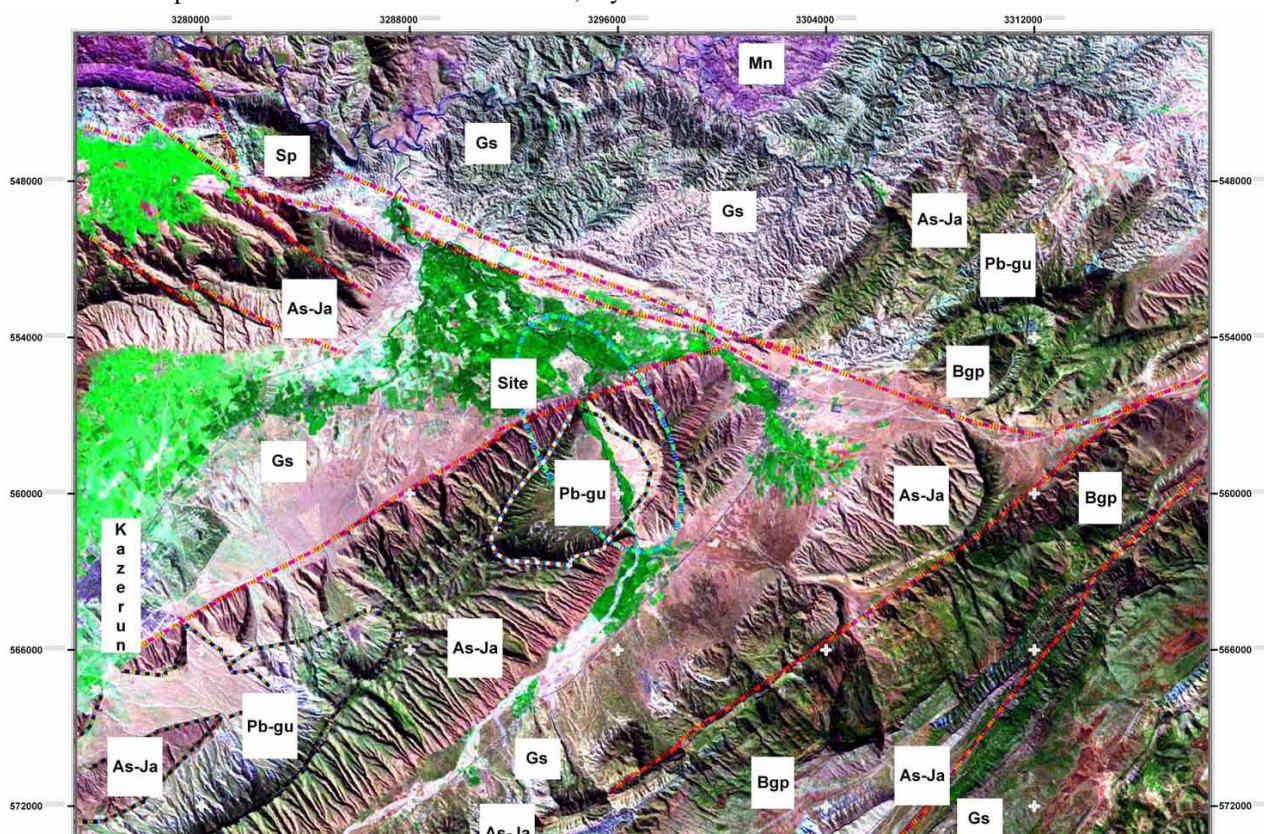
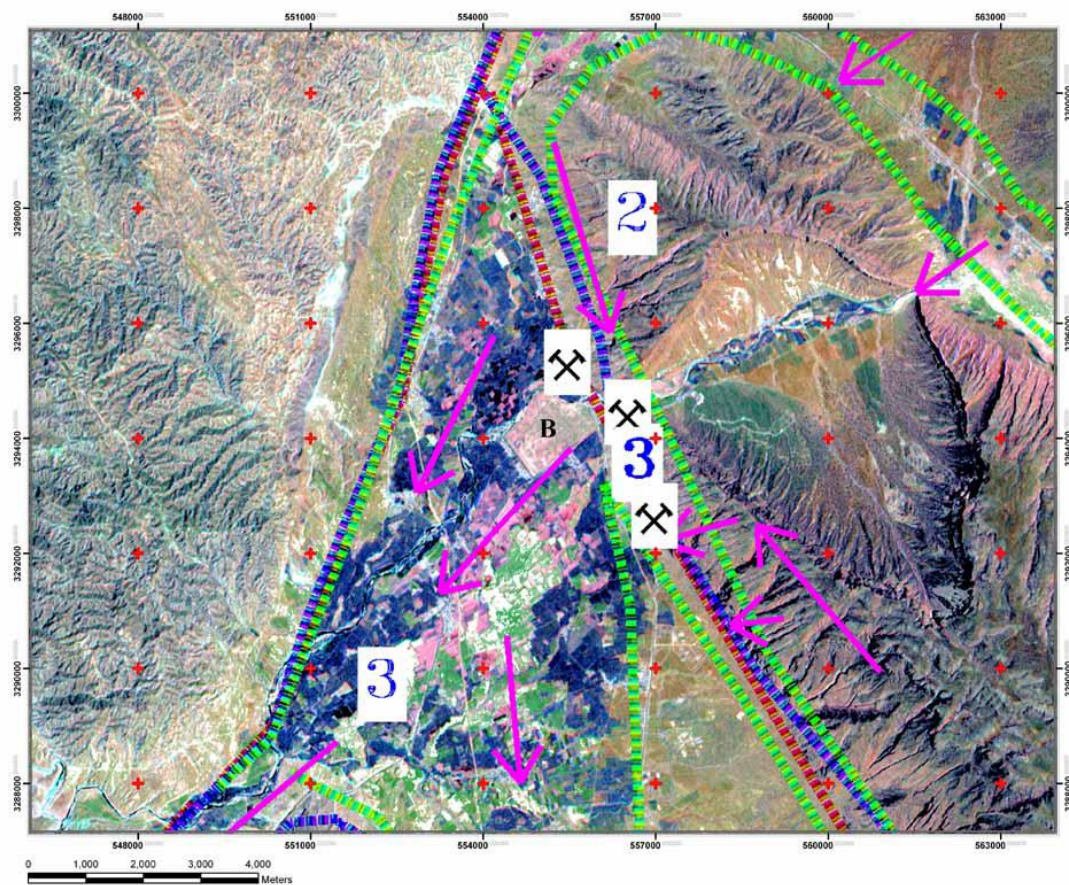




Fig. 9 Map of Geology

Meanwhile, Sassan Spring, Saraabe Dokhtaroon and Saraabe Ardeshir have such an important role in survival, beauty and natural views of Bishapur that has been admired and well- liked in Sassanid Dynasty and highly likely before that in former eras. The springs are generally surrounded by carved stone fences.



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Fig. 10 Map of Hydrogeology

The importance of the springs has been to such an extent that the Anahita Oracle has been made in Bishapur and presents the purity and fertility of water. Therefore, it's probably true if we could say that one of the most significant and replaceable feature of Bishapur city in this area had been water reservoirs such as Sassan spring, Saraabe Dokhtaroon, Saraabe Ardeshir and the dry spring living.

Considering the importance of water, especially in formation of water system to ancient city of Bishapur, the surrounding gardens and fertile farmlands are one of the other roles of water streams (especially Bishapur River) in this area. In present time, the influence of water system and canals' constant designing, ditch and Anahita Oracle which all are constructed based on engineering system in thousands of years ago, are undeniable in water system of the area.

### **3.3. The role of mountain structure in creation of Bishapur city**

Historical– geographical studies and their connection with creation of civilizations and capabilities and resources of each region show that ancient people have acquired their first learning from nature and have used them in making and designing their shelters. Perhaps designing the art of arch and dome especially with big engraved stones has a root in anticlines folds and domes like Zagros Mountains with folded layers which have been good example for the inhabitants of those areas. Nature engineering as well as exploitation of stones because of the suitable layers and solidity of its materials has been another specification which could provide ancient people with harmonious designing and engineering in accordance with nature and natural geometry. It is likely the secret of stability of this building after many centuries lies in the same secret. In this area and in the North of Bishapur city and in the foot of the mountain with orderly folded layers, there's special geo stile which had been the mine and a source of stones for construction in Bishapur city (Figure 11).





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Fig.11 Exploitation of polished stones from ancient mines and providing stone blocks for construction

In this mine, the method of working had been stairs like and construction of these stairs for stones' exploitation had been according to layers' geomorphology. The necessary designing of the stones had been done first in mine and then the polished stones transferred to the construction location after exploitation.

#### 4 CONCLUSION

As mentioned before, the ancient city of Bishapur possesses its own natural unique structure which distinguishes it from other Sassanid cities. The nature of the area with a combination of various features like high mountains, Tange Chugan river valley, Bishapur river, green and fertile plain, fruit gardens and ancient springs has been connected the city to the surrounding environment.

Taking the importance of Bishapur and its location in the political, military and commercial route of Sassanid government into account and also by considering the land shape, defensive lines have been constructed for security of the inhabitants and protecting the ancient city. In order to achieve this purpose, they have used the structure of water stream as well as the heights located in the strait as follows:

- Using the morphology and the precipitous making rim next to Sassan Spring for constructing tower and rampart in both sides of the river's opening to overlook the city (Girl and Boys' Castles). The Castles were designed for guarding the whole area.
- Constructing a floodgate in the entrance of Tange Chugan river valley and using a possible dam for turning back the water toward South and West of the city (toward the ditch).
- Constructing a vast ditch in South and West corners of the city.
- Using water as a natural barrier against any military invasion.
- Constructing tower and rampart in Northern parts of the city.

Also the location of the city by the Shahi road used to be very important during the ancient time from the political and military point of views. According to the documents, the suitable ecology of the area has made an important function in economy and livelihood of the society. The existence of natural barrier such as mountain, river and the ditch provide the security of the city and citizens and being located in a higher level than the plain creates beautiful scenery and also prevents it from possible dangers like flood. Anyhow, all the above mentioned economical, social, ecological and other conditions have been significant features in formation and development of Bishapur city.

The type and quality of soil, constancy of natural structure of gardens and native forests, the significant feature of water and designing it along the Bishapur River, have created developing condition and traditional agricultural constancy in the area. Hence, wide range of studies of this research lead to the

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fact that the natural view of Bishapur from the formation of the city and physical structures of the previous eras to the constant living of modern people in the villages of the area have a vital role. These studies highlight the natural structures' function in formation of the ancient city of Bishapur and the constant living in its surrounding.

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