

Analysis of the natural elements in Ardebil city topology and physical development

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Abstract: Studying of the cities geographical conditions especially the environment features in which they are placed based on them is one of the most important discussion that the present position recognition of the city problems and The future changes prediction are based on the recognition of natural elements or factors. The present research has been conducted for recognition analysis of the natural elements and its effect in progress and development of Ardabil city and also its potential possibilities in order to optimum development. In this research with use of Ardebil province urban general design (2007) and kinds of topography and geology plans as main tools in 1:50000, 1:250000 and 1:100000 1:250000 scales respectively we studied the development process of the city history natural and topography features and the patterns of Ardebil city development. These studies have shown that Ardebil city present development pattern has some limitations due to the existence of the elements such as industrial townships, unsuitable excretion of the waters, irrigation network to north-west wards and etc and it is not compatible with natural conditions and elements. While southern part of the city has the best directions and positions for development and progress from the structural patterns point of view.

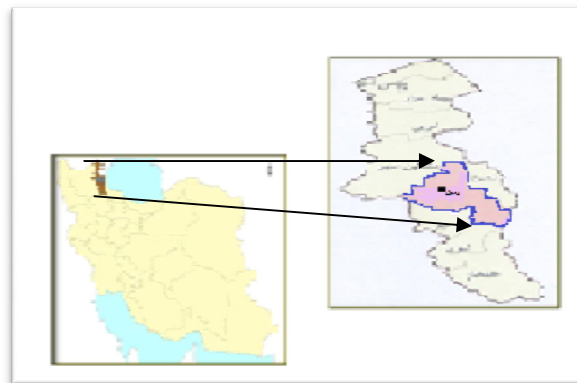
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Introduction:

The city isn't created automatically and in this manner its spatial dimensions aren't developed. The city constitutive elements such as man spatial imagining of ideals and mans though are shaped in the geographical environment and the ground area. In principle, settlement and appearance of one city more than everything are dependent to its environmental conditions and geographical situation. Because, natural events phenomena have more important effect in topology field spreading physical development urban morphology and like these. sometimes they function as a positive factor and in other times as a negative and inhibitory factor (khalili, 2010). During history man has always been in struggle and relation with natural environment. So there was a mutual relation between man and environment in survival of the cities from the early times and the environment has been as a determinative phenomenon (Nazarian, 2009). Often, the fundamental studies have been conducted about natural factors effect on resisting of urban lands, decreasing of natural dangerous or events such as flowings and slope movements or submergible of the urban lands and also

communicative ways. The most important urban studies have been done by ministry of housing and urban planning of Iran. Ardabil city like the most cities is the result of natural geographical humanity physical elements. This mountainous nature of city has been caused the urban development pattern be compressed. But the main subject of this research is that with existence of the historical record from earthquake occurring in Ardabil region, The present urban development pattern has not yet been suitable with natural condition and in other words the excretion of surface waters and flood have been caused to some urban problems in different parts, The unfavorable climatic condition (mountainous, slope unstabilities and loss of the necessary data for research) account from major limitations. Also there are potential abilities beside them which is always made this city as the most important urban center in Azerbaijan region. It is hoped that we can take a positive step with providing urban suitable pattern in improvement of the present situation of this city as one of the poor zones of the country.



Map No. 1: Geographical position plain Ardabil in northwestern Iran and eastern side of the plateau Azerbaijan.

Research objective:

The present research has been performed for recognizing or analyzing of the natural condition of Ardabil city limits and also potential possibilities in order to optimum development.

Situation and the regions limits

Ardabil city has been situated in the middle part of Ardabil tectonic pit as the greatest population focus and Ardabil province centre in 46° and 45' minutes to 1° and 43' eastern length, 37°, 46' to 38° and 37' of north latitude. Its medium height reaches to 1350 meters from sea level. This plain is limited from north to the frontier of Azerbaijan republic, from east to Taleashs mountain range, Taleash-Astara cities (Hashtbar) from south to khalkhal city and from west to Sabalan mountain and Nir and Sarein cities. Ardabil city has been placed in the middle of a plain to 900km² width and it has 2000 to 4000m heights from sea level in different regions of its lands.

Materials and method:

The current research is from applied scientific type and based on historical descriptive and analytical method and nature. Although, we used from library and internet for information collecting based on the common research objectives. The used physical instruments in the research are Ardabil geology plans 1:250000 and topography plans 1:50000 meteorology data and the other related information with research subject. Several field visits have been performed for comparison of subjective and theoretical understanding with the real facts in nature and also for more exact identifying of the environment.

The effective natural factors on Ardabil city topology and physical development.

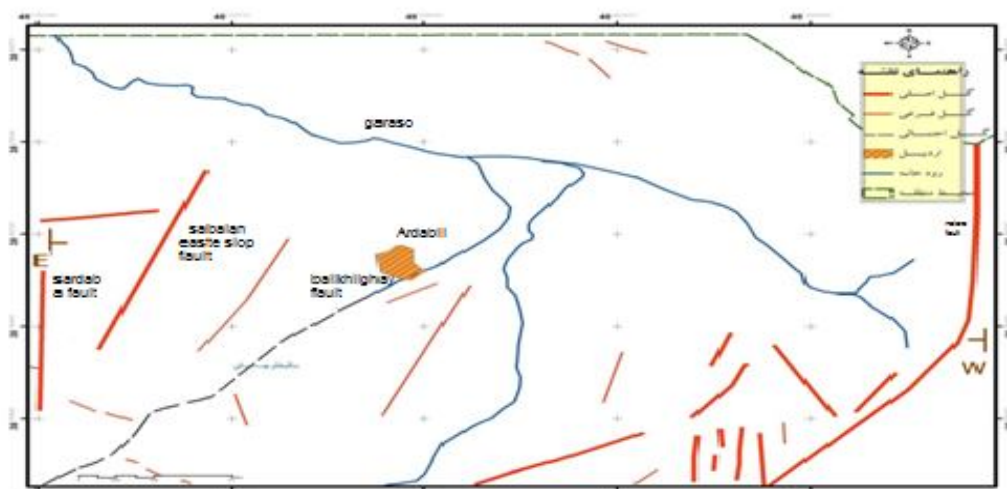
Geological and tectonic

A flat and high tectonic well or as Ardabil plain has been located in the farthest end of Azerbaijan plateau eastern side and Taleash, Sabalan, Bzghvsh mountainous mass. This plain is relatively flat that its concave slope is less than (0/5) with simple topography toward northern and north-western general direction. Surface

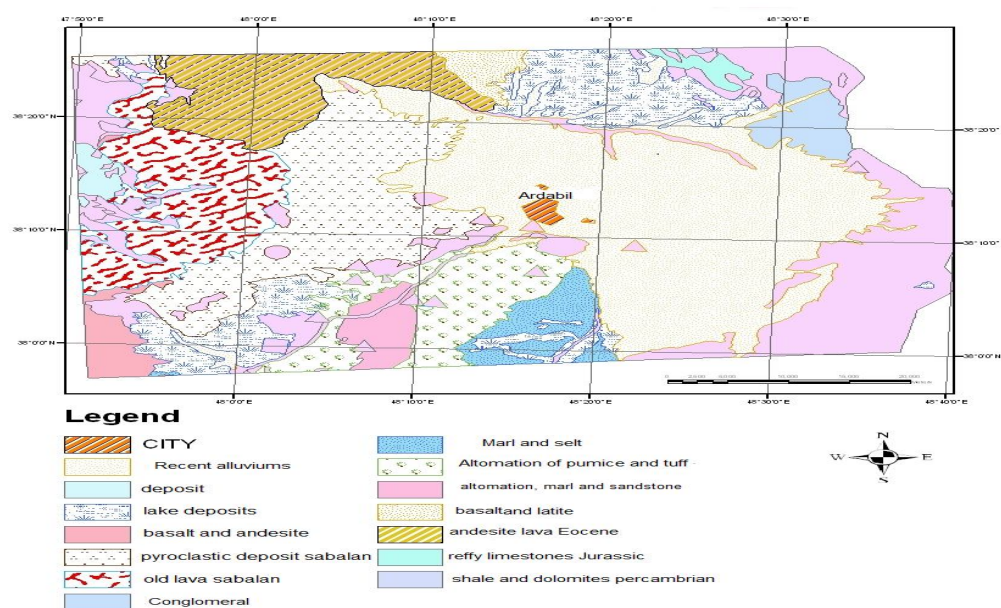
flows are in the plain level with low speed and finally they pour to Garahsoe but the plains relative harmony and flatness is ruined by some low height topographic events. As an example we can see single and several protrusion in Ardabil plain southern part. Ardabil plain has been surrounded by faults in the south-western side which their present process is with. 0/50 frequency along northwestern and southeastern and especially the most historical and destroyed earthquakes of the region have also been occurred in this limits and along the mentioned faults (sobhani, 1999). Near the end of quaternary with discharge of the lake water through garahsoe, its residues have remained as terraces on a slope which form Eocene and esite as the major part of the city underlying level rock that with passing of time analyzed and as a result have produced the present clays in this limits (samadzade, 2007). Thus these clays were from other place clay type that gradually the following of this condition establishment have created Fans in an interface of the mountain with plain which show little profile evolution of the soil or non-evolution on the small Fans but in the large fans are shaped the development pattern of very small materials. For this reason, the best and most fertile agriculture lands are seen in their level which a good sample of it is Balyglyvchay fans (sobhani 1999). Generally, this city and its around limits (north, west, east) have been spreaded on plains sediments young or new Fan terraces on slope and fans. Often the north of Ardabil city is located over the central volcanic plateau with more thickness from palaeogene volcanic rocks and the city southern limits have also scattered over Neogene units (Ardabil city general design 2007). Also geophysics studies and discovered excavations indicate the deepest part of Ardabil plain alluviums in its east and south-eastern parts. So the same zones are suitable places for using of the ground waters. While western and north-western parts of the plain aren't desirable for digging of deep wells. The external volcanism formation cover all eastern part of the plain and good quality of the ground waters in eastern and south-eastern parts are for their

proximity and supply from the same heights or volcanism formation. As a result kind of the formations has effect on the ground waters quality of that region.

Therefore alluviums of these parts are including ground waters with good quality from drinking and agriculture point (Ardabil water resources studies limits 2007).



Map number 2: Fault map of linear structures in Ardabil Plain and its surrounding areas (shape incision is marked as number (1))



Map number 3 : Geological map of the study area and its surrounding areas.

Climatic features and their roles in relation with urban development:

From the regional viewpoint, the effective factors on the city climate are divided to two groups as outside and local factors. Outside factors have influence on three atmospheric systems in cold and heat periods of year which Mediterranean climate flow is entered with temperate and marine nature respectively from west side

and is caused to decreasing of temperature and climate humidity degree in Ardabil province. Siberia climate flow comes from north and north-east of Ardabil. In winter season many value of its humidity is discharged and it is accompanied by cold and increasing of the climate humidity and it due to decreasing of heat degree and climate colding and with entering of the northern Atlantic climate flow is created intense cold and snow

(Rahnamai 1999). The effective local factors on the region climate are numerous. According to mountains chain direction height difference and 38 geographical latitude it uses from the northernmost situation which these factors put more effects on rain and humidity features of this city (parivand19999, p.20) using different methods such as Ambrejehe and Demarten climatic method we obtained Ardabil city climate semi-arid and very cold and semi-arid respectively. According to the recorded statics in Ardabil city synoptic station, during 29 year statistical period rainfalls average has been about 205/1mm. In this periods April with 50/5 mm and July with 5/6mm were identified as rainy and more humid and low rain and most dry months of year respectively. There wasn't any month without rainfall. Study of rainfall value of this station during above statistical period indicates that spring season with 114/6 mm or 36/56 yearly rainfall average is known as the most rainy season. Also winter season is appointed as the most dry time with 7/74 yearly rainfall. Absolute average of high temperature during the mentioned statistical period is 29/45 and absolute average of low temperature is also-15/09 based on the same climate temperature statistics in Ardabil from July to January month it has decreasing state and after this time increases again. High absolute temperature is about 39/8 related to July month and low absolute temperature in January month has been recorded near to -33/8 (Ardabil city general design 2006).

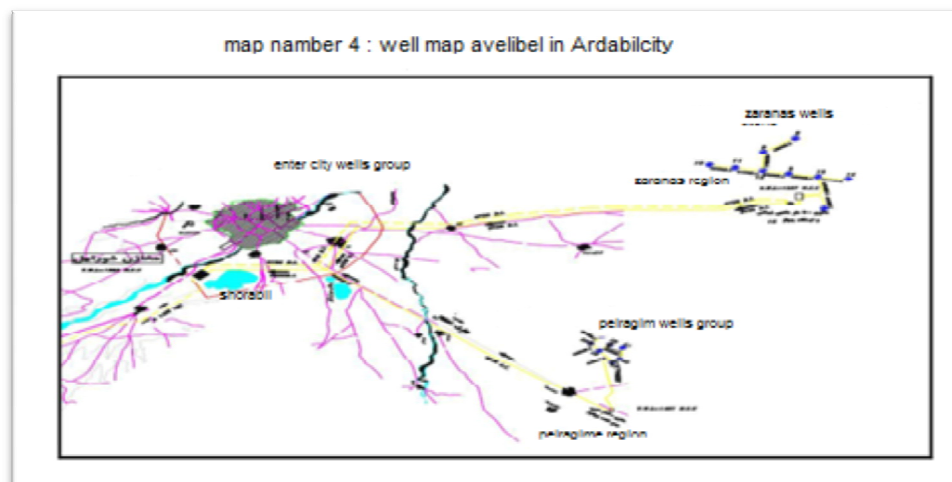
The city water resources :

Ardabil city is located among large and high mountains. The existence of the large and small

mountains has important role in the storage of its water and it causes to relative humidity and rain as good state for being permanent river basin of Sabalan mountain and its slopes is seen snow in Sabalan heights all times of year. These snows are melted in heat seasons gradually and cause to supply of the most important rivers which flow from Ardabil city level their typical is Baliglochay which passes from the center of city (shakori 1999 p6), in addition to them the other surface or level waters are flowing in the city limits. Among them we can point to Golmoghan, kalkhoran, Niar and zaranas rivers but from the other present surface water resources in Ardabil city which have ecological and tourism importance is Shorabils forbidden hunting marsh which is a sedimentary close domain with width about 170 hectare in an asymmetric syncline with the low depth at the cities of south mountainside. The main part of the city water is provided through ground waters resources which are often scattered in the regions from zaranas to piragom and within city but it has considered use of the surface waters in Baliglochays river for non-covering all of the urban needs (Ardabil city general plan 2006). Since Ardabil province from water resources point has relatively suitable conditions, but for unfavorable use of the water resources, the factors such as population increase, industries development and increasingly usage of water especially rainfall decrease in the recent years have confronted Ardabil province with water crisis problem.

table 1: Specifications of the operation of water supply wells in Ardabil

The total average discharge (liters a second)	Number of wells out of service	The number of active wells	All existing wells	Name of operation	row
260	--	10	10	Zaranas plain	1
60	4	3	7	Piragom plain	2
520	2	16	18	City inner	3



Map number 4: well map avelibel in Ardabil city

Control geomorphologic factors of the city development :

Fault

From precambrian (Era) to present, Ardabil city limits has been involved numerous tectonic events. Sabalan's volcanic activities have been accompanied with exiting of laval and the ruined pyroclastic with creating of split and the deepest faults in the region. The formation of Neors basin has also done by faults which have surrounded this plain. These faults are along the Northeastern and southwestern. Almost, all known faults are in the townships North and east part which their most important are one Astaras fault in the eastern slope and the other Neors fault in the western slope of Bagrodags heights. There are several fault structures that can point to Baliglochays probable fault along baliglochays river (Sobhani,1999). The performed case studies by Barbaryan in 1998 show that southwestern regions and the main half- eastern part of township for prone to having earthquakes are appointed as dangerous zones with high intensity (to 8 degree in rishter scale) and the rest area of township has been located in the regions with different risks (Rahnamai, 1976). According to the present development condition of Ardabil's city that is toward south western and south areas, i.e it is in the resting way of Balikhlochay's fault. The development of buildings to fault was for space limitation and it always caused these regions for preparing of the earthquake risks. Therefore, urban managers should take a step to resisting of the regions through engineering methods and in this case should be even done non- residential project with geomorphological studies. As it is conducted with building

of the residential regions with less floors, use of the resistant materials and methods in the countries which are prone to having earthquakes such as Japan in order to decrease the risks intensity.

Earthquake risk in Ardabil's city

From the viewpoint of seismologists of Ardabil's township earthquakes, they belong to geology unit of western Alborz and Azarbaijan which are prone to having earthquakes for the earth structure. It is accounted as a north part of the mountainous region of Alpe- Hymaliya in Asia west. There are many faults in Ardabil's city limits which can point to Ardabil east fault, Talesh western slope fault and Baliglochay fault among them. the recorded earthquakes statics in Ardabil city indicate that most earthquakes had low focal depth and high destruction ability or power. From prone to having earthquakes ability, the regions located in southwest and half-east are considered as dangerous spreads with high intensity of earthquake in the township. High relative height and occurring of many rainfalls in the weak layers with high sliding in the large spread and providing of the relative condition in the earth situation have been caused to sliding in the majority of regions which leave more damages throughout year of their sliding motions and the earth subsidence. For example , the destroyed earthquake occurred with 6/4 reshter intensity in Ardabil, Nir, Saraian that these earthquakes not only caused to destroying of the villages, but also it brought up more loss of life. We can evaluate the ground sliding phenomenon in the city level such as central limits, north section of Hir and Nir and parts of kalkhoran and Baliglochay (Ardabil city general plan, 2006).



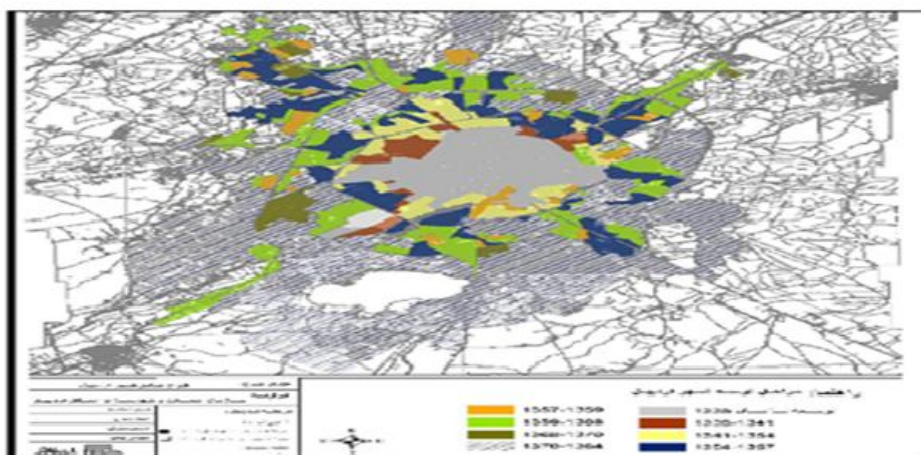
Map number 5: Earthquake hazard in Ardabil Province (1375)

Ardabil's city physical development:

Slope instability effect of Shorabil lake

Ardabil's city present development is toward south and southwest areas. That is in placing way a lake as Shorabil's lake which is located in 2 km of Ardabil's city south-west part. It has transformed to a lake spread during pleistocene (period). As a result, all of the rivers are discharged after passing from the short path in the mountainous slopes level i.e to 1900m in Sabalan eastern slopes, 1500m in western slope and Bagrodag to this lake. The end of this period volcanic ash motions combined with water according to ice melting in the times of volcanic eruption, ice periods have been completed all pits of Sabalan volcanic mass foothill

and decreased slopes to plain. As a result of these flows and being young and non-stickiness, its component particles are weak and unstable and numerous shapes of mass motions especially ground sliding were observed in their level. In other words, there are actinogenous materials within them according to youth of the volcanic materials and for being sedimentary of lake is expected the occurrence of ground sliding (Khayam, 1993). Therefore, urban managers through expert methods should attempt to stability and control of these movements. Also, the performance of non-residential projects must be with geomorphology considerations.



Map number 6: Elements of the overall fabric of the city and its environment (Ardabil Master Plan 1386).

surface waters excretion problems:

The main and most important method for gathering & conductance of the surface waters flows in Ardabil city is gutter network. But, these gutters from technical view

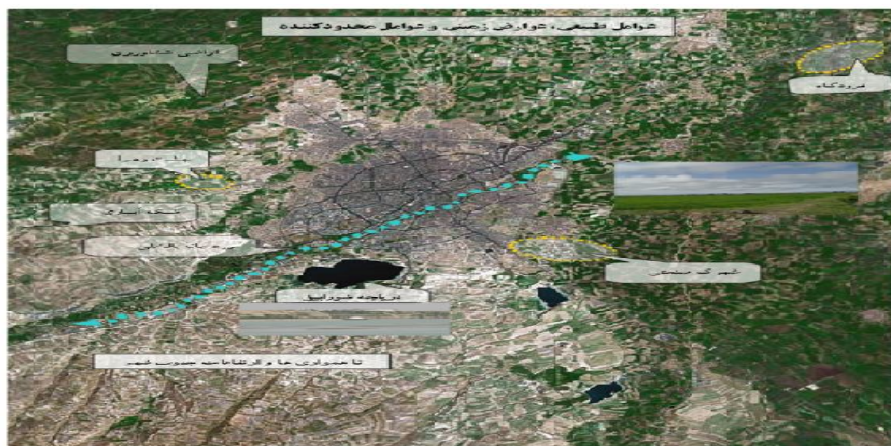
aren't responsible for urban needs without enough slope. The washed garbages and sediments from streets level are accumulated with entrance to gutters in it. Because, low slope has decreased the water flow transfer and

movement ability to more value. In other side, discharge of the produced garbages by offices residential center and commercial regions and markets near to the gutters have changed them to the propagation of contaminations and diseases center such as parasitic and infectious diseases. Surface waters is stagnant for loss of suitable slope. This matter is a serious danger for the traffic of pedestrians and ridings with freezing of water in the gutters and public passages in winter. The dimensions of the gutters and the provided canals were not enough in the city passages and have not acceptance capacity of maximum water surface flows. As a result, when rainfall is to more amount. In this time, these gutters don't supply the water volume and water flows as flood in the city level and causes to financial loss to the city people (Ardabil city general plan, 2006) .

Communicative networks :

Ardabil city oldness is estimated about 2000 - 5000 year. The mountainous nature of Ardabil city is caused to be expressive urban development pattern. Recently, this city has uniform frame which is including spaces such as Sheiykh- safi's tomb, Bazar and jomeh Mosque. But, with entrance of the early streets destroyed coherence of bazar and context of the residential quarters. According to non- balance between old and new context or ignoring of the correct place, the main spaces such as squares, markets, mosques and historical passages have been caused to destroying of the

structural system of quarters which have more effect on holding and forming of the social relations (rezazadeh , 2009). In other side, worn out main highways , central quarters of the city , regeneration cost and non-resistence of the old context materials were caused to more consideration of the residents toward urban margin parts. Ardabil city is as center of province and air and ground relation with other regions of the country and township s different areas. At present, communicative network of the city consists of two circular axis and a central circle which can create relation of the city s center with around through radius streets. passing axis are related four road of Tabriz, Meshginshahr, Astara and khalkhal to each other and they possible mid- urban transportation. for this reason, they have suitable network in the township and region s level but their function were not desirable and it is for the problems such as urban traffic, city relation with other cities , loss of parking especially in the central parts of the city and etc. for solving of the mentioned problems, we are required to urban planning with new urban patterns, compatible with environmental ecology and ecological culture, climate condition and the present needs altogether. these cases are conducted with the detailed and physical plan (Ardabil's city general plan, 2007).



Map No. 7 : natural and geological factors of Ardabil city.

conclusion :

In many of our country's cities for being away from urban planning scientific principles and physical development, cities are formed in unsuitable places and have been caused to many problems in the urban quarters. In Ardabil's township level are also considered numerous problems which are prevented from urban development and growth. The most

important factors that influence physical development are natural elements. According to special geographical situation of Ardabil plain, climate and topologic condition, this city are surrounded by mountains from around and as a result take an expressive shape of the urban development to itself. So, urban topology is with unsuitable distribution and out of planning principles loss of scientific and reasonable view in balance distribution of applications in the past has been

produced disharmony in the distribution of urban services. North, west and some parts of north-west regions of the city have also suitable slope, fertile soils with ability for agriculture according to enough water. The city's eastern and north west regions not only aren't suitable for the growth of the residential regions by the considered reasons, but also they are for ignoring of the natural elements role in these regions with construction of industrial places and airport. As a result, with Ardabil plain features and the performed studies, we can say that the best directions for future development of this city are south, south-west regions and among them with consideration of geology condition, it is cleared that the city's south lands are suitable for the city development.

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