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ARTICLE

Evaluation of Ecological Capability and Current Establishment of Industrial, Rural, and Urban Development Using GIS in Parts of Fars Province, Iran

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ABSTRACT

Land utilization without considering suitability can lead to capital loss and environmental degradation. Effective land use planning is crucial for managing environmental resources. The present study in three counties of Fars Province in southern Iran confidently assessed the ecological capability for industrial, rural, and urban development. This study employed a rigorous methodology to examine six general criteria (physiography, soil, geology, vegetation, water, and climate) and 16 indicators linked to these criteria. The Iranian ecological model served as the foundation for this analysis. A Geographic Information System (GIS) was used to overlay ecological indicator layers and determine the final suitability map. Consequently, following the Law of Maximum Limitation and Boilen's logic between the indicators, the final suitability map was determined. The resulting map classified areas into nearly suitable and unsuitable. Furthermore, the study evaluated the current industrial, rural, and urban land uses by overlaying these layers on the ecological capability map. The findings revealed that a widespread area of urban, industrial, and especially rural areas is classified as unsuitable, highlighting the disregard for environmental capacity in land development. These critical findings emphasize the necessity of conscientious land use planning to mitigate environmental challenges stemming from rapid development.

Keywords: Ecological capability; Land use; Development; Kavar; Kharameh; Sarvestan

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1. Introduction

Throughout, human history, various crises such as wars, famines, and diseases have emerged, each creating significant challenges in their respective times. However, the scale of these crises has never matched the magnitude of the current crisis. This crisis is largely a result of human actions, particularly those of urban dwellers. While civilized human settlements, including cities, ports, and roads, only occupy around 2% of the earth's surface, the impact of human development is felt across the entire planet. The remaining 98% is affected by the desires and necessities of the population residing in the 2%, leading to the annual conversion of 15 million acres of farmland into urban areas or the transformation of once fertile lands into deserts due to human inaction[1].

Humanity was once an integral part of nature, but today, it has established dominion over the natural world, viewing it merely as a means to an end. The exploitation and destruction wrought by urban societies upon the environment mirror the impact of major natural disasters such as floods and earthquakes[2]. This regression is also evident in Iran, where 1.5 billion tons of soil are eroded annually, 48 thousand hectares of forests are lost yearly, and 130 thousand hectares of pastures are degraded due to inadequate natural resource management. The key to sustainable development and optimal resource utilization is assessing and planning according to the land's capability[3, 4].

The land and natural environment are the platform for urban development. On the other hand, it is an irreplaceable resource that cannot be revived if it is misused and destroyed in many cases, even by spending large budgets. Therefore, it is necessary to use it with thought and planning. The adverse effects of any activity incorrect planning and inappropriate use of the land usually affect the life of the entire city for a long period. In some cases, even the hope of returning to the thresholds of the acceptable limits of the environmental capacity is no longer available [5].

Today, with the complexity of urban issues, increasing population, diversity, and multiplicity of needs and requirements, cities cannot be left alone to grow unbridled and continue their life. Therefore, urban development plans are considered the most fundamental means of shaping cities based on pre-planned order and plan. The preparation and implementation of urban plans in general and comprehensive plans, in particular, are appropriate for the more complex, developed, and extensive living conditions in contemporary cities, and the variety of needs and requirements resulting from it. During the 40s and 50s, traditional planning methods in practice lost the ability to solve the problems of urban society through the preparation, implementation, and evaluation of development, on the other hand, the public trust was also deprived of the efficiency of these plans[6].

In the wake of the devastation wrought by the exploitation of natural resources and the emergence of environmental crises, humanity came to recognize the necessity of formulating a systematic approach to ecological exploitation informed by an understanding of the geographical features that shape the environment. Knowing the geographic characteristics of the environment from its natural, social, and economic points of view, can lead to the breadth of insight and knowledge about the environment, and on the other hand, it can provide the possibility of any measured and thoughtful movement in the environment by humans in the form of an orderly method. Therefore, knowing the components of elements and constructive and effective factors in the environment is a prerequisite. It is a deliberate movement by humans to manage the environment and in the environment [7]. Because the development of cities cannot be limited, they must be adapted to the needs of today and tomorrow, in such a way as to prevent damage to the environment [8].

The planning of uses with the view of land use or ecology is the only logical solution to break the environmental crisis and the cycle of poverty in society and create the necessary platform to achieve sustainable development [9, 10]. For this reason, one of the most important issues that are emphasized in all regional development programs, both rural and urban, is the evaluation of environmental capabilities as one of the dimensions of sustainable development in such a way that regardless of the concept of sustainability Any new discussion about development is considered incomplete [11, 12].

In Iran, achieving land development involves a comprehensive, multi-factorial evaluation of the ecological potential of the environment. This evaluation includes comparing the bio-environmental units' ecological characteristics and Iran's ecological capability models to classify the land for sustainable development effectively. To assess the environmental potential of urban, rural, and industrial development, a model with three classes of potential (suitable, moderately suitable, and not suitable) was developed[13, 14]. In any case, sustainable and appropriate development requires land use planning based on an assessment of environmental potential [15].

It is essential to have a plan based on a comprehensive assessment of the natural environment to achieve sustainable development. Considering that the natural environment has a limited ecological capacity for human applications, ecological capacity assessment as the core of environmental studies provides a suitable platform for environmental planning by preventing existing crises. The analysis of land suitability for urban development is one of the main categories that urban planners deal with[16]. The purpose of assessing the potential of the environment (economic potential, social and ecological potential) is to estimate the possible human use of the land for various agricultural, pasture, forestry, park management (protection, tourism), aquaculture, engineering, and military affairs, and urban development, industrial and rural in the framework of agricultural, industry, service and commercial uses[17].

Urban development plans continue to evolve, intending to serve humanity and follow the example of sustainable development components, moving towards becoming more efficient. Meanwhile, the level of success, realism, and humanity of the plans can be revealed by achieving the goals of the plans. On the other hand, the provision of basic services and human and urban infrastructure for the comprehensive development of human settlements is one of the important goals of these plans[18]. Environmental capability assessment is a collection of environmental data that is effective in the human economic exploitation of the environment and is in line with human economic activities in the environment [19]. Therefore, the capabilities of the natural and human environment include both the potential of the existing situation and the latent potential of the region, and these latent potentials have a wide scope, which can be easily identified and evaluated in the future [20]. A part of the land preparation process is the evaluation of the ecological capacity, based on which the capacity of each area is evaluated in line with specific uses, and the capacity of the area is graded and determined based on scientific components. Ecological capability smooths human activities in the territory in line with the talent and capability of each region to achieve sustainable development [21].

Evaluating the ecological potential is due to the necessity of optimal selection and utilization of the ecological potential of the land in the form of environmental planning and management studies to achieve the principle of sustainable development [22, 23]. Since urban growth and development are inevitable, therefore to prevent complications, problems, and irreparable changes in the structure, function, and ecological process of the city bed and to harmonize the man-made environment with the natural environment, it is necessary to have principles and standards, and policies for the ecological sustainability of the city should be taken into consideration[5]. In this regard, the geographic information system (GIS) with high capabilities in data management and providing new data is proposed as an efficient tool in environmental planning[24]. The objective of utilizing this system is to provide support for the formulation of space-related decisions[25]. One of the most significant capabilities of a geographic information system is its ability to integrate data for modeling, locating, and determining land suitability by evaluating land area [26].

Pour Ebrahim (2001) [27] in determining the future development of Qeshm Island, used the method of systematic analysis and optimal integration and superimposed it on appropriate planning units to determine the types of uses, including the use of urban development. Mozaffari and Olizadeh (2007) [28] determined the optimal directions for the future development of Saqqez city using a descriptive-analytical method, with the help of GIS software. Sudhira et al. (2004) [29] investigated the parameters, dynamics, and modeling of urban expansion with the help of GIS in Mangalore City, India. After that, they made it possible to predict the type of future city expansion. Sante Rivera et al. (2008) [30] performed the localization of rural land use in the Tracha region of Spain with the help of a GIS-based planning support system.

By studying the physical and biological factors involved in the use of urban, rural, and industrial development, this research aims to determine the quality of Kharameh, Sarvestan, and Kavar counties in terms of their use. To achieve this aim, the ecological suitability of urban, rural, and industrial development is evaluated through the mapping of each of these factors.

2. Material and methods

2.1 Study area

Kavar County, with an area of 106,596 ha, is one of the counties of Fars province. The population of Kavar is 77,836 people. Kavar city is located at 29º and 12′ north latitude and 52º and 41′ east longitude and has a mild Mediterranean climate. The average height of Kavar County is about 1550 m above sea level.

Kharameh County, with an area of 151,689 ha, is one of the districts of the province of Fars. Kharameh County's population is 61,580. Kharameh County has a mild mountainous climate. Kharameh city is located at 29º and 30′ of north latitude and 53º and 19′ of east longitude. The average height of the County of Khorameh is about 1500 m above sea level.

Sarvestan County, with an area of 170,841 ha, is a county of Fars Province. Sarvestan County's population is estimated at 40,531. The average annual rainfall is estimated at 220 mm. Sarvestan city is located at 29º and 16′ north latitude and 53º and 14′ east longitude. The average height of Sarvestan County is about 1557 m above sea level. The location of these areas is shown in **Figure 1.**

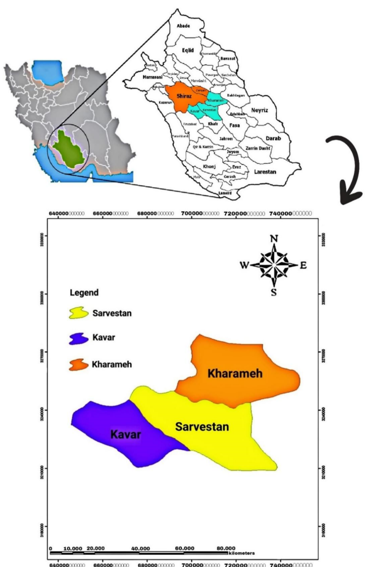

Figure 1. Location of Kavar, Sarvestan, and Kharameh counties in Fars Province and Iran.

2.2 Methodology

In environmental planning and prevention of environmental destruction along the goals of sustainable development, optimal use of natural environment resources and land use arrangement based on its natural environment capability play a great role. One of the ecological capability assessment models is the Iranian Ecological Model [31] used in this research. One of the ways to determine optimal land uses is to evaluate the ecological potential. The applied ecological model of urban development is divided into three classes: 1 to 3, as the capability and quality of urban development decline [31]. To assess the development capability, a systematic analysis was conducted using the multi-factor evaluation method, which is a standard approach for evaluating resources.

The geographic information system (ArcGIS 9.3 software) was employed in the present research to identify, process, and analyze data to reduce the time and cost involved in capability assessment and land planning. In this study, ecological parameters (physical and biological) are used for evaluating the ecological potential of urban, rural, and industrial development including elevation, land type, rainfall, slope, dominant wind speed, relative humidity, temperature, geology, soil drainage, soil depth, evolution (structure), soil texture, gravel amount, erosion, water discharge, vegetation density.

In addition, the research provided the percent of capability classes used in estimating the current distribution of urban, rural, and industrial land use. For this purpose, the urban polygon layer, and points of rural and industrial areas were located on the map of ecological suitability of development, and the state of these areas was identified. **Figure 2** illustrates the operational sequence of the programmed model.

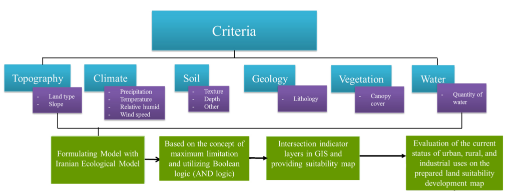

Figure 2. Flowchart of the method used to evaluate the ecological capability in this research.

Assessing the environmental suitability of the land

In the process of analyzing the data, the various classes of each information layer were classified based on their functional parameters associated with urban development derived from the ecological model of Iran. The codes play a crucial role in identifying the subject data types in the computer and model, as Makhdoum et al. (2018) discussed [31]. Each layer was categorized into three classes based on the model's three different classes (**Table 1**). During the process of combining the pertinent layers, various functions such as overlying functions, Boolean logic (AND logic), integration, cutting, and margin in the geographic information system were employed to merge the layers effectively.

The major and minor fault boundaries were unequivocally set at 1000 m and 300 m per the regulations stipulated by the Ministry of Housing and Urban Development. The river boundaries were also mandated at 1000 m per the stringent guidelines outlined by the Ministry of Energy. The study area's estimated area of urban use stands at an unwavering 1750 hectares.

Moreover, when introducing residential and industrial zones in a region, it is imperative to adhere to a set of ecological parameters [31]: 1- Ensuring a stable and harmonized support for the weight of the buildings. 2- The process of absorption and decomposition of waste, sewage, garbage, and polluted air resulting from construction activities is a crucial aspect of environmental management. 3- Providing the preferred landscape, views, and green spaces from an aesthetic point of view and reducing air and noise pollution.

In this investigation, we meticulously assessed the land's characteristics in the ecological development model to categorize the ecological capability of the specified area. According to the ecological capability model, the area is deemed incapable if just one indicator exhibits inappropriate characteristics. Furthermore, for an area to be classified in the first class, all indicators must meet the conditions of the first class in terms of ecological characteristics (Boilen logic of And). This thorough evaluation methodology diminishes the likelihood of an area meeting all the first-class conditions. Areas that do not fit into the first or inappropriate classes are categorized as the second appropriate class. The present study examined six general criteria: physiography, soil, geology, vegetation, water, and climate (**Table 1**). In this way, each criterion and the final class of suitability were determined based on the law of maximum restriction between the indicators and the six criteria. These six criteria are mentioned below:

1) Physiography: this criterion includes slope, elevation, and land type indicators. Physiographic indicators are essential for urban and industrial development for various reasons. These indicators encompass the physical and geographical features of the land. Topography plays a significant role in determining the land's suitability for construction, with flat terrains being favored to minimize costs. Furthermore, physiographic features influence the layout of crucial transportation infrastructure, such as roads and railways. Understanding these indicators aids in assessing risks associated with natural disasters, leading to more resilient urban and industrial planning.

2) Climate: this criterion includes indicators of annual temperature, annual precipitation, relative humidity, and prevailing wind speed. Residential areas must prioritize building infrastructure and public services that can endure extreme weather events. By utilizing climate indicators, areas at risk of flooding, heat waves, and other climate-related hazards can be pinpointed. Governments must integrate these indicators into building codes and urban planning regulations to ensure that new developments are both environmentally sustainable and compliant with climate resilience standards.

3) Geology: this criterion includes an indicator of lithology along with fault and waterway conditions. Understanding the geological and hydrological aspects of an area is crucial for safe and sustainable urban and industrial development. Comprehensive assessments help optimize resource use, protect the environment, and ensure the well-being of communities. The type of bedrock and soil composition directly impact structural stability, making it essential to consider these factors in development projects. Geology assessments also help in mitigating natural disaster risks such as earthquakes, landslides, and sinkholes. Identifying and mapping fault lines is crucial for assessing earthquake risk while planning urban development around floodplains helps mitigate potential flood damage.

4) Soil: this criterion includes indicators of texture, depth, gravel amount, erosion, evolution (structure), and drainage conditions. Understanding and managing soil conditions is crucial for the successful and sustainable development of urban and industrial areas. Thorough soil assessments guide engineering decisions, environmental protection measures, and land use planning, ultimately enhancing the resilience and quality of life in developed regions. Soil conditions directly impact the load-bearing capacity of the ground.

Substandard soil conditions, such as high compressibility or low strength, can result in foundation issues, leading to uneven settlement or structural collapses. Additionally, soil permeability influences water drainage and the potential for flooding. Considering that urban development can disrupt natural water flow, comprehending soil drainage characteristics is imperative for developing effective water management systems. Conducting proper soil analysis can prevent costly construction delays, repairs, and failures. Investing in soil testing and appropriate foundation design can lead to significant long-term cost savings.

5) Vegetation: this criterion includes an indicator of canopy cover in % (in pasture and forest area). Urban and industrial areas benefit from vegetation canopy cover but also face challenges. The current model focuses on the negative impacts of vegetation on the development process. For instance, tree roots may cause damage to sidewalks, roads, and underground utilities, resulting in additional repair costs. In regions with a high density of vegetation (more than 50% cover), it is crucial to prioritize environmental considerations and preservation efforts for pastures, forests, and their associated benefits. It is highly recommended to safeguard these areas and avoid encroaching on their natural resources.

6) Water: this criterion includes an indicator of the quantity of water for everyone (Lit/day). Water is crucial for the growth and operation of urban and industrial areas. It is imperative to implement effective management and conservation strategies to ensure the availability and sustainability of this vital resource for future generations. Clean water is essential for drinking, cooking, and personal hygiene, playing a fundamental role in human health and well-being. Furthermore, parks, gardens, and recreational facilities rely on water for maintenance, while urban water bodies such as lakes and fountains enhance the aesthetic appeal of a city. In addition, many industrial processes depend on water for cooling, cleaning, and as a component of manufactured products.

Table 1. The indicators used in the model of urban, rural, and industrial development.

Criterion	Indicators of each criterion	classes		
		Appropriate		Inappropriate
		Class 1 (suitable)	Class 2 (semi suitable)	Class 3
Climate	Average of annual rainfall (mm)	500–800	50–500 or	<50
	Average of annual temperature (°C)	18–24	24–30 or 18>	>30
	Prevailing wind speed (km/h)	<35	35–60	>60
	Relative humidity (%)	40–70	40> or 70–80	>80
Physiography	Land Type	Plains except of flood plains	Plateau & upper terraces, alluvial- colluvial fans	Mountains, Hills, Flood Plains
	Slope (%)	0–15	15–30	>30
	Elevation (m)	400–1200	0–400 or 1200–1800	1800<
Geology	Lithology and fault and waterway conditions	Flows of basalt, alluvial sediments (continental plateau alluvium), sandstone	Limestone and clay, fissured tuffs, granite, interstratified flows, loess and alluvium	Major and minor faults (with a buffer of 1000 m and 300 m), marl layers under the mother rock, marl mother rock, earthquake-prone, schist, sand dunes, and waterway and river boundaries (with a buffer of 1000 m)
Soil	Soil texture and kind	Moderate (often)	Light (often)	Heavy (often), Regosols, Lithosols
	Soil depth	Deep	semi-deep	Shallow to no soil
	Gravel amount (%)	0–25	26–50	>50
	Erosion	Low	Moderate	High
	Evolution (Structure)	Perfect (granular)	Moderate	Low
	Soil drainage (cm/h)	Good (2–6)	Moderate (0.1–2, 6–25)	Poor (<0.1, >25)
Vegetation	Canopy cover in % (in pasture and forest area)	25>	25–50	50<
Water	Quantity of water for everyone (Lit/day)	>225	150–225	<150

3. Results and discussion

With the increase in the speed of urbanization and the growth of migration to cities in the last few decades, there have been extensive changes in the physical structure of cities. Without considering the ecological capability of the land and paying attention to the requirements of sustainable residential and industrial development, the application of these changes has faced many challenges in these areas[32]. One of these challenges is determining suitable lands for the physical expansion of the residential and industrial areas, and establishing these developments. Among the scientific and reliable methods for determining and evaluating the areas susceptible to development, taking into account the environmental conditions and characteristics is the assessment of ecological capacity. Assessing the ecological suitability of the land is determining the potential and natural potential of land for the establishment of land use and human activities[33].

Considering the ecological capacity of an area is vital for sustainable land use planning, particularly in urban and industrial zones. This approach ensures that land use is sustainable for both the environment and humans. Urban areas are pivotal in achieving Sustainable Development Goals by providing safe and affordable housing, water, and sanitation, and improving transportation systems for accessibility and sustainability. Prioritizing these factors makes cities safer, more resilient, and sustainable, contributing to a better future. Utilizing potential planning grounded in land capability is crucial to preventing ongoing crises and minimizing their negative impacts[34].

In this research, we utilized the Iranian ecological capability model [31], which employs 16 indicators (**Table 1**) to assess urban, rural, and industrial development. This model, based on the concept of maximum limitation and utilizing Boolean logic (AND logic), accurately identifies suitable and semi-suitable lands. The model classifies lands into three capability classes for development. The first class represents the most suitable conditions for development, while the second class indicates semi-suitable conditions and moderate limitations. The third class denotes unsuitable conditions for development, signifying the presence of one or more evaluation indicators with unsuitable ecological conditions.

Based on the evaluation model and the results of this research in Kavar, Kharameh, and Sarvestan Counties, it was determined that no suitable class exists for urban, rural, and industrial development. The results of the ecological parameter studies indicate areas susceptible to development in the study area, classified as semi-suitable (class 2) and not-suitable (class 3) as shown in **Figure 3**, with the distribution percentages outlined in **Figure 4**. The results show that Most of the three counties (94%) are in the third or inappropriate class. As mentioned earlier, the model determines the suitable and semi-suitable areas with high rigor, so it is difficult to find completely suitable lands based on the evaluation point of view, and it is expected to see more unsuitable lands, which is in line with the results of this research. The reason for the existence of a large area of unsuitable land is mainly due to several reasons like high land with almost high slopes, unsuitable stone and soil conditions, and even the existence of insufficient water in some areas.

In another study, Monaveri et al. (2008) [35] assessed the ecological potential of the Zakhard basin in northwestern Shiraz city and eastern Kazeroon city in Fars province. The result of the survey shows that considering all the ecological parameters, the whole area is unsuitable for urban development but by removing the height parameter from the 75 environmental units created in the region, about 91.51% of the basin has unsuitable capacity for urban development It seems that the current model for evaluating ecological power is somewhat strict and should be calibrated for local conditions while Pourkhabbaz et al. (2009) [36] evaluated the ecological potential of Qazvin region to determine the potential points of urban development and their results indicate the existence of only one suitable class of urban development use in the studied area.

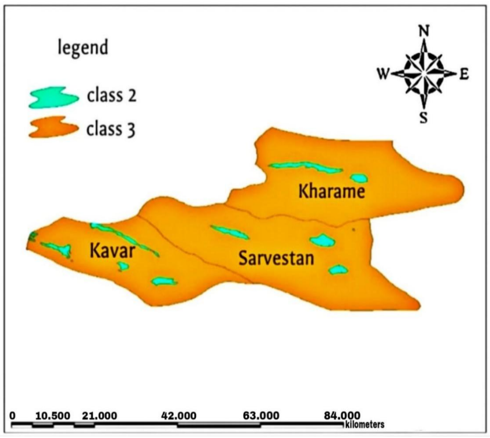

Figure 3. Areas susceptible to the development classes of the urban, rural, and industrial areas in the study areas.

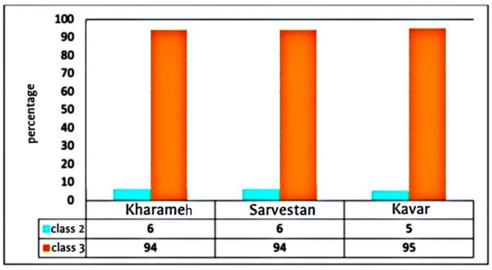

Figure 4. The percent of urban, industrial, and rural development classes.

Furthermore, the research yielded the percentage of suitability classes utilized in estimating the current establishment of urban, rural, and industrial uses presented in **Table 2.** The data reveals that most metropolitan areas in Sarvestan (77%) fall into the second suitability class, while in Kavar, most urban areas (66%) are classified as third class or inappropriate. Only 1% of urban areas in Kharameh are considered second-class or not suitable. In rural areas, extensive village areas are categorized as third-class or inappropriate. Industry areas are predominantly situated in the third class or inappropriate, except in Kavar county, indicating a lack of consideration for ecological impact. This oversight poses a significant risk of environmental damage to both industrial and residential areas. On the other hand, the current establishment of industries and residential areas could seriously harm the environment.

In general, it can be asserted that non-strict WLC methods tend to lead most regions toward appropriate classes when the limiting factor is not considered. However, stricter methods such as Iran's ecological models and FAO models push the majority of the region into inappropriate classes[37]. It is rare to find areas in a region that have both appropriate and moderate levels of capability. The results of this study are in agreement with the findings of prior research conducted by Baja et al. (2006)[38], Najafinejad et al. (2013)[39], Jokar et al. (2022, 2023)[40, 41], and Razaghi and Masoudi (2024)[42].

In the FAO models, the assessment of land use capability is firmly focused on the maximum limitation approach. Similarly, the ecological models of Iran also adopt a strict decision-making process about the location of land uses. This decisive approach, involving maximum limitation and a systemic method, is rooted in the environmental attitude and thorough examination of its components. It aims to estimate capability objectively, without bias, solely based on the land's inherent potential[12, 39].

4. Conclusion

Achieving sustainable development and using resources effectively depends on having a full and accurate understanding of the land uses, capabilities, and limitations to achieve the desired status. Environmental planning encompasses the regulation of the interrelationship between the natural environment, human activities, and human settlements on Earth. It aims to ensure the sustainable, appropriate, and beneficial utilization of spatial resources and human facilities to enhance the socioeconomic conditions of communities over time. In other words, environmental planning means choosing the right uses in a watershed or a region. Therefore, in the process of land preparation, we are dealing with the biological and natural resources of the land on the one hand, and with the social conditions and economic resources of the land on the other hand.

Nowadays, land use studies are considered necessary in every country and region due to the importance of sustainable development. Fortunately, land use studies were legalized in the fourth program of social, economic, and cultural development of the Islamic Republic of Iran[43]. Regardless of ecological differences and environmental potentials, the utilization of land causes environmental destruction and unfortunate consequences, which ultimately puts natural resources under threat and keeps the environment away from sustainable development. Considering the uniqueness of each region's ecological features, assessing capability in each region includes its criteria.

In Iran, the evaluation of ecological suitability considers multiple factors. This research takes an all-encompassing approach to assessing the ecological potential for development within a management domain as a planning and land management unit. It delves into physical and biological parameters and notably leverages GIS at every stage of the process.

Based on the research findings, the most effective evaluation methods employ the multi-factor evaluation model and prioritize the use of impactful ecological (physical and biological) factors. It is crucial to recognize the strong correlation between the natural environment and the selection of an appropriate platform for regional development.

Table 2. The percentages of capability classes in estimating the existing establishments of urban, rural, and industrial uses.

Area	County	Class 2	Class 3
Urban area	Kavar	34	66
	Sarvestan	77	23
	Kharameh	1	99
Rural area	Kavar	14	86
	Sarvestan	11	89
	Kharameh	0	100
Industrial area	Kavar	57	43
	Sarvestan	17	83
	Kharameh	0	100

In conclusion, the results of this study offer valuable insights that can be directly applied to land use planning in similar regions. As a result, these findings have the potential to significantly enhance land use management for a wide range of stakeholders and managers. Finally, for the sustainable development of land, especially for the use of residential and industrial areas, the following suggestions are presented:

1) The findings of this study unequivocally underscore the urgent need for homogeneous resource management in light of the rapid urbanization process and the resulting bio-environmental crisis.

2) The use of geographic information systems in evaluating ecological capability is an indispensable tool that not only reduces evaluation costs and time but also assists experts in selecting optimal solutions.

3) Moreover, urban development plans must unequivocally prioritize environmental perspectives and be rooted in the assessment of ecological potential and land use principles. These definitive findings can be directly applied to land use planning in similar regions and should be promptly leveraged by various stakeholders for proficient land use management.

Authors' Contributions

All authors cooperated with the research idea and methodology. Data gathering and analysis were carried out by Masoud Masoudi, and Ayda Ranjbar Sarvestani. The first draft of the paper was written by Masoud Masoudi. All authors studied and accepted the final manuscript.

Ethical Approval

No human or animal studies were conducted and no ethical approvals were required.

Conflicts of Interest

The authors announce that they do not have any conflicts of interest.

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Data Availability Statement

The data used and analyzed throughout the present research are obtainable from the corresponding author on sensible demand.

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