Tourism model of Kurdistan province using the integration of hierarchical analysis and spatial information system

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Abstract

The tourism industry is currently one of the main pillars of the world trade economy. Due to the variety of tourist attractions, Iran has a good ground for the expansion of tourism. The exploitation of this situation requires the creation of favorable conditions that can be exploited in the form of comprehensive and inclusive planning. Creating a sustainable tourism industry requires adequate political, social, and cultural infrastructure and requires the broad participation of local communities in development projects. Therefore, in tourism industry development plans, it is necessary to pay attention to quality criteria and social goals, because inappropriate, uncoordinated, and unaccounted for development can have many negative consequences, for example, harmful effects on nature and the environment. Brought. Kurdistan province, considering the potential capacities in the field of tourism and despite the widespread poverty that has caused the smuggling industry in the province, needs the transformation of the smuggling industry into an effective and lucrative tourism industry. Despite principled and appropriate planning as well as identifying the advantages and limitations of tourism in Kurdistan province, we can hope for the development of the region and as a result national development, so the question arises that the potentials and limitations of development. What is the tourism of Kurdistan province? And what are the strategies and strategies for the development of the tourism industry in this region? This research has been done by using GIS and Hierarchical Analysis Model (AHP) to design a tourism model for tourism development in Kurdistan province. Data analysis showed that the development of the tourism industry in Kurdistan province should be based on investment in the western regions of the province and improving the security situation and access roads.

Keywords; Tourism, development, Geographic Information System, Analytic Hierarchy Process, Kurdistan Province

1.Introduction

Most of the third world and developing countries often deal with the issues, such as local and regional underdevelopment as the infrastructure of the national development, the lack of proper and efficient planning, unemployment, unequal distribution of the facilities and equipment at the national level, environmental pollution, and economic inefficiency (Huong LLT, et. al., 2022; Asfahani A., 2022). Unemployment emerges as the objective manifestation of the problems more than the above issues (Sadovnikova N, et. al., 2022; Ranganadhareddy A., 2022).

Planned and managed tourism can play a significant and influential role in creating jobs (Brekeit KA, et. al., 2022; Gaikwad SS, et. al., 2022). Considering the diversity of natural and human attractions, Iran has a proper potential for developing tourism (Polevoy GG, et. al., 2022). Tourism is an industry affecting both the natural environment and is affected by that. Significant raw numerical information and data in tourism in developing countries allows experts to manage data correctly, inadequacies related to infrastructure facilities, investable areas, and acceptably identify the tourist sender destinations.

Although tourism is a significant income resource for many developing countries, it is less than 0.5 % in Iran. On the other hand, studying the main tourism currents in Iran indicate that currently, the

tourism industry in Iran acts regarding decentralization policies and against the spatial planning strategies to reduce the regional inequalities and improve the residents' quality of life of the surrounding and less-developed areas.

Some studies have been conducted on the modeling of the tourism industry. Christo (2002) used modeling by GIS to determine the location of the local committees for tourism planning in Greece. He proposed to create these committees near the beaches and population centers of more than 62000 people and use 22000 rest beds for beach tourists. Bueneromakai Kavatatay (2011) modeled the eco-tourism in Thani Province in Thailand using the AHP model in the GIS environment and the data related to the natural attraction, such as forest, river, etc. Eventually, he selected a region in the eastern region of the province with an area of 120,000 acres. Taghvaei (2011) located the tourism villages using the GIS and SWOT model on the shore of Kaftar Lake. Eventually, he selected a place with an area of 103 acres on the southern side of the lake. Jozi (2009) evaluated the ecological potential of the Bolhasan region of Dezfoul to establish tourism land use using the AHP method. The results showed the high potential of the region to develop tourism activities. Roustaei (2011) applied the AHP model to locate the local parking lots in Tabriz. According to the data related to the land uses, commercial centers, and population centers, he selected a place in the Abresan region of Tabriz. Ghalibaf (2011), in a study entitled "Evaluating and prioritizing the tourist attraction for the urban tourism development based on Multivariate Decision-Making Models in Sanandaj", modeled the urban tourism of Sanandaj, considering the human-made, natural, cultural, and historical attractions. The findings of this study showed that the cultural and historical attractions of Sanandaj city have more priority of other attractions for development and planning. The used model with the consistency of 0.08 shows the validity of the calculations and the results obtained from the prioritizing.

Although the history of GIS technology in the tourism literature is more than a decade, the application of GIS in tourism research has been limited. Geographic Information Systems have significant capabilities to create backup systems for spatial decision-making. The analytical functions, network analysis, and location-allocation models in these systems, in particular, are very suitable for solving different problems, such as problems related to access, and determining the influence area, and allocating the resources in the urban environment, the majority of which increasingly rely on the communication routes. Spatial planning can be done in a flexible and influential way using GIS, and different scenarios can be evaluated and compared (Alimohammadi, 2002).

It is noteworthy that the maximum efficiency of the investments in the tourism sector to achieve the local and regional development is not possible without conducting accurate feasibility studies (assessing the environmental facilities, the required and existing capacities, the development of the facilities, and alike) to determine the regions with development potential (Ghaderi). On the other hand, tourism planning is essential at all levels to achieve its successful management and development (World Tourism Organization). Also, identifying suitable areas for developing touristic activities is one of the main subjects for tourism planning (Farajzadeh Asl, 2004).

Moreover, tourism environmentally acts like a double-edged sword in relationship with the natural and human environment. If the development is designed reasonably and based on sustainable development principles, it will be possible to achieve many environmental benefits of this industry. However, if the tourism activities are developed unplanned, it will result in tourism breakdown and environmental destruction (Manely, 1990). On the other hand, socially and culturally, this industry can raise awareness among people to the native traditions and common lifestyle in the host community by identifying the particular cultures and promoting them and contribute effectively to the revitalization of the arts and handicrafts and the cultures of the local communities that are destroying (Massoumi, 2006).

The current research studied the tourism attractions of Kurdistan province in different historic-cultural, natural, and human-made, etc. areas using the Analytic Hierarchy Process for prioritizing and desirable tourism development of Kurdistan province. After explaining the theoretical foundations and defining the main and influential criteria in selecting and developing tourism activities, the required data and information were collected by field studies to determine the top typic tourism regions. To evaluate and advance the selection process, first, a set of various criteria were identified. Then, the

final criteria were determined by studying the successful foreign and domestic experiences and surveying the tourists and experts through questionnaires. Finally, AHP and descriptive methods were applied to analyze the data and information and, eventually, determining the typic tourism regions.

2. Methods and materials
General characteristics of Kurdistan Province

Kurdistan province, with an area of 29,137 square kilometers, is located in the western part of Iran and adjacent to the Iran-Iraq border. It is bordered by West Azerbaijan province and part of Zanjan from the north, Hamedan province and another part of Zanjan province from the east, Kermanshah province from the south, and Iraq from the west (Sulaimaniyah Kurdish province). According to the recent country divisions in 2005, Kurdistan province has 10 counties, 25 cities, 23 districts, 79 rural districts, and 1767 villages. The counties of this province are as follows: Sanandaj, Baneh, Bijar, Divandarreh, Sarvabad, Saqez, Qorveh, Kamyaran, Marivan, and Dehgolan. Sanandaj is the capital of the Kurdistan Province, located 512 square kilometers from Tehran.
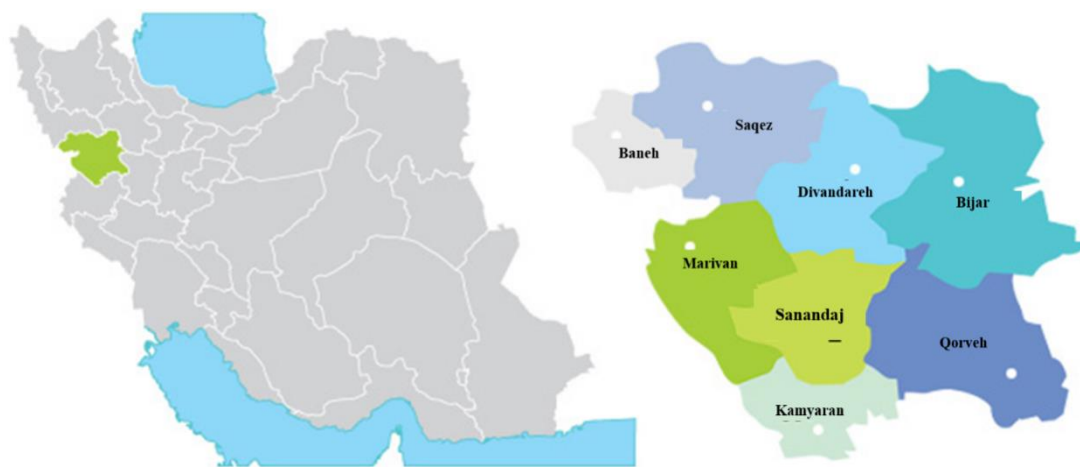

Figure 1. Location of Kurdistan Province

Kurdistan Province has four lakes: Zarivar Lakein Marivan, Qeshlaq Dam Lake located 15 km north of Sanandaj, Gavoshan Dam Lake Located 45 km south of Sanandaj, and Bukan Dam Lake located north of Saqez. The forest cover of Kurdistan province is located in the western areas of the province with an area of 320,000 acres and ranks second after the northern forests of Iran. The handicrafts of this province are a part of the culture of Kurdistan province people, which was formed based on the need and creativity over time. The most important handicrafts of Kurdistan province are as follows: Wood Joinery, the main products of which are backgammon and chess that have a global reputation.

In terms of the agricultural economy, Kurdistan Province is among the considerable regions and one of the main hubs of the livestock of Iran. Agricultural products of this province are as follows, respectively, in terms of importance: wheat, barley, and legume. Given the natural conditions, its agricultural activities are implemented as dryland and irrigated farming. In the industry sector of Kurdistan province, 775 operation licenses have been issued until 2008, resulting in the employment of 14409 individuals. Kurdistan Province has comparative advantages for the development of the industrial activities that hopes for a prosperous prospect in case of suitable investment. Most of the western areas are mountainous and often covered by natural forests. There are tablelands, plains, and relatively extensive plateaus. One of the most important attractions of Kurdistan is its cultural features as follows: language, custom, music, dance, festivals, specific ceremonies, and handicrafts. Handicrafts are a part of the culture of Kurdistan people, which is formed based on need and creativity over time. The most important handicrafts of Kurdistan province are as follows: Wood Joinery, the main products of which are backgammon and chess that have a global reputation.

The current study was applied in terms of purpose and descriptive-analytical in terms of method. First, the main criteria and sub-criteria and the weights obtained from experts' opinions and questionnaires filled by different people of various ages and occupations were obtained and prioritized using the AHP method. After weighing through the AHP method, the data and layers were integrated and combined in a priority of overlaying. The priority of overlaying the data logically and arithmetic is a part of GIS Software Tools. The considered criteria in the research were studied considering their interaction with the function of the places to find proper locations of the tourism industry, and each criterion was placed in a separate layer with the considered sub-criteria in ArcGIS software. Then, using Extension, the spatial analysis for situations in which these terms were applied was integrated with the operation of the considered weights. Finally, the final map of the popper location for the tourism industry was determined using Overlay Index.

Digital maps of the Department of Natural Resources and Watershed Management, Administration of Cultural Heritage and Tourism, and Surveying Organization of Kurdistan Province were used, such as vegetation, geomorphology, access routes, topography. In the following, the digital maps were transferred to the computer system and ArcGIS software. The topological relations for each layer of the map were prepared in ArcGIS, and a geographic information database was laid out. Raster form was used for the multi-criteria evaluation, and the UTM coordination system was applied similarly for all the maps.

First, the initial criteria were collected for pre-test through basic resources and analyzing the retrospective studies. The collected list was provided as a questionnaire to determine the criteria. This questionnaire was then distributed among a group of elites and experts in different disciplines related to tourism to confirm its validity to state their agreement or disagreement with the proposed criterion or introduce a new criterion.

The second step is to form a hierarchal structure. First, the hierarchal structure was formed to locate the best tourism region of the Kurdistan Province. 15 options were selected as the main criteria at the second level of the hierarchal structure. The selected sub-criteria were also in the third level. The main criteria were as follows: security, sports, vegetation, precipitation, temperature, slope, access routes, travel services, economic workshops, economic attraction, human attraction, religious attraction, historical attraction, cultural attraction, and natural attraction.

The weighing was conducted in the third step. The selected criteria were weighted to prioritize between different criteria so that the degree of importance of each factor or criterion could be measurable in determining the potential or carrying capacity of the region. The weighing was also done by the experts. Weighing the criteria and items was done using paired comparison. The scoring system was based on a 9-degree Saati scale. In the fourth step, after digitization and inserting the geographic information system using GIS and ArcGIS system, integration of the layers was done using the overlaying method.

3. Research Findings
   1.   **Data collection and digitization (GIS Ready)**

In the present study, the data were collected in different ways, the most important of which was using the maps of the related organizations, including the provincial government, Organization of Cultural Heritage and Tourism, Administration of Natural Resources and Watershed Management of Kurdistan Province, Administration of Industry, Mine, and Trade of Kurdistan Province, Agricultural Organization of Kurdistan Province, etc. (However, some data were photos or descriptions). Another method was field observations and filling questionnaires. In this stage, after collecting information, the data in CAD and Shape formats were inserted into ArcGIS software. Then, the required editions were done to create the Base Map to which information was added.

The first criterion is security. The results showed that a great part of the province, with an area of 17000 km, has very high security located in the east of Kurdistan. However, as we move from east to the west, the security reduces so that it reaches the minimum in the borderline in Sarshiv district, which is located between three cities, Baneh, Marivan, and Saqez. Thus, it can be seen that the security reduces from east to the west. According to the above mentioned, this area was classified into

five regions in a ranking using the AHP method. In this ranking, Marivan has the minimum security, and Bijar and Qorveh have the maximum security.

The second criterion was the forest cover of Kurdistan province, which is opposite the security. That is, as we move from the west to the east, the forest cover is reduced and minimized into lower rangelands. There can be a relationship between vegetation and security. As the security reduces, the vegetation eventually turns into forest cover, which can be due to the possibility for more camouflage in these regions as the armed groups are inclined to such vegetation.

The third criterion was precipitation. The western parts of Kurdistan province have more precipitation than the eastern parts, indicating the direct relationship between the precipitation and vegetation. That is, where there is forest cover, the precipitation is more. Marivan has the maximum precipitation of 970 mm annually in the province, and Bijar has the minimum precipitation of approximately 400 mm.

The climate conditions of a region are one of the other required criteria to study the tourism industry among which is the temperature that is increasingly related to the climate. According to the thermal map of Kurdistan Province, most parts of the province have a thermal range of very cold with frosty days of more than 100. A very cold area is mainly in the east and north part of the province, and the warm area is in the southwest. Many cities of Kurdistan Province, including Saqez, Bijar, Qorveh, and Divandareh, have a very cold thermal range, indicating that autumn and winter, as well as the early spring, cannot be the suitable seasons for tourism activities.

The fifth criterion is the access routes. Kurdistan Province experiences a crisis in terms of routes. Many routes of this province are earthen rural roads. The main roads connect Sanandaj and other counties, and the important cities do not have access roads to each other. Therefore, improving the roads is another underlying condition for tourism and Kurdistan Province's development. In this regard, Marivan has the worst situation. Other cities of this province have the same situation.

Sports is the sixth criterion. This criterion consists of five classes: water sports, air sports, martial arts sports, and wrestling. Sports tourism in Kurdistan province does not have a suitable status due to the lack of proper sports facilities and equipment, which requires constructing stadiums and standard sports salons, and other infrastructures. Sports tourism must be invested in large cities of Kurdistan province, such as Sanandaj, Saqez, and Marivan.

Travel service is the seventh criterion studied in the form of 3-stars hotels, 2-stars hotels, 1-star hotels, motels, agencies, terminals, and airports. Most of the travel services are located in the western area of Kurdistan province, including Baneh, Marivan, and, to some extent, Saqez, as well as Sanandaj, as the center of the province, due to the higher tourists in these regions.

Small industries and medium technologies development in villages and economic activities development and tourism play a significant role in rural development in the deprived Kurdistan Province. Most of the economic workshops of Kurdistan province are located in Sanandaj or its neighboring cities, indicating that professional investigations have not been done in this regard, and these workshops are located in Sanandaj due to their centrality. Sanandaj and Qorveh have proper status compared to other cities in terms of economic workshops. However, it does not have a proper situation in the province.

The ninth criterion is natural attractions. The natural attractions of Kurdistan province are mainly located at the western and borderline of the province. The number of these attractions reduces as moving towards the east. Marivan has a great potential for investing in natural attractions and nature tourism.

Historical attractions are the tenth criterion. In the present study, the historical attractions of the province were classified into three groups: 2000 years old, 1000 years old, and 5000 years old. Historical attraction map provided by the Organization of Tourism and Cultural Heritage of Kurdistan Province as a text file using the list of the historical attractions of Kurdistan Province was digitizedand processed. This map shows that in the northern province of Saqez, with a history of 3,500 years, the capital of Deioces, the most powerful Medes king, with the remnants of the Medes, Mannaean, and Scythians, is an area with maximum potential for historical tourism.

Kurdistan Province is one of the unique provinces in Iran in terms of cultural attractions. In the present study, the cultural attraction of Kurdistan province was classified into 8 groups: Custom,

language, rite, food, nomads, dance, music, and handicrafts. After digitization and required processes, it was revealed that the borderline cities in the west of the province, including Baneh, Marivan, and Sanandaj, considering its centrality, have the maximum rich cultural attractions.

Religious attractions are the twelfth criterion. Religious attractions can be classified into four groups: mosques, Imamzadeh, tombs, shrines, tekye, and Khanqah. The map of religious attractions was turned into text format by the Organization of Tourism and Cultural Heritage of Kurdistan Province using the list of the religious attractions of Kurdistan Province. After digitizing and processing, it was revealed that Kurdistan Province does not enjoy particular potential in terms of religious attractions, and it is better to invest less in this area. The cities with a medium level in terms of religious attraction are located at the eastern of the province, including Bijar and Qorveh that the maximum investment can be done in these cities.

Economic attraction is another criterion. The Economic map of Kurdistan Province was provided after studying the 2011 statistical yearbook and field study. This map was classified into six parts: agriculture, industry, mine, market, set of malls, and border market. Kurdistan Province is poor in terms of industry. However, due to neighboring the Kurdistan of Iraq border, it has a high economic potential.

The fourteenth criterion is human attractions. Studies showed a few human attractions of Kurdistan province, indicating inattention and neglect in this regard. Tourism development requires investment in all tourism areas. According to the experience, the investment in only one sector will not be responsive.

2. Forming hierarchy and weighting criteria

Before implementing the model on the data, first, based on selecting the AHP model, the structure of the hierarchy must be formed considering the main criteria and sub-criteria and weights obtained based on the experts' opinions and questionnaires filled by various people of different ages and occupations. To this end, Expert Choice software was used.
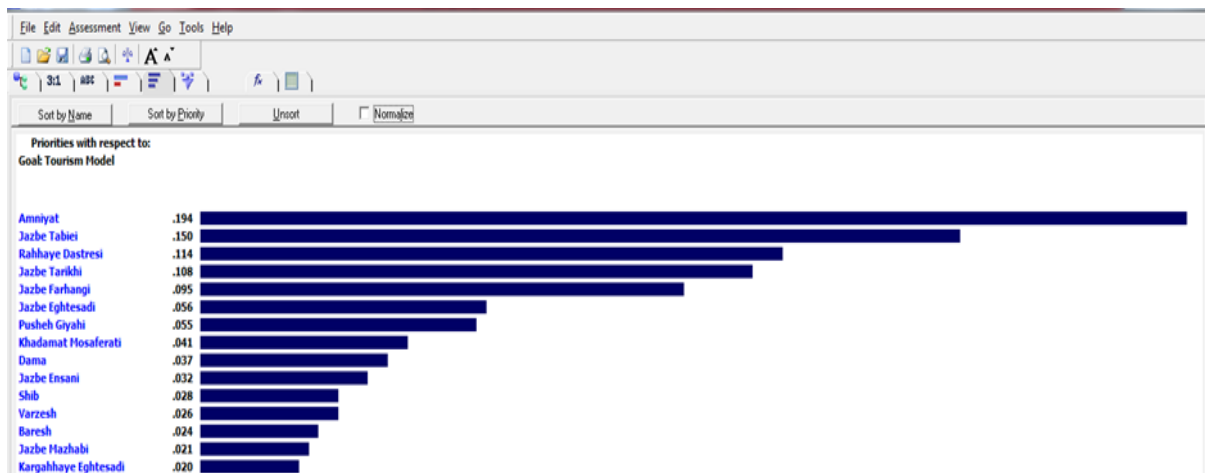

Figure 2. Final weights of the criteria in Expert Choice Software

After studying the weights, these weights must be implemented on the existing layers in ArcGIS software to be participated based on the considered value in the modeling (Figure 2). However, before inserting the weights in ArcGIS software, it must be ensured that whether the obtained weights have validity or not, which can be achieved by studying the inconsistency rate of the criteria.

3. Investigating the Inconsistency rate of the criteria

Accurate implementation of the location using selected criteria in the AHP model depends on the inconsistency in valuing them. In this project, the inconsistency rate, which displays the consistency between the components, is 0.08, which is acceptable for this project.

4. Final integration and combination of data

Data and layers provided in previous steps were combined and integrated with the priority of

overlaying the layers after weighting by the AHP model. Priority of overlaying logically and arithmetic are the part of the GIS software tools. After inserting and preparing data in ArcGIS software, according to Figure (3), the considered model was designed in Model Builder.
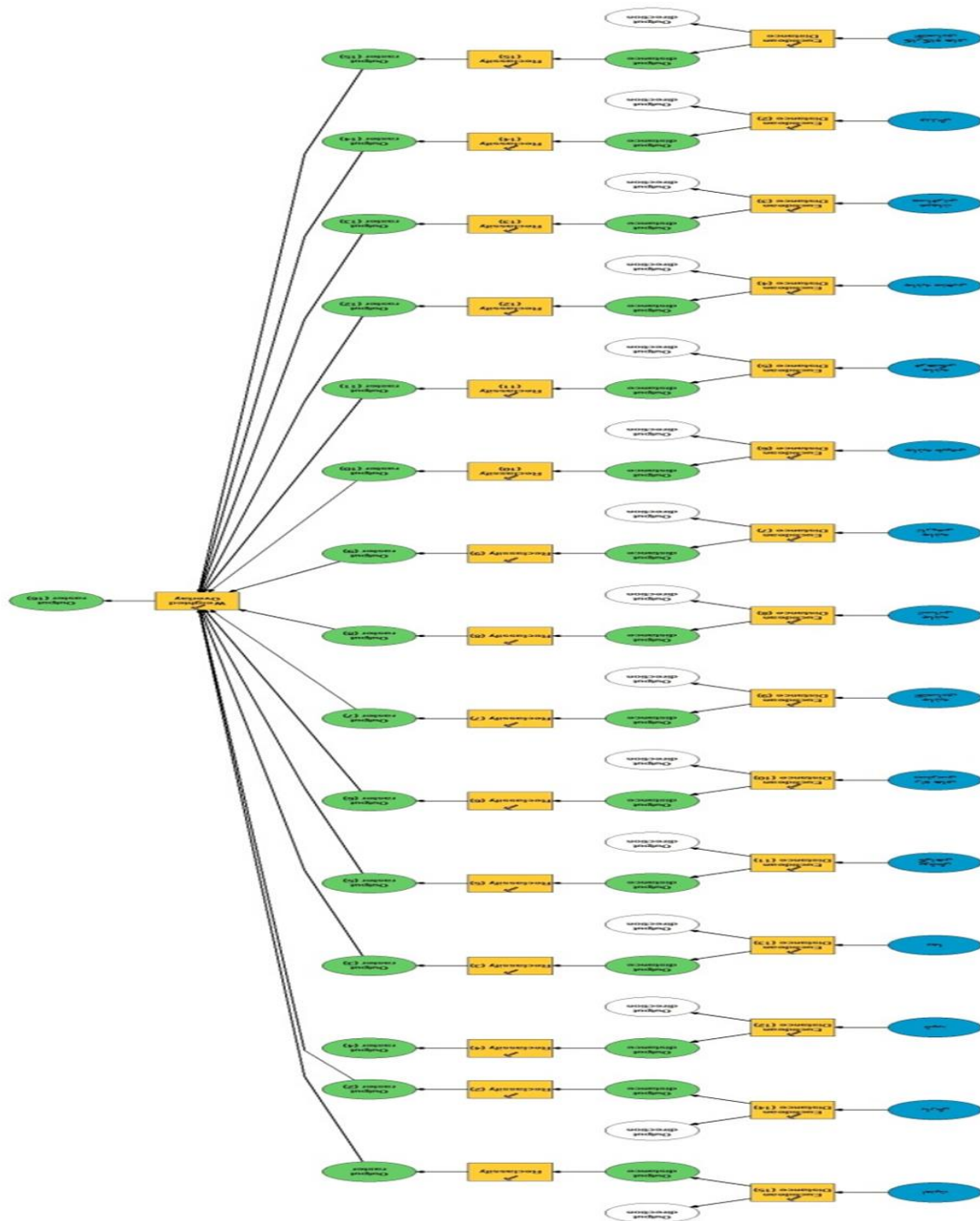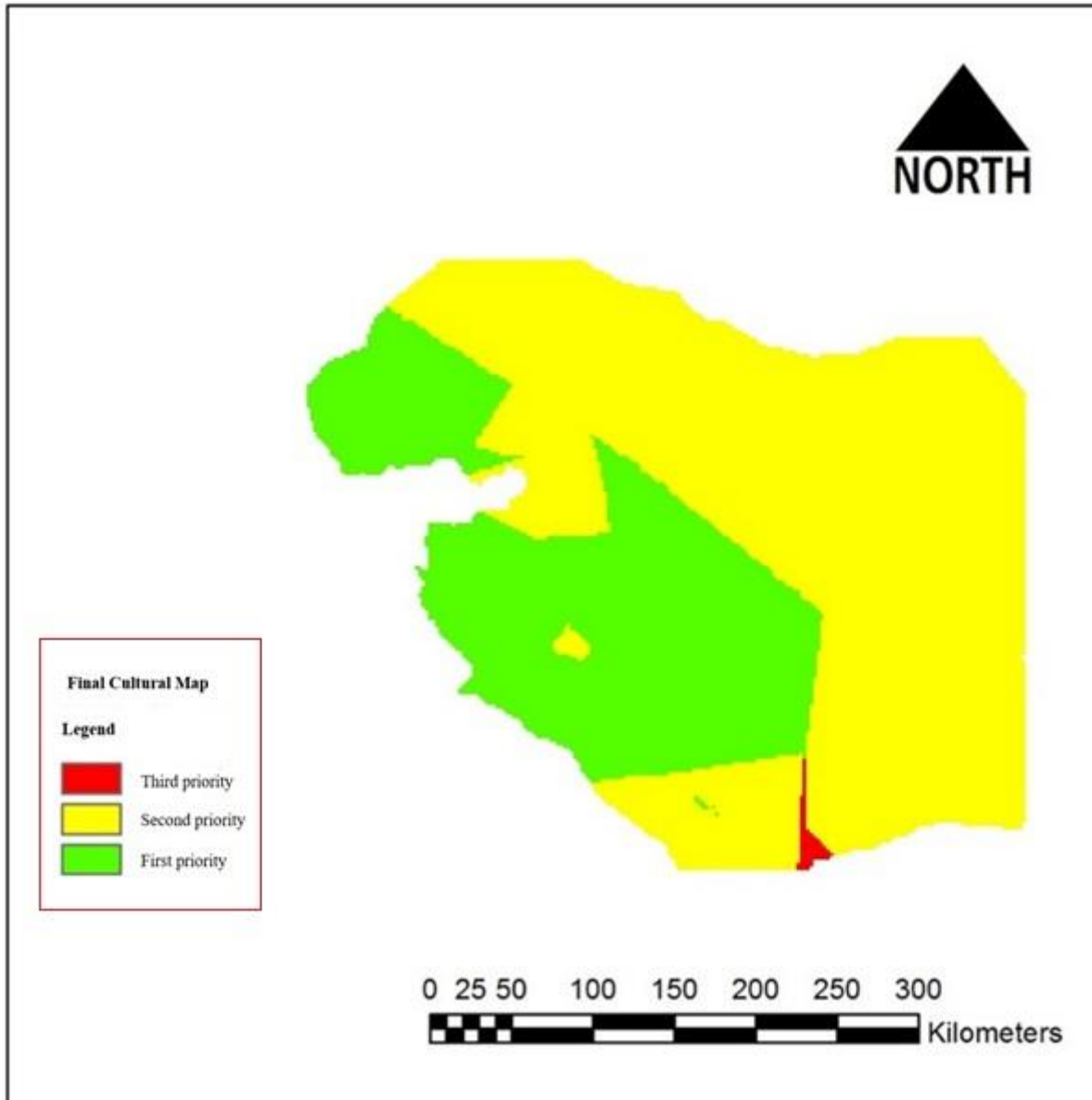

Figure 3. Designing a model in ArcGIS software

Finally, by implementing the designed model on the considered layers, the final priority map of the tourism-prone areas was obtained based on the weighted overlapping. Map (1) shows the final output, i.e., the tourism-prone areas based on the cultural attractions in Kurdistan Province.
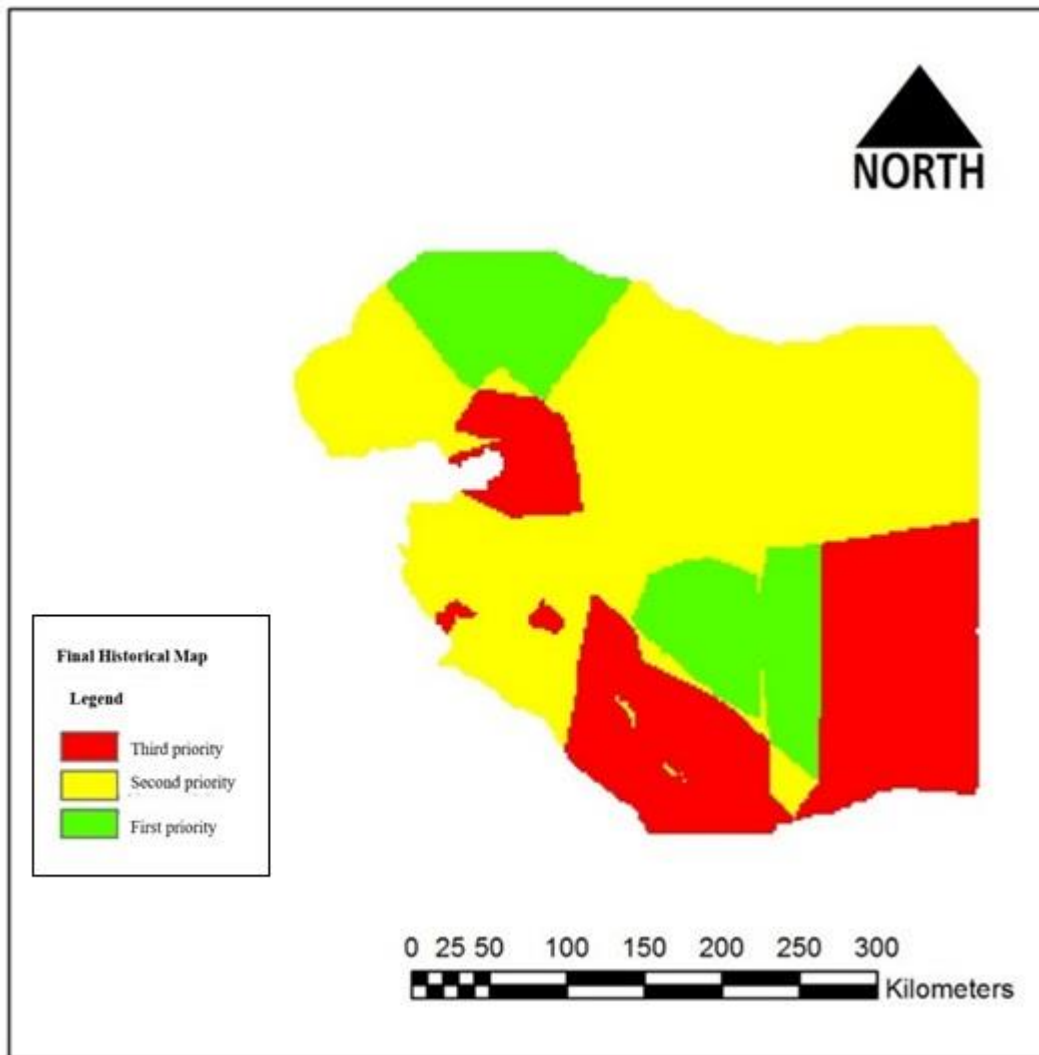

Map 1. Prioritizing the cultural tourism-prone areas in Kurdistan Province

According to Map (1), the western and central areas of Kurdistan Province, i.e., Sanandaj, Marivan, and Baneh, have the maximum capacity for investment in the cultural tourism sector.
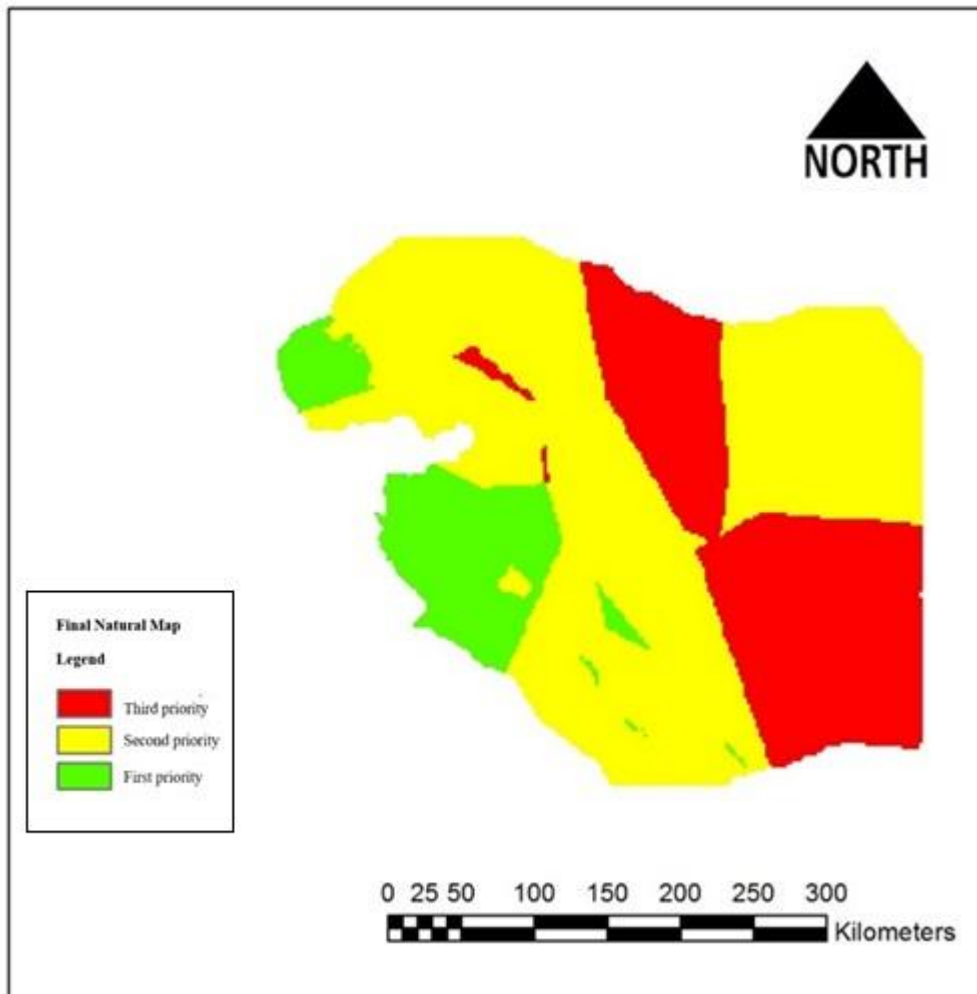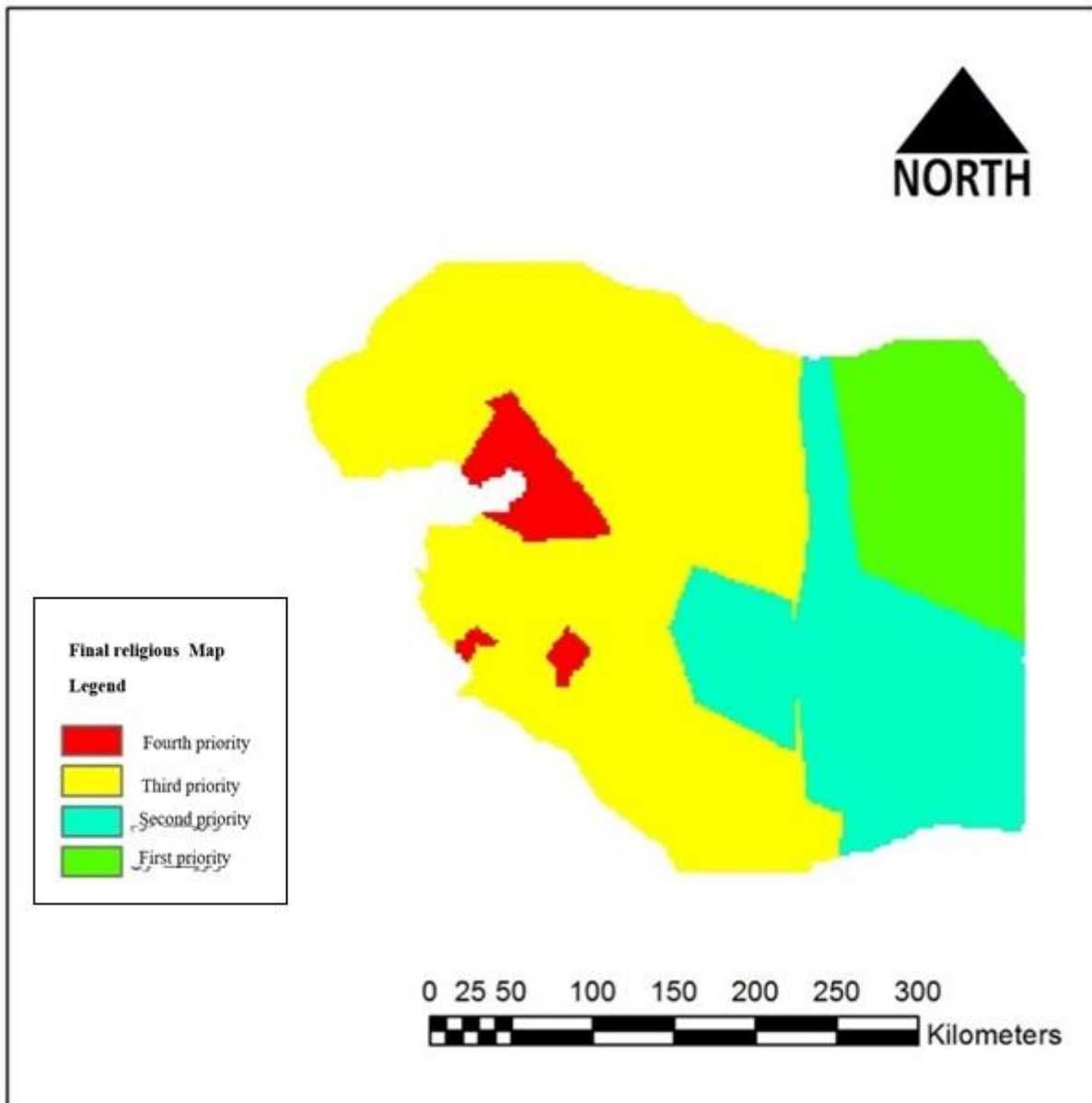
Map 2. Prioritizing the natural tourism-prone areas in Kurdistan Province

According to Map (2), the western areas of the province, Marivan, and Baneh, in particular, have the maximum capacity for investment in the nature tourism sector.
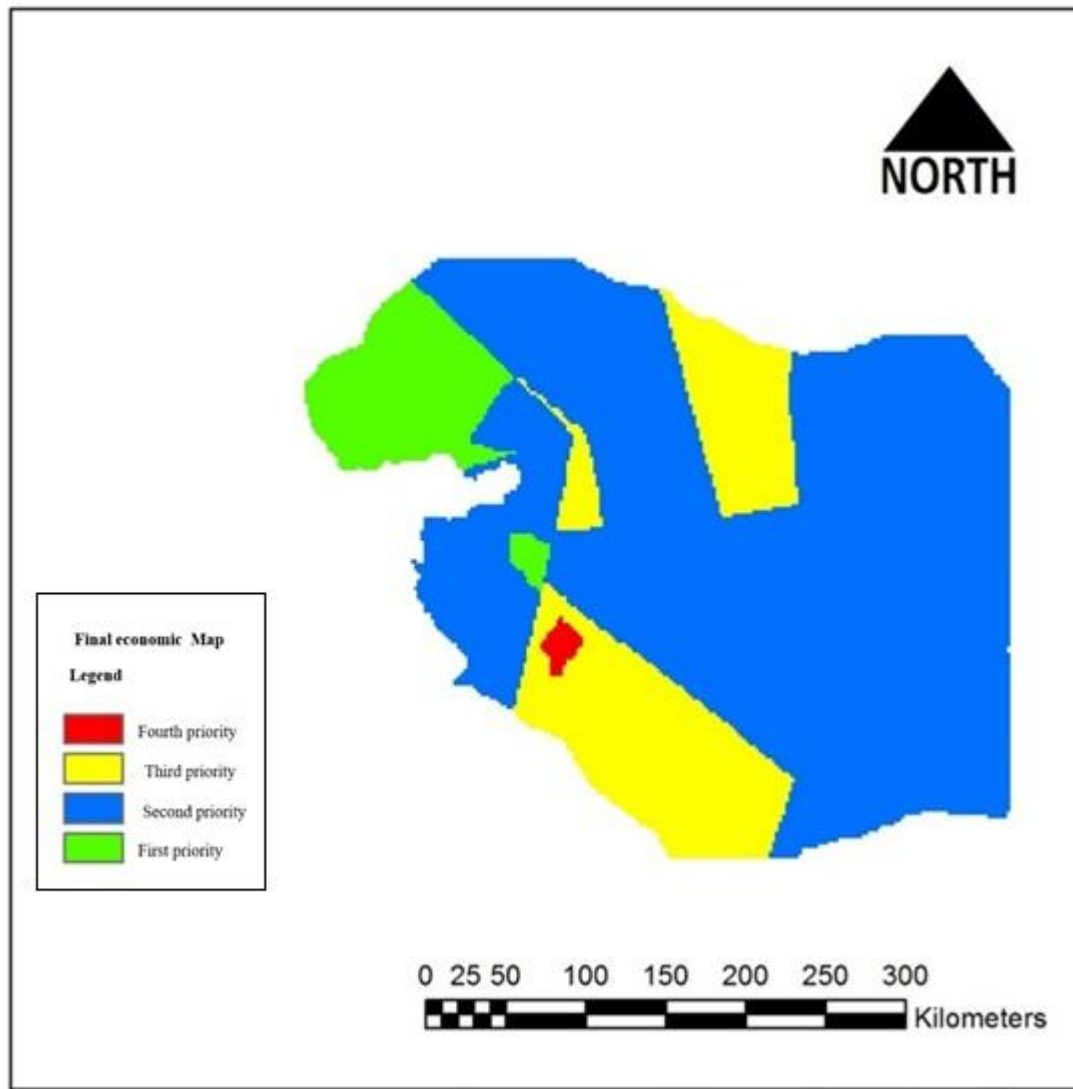
Map 3. Prioritizing the historical tourism-prone areas in Kurdistan Province

According to Map (3), the northern and central areas of Kurdistan Province, particularly, Saqez, have the maximum capacity for investment in the historical tourism sector.

Map 4. Prioritizing the religious tourism-prone areas in Kurdistan Province

As Map (4) shows, the eastern areas of the province have a suitable capacity for religious tourism. Bijar and Qorveh, as the destinations of the tourists in Kurdistan, can function better in religious tourism than other tourism sectors.
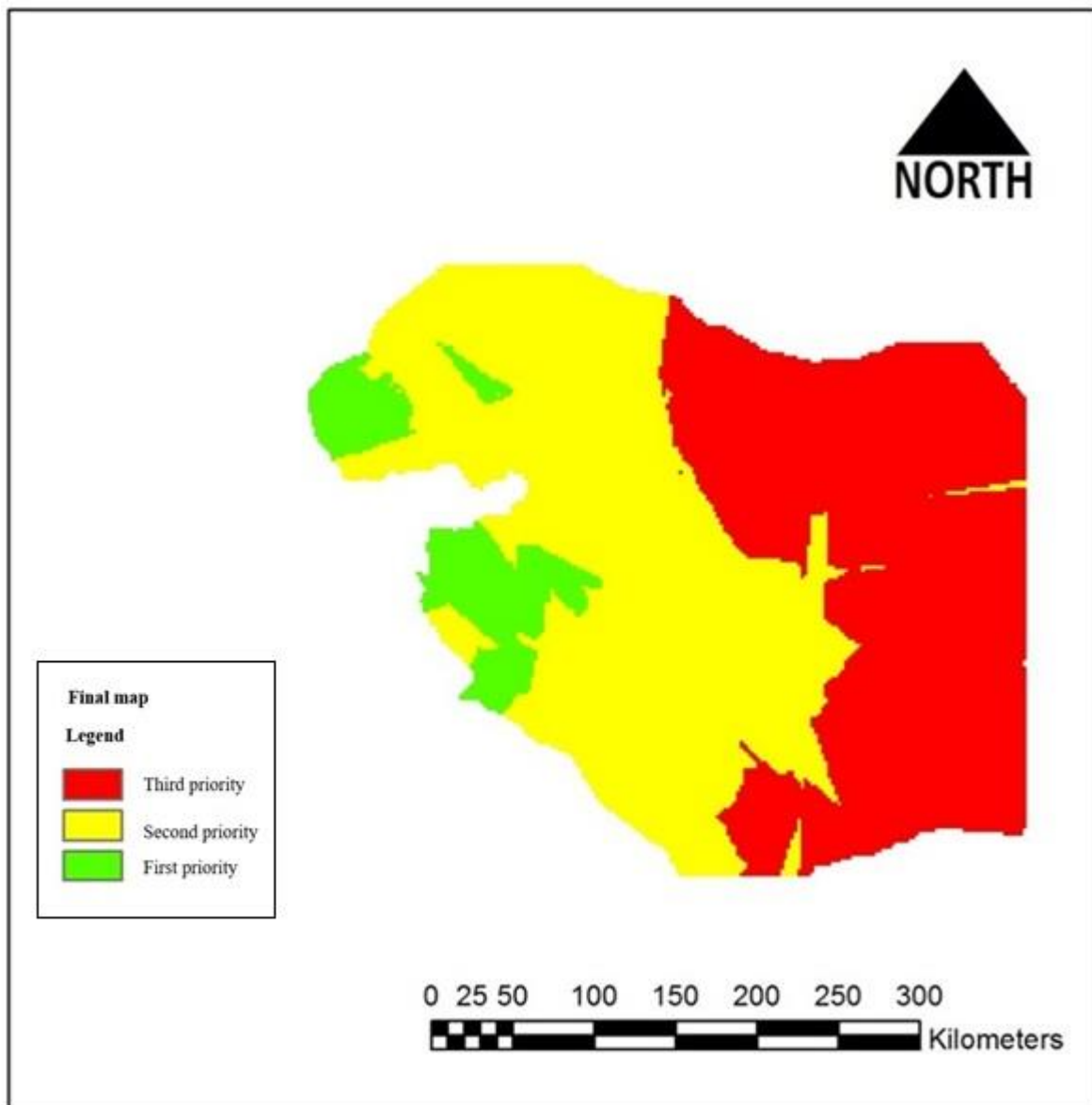
Map 5. Prioritizing the economic tourism-prone areas in Kurdistan Province

As can be seen in Map (5), the western and borderline areas have a desirable capacity for economic tourism. Baneh, Marivan, and Saqez can function in economic tourism. In particular, Baneh and Marivan have the maximum potential considering the potential capacities in other tourism areas, such as cultural and nature tourism.
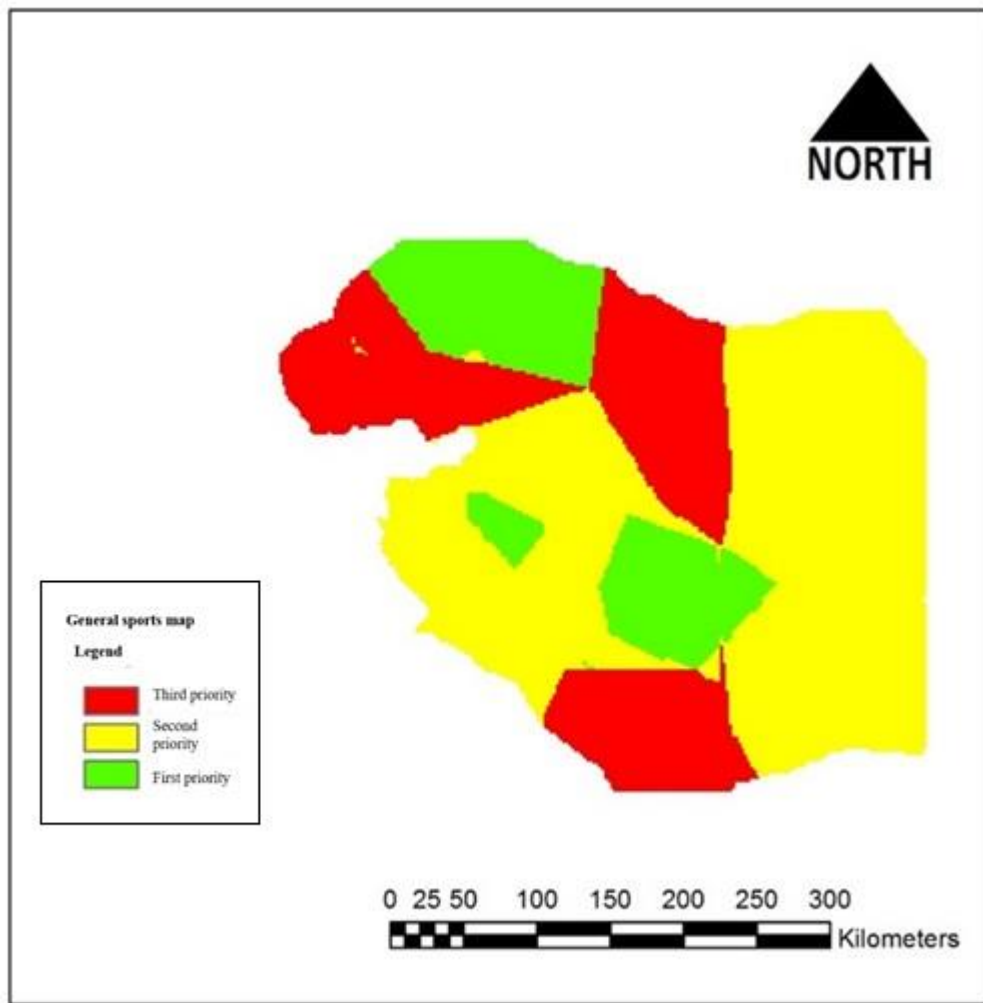
Map 6. Prioritizing the sports tourism-prone areas in Kurdistan Province

According to Map (6), three large cities of the province, i.e., Sanandaj, Saqez, and Marivan, were introduced as the priorities of sports tourism. Particularly, Saqez has the maximum potential to use sports tourism by having Ski resorts, various sports facilities, and capable athletes.

Map 7. Prioritizing the tourism-prone areas in Kurdistan Province

According to Map (7), the western areas of this province have the highest priority, and the eastern areas have the lowest priority. Baneh and Marivan are the best areas for investment in tourism, considering various natural, cultural, and economic attractions. Although they obtained the highest scores in weighing the security and access routes, these cities obtained the highest priority due to numerous attractions. Therefore, the security and access routes of these cities must be more considered. However, eastern cities of Kurdistan province obtained the lowest priority disregarding the high security, indicating the low number of the various attractions in these cities. Sanandaj, Qorveh, and Kamiaran have the medium priority, indicating the potential and capacity of these cities in some tourism areas. For instance, Sanandaj has a desirable potential in cultural tourism, and Saqez has proper potential in sports and historical tourism. Kamiaran also enjoys nature tourism potential. Figure 4 shows the tourism model of Kurdistan Province schematically.
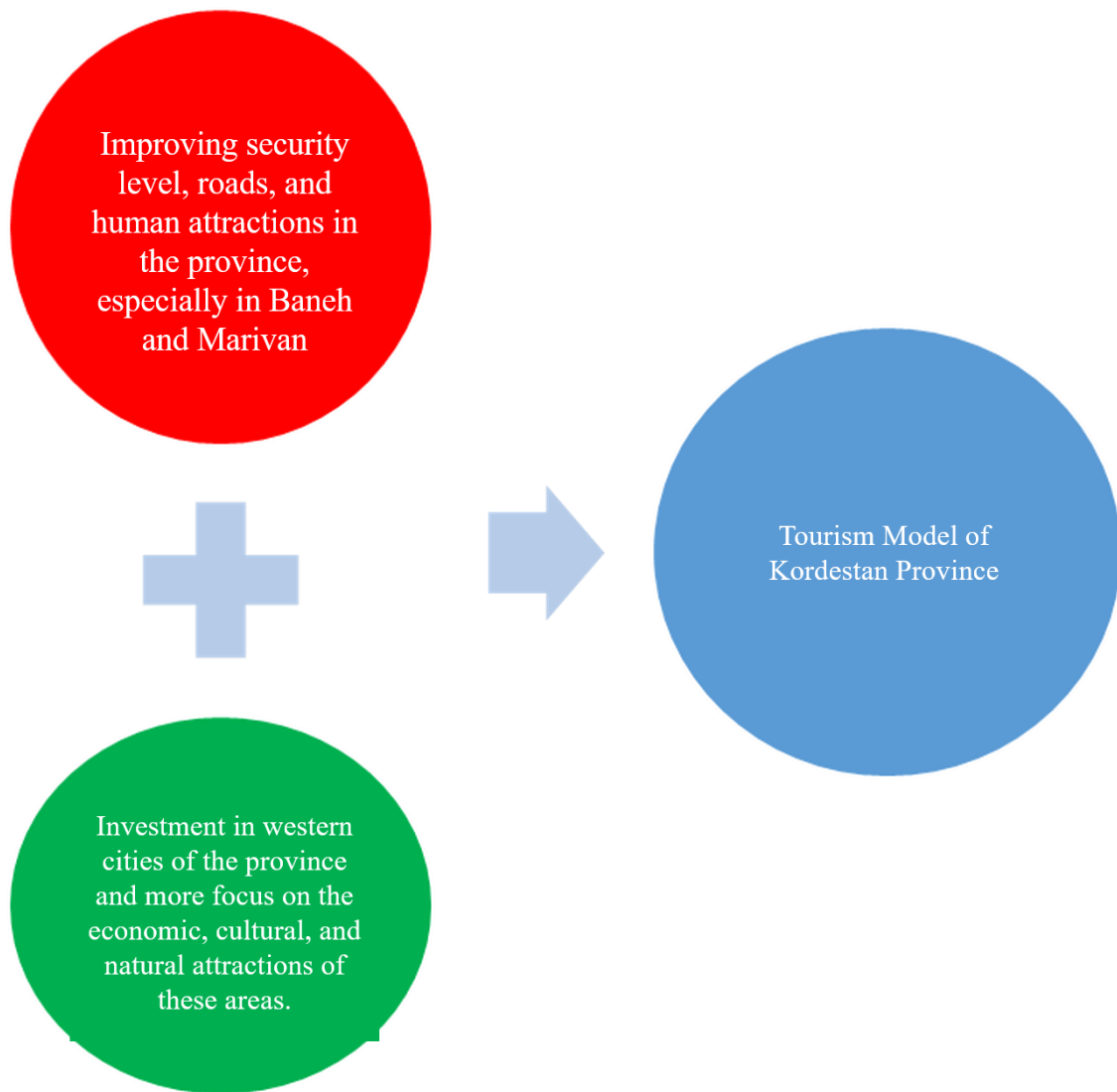
Figure 4. Tourism Model of Kurdistan Province

4.Conclusion

The present study investigated the tourism attraction of Kurdistan Province in different cultural-historical, human-made, and natural parts using the Analytic Hierarchy Process to prioritize and develop tourism of Kurdistan Province. Kurdistan province has a desirable potential for developing tourism, considering its human and natural attractions. According to Inskeep's theory, tourism planning deals with predicting and legalizing the changes in the current situation by creating a regular development to increase the socioeconomic and environmental benefits. Thus, a tourism model can be developed for cities of the province by required and influential data in tourism that the development of these cities are based on these models. Although tourism also deals with the regional and trans-regional scales, a model can be briefly defined for these cities. The results showed that the tourism model of Baneh city included improving the roads situation, security, human-made attractions, and sports facilities, investment in the economic attraction, cultural attraction, and natural attraction. Furthermore, the tourism model of Bijar city consisted of improving the roads situation and human-made attractions, the investment in religious attraction and sports attraction, particularly, in the ski. The tourism model of Divandare was improving the roads situation and travel services, investment in human-made attraction, and Saqez tourism model included improving the roads situation, security, human-made attractions, and travel services, investment in the historical attractions, economic

attraction, and cultural attraction, and sports tourism. The tourism model of Sanandaj consisted of improving the roads situation, human-made attractions, investment in cultural attraction, historical attraction, and sports tourism. The tourism model of Qorveh was improving the roads situation, human-made attractions and sports facilities, investment in religious attraction, and tourism model of Kamiaran included improving the roads situation, human-made attractions, and sports facilities, investment in the natural attraction, cultural attraction, and economic workshops. And finally, the tourism model of Marivan consisted of improving the roads situation, security, human-made attractions, and investment in economic attraction, cultural attraction, natural attraction, and sports tourism.

Finally, according to the schematic design of the tourism model of Kurdistan Province, the western regions, especially Baneh and Marivan, were introduced as the best areas for investment in tourism, and these cities must be significantly considered. However, there are some shortcomings, including security and access roads, that must be improved.

Some recommendations are provided for tourism development of Kurdistan Province that are as follows:

Developing relevant institutions and organizations to educate people for the optimal and purposeful use of the benefits and positive effects of tourism, and informing and training people regarding dealing with the tourist and tourism. Diversification and development of the advertising plans to introduce the natural and historical attractions, the prominent cultural features, architecture, customs in the global networks. Directing the investment and distribution of the facilities, and tourism services and facilities at the regional level and prioritizing reallocation of this type of facilities to the areas with high capability to attract the tourist.

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