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**Original article**

## **Study of the effects and adaptability of tehran-north highway on sustainable development of the coastline of west mazandaran in chalus and noushahr cities**

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**ABSTRACT**

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Sustainable development, justice among generations and human's endeavors for progress and development together with protection of environment and the existing resources show that the role of the transportation sector to reach sustainable development is very effective. Tehran-North Highway is one of the most important elements of transportation in the process of sustainable development of north of the country, particularly in the coastline of West Mazandaran Province. In this study, using the objective observations, library studies and collecting survey data, the fourth district of the highway in the first phase of the project and the quality of its link and adaptability with the coastline of the West Mazandaran region, particularly Noushahr and Chalus cities are studied aiming to assess the sustainable development of the region. The studied characteristics are: noise pollution, pollution of the water resources and aquaculture, extinction of animal species, extinction of plant cover, waste management, rural texture and body and tourism industry. The results of the study show that increased capacity and safety of the road and the reduced travel time are the positive effects of the high way, while noise pollution, extinction of animal and plant species and absence of correct waste management mechanism are the

negative effects of it on the region. At the end, solutions to reduce and remove the negative effects of the project based on sustainable development of the region are suggested.

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## **1. Introduction**

Urban development has nowadays created an unsustainable situation in the cities because of following the classic model of development and going after the cliché patterns of urban development blindly which has made it not to care about the native and local situation and characteristics of the region. This has led to unsustainability of the surrounding areas as well. Sustainability means to satisfy the current needs without destroying the potentials of the future generations to meet their requirements. Sustainable development is a concept that emerged following the increasing concern about the negative consequences of uncontrolled development (Tudela, 1999: 19). A development is sustainable when it meets the current requirements of the present generation without damaging the potentials of the future generations. In fact such a development establishes justice among generations and shows human beings' endeavor to progress and develop together with maintaining environment and the existing resources. Thus, in a nutshell, sustainable development could be considered as balanced and moderated aspects of sustainability over time. The major results of the developments at present are that human being is separated from the nature completely and is placed in an unsustainable path that will surely result in complete destruction of the environment and removal of the biological facilities on the planet earth (Bahraini, 1996: 4). The basis of sustainability is to satisfy the people's needs as far as the social, cultural, economic, infrastructural, physical and environmental aspects of it are concerned. The role of the transportation sector to reach sustainable development is very important and effective and the connections among these aspects form the process of sustainable development.

Using coastlines for entertainment is by itself a threat to the fragile water ecosystems of the coastline areas. Coastline development has changed the shape and look of the land and is in contradiction with the environmental objectives of the coastline areas. As tourism makes sense when visiting a virgin environment, on the opposite, irregular expansion and mismanagement could damage the resources that tourism has to enjoy. The inherent tourist value of the coastlines (sea, river, jungle, climate and natural spectacles) indicates the investment that the nature has made for the human being. The goods and services resulting from it are the profits coming from this investment. Thus destruction of the basic resources means to decrease the principal capital and therefore have less profit and eventually demolition of what the nature has provided us with freely. Most of the destructive factors of the coastlines are human made, and were created by human interventions. Factors such as pollution of waters of sea, river and watersheds, pollution from sewage systems (household, industrial and agricultural), pollution from wastes, air pollution and noise pollution all result from transportation which is caused by human or artificial factors. But due to the importance and significance of the issue, Tehran-North Highway was selected as the title of this study.

## **2. Definition of topic and research methodology**

Tehran-North Highway is one of the most important elements of transportation in the process of sustainable development in north of the country, particularly the coastline of the West Mazandaran area. The most important connecting road among Tehran, Alborz and Mazandaran provinces is under construction in order to provide a secure, quick and cheap connection between the northern and central areas of the country and to facilitate the connection with the northern neighbors. In the physical plan of Gilan and Mazandaran regions and the set of strategies and policies that were approved by the Supreme Council of Architecture and Urban Development, emphasis was put on constructing a quick connecting road between Tehran and West Mazandaran. This highway is part of the overall north-south highway

which is the shortest connecting route between the Caspian Sea and Persian Gulf and will play a major role in the transit activities of the region. The drawn map for the highway in question starts from west Tehran and goes through Kan, Soloqan, Shahrestanak, Gachsar and Marzanabad regions and connects to the west ring road of Chalus. The length of the highway is 121 km. It has two lanes from each side and three lanes are anticipated for steep bends prone to avalanche. District one of the highway between Tehran and Doab Shahrestanak is 30 km long, district two between Shahrestanak and Pole Zanguleh is 25 km long, district three between Pole Zanguleh and Serahi Dasht Nazir and Marzanabad is 44 km long and district four between Doab (crossing the old road) and Marzanabad to Chalus is 20 km long. This project has 3 phases and is exploited upon construction of 24 parts which is shown in figure 1.

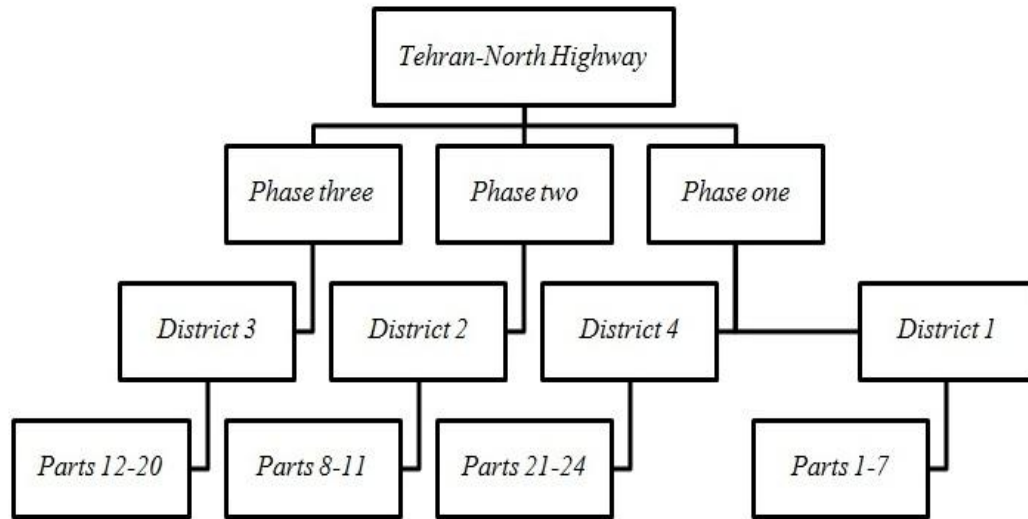


Fig. 1. Characteristics of the Process of Constructing Tehran-North Highway Project.

Generally speaking, Tehran-North Highway has some advantages and disadvantages just like any other project. Increased potential for tourism industry, reduced travel time, reduced delayed time, reduced consumption of fuel, increased capacity of the route, reduced average slope of the route and completion of part of the north-south transportation corridor are the advantages of the project. Going through the jungle, pasture and agricultural farms, passing the rural areas and cutting the rural texture, noise pollution for the villagers (which is against the peaceful tradition of the villages) and very high costs to construct it are among the disadvantages of the project.

In this study, using objective observations, library studies and collecting survey data through interviews, objective questions and observations, district four of the highway (between Chalus and Marzanabad) from the first phase of the project and the quality of connecting and adapting it with the coastline of West Mazandaran province, particularly Noushahr and Chalus are studied aiming to put emphasis on characteristics of sustainable development of the region. Figure 2 shows this territory. Despite the existence of different aspects of the project (according to figure 3) in this research, the characteristics of sustainable development have been studied relying on environmental and transportation approaches within the framework of the following criteria: noise pollution, pollution of water resources and aquaculture, extinction of animal species, extinction of plant cover, waste management, rural texture and body and tourism industry.



Fig. 2. District 4 of phase one of Tehran-North Highway.



Fig. 3. Different aspects of Tehran-North Highway within the area under study.

### 3. Analysis

#### 3.1. Noise pollution

The right to enjoy a healthy, clean and quiet environment is the right of every citizen nowadays. In fact everyone has the fundamental rights to live in an environment that enables him to live respectfully and prosperously. Absence of unauthorized noise pollution beside other factors such as healthy air,

hygienic water and greeneries are the other aspects of this right. This particularly applies to vulnerable people like children and the elderly (Mashhadi, 2007: 61).

The issue of noise pollution caused by transportation in north Iran where the residential texture is located in the vicinity and sometimes completely adjacent to the main roads is of ultimate importance (Fathi Najafabadi, 2007: 79). Generally the effects of noise on human being could be classified into three groups: Effects on human health and effects on human activities such as sleep and rest, anger and annoyance (Sohrabi, 13: 3). From among the indirect effects that the unwanted noises could have on human being, nervous sensitivity, intensive irritation, muscular dystrophy, nervous shock, mental and physical tiresome, dizziness, anxiety, anger and balance disorders could be named (Dabiri, 2006: 375). According to figure 4, it is noticed that the height differences and or retaining walls will have a positive effect the surrounding environment as far as the way the noise is spread from the highway is concerned.

According to the regulations, the minimum width of the noise barrier for residential areas neighboring highways is defined as follows:

-If the type of land is located between the highway and the residential areas and the land is soft and absorbing (pastureland), the minimum noise barrier is 200 meters.

-If relatively dense plant cover is used, the minimum width of the noise barrier is 110 meters.

-If completely dense plant cover is used, the minimum width of the noise barrier is 60 meters.

-If noise dam with the height of 60 meters, 3 meters away from the road edge is used, the noise barrier for the residential areas up to 8 stories is 60 meters (State Management and Planning Organization, 2006: 10).

Considering the existing situation of the region, since the lands surrounding the highway are of soft and absorbing pasturelands and there is no dense plant cover and or noise dam between the highway and the neighboring residential areas, the minimum noise barrier is 200 meters. While the boundary of Tehran-North highway was determined and approved to be 120 meters (60 meters from the highway center to the sides) with 40-meter strip for the space of infrastructural facilities. Although district 4 of the highway has been exploited, no action has been taken to buy the boundaries and many residential units are located in the villages on the way inside the boundary, and this is one of the existing problems, i.e., noise pollution for the inhabitants.

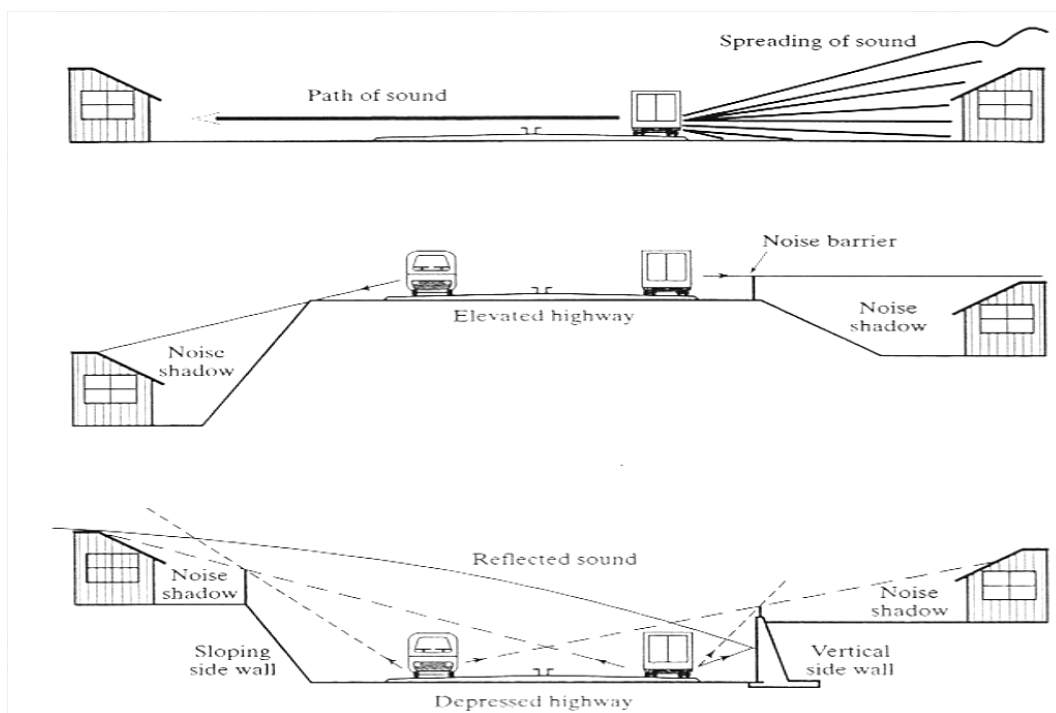


Fig. 4. Different conditions of sound reflection from highway on neighboring uses of land (Papa Costas, 2001: 511).

### **3.2. Pollution of water resources and extinction of aquaculture**

Rivers as one of the most important habitats of aquaculture are one of the ecosystems that are less focused on. Chalus River has a vast drainage basin and a freezing regime and is considered as one of the most important rivers of Mazandaran province. It is one of the five preserved rivers by the Supreme Council of Environment as far as fishery and environmental aspects are concerned. Nowadays, the development of industries, the increased population and lack of suitable environment control have imposed many risks as far as water pollution is concerned. Unfortunately, one basin or region has been taken into account to calculate the water balance more than all and study of the water quality is often forgotten. While the existence of water is useful when it could be used without spending high costs, the water resources of a region could be exploited the best only when the quality specifications of water are known. Principally, the effect resulting from pollutions by natural resources opposite to pollutions by artificial factors (human made), sudden, per time and or seasonally are the cases which are very intensive anyway. One of the most important factors of natural pollutants in this area are floods and or pollution from penetration and feeding of underground waters. In addition to pollutions of natural resources, human-made pollutant sources consist of the existing dams on the way, household sewages, service sewages, agricultural, industrial and mining wastes, sand workshops and Tehran-North Highway in recent years. The main part of this project is in the domain under study which is 200 meters away from the river boundary.

Unclear water and the remains of mud in lower layers and the unsustainability of the river bed reduce the population of the aquaculture plants such as microphytes and seaweeds and as a result it affects the density and metabolism of the aquaculture. In addition to affecting the plants, it affects the variety of aquaculture in Chalus River. There are four types of fish in this river called Salmons, Cyprinidae, stream Sturgeon and Cowfish. Reproduction of Salmons is an indication of the good conditions of the river water for those species. In recent years, the population of the Salmons has reduced drastically and they are now one of the species prone to extinction. The reasons for this were fishing, construction of minor dams on the way that have caused the heavy piling up of suspended materials (as a result of the mentioned factors) on the fish through erosion and blocking their gills (Firouzi Norouzi, 2011: 26).

### **3.3. Extinction of animal and plant species**

Although roads are one of the main components of the infrastructures as one of the indexes of development in every country, they are considered as the main resources to damage the environment such as distorting the habitats and damaging the plant and animal cover (Nejadi et al, 2008: 97). Also highways could pave the ground for changing the land of buildings and or even destruction of the local communicates as a result of moving (Majzoubian, 2000: 43).

#### **3.1.1. Plant cover**

As a result of changed distance from sea level in the jungles of north of the country, the climate has changed and different plant cover has spread throughout the different heights naturally. Abundant moisture and precipitation in coastline of north of the country is the most important factor to form jungle communities in this region. The large number of plant species (famous species) including trees, small trees and plants due to their ecological nature and demand are located in different areas (Siahbisheh Pump Power Plant Project, 2003: 78). Although Tehran-North Highway is considered a national project, there are many traces of damages to the environment such as jungle reserves of Zarinabad Hassanabad in the area of study. Zarbin is one of the species whose cut is banned. In early 1970s, a legal article was passed to prohibit the cut of 13 species that were threatened including Zarbin and the Ministry of Agricultural Jihad was made to specify and protect the areas where these banned species lived and to introduce the offenders to the judicial authorities. The goal to preserve the jungle reserves was to protect the unique natural species which could not be planted or replaced and therefore were nationally valid. According to the international standards, up to one km away from the lands in the margins of highways and expressways were considered as preserved zones to maintain the potentials of the north of the country. Tehran-North Highway will have many ecological damages in long-run and inevitably, these damages should be mainly treated at this point of time. The implementation of projects continue if the

environmental concerns and recommendations are taken into account and the uses of the road margins will be made according to the environmental rules and regulations.

### **3.3.2. Wild life**

Biological environment, particularly animal wild life is remarkably affected by the negative effects of the road construction projects. The studies that were conducted during recent decades on the natural ecosystems introduced roads as an effective factor to intensify the threatening factors of wild animals due to destruction of their habitats and dissection as well as provision of the ground for pollution and irregular hunting of them (Riazi et al, 2006: 53). Tehran-North Highway passes through the preserved zone of central Alborz. These areas have strategic values and national importance that have been selected for protection and enhancement of animal and plant life and prevention of their gradual extinction. Thus construction of new roads in the vicinity and or inside these areas will have possible potential environmental effects (Monavari et al, 2009: 43).

The area under study has different species of wild life and has created important habitats for special topographic and climate conditions. In habitants of this region, different species of animal wild life from mammals, birds, reptiles, the amphibia and fish live. Among different species of wildlife in the region and its surrounding area, panthers, brown bears, pheasants and partridges are of high importance because of having aesthetic and ecological values and are under emphasis as prominent species. It is worth mentioning that the two species of panther and brown bear living in the domain under study are subject to the annexes of CITES convention. This convention was passed in 1973 in order to protect some of the species at the risk of extinction against irregular use of them to control and restrict trading them. This convention has two annexes. Annex 1 consists of animal and plant species that are exposed to extinction at international level and or their population is very low and should be protected and controlled strictly so that their survival not to be put at risk anymore. The entry and exit of these species from the state borders is only authorized under exceptional circumstances. Annex 2 consists of animal and plant species that are not at risk of extinction as much as the annex 1 cases are, but their population is not at a suitable level and if they are not controlled, they might be exposed to the risk of extinction of species. Entry and exit of these species from the state borders depend on very strict regulations (Siahbیشه pump power plant project, 2003: 126).

Further more, one of the most important and major effects of construction and exploitation of this road on the animals of the region could be referred to as the direct effects such as road accidents (death), behavioral changes, splitting the populations, effects from noise pollution of highways on the changes in behavior, reproduction and immigration of animals and its indirect effects including increased access of human beings and as a result increased hunting and collective effects of pollutions from the road. Piling up waste beside the roads leaves important effects on living animals in the ecosystems in the margin of roads (Watson, 2005: 4). Construction of this road could divide the route of immigration and or daily commuting path of wild animals into two groups. Accidents often happen where the immigration route and or the daily commuting path of the animals cross each other. Of course, in addition to this issue, other factors also increase the possibility of accidents by the vehicles. Among these factors, the following cases could be referred to:

- At night the dazzling light of some vehicles confuses a group of animals and attracts them to the middle of the roads.
- Animals such as foxes and badgers use the embankments existing in the margins of the road to construct their nest.
- Animals such as bears and bats use the existing embankments in the margins of the roads to create a nest.
- Animals such as bears and bats use tunnels as their bedrooms.

The warm surface of roads plays an important role to attract animals. This issue is easily noticed in reptiles. In addition to it, it has been seen in some instances that a group of birds stay in the road at night. The reason could be the remained heat at the road level.

### **3.4. Waste management**



One of the major problems of the human societies is production of different solid wastes at different qualities and quantities and their disposal (Monnavari, 1991: 6). The method of disposal and annihilation of waste has turned to one of the principal concerns in urban environment management. The objective is to design and implement a system of urban wastes management to remove the problem of the city and eventually to help the health, hygiene and comfort of the citizens. Currently disposal of wastes is the most common method to dispose of waste in many countries including Iran (Fataei et al, 2009: 146). Urban wastes are one of the components of this group and inattention to them could affect the perspectives of the urban units. Increasing development of urban districts and particularly change of consumption model in the recent decades has caused the volume per capita of the produced waste to increase remarkably.

One of the most important environmental problems in Mazandaran province is waste and it requires serious attention. Solid wastes are of special importance within the framework of the environmental programs of the province. Increasing production of waste has reached a stage that threatens the health of human being and environment increasingly. Most of the regions of Mazandaran province are connected to each other by the sea on the north and the jungle on the south in very short distances, and the surface of soil in these regions is very humid and plain-like. For this reason there is no space to bury waste, and the jungles should be used for this purpose, but in one hand, piling up moist waste in these regions have caused the produced latex of these wastes to enter into the rivers and subterranean waters and on the other hand damage the plant cover of the jungle and it will have the disgusting smell as well (Jamshidi Nitel, 2012: 27). The problems of collecting and disposal of waste, the absence of suitable land and factory to burn the waste and compost are the problems that enhance the difficulties. It should be noted that solid waste comes with the tourists and never goes away, therefore it could be said that unsuitable disposal of waste and sewage pollutes the sea and jungle and reduces the existing beauties (Port and Sea, 2005: 67).

### **3.5. Tourism industry**

Mazandaran province is one of the memorable and beautiful areas of the vast territory of Iran which is full of natural attractions including parks, waterfalls, jungles, dams and attractive and lovely villages and the most important of all is the biggest lake in the world called Khazar Lake. This province has the most famous tourist attractions according to the existing evidences in natural, jungle and ecotourism sectors and that is why it could be the tourist centre of the north. Jungle and sea are located in the region under study and have two different ecosystems that should be particularly noted. As far as environment is concerned, the coastline is very important and remarkably valuable due to having productive and sensitive ecosystems. These regions are where maximum activities and residence of human being is located. This leads to a series of development pressures and its effects that often lead to damage the ecological integrity of the coastline and sea environments (Razavi Fashkouri, 2010: 2). Tourism is the contemporary move of people who want to use their leisure time in places outside home. There are activities that they perform during their stay and facilities that were created according to their requirements. The main responsibility to attract tourists is to protect the tourist resources and it should be sufficiently tried hard to determine the necessary rules and regulations to maintain boundary of roads and passages, where the rivers pass as well as determining the type of land use. The construction regulations could protect the natural specifications of the region and prevent any action that might damage it employing sufficient care. Anyhow attention to the advantages of tourism should not make us forget about the undesirable aspects of this phenomenon. The study that was conducted by the UN regarding the impact of tourism on developing countries showed that despite the fact that tourism industry is meant to bring economic development to the host countries and strengthen cultural exchanges, unfortunately, it causes some social and environmental disorders too (Nazeri, 2010: 13, 14). It was found out during studying and interviewing that unfortunately the responsible factor to destroy environment is a souvenir brought by tourists and government to the local people. Demolition of environment threatens all the life aspects of the people of West Mazandaran (Ebdali, 2009: 2).

One of the prominent effects that tourism will have on the region are as follows:

Cultural-social effects of tourism: When a large number of tourists immigrate from one region to another, they convey the way they behave, the way they are dressed, the way they eat food and their special culture to that society that might be different from their cultural values. This will put the ethical



system of the host society at risk by inattention to the local traditions and consequently fundamental loosening the local lifestyle. On the other hand, the positive cultural and social aspects of tourism could include cultural exchange among different countries and regions and increase social insight and international understanding.

Environmental effects of tourism consist of what exists in the nature such as water and air, land and its soil, topography, geology, water resources, plants, animals and ecological systems. There is another environment which is made by human and implies human-made consequences which have generally different buildings and structural development such as historical and ancient venues.

Tourism and economic effects: Tourism has inevitable effects on the environment as an economic activity. As environment is an important part of tourism. It is inevitable to support and protect ecosystem resources including natural, cultural and historical resources. One of the tools that could be used to support and optimize use of environmental resources is tax policies (Lima et al, 2005: 1433). The necessity of management of tourism industry in the region is a management program proportionate to the environmental, social and economic characteristics. Compilation of this program helps manage tourism and understand the relevant facilities to it (Moharamnejad, 2009: 238).

### 3.6. Rural texture and body

Speedy growth of urbanism has caused the physical atmosphere of the cities to expand and it has threatened the rural habitats around the cities too. This threat in addition to mega cities is very serious regarding the northwest cities of Mazandaran, particularly Chalus (due to Tehran-North Highway). Thus every rural habitant which is located in the margins of these urban centers is exposed to physical expansion of the city and faces a twofold challenge:

- Due to expansion and advancement of the city body, the surrounding villages are exposed to transformation and merger with the texture and body of the city.

- The villages are affected by the economic and social developments and the external forces of the internal body of the villages and are about to disintegrate structurally and functionally.

Furthermore, four highways in the region according to figure 5 going through the body of the villages on the way (Sinva, Sinva Cheshmeh, Sarcheshmeh, Pole Karat, Shahrara, Mazooposhteh, Darkola Olia in eastern Kelarestan part of the central district of Chalus-7 villages with the population over 5000 people) and creating a rift in the rural texture have disturbed and distorted the method of connection, quality and integrity of these habitats. The increased price of land, demolition of residential houses, immigration from village, huge restriction to access the river, destruction of agricultural lands, restriction of livestock farming of the villagers, land slide in the vicinity of trenches and excavations as well as disturbing the peace and silence of the villages could be named among these disturbances.

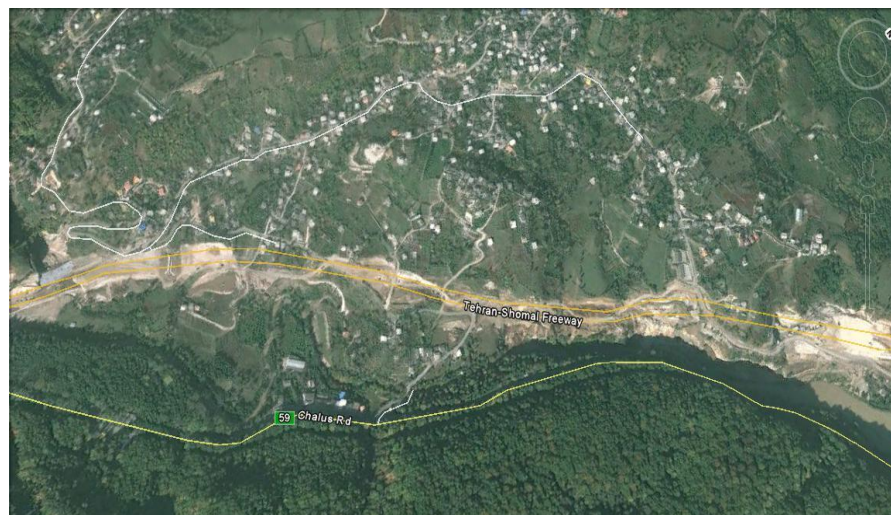


Fig. 5. Body and Texture of part of neighboring villages to district four of the Highway.

#### 4. Conclusion

Tehran-North Highway is one of the most important elements of transportation in the process of sustainable development of the north of the country and the conducted analyses in this study show its positive and negative effects on sustainable development of the ecosystem of coastline of West Mazandaran, particularly Noushahr and Chalus as per table 1.

But paying attention to the existing negative consequences to reduce the negative effects of the project on the region under study and to some extent removal of those effects could present solutions to reach sustainable development of the region as per table 2.

**Table 1**

Positive and Negative Effects of Tehran-North Highway on Sustainable Development of Coastline.

<b>Negative Effects</b>	<b>Positive Effects</b>
Passing through jungle, pasture and agricultural farms texture	Increased potential of tourism industry
Passing through rural areas and intruding the rural texture	Reduced travel time
Noise pollution	Reduced delay time
High construction costs	Reduced consumption of fuel
Destruction of a considerable part of the plant cover of the region	Reduced vertical and horizontal slopes and bents of the road
Extinction of animal species of the protected zones of Central Alborz	Increased capacity and security of the road
Disappearance of water resources and aquaculture of Chalus river	Completion of a part of international transportation corridor
Lack of preparedness of the regional cities to receive and attract tourist visits as far as infrastructural and management facilities are concerned	Increased commercial and trade exchanges
Absence of suitable mechanism for waste management	Development of transportation infrastructures of the region

**Table 2**

Negative Consequences of Tehran-North Highway and Solutions to reach Sustainable Development.

<b>Negative consequences</b>	<b>Solutions to reach sustainable development in the region</b>
Noise pollution	<p>To plant trees and plants around the road.</p> <p>To create obstacle to reduce the noise produced by the vehicles.</p> <p>To construct acoustic wall in residential areas, particularly in rural areas.</p>
Pollution of water resources and extinction of aquaculture	<p>To prevent land slide and fall and other major movements of land, embankments should be done and stabilized by using suitable construction materials such as retaining walls.</p> <p>To increase the suspending materials from erosion, the erodible surfaces could be protected from erosion by plant cover to prevent erosion.</p>
Extinction of animal and plant species	<p>To prevent the reduction of area and destruction of wildlife, the remaining roads should go through the parts that inflict the least damage to the sensitive ecologies.</p> <p>Fencing should be made to prevent the animals to enter the road.</p> <p>Using underground passages or flyovers and connective holes inside the concrete walls to allow the animals go through the underground passages.</p>
Lack of a waste management mechanism	<p>It is necessary to implement a solid waste managed program to collect the wastes in the region.</p> <p>To give priority to other methods of waste disposal for coastline areas and pay special attention to the current operation of waste disposal in this type of cities.</p>
Unsuitable management of marginal uses	<p>To specify the legal boundary of the road and to prevent any aggression of it.</p> <p>To pay compensation to the inhabitants who have lost their lands and or the use of their lands have changed in order to prevent inflicting loss on them.</p>
Tourism Industry	<p>To receive tourist visiting fees from the tourists using the tourist resorts existing in the region.</p> <p>To reinforce the research and educational budget for the capacity of the tourist resorts in the coastline under study.</p> <p>To implement tourism management program proportionate to the environmental, economic and social characteristics.</p>
Lack of preparedness of northern cities	<p>It is suggested to manage West Mazandaran as an independent and separate province to manage it comprehensively and qualitatively.</p> <p>To provide infra-structural facilities and services for the welfare, commercial, medical treatment sectors.</p> <p>To provide vast cultural and social arrangements to treat the vital resources correctly and use them properly in north of the country.</p>

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