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Research Article

EVALUATION OF THE ECOLOGICAL CAPACITY OF GHAEMSHAHR PROVINCE TO PRIORITIZE DEVELOPMENT-PRONE ZONES

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ABSTRACT
In this descriptive-analytical article, ecological uses capacity in Ghaemshahr Province is investigated. For this purpose, the required layers and data are collected and analyzed using Makhdum model. In addition, ecological potential of the investigated zone is studied for each uses in GIS. Then, the map of optimal uses is prepared in different (first and second) classes, based on which agricultural and forestry uses with the total of 37.332 and 4188 hectares are placed in the first and second categories. In the second class of optimal uses, extensive recreation of the first category, with 43848 hectares area, is ranked first, aquaculture activity with 40.168 hectares is ranked second, and intensive recreation of the first category with 32.201 hectares is ranked third.

Keywords: *Evaluation, Ecological Potential, Optimal Uses, Ghaemshahr*

INTRODUCTION
Today, population growth, expansion of human activity in the nature, inappropriate land uses, and uncontrolled and non-normative exploitation of water, soil, and vegetation resources have faced a wide area of the country with the risk of desertification and land degradation, leading to vegetation degradation, erosion and loss of soil fertility, production decline, unemployment, and negative social, economic consequences (Bayat *et al.*, 2011).
On the other hand, appropriate urban development is achieved when the land is used according to its potentialities and capabilities. Based on this, realization of the land potentials before settlement and loading urban uses and activities on it is very essential. Otherwise, the development of cities and settlements will be done in a way that natural and ecological resources will hinder the continuation of activities and waste many of investments (Pourjafar *et al.*, 1391). Therefore, it can be said, explicitly, that the most important factor in the occurrence of today's environmental problems is irrational use of land (water and earth) (Bahrami, 1373). In addition, it can be concluded that the natural environment is ecologically limited (Amiri *et al.*, 1388). Thus, ecological potential of every land for the desired development should be evaluated before any interference.
Evaluation of the ecological potential is the estimation of potential use of land for agricultural, range management, forestry, park (tourism conservation), aquaculture, military engineering, urban and industrial development applications, within industrial, agricultural, service, and business framework (Azizian,1392).
The evaluation of ecological potential is the estimation of potential capacity and inventory of the land based on predetermined and preplanned criteria and measures. These studies are employed as a basis for land use decision making and planning across the world (Firozi, 1392). That is, finding out the applicability of lands and regions. In effect, potential evaluation is a large step towards a plan for stable development. Since, with identification and assessment of ecological features in each region, development plan can be devised in compliance to the nature; Therefore, evaluation of ecological potential as a basis for surveying the land and environmental planing is inevitable for the countries seeking stable development without costing the interests of future generations (Tofigh, 1384). Finally, the way the appearance of human-made environments is organized should clearly reflect the optimal national

development in every country. In addition, ecological potential of an environment should express the development flow in that land (Qragvzlv, 1384).

Therefore, in this study, it is sought to explain the optimal uses of the lands under investigation for different activities such as forestry, agriculture, range management, aquaculture, settlement development, and establishment of settlements and business, tourism, and environmental preservation centers by identifying and determining ecological capacities of a large area in Ghaemshahr. Consequently, appropriate and required corrective actions and plans are developed for the qualitative modification and promotion of the lands with limitations for optimal land use.

It is a descriptive-analytical research, in which library, literature review, and field observations have been used as data collection instruments. The process of ecological potential evaluation in the present study includes three main stages, through which ecological potential of the investigated area is determined:

First- Identification of ecological resources;

Second- Analysis and summarization of the data;

Third- Land evaluation and classification;

To evaluate ecological potential of the region, ecological unit maps should first be prepared. Then, the potential of each unit should be determined for agricultural, range management, forestry, aquaculture, recreation, urban, industrial, and rural applications. To assess ecological potential, required information and maps are collected. Then, with the combination of maps on a certain pattern using GISs, including ARG GIS and ARC VIEW, type maps were developed with different degrees. In general, the model used in this study is based on a model known as "Dr. Makhdum."

Investigating the geographical location, natural and climatic conditions, and water resources of Ghaemshahr: Ghaemshahr is located at 36º29'N latitude and 52º53'E longitude. With 45.722 hectares, it accounts for 2% of the whole area in the province. In terms of relative position (Figure 1), Ghaemshahr is -surrounded by Joybar and Babolsar from the north, Sari from the east, Babol from the west, and Savadkoh (Zirab, Shirgah, Polsefid, and Alasht) from the south.

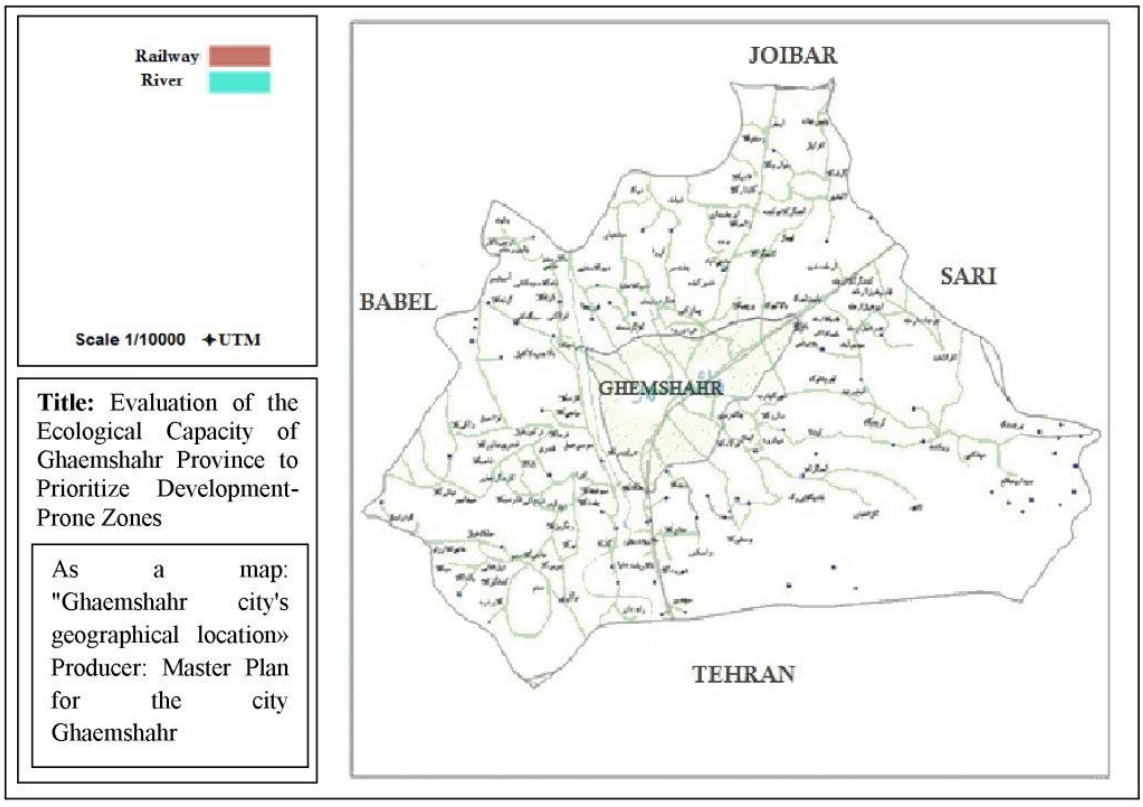

Figure 1: Geographical location of Ghaemshahr City [PERSIAN FONTS]

It has road connection with the main cities within the province, which meets major economic activity requirements of Mazandaran Province. It is located about 25km from Sari (capital of Mazandaran) and 230kn from Tehran. Ghaemshahr, located in Mazandaran Province, has a temperate climate. This region is located in eastern part of the deep plains, surrounded by Alborz Mountains and Caspian Sea, where the humidity and moderate climate are less than the western part, where Caspian forests are. It is 51meters above sea level, and its soil, as one of the best for farming purposes, is suitable for agriculture. Its climate is affected by the sea, natural vegetation, and its altitude. Ghaemshahr, located in Mazandaran Province, has a temperate climate. This region is located in the eastern part of the deep plains, surrounded by Alborz Mountains and Caspian Sea, where the humidity and moderate climate are less than the western part where Caspian forests are. The mean temperature ranges from 34.5 to 1.12 (Amkv, 1356). Water resources include surface and underground waters. Two rivers, namely Saihrood and Telar, originated from the southern mountains and flowing into the Caspian Sea, are running on the eastern and western parts of the city, respectively. The depth of underground waters differs in various parts of the city.

Optimal Uses of the First Group:

1. *Optimal Use for Forestry*

It almost can be said that Ghaemshahr lacks forestry-prone lands at the 1st, 2nd, 5th, 6th, and 7th classes. The 3th and 4th classes account for the most suitable lands for forestry with 1.772 and 2.295 hectares, respectively, which cover 9% of the city's total area. Distribution of the lands is mostly in the southern part of the city. It has 4.188 hectares lands suitable for forestry.

2. *Optimal Use for Agriculture*

As can be seen in Figure 2, the largest part of the city is suitable for optimal uses of the 1st and 2nd classes, with 13.300 hectares area. Each of these lands covers 29% of the total area in the city. In addition, 58% of the lands withing Ghaemshar are placed in the 1st and 2nd classes, which cover 26.679 hectares. The city's lands are mostly distributed in the plain part of it. They are followed by the 4th and 6th classes, each of which almost covers hectares of the province lands (18% of it in total). Distribution of these lands is in the southern and foothill areas of the city. Agricultural lands accounts for 80% of Ghaemshahr area.

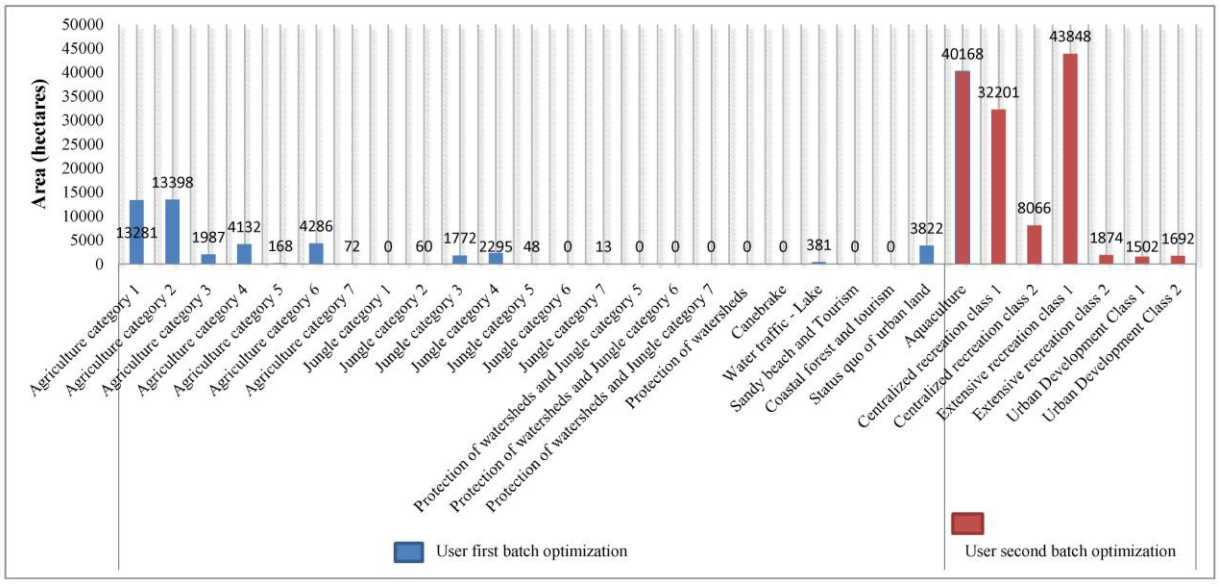

Figure 2: The share of optimal uses in Ghaemshar

3. *Protected Areas*

What is meant in this study of environmental protection differs from what was meant 40 years ago. Previously, environmental protection referred to confining and limiting both natural and cultural resources; while, it now means maintenance and development of resources for the present and future

generations. In this regard, protection is considered essential for development, and vice versa. In fact, conservation and development are interdependent. However, Ghaemshahr lacks protected lands in the first class of the uses. The distribution of the lands, suitable for the first class optimal uses, has been shown in Figure 3.

Optimal Uses of the Second Group:

1. *Aquaculture Uses*

Usually, lands are taken suitable for aquaculture depending on the regional water level, regional water flow system, micro-climatic conditions, type and extent of suitable soil, which all are of ecological parameters. According to these interpretations, the major part of Ghaemshahr lands (87.7%) has been determined suitable for aquaculture.

2. *Ecological Potentiality for Tourism*

To determine the land suitability for tourism uses, certain ecological models have been developed, which allow the evaluation of lands potentiality and capability for the development of tourism activities. In such models, tourism activities are taken in two states, namely intensive (i.e. in closed environments) and extensive (i.e. in open environments).

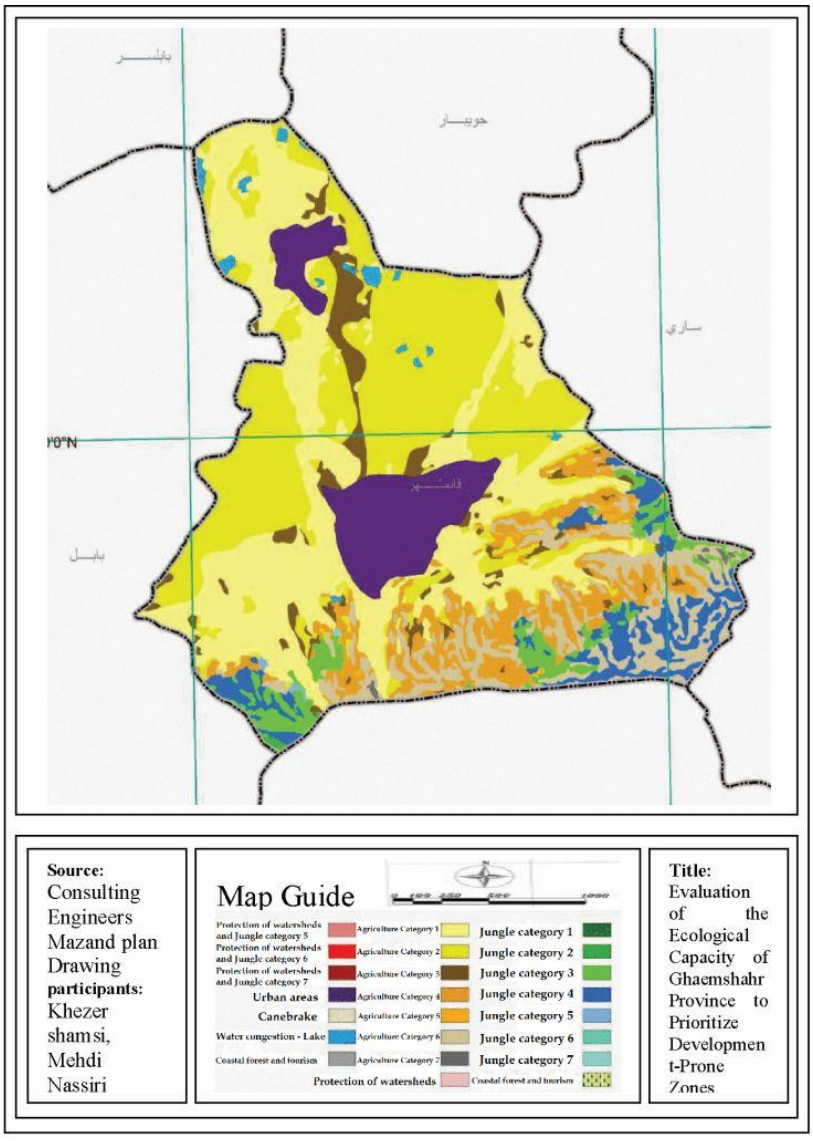

Figure 3: Ecological potential of Ghaemshahr areas (1st class)

Therefore, to evaluate potentiality, different factors are used depending on the requirements of above activities (Farajzadehasl, 1384). Intensive recreations, that require developmental measures, are such activities as swimming, skying, picnicking, camping, cycling, and visiting cultural works. Extensive recreations include those activities that are not in need of development, like hiking and haunting, or are in need of slight development, such as fishing, cross-counting, horse riding, and watching animal in nature (Makhdoom, 1385).

A large area in Ghaemshahr has been evaluated suitable for tourism activities, in both intensive and extensive forms. In terms of intensive recreation, almost 40.267 hectares of its lands have been assessed suitable for tourism activities; out of which, 32.201 hectares belong to the first class and 8.066 hectares belong to the second class. With respect to the extensive recreation, all areas in the city have been assessed convinient for these activities; out of which, 43.848 and 1.874 hectares are placed in the first and second classes, respectively. The distribution of the both types of the recreations are the same, in that their first class are mostly distributed in the plain areas, northern part of the province, and their second class is mostly distributed in the foothills, the southern part of the province.

3. *Optimal Uses for Urban, Rural, and Industrial Development*

Out of 45.722 hectares of Ghaemshahr area, 1.502 and 1.692 hectares have been evaluated as the first and second classes of development. These lands cover 3% and 4% of the province area, respectively. Lands of the first class urban development are mostly distributed in the northern half of the city, in plain areas. Lands of the second class are scattered in the southern half of the province, in the foothill areas. Distribution of the lands suitable for the optimal uses of the second class has been shown in Figure 4.

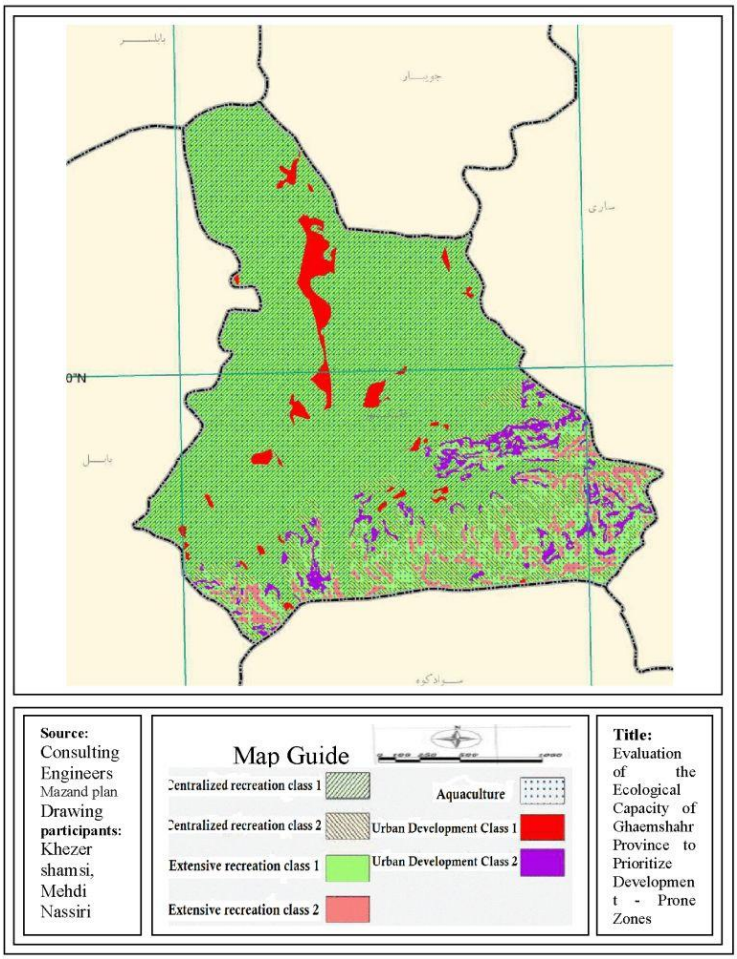

Figure 4: Ecological potential of Ghaemshahr areas (2nd class)

RESULTS AND DISCUSSION

In some environments, nature is prone to the development with the slightest amount of damage. In some other environments, even the slightest development leads to environmental degradation. This means that for the purpose of environmental development, before planning for using it, its ecological potential should be evaluated based on a logical planning framework. Environmental planning of the land includes the prediction or evaluation of its quality for required uses and for determining its managerial requirements.

Evaluation of Iran's ecological potential is based on a multivariate evaluation. Regarding the unique ecological characteristics of each region, what is obvious is that the evaluation of ecological potential of each area has its own specific criteria and measures. Accordingly, potentialities of Ghaemshar lands for different uses such as agricultural, forestry, aquaculture, urbanism, industrial, protective, recreational are determined, based on ecological potential evaluation model at different degrees. Based on the evaluated and determined ecological potentials, in total, 26 types of optimal uses have been identified across Mazandaran Province, in regional forms. Majority of the uses are determined based on agricultural and forestry models, leading to different types of agriculture (degree one to seven), forestry (degree one to seven), and protection of forest areas. To put it more accurately, regarding the desired target type in evaluation of ecological potential, agricultural and forestry ecosystems with certain, graded areas and borders, each with its own criteria and measures, have been generated. The mentioned maps (2 and 3), show the extent and distribution of different types of optimal uses across the city. As can be seen, these uses have been categorized and provided in two classes (i.e. 1st and 2nd), in which agricultural use with 37.3332 hectares, in total, covers the largest area in the first class of optimal uses. The first and second agricultural classes with almost 13.300 hectares account for the greatest parts of these lands, and are ranked first. They are followed by forestry uses with 4.188 hectares in total. The 3th and 4th classes account for the most suitable lands for forestry with 1.772 and 2.295 hectares, respectively, which cover 9% of the city's total area. In the second class of optimal uses, extensive recreation of the first category, with 43.848 hectares area, is ranked first, aquaculture activity with 40.168 hectares s ranked second. In addition, the intensive recreation of the first category with 32.201 hectares is ranked third. Regarding the results of this study, it can be concluded that agricultural activities in the first class and optimal activities in the second class have required potential and capacity for future development and investment, either by the junior managers of the city or its citizens.

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