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A Scenario-Based Framework to Optimising Eco-Wellness Tourism Development and Creating Niche Markets: A Case Study of Ardabil, Iran

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Abstract

Decision-making and planning in eco-wellness tourism can vary depending on time, resources, and the perspectives of stakeholders, as it is often challenging to generalize the results of decision-making models across different scenarios. Hence, the primary objective of this study was to propose a scenario-based framework for optimising eco-wellness tourism development. For this purpose, maps of 26 factors affecting the evaluation of nature-based eco-wellness tourism, including water, climatic, and kinetic therapies, were used in the Ardabil province of Iran. Weighted criteria maps are integrated into suitability maps for various wellness tourism products under different scenarios, ranging from very pessimistic to very optimistic, using the Ordered Weighted Averaging (OWA) operator. Then, to identify areas of consensus, scenario-based maps for water, climate, and kinetic therapies are combined. In the very pessimistic (optimistic) scenario, climate-only therapy accounts for 0.91% (2.23%), water-only therapy for 1.07% (8.44%), and kinetic-only therapy for 3.5% (5.81%) of the area. The most significant expansion is observed in areas integrating all three therapies—climate, water, and kinetic—which increase from 3.23% in the very pessimistic scenario to 14.5% in the very optimistic scenario. The findings have substantial insights for policymakers, tourism planners, and investors in developing and promoting unique eco-wellness experiences that benefit tourists. The methodical approach and choice of data and parameters in the study can be inspirational and adjustable for relevant studies.

Keywords: eco-wellness tourism; natural resources; niche markets; Ordered Weighted Averaging (OWA); GIS-MCDM

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1. Introduction

Tourism has long been recognized as having a role to play in human health and well-being. It improves health in several ways, including decreasing the incidence of heart disease, reducing stress, and enhancing psycho-physical abilities [1–6]. Thus, eco-wellness tourism is considered as one of the most important types of tourism. It integrates health-based treatments, characteristic of wellness tourism, with ecotourism-oriented experiences [7]. By including physical, mental, spiritual, emotional, social, and environmental aspects, it creates a holistic approach to well-being. Despite being a key sector of health tourism, eco-wellness tourism has received relatively little attention compared to medical tourism. This underscores the need for more extensive studies on eco-wellness, which is defined as a physical and mental state characterized by a connection to nature [8,9]. While some researchers argue that wellness tourism sites do not necessarily require natural healing resources, such resources remain crucial for achieving wellness [10], as highlighted in the definition of the International Union of Official Travel Organizations (1973). The definition emphasizes health facilities in rural areas having natural resources, such as hot springs and unique climates [11]. Consequently, natural resources serve as core factors of eco-wellness tourism, offering therapeutic benefits that have been recognized and utilized for centuries [9,12,13].

Many countries have initiated plans to develop tourism in the regions with natural resources [14]. However, limited resources and financial constraints pose significant challenges. One effective strategy to tackle challenges is to create unique wellness products tailored to distinctive environments, offering enjoyable activities, well-designed facilities, and infrastructure [15]. This is particularly important as eco-wellness tourists prioritize comfort, relief, and convenience [10,16]. Given the regional disparities in natural resources, accessibility [10,17], ecological conditions, and the quality of natural healing factors [18], it is essential to allocate scarce resources strategically and avoid locked-in effects. Investments should be directed towards the most promising areas to maximize the potential for eco-wellness tourism, meet the evolving demands of the market, and ensure sustainability of land use planning.

Evaluating the potential of regions for eco-wellness tourism is of great importance and essential for sustainable tourism development. Spatial analyses using Geographic Information System (GIS) and Multi-Criteria Decision Model (MCDM) are crucial [19–22] for identifying and assessing suitable areas for the development of eco-wellness tourism. For precise and informed decision-making, they enable the integration of complex spatial data, such as environmental, climatic, and therapeutic resources. GIS can, for instance, guide planners in selecting locations with high potential for health tourism infrastructure. Additionally, MCDM plays a critical role in prioritizing areas based on criteria such as accessibility and proximity to required facilities. These models allow policymakers to allocate limited resources effectively and focus on regions with the greatest potential to attract eco-wellness tourists. Particularly in developing countries with abundant natural resources but economic constraints, spatial analysis can drive sustainable eco-wellness tourism development and enhance competitiveness. It can also support strategic marketing and investment efforts.

Decision-making and planning in eco-wellness tourism can vary depending on time, resources, and the perspectives of stakeholders. Thus, it is often challenging to generalize the results of decision-making models across different scenarios. The Ordered Weighted Averaging (OWA) model, a decision-making approach based on prioritization, allows for the integration of decision-makers' subjective preferences and their influence on the decision-making process [23–26]. The model excels in combining various criteria and generating multiple outputs for diverse scenarios, offering flexibility to create a range of optimistic to pessimistic outcomes. The results can help planners and stakeholders with varying viewpoints on eco-wellness tourism development. As optimism levels increase in the model, decision-making risks rise, and desired quality standards may decrease. Conversely, pessimistic views focus on investing in locations that meet a maximum threshold of attractiveness and eco-wellness potential. This model is particularly effective for prioritizing eco-wellness tourism development projects, especially in regions where financial resources are limited.

This study aims to propose a scenario-based spatial multi-criteria decision-making framework that can serve as a reference to prioritize and allocate resources for eco-wellness tourism development. This framework explores key factors that contribute to the success and attractiveness of eco-wellness tourism products in natural environments. The importance of this study lies, firstly, in addressing the relatively little academic attention paid to wellness tourism compared to medical tourism, as two main products of health tourism. Moreover, while some literature acknowledges the importance of natural resources, their contribution to wellness has received limited attention in spatial tourism studies, which have primarily focused on their use for recreational purposes. The authors highlight the limited attention paid to spatial analysis as a planning tool for this specific niche market. This study aims to fill this gap by providing insights into this approach. These objectives are to answer the following questions:

1. What are the key natural factors that contribute to the success and attractiveness of eco-wellness tourism products?
2. What are the potential scenarios for the development of eco-wellness tourism, and how do these scenarios impact the optimal allocation of resources?

Contribution to Existing Knowledge

Given the limited attention to niche market development in eco-wellness tourism, the study offers valuable insights into the key attributes required to develop these markets. The findings can support strategic investments, planning, and the implementation of innovative land-use models aimed at enhancing the physical and technical infrastructure for wellness tourism. The developed model provides a framework to identify suitable areas for eco-wellness destination development. It is significant because a large portion of existing studies focus on natural-based development for recreational purposes. The framework is particularly important for developing countries with rich natural environments seeking to be leaders in health tourism, especially considering the recent trend of health tourism shifting from developed to developing countries. Moreover, integrating health services by leveraging facilities that cater to both medical and wellness tourists serves as an effective positioning strategy which is important because the existing literature has a greater focus on medical tourism. To our knowledge, little focus has been placed on market development within spatial analysis in health tourism studies. Finally, this study contributes to the relatively underexplored literature on the spatial modeling of wellness tourism. By examining diversified products and mapping therapeutic landscapes, it provides a deeper understanding of how spatial analysis can optimize the development of this promising sector.

2. State of the Art

2.1. Spatial Perspectives on Eco-Wellness Tourism

Location influences both customer choices and the strategy of service delivery [10]. Therefore, suitable geographical locations are emphasized in tourism, especially for products that depend on natural and geographical conditions [27], such as eco-wellness tourism. Eco-wellness consumers are drawn to natural resources and therapies, with many natural treatments reflecting the locality [28]. According to Pan, et al. [29], to foster a harmonious and balanced relationship with nature, different eco-wellness tourism activities have specific requirements related to factors such as slope, air quality, and vegetation types. There are interactions between the environment, the recreational services and activities [30]. However, due to the uneven spatial distribution of natural healing assets [31], and the significance of geographical proximity and distance in tourism studies [32], spatial planning is recognized as an approach for logically arranging and balancing the distribution of facilities.

The health tourism literature links eco-wellness tourism with spatial studies in several ways. The first and most important way is through the study of potential, as many natural treatments and healing practices are tied to geographical features [32–38]. This body of literature explores the potential of geographical areas and their differences in terms of managing and developing nature-based values [12,33]. Understanding the spatial patterns of environmental suitability offers valuable insights for tourism decision-making [36,37]. This is essential for promoting sustainable interventions and estimating resource needs within the framework of geo-environmental analysis, a process that is critical for rationalizing natural resources and developing eco-wellness tourism [39]. Additionally, these studies are crucial for planning tourism products, as geographical allocation and attraction potential lead to the creation of different types of tourism spaces [1], including eco-wellness centers integrated with natural factors such as climate and springs [15].

A second observation from the literature involves regional analysis [40]. Some spatial perspectives aim to examine the characteristic features of health tourism destinations from a regional planning viewpoint. Jónás-Berki, et al. [1] noted that health tourism plays a role in the regional concentration of tourism demand, with significant investments leading to development focused on certain settlements. In terms of regional development, natural resources are crucial determinants of a destination's image. The geographical position of mineral springs influences the facilities offered and shapes visitor preferences [15]. However, the impacts of eco-wellness tourism are not always positive. Wang, et al. [41] argue that when eco-wellness tourism attracts individuals with certain illnesses, the destination may gain a reputation as a place primarily for sick people, which creates a form of spatial stigma, where the location is socially perceived as unhealthy or undesirable, potentially reducing its appeal to other tourists.

The third group of studies seeks to evaluate health tourism destinations. Some studies have established and validated key indicators using multiple criteria decision-making [11]. Others have explored the dynamics of the co-evolution of the therapeutic landscape due to the rapid expansion of tourism [42]. These studies contribute to the overall strategic planning process by identifying opportunities to improve activities and enhance competitiveness in health tourism management [11]. This is particularly important as the emergence of spatial-based, complex product packages indicates a shift from a product-centered approach to a more holistic, customer-centered approach tourism supply marketing [1].

2.2. Wellness and Nature-Based Tourism

Wellness tourists seek comfort and stimulation from their surroundings, without necessarily requiring direct medical treatment [43,44]. Given the close connection between wellness tourism and nature [2,11], natural resources, landscapes, and sceneries are considered crucial factors for eco-wellness tourism development [12]. Eco-wellness tourism benefits natural healing factors [30,43] to meet tourists' desires for natural remedies [12]. Many argue that the natural environment fulfills human needs for recreation, relaxation, and therapy, and plays an irreplaceable role in the essence of wellness tourism [30]. Consequently, natural features such as topography, climate, weather, and water resources are vital in attracting tourists.

Natural characteristics not only influence tourist decision-making and preferences [30,45] but also enhance a destination's competitiveness by offering a distinctive edge and fostering new business opportunities [12]. Differentiation in terms of environmental experience—the emotional responses tourists have to the physical environment—is a key determinant of customer loyalty for health tourism destinations [46]. Therefore, the restorative qualities of the natural environment are central to the eco-wellness experience [47]. As a result, eco-wellness tourism can be categorized into three groups based on the resources available at a given location including water-based therapy, climate-based therapy, and kinetic-based therapy.

2.2.1. Water-Based Therapy

The concept of eco-wellness originated from the use of geothermal springs, which are natural sources of hot and mineral-rich water [48]. As a result, many eco-wellness destinations and facilities have been established and flourished near the springs [15,49]. Natural water therapies have taken various forms, with bathing being the most common, as many traditional medicinal systems still recognize the curative properties of water [13]. Water is considered irreplaceable in disease prevention, as it helps refresh and relieve the musculoskeletal system [33], alleviate stress, and revitalize the body, often without the need for medical intervention or monitoring, particularly for tourists with no specific physical ailments [50]. Bathing in mineral springs and drinking their waters are considered essential components of a holistic approach to eco-wellness [48].

2.2.2. Climate-Based Therapy

Climate is essential for tourism, particularly eco-wellness tourism, as it has a significant impact on favorable climate conditions [51–53]. It plays a crucial role in shaping and determining tourism activities in various destinations [35,53]. The literature suggests that warm climate conditions positively influence rehabilitation programs, leading to higher patient satisfaction [54]. In favorable climates, activities such as walking and hiking help reduce fatigue while enhancing endurance and flexibility [2]. Climatic factors such as temperature, humidity, atmospheric pressure, and air quality offer numerous health benefits that urban environments cannot replicate [11]. Temperature, in particular, plays a vital role in promoting health and attracting tourists [35].

2.2.3. Kinetic-Based Therapy

Fitness, active aging, longevity programs, learning, adventure, spiritual enlightenment, and personal growth [28] can be significantly enhanced by natural and physical features such as mountains, forests, coasts, and deserts [12,52]. These features offer fresh air, medical herbs, a safe environment, and scenic landscapes [55]. Eco-wellness tourism destinations near mountainous areas can provide activities such as directional activities, cross-country running, rock climbing, grass skiing, mountain biking, hiking, and climbing. Coastal destinations, on the other hand, offer activities like ball sports, jogging, waterfront walking, swimming, and boating [11]. In addition to physical activities, these geographical features also contribute to eco-wellness through herbal therapy, sightseeing, and relaxation [11,13,40].

3. Study Area

Iran offers a unique combination of favorable climate conditions, stunning landscapes, and natural healing resources like spas and hot springs [56]. In addition to these natural features, the country provides affordable services, ranking first globally in terms of price competitiveness in the tourism industry [57]. Among Iran's provinces, Ardabil stands out as a leading eco-wellness tourism destination due to its attractions and favorable climate, which provides an escape from the heatwaves of nearby arid areas. The province is renowned for its geothermal springs and mild air conditions during the spring and summer seasons [44,50,58]. However, like many of Iran's destinations rich in natural resources, Ardabil faces challenges with inadequate infrastructure [59]. To fully capitalize on its natural assets, strategic operational planning is needed to position Ardabil as the leading eco-wellness destination in Iran [58]. Hence, the Ardabil province in Iran was selected as the study area for implementing the proposed framework. This area, located at approximately 38° North latitude and 48° East longitude, covers an approximate area of 17,901 km^2. It offers a high degree of diversity in terms of climatic characteristics, topography, land cover, and landscape. According to the latest statistics of the Provincial Meteorological Organization, the average air temperature and annual precipitation in the study area are around 11 °C and 330 cm, respectively. The elevation above sea level in this region ranges from 4 m to 4787 m. The land cover in this area is composed of built-up land, agricultural areas, forests, grasslands, water bodies, barren land (Figure 1). The area also experiences a mix of humid, semi-humid, and dry climatic conditions.

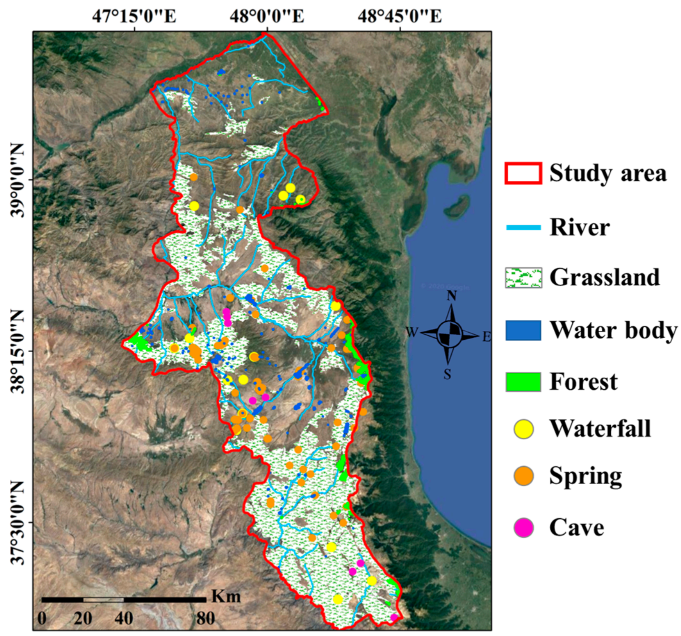

Figure 1. Map of the geographical location and some natural features in the study area.

4. Materials and Methods

4.1. Data

A comprehensive geodatabase was developed to support the spatial assessment of eco-wellness tourism suitability. The dataset integrated multiple environmental and geographical variables, including land cover, topography, climate conditions, hydrological features, air quality, vegetation indices, and radiation factors (Table 1). To ensure reliability and applicability, we used datasets from both trusted national organizations and internationally recognized sources. National data were obtained from the Iranian Natural Resources and Watershed Management Organization, the Iranian Meteorological Organization, and the Ministry of Energy, while international datasets were acquired from NASA, the European Space Agency (ESA), ECMWF, and other established providers.

The climatic variables, including air temperature, precipitation, wind speed, surface pressure, relative humidity, and climate classes, were obtained from the Iranian Meteorological Organization and ERA5 reanalysis products, ensuring consistency between regional and global climate information. Air quality was represented using Sentinel-3 Greenhouse Gas products and MODIS AOD data, which have been widely validated for regional-scale air quality monitoring. Snow cover, NDVI, and LAI were derived from MODIS products, while topography, slope, landform, and solar radiation were obtained from the AW3D digital elevation model at 30 m resolution. In addition, local hydrological features such as rivers, springs, waterfalls, and caves were extracted from datasets provided by the Ministry of Energy and complemented with OpenStreetMap and Google Earth databases.

Table 1. Data and their types and sources.

Data	Type	Descriptions	Website (Access Date)
Land cover, Forest, Grassland, Water body, Vegetation landscape	Shapefile (Polygon)	Land cover, including shapefiles for Forest, Grassland, Water body, Vegetation landscape was extracted from the Land Use Shapefile of Iran provided by the Iranian Natural Resources and Watershed Management Organization.	https://en.frw.ir/ (accessed on 5 April 2025)
Mountains		The shapefile for mountainous areas was derived from a digital elevation model. The AW3D model with a 30 m spatial resolution was used.	https://www.aw3d.jp/en/products/standard/ (accessed on 5 April 2025)
Climate class		The Climate class map was derived from the Climate shapefile of Iran, provided by the Iranian Meteorological Organization.	https://www.irimo.ir/eng/index.php (accessed on 5 April 2025)
River and Coastline	Shapefile (Polyline)	The shapefile for rivers and coastline in Ardabil Province was extracted from the river dataset provided by the Ministry of Energy.	https://new.moe.gov.ir/ (accessed on 4 April 2025)
Air temperature Precipitation		The Air temperature and Precipitation maps were derived from the isotherm and isohyet shapefiles of Iran, provided by the Iranian Meteorological Organization.	https://www.irimo.ir/eng/index.php (accessed on 4 April 2025)
Spring	Shapefile (Point)	The shapefile for Spring was extracted from the Spring dataset provided by the Ministry of Energy.	https://new.moe.gov.ir/ (accessed on 4 March 2025)
Waterfall and Cave		The shapefile for Waterfall and Cave was extracted from the Google earth and Open Street map database.	https://earth.google.com/web/ (accessed on 28 March 2025) https://www.openstreetmap.org/
Air quality	Raster	The Air quality map was derived from the Sentinel 3 Greenhouse Gas Products/MOD04 AOD from MODIS Terra with a 1000 m spatial resolution.	https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-3/Data_products (accessed on 28 March 2025) https://modis.gsfc.nasa.gov/data/dataprod/ (accessed on 28 March 2025)
Snow cover		The snow cover map was derived from the MOD10A1.061 Terra Snow Cover with a 500 m spatial resolution.	https://modis.gsfc.nasa.gov/data/dataprod/ (accessed on 28 March 2025)
NDVI and LAI		The NDVI and LAI maps were derived from the MOD13A3 V6.1 NDVI and MOD15A2H.006 LAI Products with a 1000 m spatial resolution	
Topography (Elevation), Slope, Landform and Solar radiation		The topographic map, slope map, landform map, and solar radiation map were derived from the AW3D digital elevation model with a 30 m spatial resolution.	https://www.aw3d.jp/en/products/standard/ (accessed on 27 March 2025)
UVB		The UVB map was derived from the glUV Products with a 25,000 m spatial resolution.	https://www.ufz.de/gluv/index.php?en=32435 (accessed on 29 March 2025)
Wind speed, Surface Pressure and Relative humidity		The Climatic factors maps were derived from the ECMWF Reanalysis v5 (ERA5) Products with a 3000 m spatial resolution	https://www.ecmwf.int/en/forecasts/dataset/ecmwf-reanalysis-v5 (accessed on 29 March 2025)

By combining multiple data sources of varying resolutions and formats (raster, vector, and point data), the geodatabase ensured a robust representation of environmental attributes. All layers were pre-processed and harmonized into a consistent spatial framework before integration into the GIS-MCDM analysis. This approach enhanced both the reliability and applicability of the datasets to the eco-wellness tourism suitability assessment in Ardabil Province.

4.2. Methods

The methodological framework for conducting the MCDM-GIS analysis is illustrated in Figure 2. This framework is specifically designed for spatial modeling to identify suitable natural sites for eco-wellness tourism in different scenarios. It incorporates a range of techniques, including data collection, criterion selection and weighting, spatial analysis, and validation to identify and assess potential sites for eco-wellness tourism development. The framework is designed to comprehensively evaluate the suitability of areas for eco-wellness tourism by addressing multiple factors and scenarios. It consists of six distinct steps: Step 1 involves preparing the geodatabase by collecting relevant spatial data layers, including topography, climate, vegetation, and water bodies, which form the basis for further analysis. Step 2 focuses on standardizing the criteria maps using the min-max method to ensure consistency in scale for all maps. Step 3 applies the Analytic Hierarchy

Process (AHP) to assign weights to the criteria based on their importance. Step 4 involves spatial analysis and modeling, where weighted criteria maps are integrated into suitability maps for various eco-wellness tourism products, considering different scenarios (from very pessimistic to very optimistic) using the OWA operator. In Step 5, statistical analysis is conducted to assess changes in the suitability of areas according to their natural capacity for eco-wellness tourism under different scenarios. Finally, Step 6 includes ensemble analysis, where the maps from different scenarios for water, climate, and kinetic therapies are analyzed to identify areas of consensus and evaluate the suitability for each type of eco-wellness product.

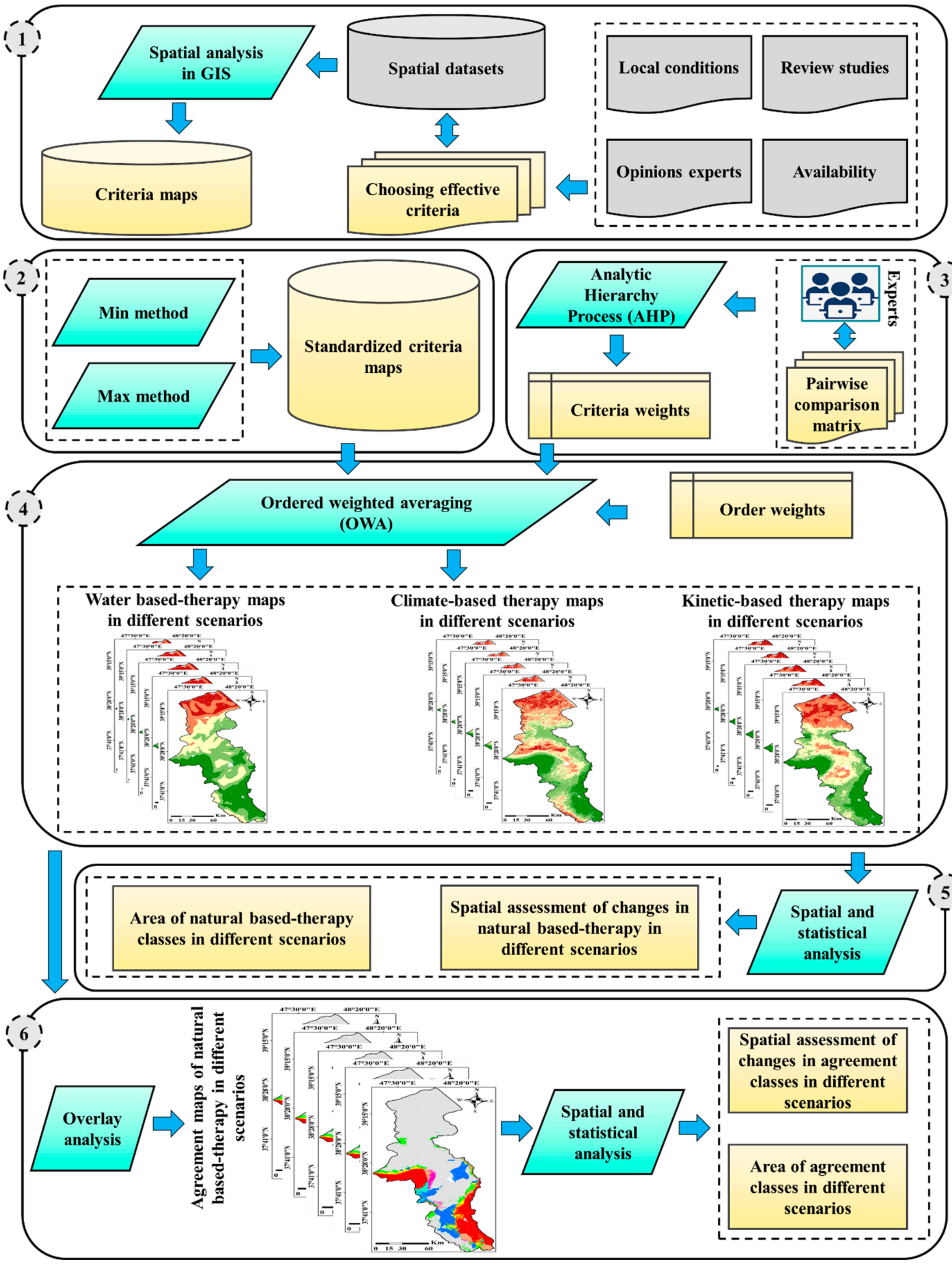

Figure 2. Research flowchart.

4.2.1. Effective Criteria

To assess the suitability of the study area for developing eco-wellness tourism, three main products were considered: water, climate, and kinetic-based eco-wellness products. Each of these products includes several criteria, as follows. In the water category, factors such as the presence of springs, seas and lakes, rivers, waterfalls, water bodies, and snow cover were assessed. For climate, indicators like UVB radiation, air quality, climate classification, temperature, humidity, precipitation, solar radiation, air pressure, wind speed, and snow cover were analyzed. In the kinetic category, criteria included air quality, elevation, forests, grasslands, caves, slope, vegetation landscape coverage (VLC), normalized difference vegetation index (NDVI), leaf area index (LAI), and snow cover. These comprehensive criteria provide a holistic approach to evaluating environmental and climatic features of different regions for their potential in eco-wellness tourism. The details of the criteria were presented in Table 2.

Table 2. The details of the criteria.

Eco-Wellness Product	Criteria	Descriptions
Water	Springs	Greater proximity to natural springs facilitates easier access for tourists seeking therapeutic mineral baths and spa treatments, enhancing the overall appeal of the location for eco-wellness tourism.
	Sea and lakes	Proximity to large water bodies like seas and lakes offers opportunities for a variety of water-based eco-wellness activities such as swimming, boating, water sports, and thalassotherapy, attracting tourists seeking diverse eco-wellness experiences.
	Rivers	Rivers provide access to activities like river rafting, kayaking, and stand-up paddleboarding, which can be incorporated into eco-wellness resorts and adventure-based tourism packages. Proximity to rivers also enhances the scenic beauty of the location.
	Waterfalls	Waterfalls offer stunning visual appeal and can be incorporated into eco-wellness resorts through activities like waterfall meditation, sound therapy, and invigorating mist treatments.
	Water body	Closer proximity to any water body, regardless of its specific type, increases the potential for water-based recreational activities, enhancing the appeal of the location for tourists seeking eco-wellness experiences related to water.
	Snow cover	Snow cover directly influences the availability of meltwater, which supports water resources such as rivers and lakes. Additionally, snow-covered landscapes enhance the aesthetic appeal and provide unique opportunities for eco-wellness activities in natural winter settings.
Climate	UVB	Excessive exposure to UVB rays can lead to skin damage, increased risk of skin cancer, and other health issues. Therefore, areas with high UVB radiation may deter tourists seeking outdoor activities and physical eco-wellness experiences.
	Air quality	Clean air is crucial for respiratory eco-wellness. Resorts located in areas with excellent air quality can offer activities like forest bathing, yoga retreats, and meditation sessions, emphasizing the benefits of fresh air and reduced pollution.
	Climate class	Favorable climate classes, with mild temperatures and clean air, create ideal conditions for promoting physical and mental well-being.
	Temperature	Temperature is a key factor in the comfort and suitability of outdoor eco-wellness activities, with mild and stable temperatures enhancing relaxation and making the destination more attractive for eco-wellness tourism.
	Humidity	Humidity plays a crucial role in comfort and health benefits, with optimal levels enhancing air quality and improving the eco-wellness experience.
	Precipitation	Precipitation is key to creating lush landscapes, clean air, and ideal humidity, enhancing relaxation and outdoor eco-wellness activities.

Table 2. *Cont.*

Eco-Wellness Product	Criteria	Descriptions
Climate	Solar radiation	Solar radiation can be harnessed for vitamin D production and natural light therapy.
	Air pressure	Air pressure influences oxygen availability and physical comfort, particularly in high-altitude areas. Lower air pressure in such regions can promote relaxation and improve respiratory health, attracting tourists seeking therapeutic benefits.
	Wind speed	Areas with consistent wind can offer opportunities for wind-based activities like kiteboarding and windsurfing, which can be incorporated into adventure eco-wellness retreats.
	Snow cover	Snow cover is a key factor for climate-based eco-wellness tourism, as it enables activities such as snow therapy, and cold exposure treatments, which contribute to relaxation and health benefits.
Kinetic	Air quality	Clean air enhances the effectiveness of outdoor kinetic-based therapies allowing deeper breathing and improved energy flow.
	Elevation	High-altitude locations with lower air pressure can be beneficial for altitude training and can be incorporated into eco-wellness resorts focused on improving health and endurance.
	Forest	Forests provide a serene environment for forest bathing, a practice that combines gentle movement with mindful awareness, reducing stress and improving mood.
	Grassland	Grasslands offer expansive spaces for activities like running, walking, and hiking, promoting health and providing a sense of freedom and openness.
	Cave	Cave environments can provide a unique setting for grounding and meditative practices, reducing sensory overload and promoting a sense of inner peace.
	Slope	Slopes can be incorporated into kinetic-based therapies like hill sprints and incline walking, enhancing strength training.
	VLC	High VLC indicates lush vegetation, providing shade and cooler temperatures, making outdoor activities more comfortable during hot weather.
	NDVI	High NDVI values suggest healthy vegetation, which can enhance the air quality and provide a more visually appealing and invigorating environment for outdoor activities.
	LAI	High LAI indicates dense vegetation, which can increase the shade and humidity, creating a more humid and potentially cooler microclimate suitable for certain types of exercise.
	Snow cover	Snow cover can provide opportunities for winter sports like skiing and snowboarding, which are excellent forms of cardio and full-body exercise.

4.2.2. Standardization of Criteria Maps

The criteria used for evaluating eco-wellness tourism were standardized. For this purpose, the criteria were standardized based on their minimum and maximum values to make them dimensionless [24,25]. The standardization method for each criterion depended on its type of impact. For criteria where higher values indicate better quality and desirability in natural-based wellness tourism evaluation, Equation (1) was used. For criteria where lower values indicate better quality and desirability, Equation (2) was applied.

$$SC_{ij} = \frac{C_{ij} - C_j^{min}}{C_j^{max} - C_j^{min}} \tag{1}$$

$$SC_{ij} = \frac{C_j^{max} - C_{ij}}{C_j^{max} - C_j^{min}} \tag{2}$$

In Equations (1) and (2), SC_{ij} is the standardized value for location i-th in criterion j-th, C_{ij} is the value for location i-th in criterion j-th, and C_j^{max} and C_j^{min} are the maximum and minimum values for criterion j-th, respectively. After standardization, the minimum and maximum values of the standardized criteria varied between 0 and 1, where values close to 1 represent the excellent potential for eco-wellness tourism development, and values close to 0 represent the poor potential for eco-wellness tourism development.

4.2.3. Criteria Weighting

To finalize the criteria and assign their weights, we engaged 91 experts representing both the academic community and the tourism-related industry, some from Ardabil Province, the study area. This ensured the incorporation of local perspectives alongside scientific expertise. The experts came from diverse disciplines, including tourism planning (25), health and wellness sciences (18), geography and spatial planning (20), environmental sciences (15), and stakeholders from the tourism industry and wellness facilities (13). To select these participants, we applied a two-stage approach: first, purposive sampling of well-recognized specialists in relevant fields, and second, snowball sampling by asking initial experts to recommend other qualified individuals.

For weighting the criteria, we used the AHP proposed by Saaty [60], which involves developing a pairwise comparison matrix, calculating the Eigenvector, and assigning weighting coefficients. This approach provided a systematic framework for evaluating the relative importance of the criteria and ensuring a structured, locally informed weighting process.

4.2.4. Scenario-Based Spatial Analysis and Modeling

The OWA operator is an advanced decision-making method for making decisions that go beyond simple averages. It allows the prioritization of the criteria based on decision-makers risk tolerance. The OWA operator can simulate various decision-making styles, from highly risk-averse to highly risk-taking, by assigning ordered weights to criteria based on their rank. This not only enables decision-makers to tailor the decision-making process to their specific needs and preferences, but also makes it a valuable tool for navigating complex and uncertain situations [23,27]. OWA was employed using a set of effective criteria (Equation (3)) to assess the suitability of the study areas for three types of nature-based eco-wellness products.

$$V(A_i^o) = \sum_{j=1}^{n} \frac{\lambda_k U_k Z_{ik}}{\sum_{k=1}^{n} \lambda_k U_k} \quad (3)$$

In Equation (3), $V(A_i^o)$ denotes the ultimate output derived from the OWA method. Z_{ik} signifies the standardized values associated with the k-th criterion at the i-th location. U_k indicates the weight assigned to the k-th criterion, while λ_k represents the ordinal weight attributed to the k-th criterion. It is important to note that these ordinal weights can differ depending on the specific scenario. Additionally, the variable n indicates the total number of criteria considered. The OWA operator utilizes two types of weights: (a) relative weights to show the relative importance of criteria (w1, w2,. . ., wn), and (b) the order weights (λ_1, λ_2,. . ., λ_n) are allocated according to the location of cells within the layers or maps. This implies that within a criterion map, all cells possess the same criterion weight, while their ordinal weights λ vary. The sorting mechanism assigns the weight λ_k to the ordered values of the criteria at the i-th position.

To develop scenarios ranging from very pessimistic to very optimistic, OWA uses the ORness degree to evaluate the risk-taking level of decision-makers (Equation (3)). This parameter serves as an indicator of their optimism or risk tolerance levels during the decision-making process. More precisely, values closer to 1indicate higher levels of risk-taking (a more optimistic scenario). In contrast, values closer to 0 suggest pessimistic views and a tendency towards risk aversion.

In this study, five scenarios were developed based on the ORness parameter in the OWA operator, which ranges from 0 (fully pessimistic) to 1 (fully optimistic) (Equation (3)). These scenarios were defined as: very pessimistic (ORness = 0), pessimistic (ORness = 0.25), intermediate (ORness = 0.5), optimistic (ORness = 0.75), and very optimistic (ORness = 1). The rationale for choosing these scenarios was to capture a complete spectrum of decision-making attitudes, from highly risk-averse perspectives—where suitability is determined by the least favorable conditions—to highly risk-taking perspectives—where suitability is determined by the most favorable conditions. This ensures that the analysis does not rely on a single deterministic weighting, but rather considers the variability of outcomes under different assumptions.

The validity of these assumptions is grounded in the flexibility of the OWA model, which allows the incorporation of both the relative importance of criteria and decision-makers' attitudes toward uncertainty. By explicitly setting scenarios across the ORness continuum, the model accounts for diverse perspectives that may exist among stakeholders, such as policymakers, planners, and local communities, whose tolerance for risk and optimism may vary. These assumptions affect the reliability of the results by offering a range of plausible outcomes rather than a single solution, thereby enhancing the robustness of decision support in eco-wellness tourism planning. Moreover, scenario analysis helps to identify areas of consensus across multiple decision-making styles, which can guide practical implementation in contexts of uncertainty and stakeholder diversity.

The OWA operator was selected for this study due to its unique ability to integrate both the relative importance of criteria and the decision-makers' attitudes toward risk within a single framework. Unlike deterministic MCDM methods such as TOPSIS or AHP alone, OWA allows for the simulation of multiple decision-making styles, from highly risk-averse to highly risk-taking, through the ORness parameter. This flexibility enables a more realistic representation of uncertainty and variability in eco-wellness tourism planning, ensuring that scenario-based analyses can reflect diverse decision preferences. Moreover, OWA's capacity to assign ordered weights to criteria provides a nuanced approach to aggregating spatial data, enhancing the method's applicability for complex, multi-dimensional environmental assessments.

4.2.5. Spatial and Statistical Analysis

In this phase, sensitivity analysis is conducted to assess changes in the suitability of areas based on their natural capacity for eco-wellness tourism under different scenarios. After the scenario analysis, the suitability of areas is classified into five categories, which are essential for developing alternatives and management strategies. These categories include very low suitability (0–0.2), low suitability (0.2–0.4), moderate suitability (0.4–0.6), high suitability (0.6–0.8), and very high suitability (0.8–1.0). The spatial distribution of these categories in the study area for three types of eco-wellness therapies—water, climate, and kinetic therapies—was assessed under five different scenarios (very pessimistic, pessimistic, optimistic, intermediate, and very optimistic). Additionally, the area of each category was calculated for different scenarios and compared to one another, allowing for a comprehensive understanding of how suitability changes under varying conditions.

4.2.6. Ensemble Analysis

The classified suitability maps for water, climate, and kinetic therapies in different scenarios were spatially overlapped to analyze the distribution of very high suitability classes for each therapy type. Two analyses were performed: first, a spatial assessment of changes in agreement classes across different scenarios, which evaluated how the distribution of suitability classes shifted under various scenarios (from very pessimistic to very optimistic). Second, the area of agreement classes in different scenarios was calculated to quantify the spatial overlap of suitability areas across the scenarios. These analyses provide a comprehensive understanding of the spatial distribution and variability of eco-wellness tourism suitability for water, climate, and kinetic therapies, offering insights into potential locations for development under different conditions.

5. Results

5.1. Water-Based Eco-Wellness Tourism

In assessing suitable areas for water-based therapies of eco-wellness tourism, it was discovered that springs have the highest priority weight (0.38). Sea and lakes (0.25), rivers (0.16), waterfalls (0.11), water bodies (0.06), and snow cover (0.02) are the remaining criteria. The analytic hierarchy process reveals that springs hold the highest priority weight for this eco-wellness tourism product, a finding that is significant both theoretically and historically. This high prioritization reflects the foundational role of mineral and thermal springs in the history of hydrotherapy and eco-wellness. The historical development of many spa towns and wellness resorts has centered around these unique geological features, establishing them as primary destinations for therapeutic and restorative experiences [48,49].

The spatial analysis of water resources reveals a complex and varied landscape for water-based eco-wellness tourism (Figure 3). It highlights both opportunities and limitations. Rather than simply indicating areas of high potential, the maps show a tension between the favorable distribution of springs and rivers and the more widespread limitations of other critical water features. The varied suitability of water bodies and the largely unfavorable conditions of seas, lakes, and snow cover create distinct regional profiles. While the presence of springs might indicate an initial potential, the lack of suitable conditions for larger bodies of water suggests that development must be directed towards smaller-scale, spring-fed eco-wellness experiences. In contrast, in areas where several water criteria overlap and are favorable, a more diversified and comprehensive tourism product could be developed. The findings, therefore, move beyond a simple inventory of natural resources to a critical understanding of their interdependencies and collective influence. This guides a policy framework that acknowledges these complex relationships to foster a sustainable and differentiated water-based eco-wellness tourism product.

Findings demonstrate that the suitability for water-based eco-wellness increases, particularly within the highly suitable category, in the very optimistic scenario, while it diminishes in the very pessimistic scenario (Figure 4). An increase in the ORness value results in a broader highly suitable category, and conversely, a decrease leads to a reduction in this class [27]. The increase in highly suitable areas to 27% in the very optimistic scenario, contrasted with a drop to just 6% in the very pessimistic one (Figure 5) underscores a fundamental dependency of this eco-wellness product on favorable environmental conditions and the necessity of conservation parameters. This dramatic shift highlights the risk associated with developing tourism strategies relying on water resources. The pessimistic scenario's classification of almost a quarter of the area as "very low potential" implies the fragility of factors such as water scarcity, which are often intensified by climate change. Therefore, an optimistic development approach, while it seems promising, could lead to significant future losses and a misallocation of resources. A sustainable strategy must acknowledge and plan for this sensitivity, moving towards a deep understanding of the environmental thresholds.

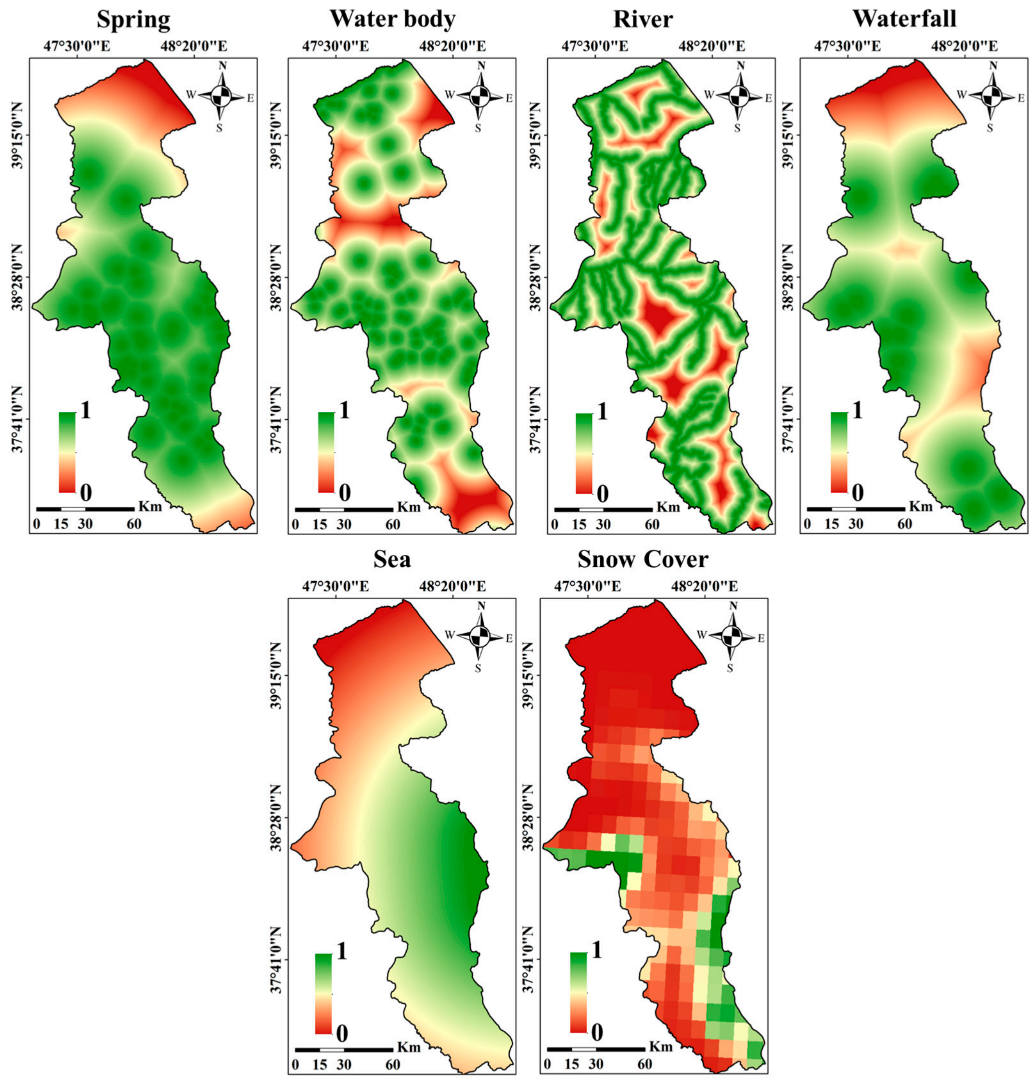

Figure 3. Criteria maps for water-based eco-wellness tourism.

5.2. Climate-Based Eco-Wellness Tourism

The literature review and expert opinions led to ten criteria for climate-based therapies required to develop eco-wellness tourism. These include UVB, air quality, climate classification, temperature, humidity, precipitation, solar radiation, atmospheric pressure, wind velocity, and snow cover. A weighted analysis indicated that UVB and air quality emerged as the most significant criteria with the weights of 0.24 and 0.23, respectively. Following these, climate classification was assigned a weight of 0.14, while temperature, humidity, and precipitation were weighted at 0.10, 0.07, and 0.06, respectively. The remaining criteria—solar radiation, atmospheric pressure, wind velocity, and snow cover—were considered less important, with weights of 0.06, 0.04, 0.03, and 0.02, respectively. The results highlight the necessity of prioritizing UVB and air quality in the development of climate-based eco-wellness tourism interventions.

The study area shows a significant spatial variability in the criteria maps for climate-based eco-wellness tourism (Figure 6). The predominantly low temperatures, except for localized warm areas in the southwest and southeast, pose a significant constraint on annual appeal for this product, which typically thrives in warmer climates. Conversely, the relatively high precipitation and humidity, while limiting some outdoor activities, may support hydro-therapeutic or specialized wellness experiences. The climatic classification and the clear south-to-north gradient in air pressure suggest distinct microclimates, which could be leveraged to develop diverse and targeted eco-wellness products rather than a one-size-fits-all approach. For example, areas with higher pressure and lower temperatures could be promoted for specific cold-weather therapies or as a retreat from warmer, more humid regions. Furthermore, the complex mosaic of solar radiation and high-concentration zones of UVB radiation are critical considerations. This pattern necessitates a cautious approach in promoting therapies reliant on solar exposure, emphasizing a targeted development in a few specific northern areas while acknowledging the limitations in the southwest. The highly localized minimum wind speeds, forming a central band across the study area, are an important finding. This zone could be strategically developed for activities requiring minimal wind disturbance, such as meditation or certain kinetic therapies, presenting a unique micro-environmental advantage. Finally, while good air quality provides a foundational benefit for all eco-wellness activities, the notable exceptions in the central and northern regions serve as a critical warning. These areas with poorer air quality require specific mitigation strategies or may be deemed unsuitable for tourism development. They also highlight the need for a site-specific approach to planning and a deeper analysis of the causes of this poor air quality.

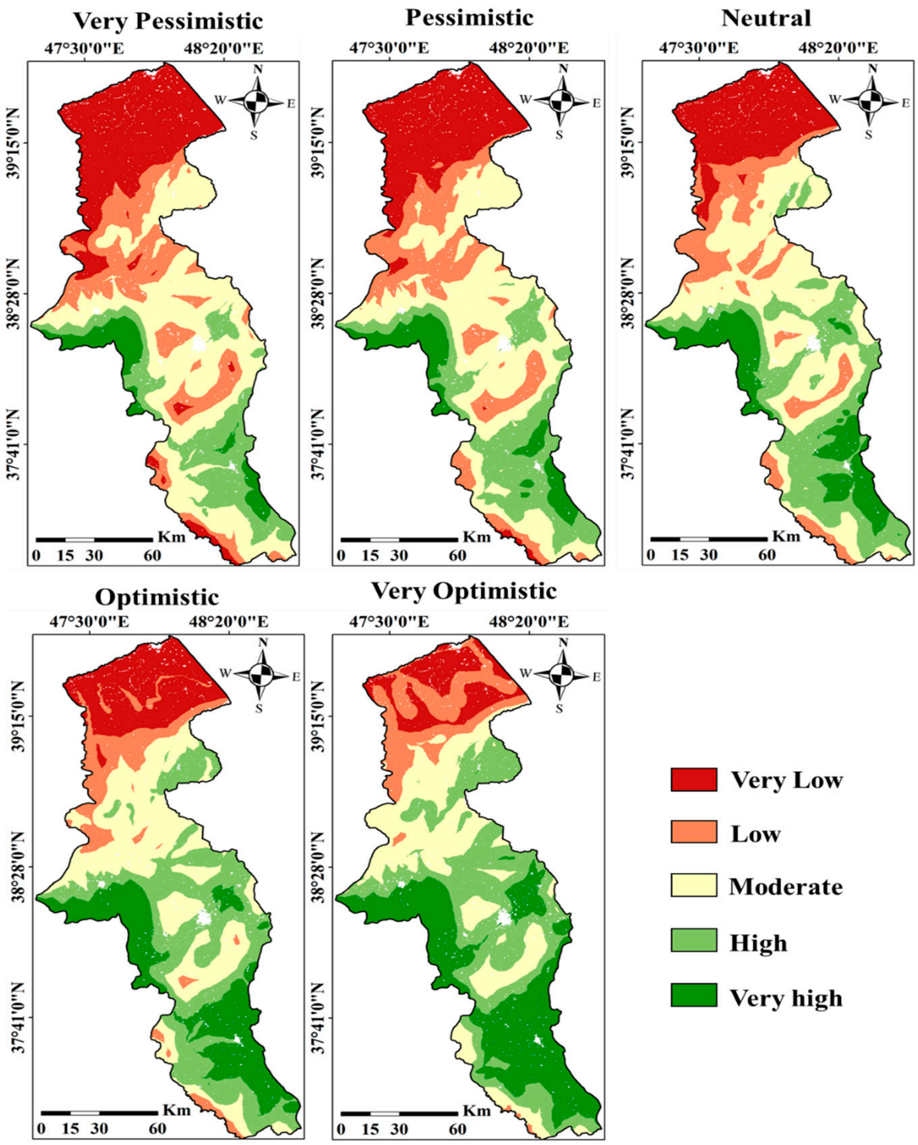

Figure 4. The potential areas maps for water-based eco-wellness tourism in different scenarios.

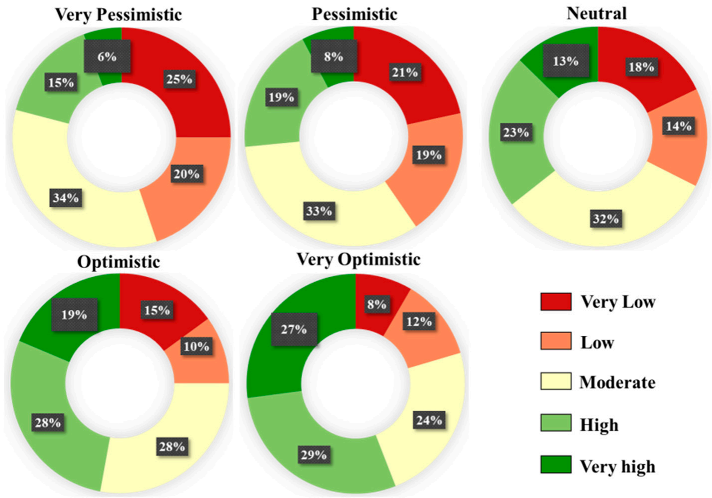

Figure 5. The percentages of potential classes for water-based eco-wellness tourism in different scenarios.

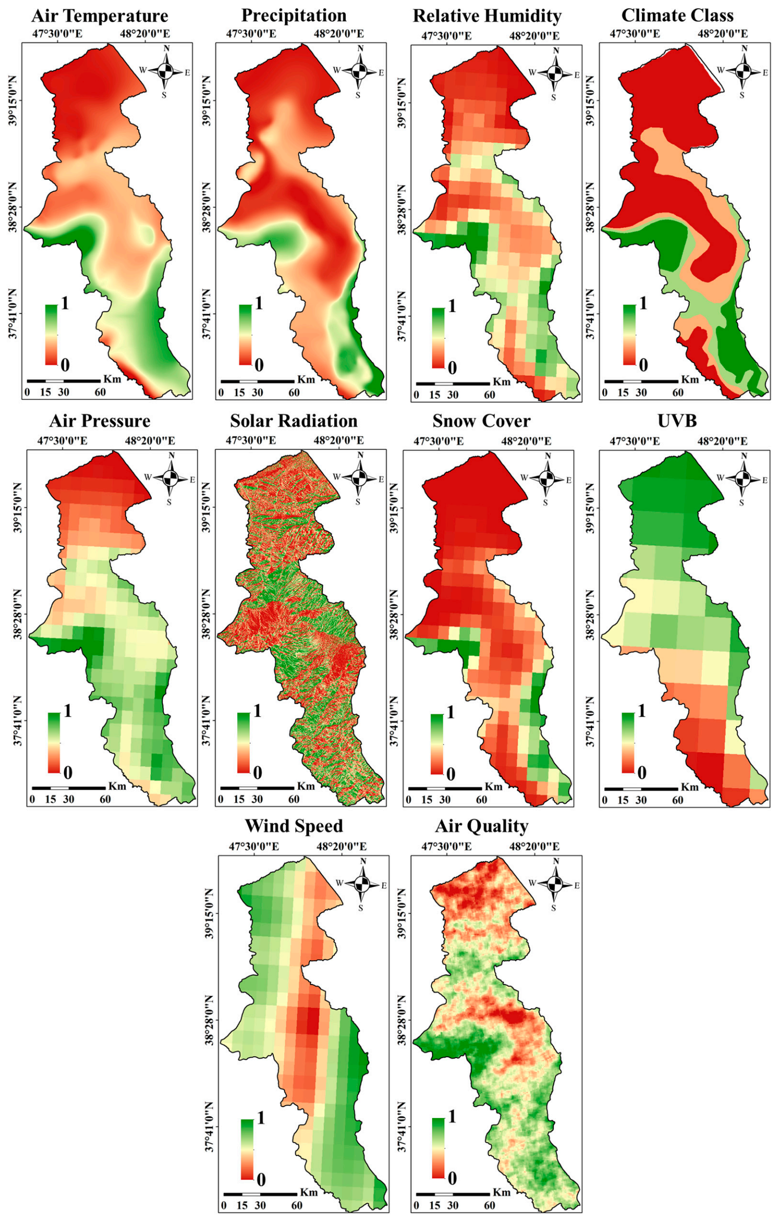

Figure 6. Criteria maps for climate-based eco-wellness tourism.

The spatial distribution of suitable areas is not static but rather dynamic and highly dependent on climate projections (Figure 7). The dramatic shift from a very pessimistic scenario, where 60% of the area is of low and very low suitability, to a very optimistic one, where high-to-very-high suitability areas surge to over 46%, serves as a powerful illustration (Figure 8). This shift, which is more than a mere change in percentages, represents a transformation of opportunities. It indicates that climate conditions are primary determinants of eco-wellness tourism. While optimistic projections might present a compelling picture of widespread potential, a responsible development strategy must acknowledge the significant risk of a less favorable climate future. Therefore, prioritizing the pessimistic scenarios is not an act of pessimism but one of strategic foresight and resilience-building. Projects and investments should be concentrated in areas that maintain their suitability even under the least favorable conditions. This approach ensures that capital is deployed in locations with the highest potential, mitigating the risk of investment and ensuring the sustainability of eco-wellness offerings. The growth in highly suitable areas under optimistic conditions should not be a trigger for unrestricted expansion but rather a goal to be achieved through proactive environmental management and climate mitigation strategies.

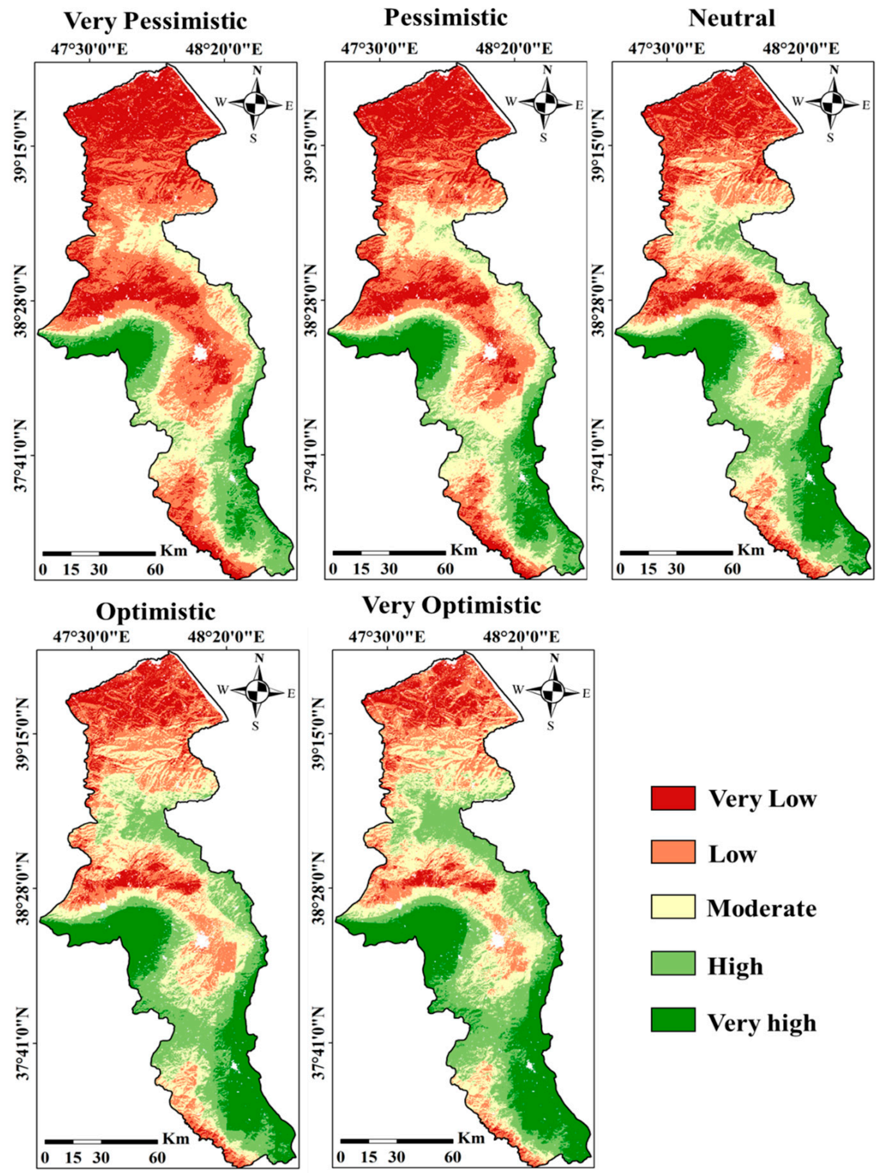

Figure 7. The potential areas maps for climate-based eco-wellness tourism in different scenarios.

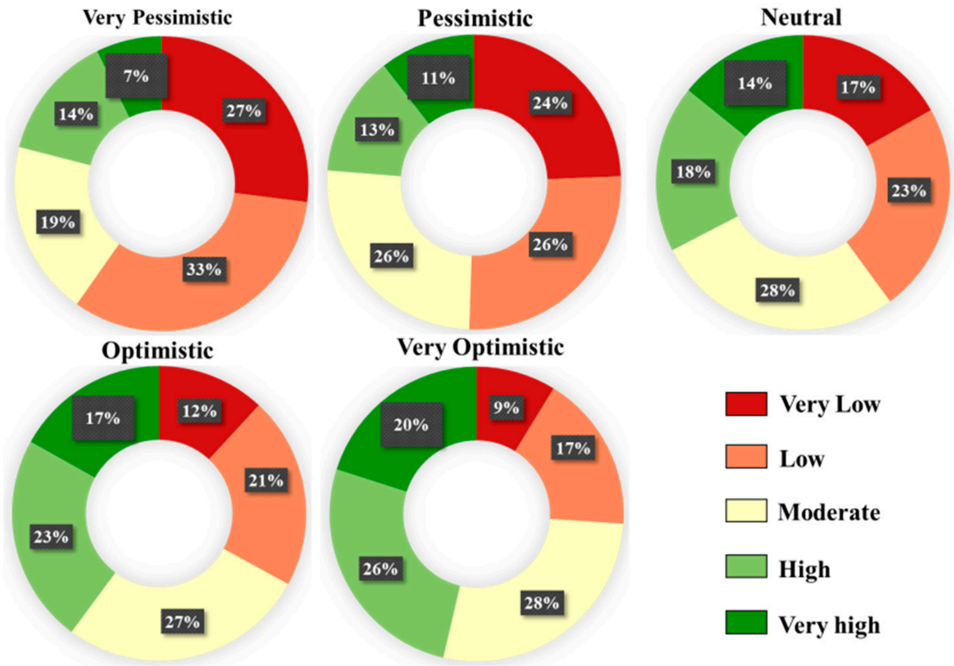

Figure 8. The percentages of potential classes for climate-based eco-wellness tourism in different scenarios.

5.3. Kinetic-Based Eco-Wellness Tourism

A total of ten criteria were used to map potential areas for kinetic-based eco-wellness tourism: air quality, elevation, forest cover, grassland cover, presence of caves, slope, vegetation cover, NDVI, LAI, and snow cover. The weights of these criteria reflect their relative significance. Air quality and elevation were recognized as the most influential, with the highest weights of 0.25 and 0.16, respectively. They were followed by forest and grassland covers, which were weighted at 0.14 and 0.13. The remaining criteria—caves (0.08), vegetation cover (0.07), NDVI (0.06), LAI (0.05), and snow cover (0.03)—received lower weights.

While good air quality provides a foundational benefit, the notable exceptions in the northern and central areas serve as a critical warning (Figure 9). The limited distribution of key resources—such as high Leaf Area Index (LAI) and Normalized Difference Vegetation Index (NDVI) values, and dense forest cover—presents a significant constraint on widespread development. The concentration of these key factors in only a few areas suggests that sustainable kinetic-based tourism, which relies on green spaces and clean air, cannot be a region-wide initiative. Instead, it must be strategically targeted to the highly potential zones. This is further complicated by the fact that areas with the highest vegetation also coincide with the lowest elevations and subtle slopes in the northern regions. While the low slopes are favorable for walking, the lack of topographic relief may limit the variety of challenging kinetic activities, such as trekking and climbing, which are often sought after by active tourists. Therefore, the most promising locations are likely those with a combination of good vegetation and more varied topography. This highlights a trade-off in tourism development strategies: optimizing for either ease of access and gentle activities or for more physically demanding and diverse experiences.

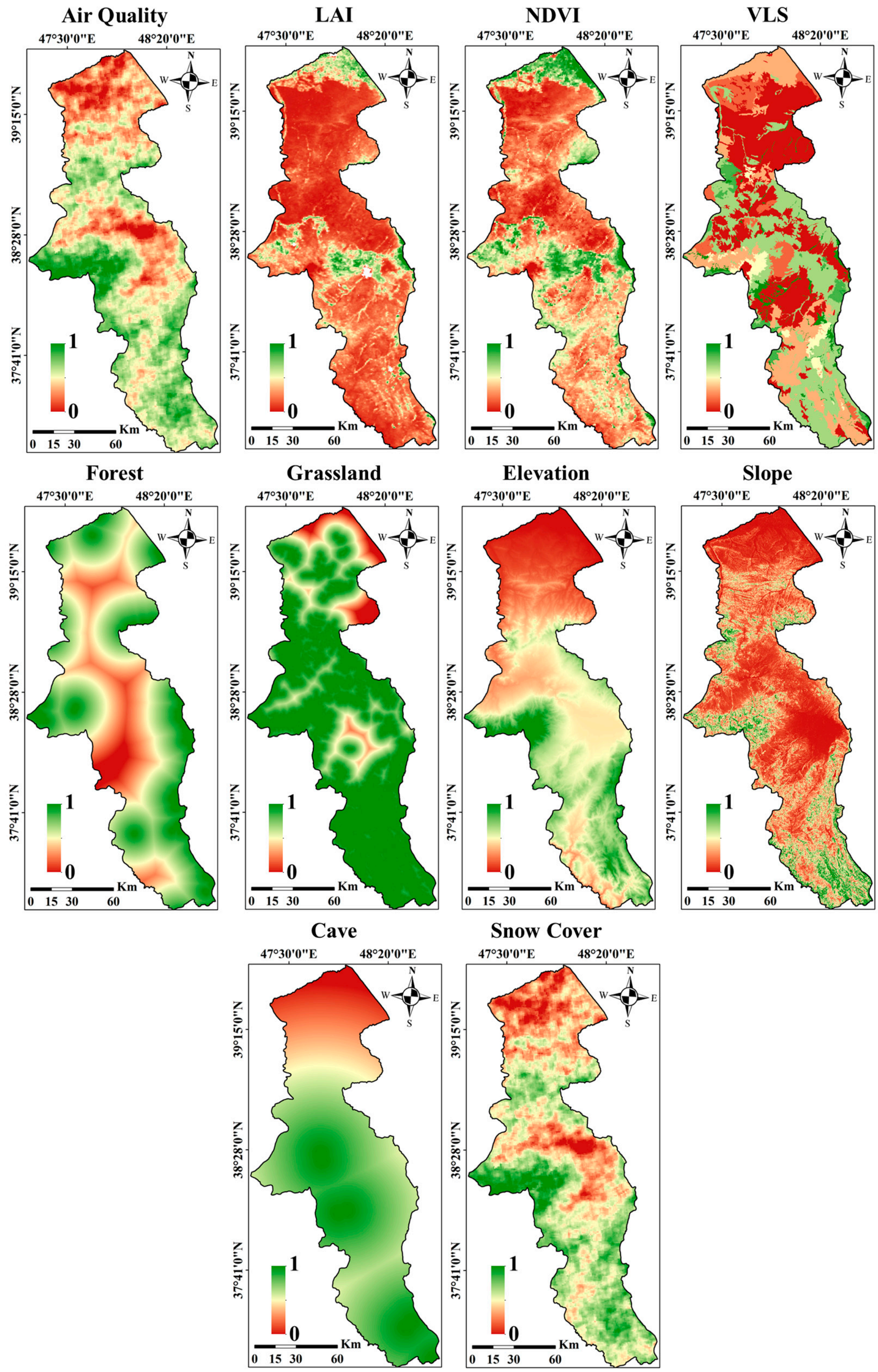

Figure 9. Criteria maps for kinetic-based eco-wellness tourism.

The analysis of potential areas for kinetic-based eco-wellness tourism reveals a sensitivity to scenario parameters, underscoring the critical role of planning assumptions in shaping development strategies. The spatial polarization evident in the maps (Figure 10)—with northern areas consistently demonstrating very low suitability and southern/western areas shifting towards higher potential— is an essential finding that highlights nature-related limitations in the north. This suggests that resources for kinetic tourism are geographically concentrated, and that a single, uniform development strategy is not possible. The quantitative shifts across scenarios further reinforce this conclusion. The percentage of very high and high suitability areas in optimistic scenarios indicates that a significant portion of the landscape is not inherently unsuitable but is instead highly responsive to policy interventions (Figure 11). It implies that the primary barrier to development in many areas is not a lack of resources but rather the presence of modifiable conditions. Therefore, under optimistic scenarios, the focus should shift from identifying suitable areas to optimizing the potential of these highly responsive zones. The relatively stable nature of the moderate suitability class across scenarios presents another strategic insight, as these areas could be developed for a broader, less-specialized range of activities.

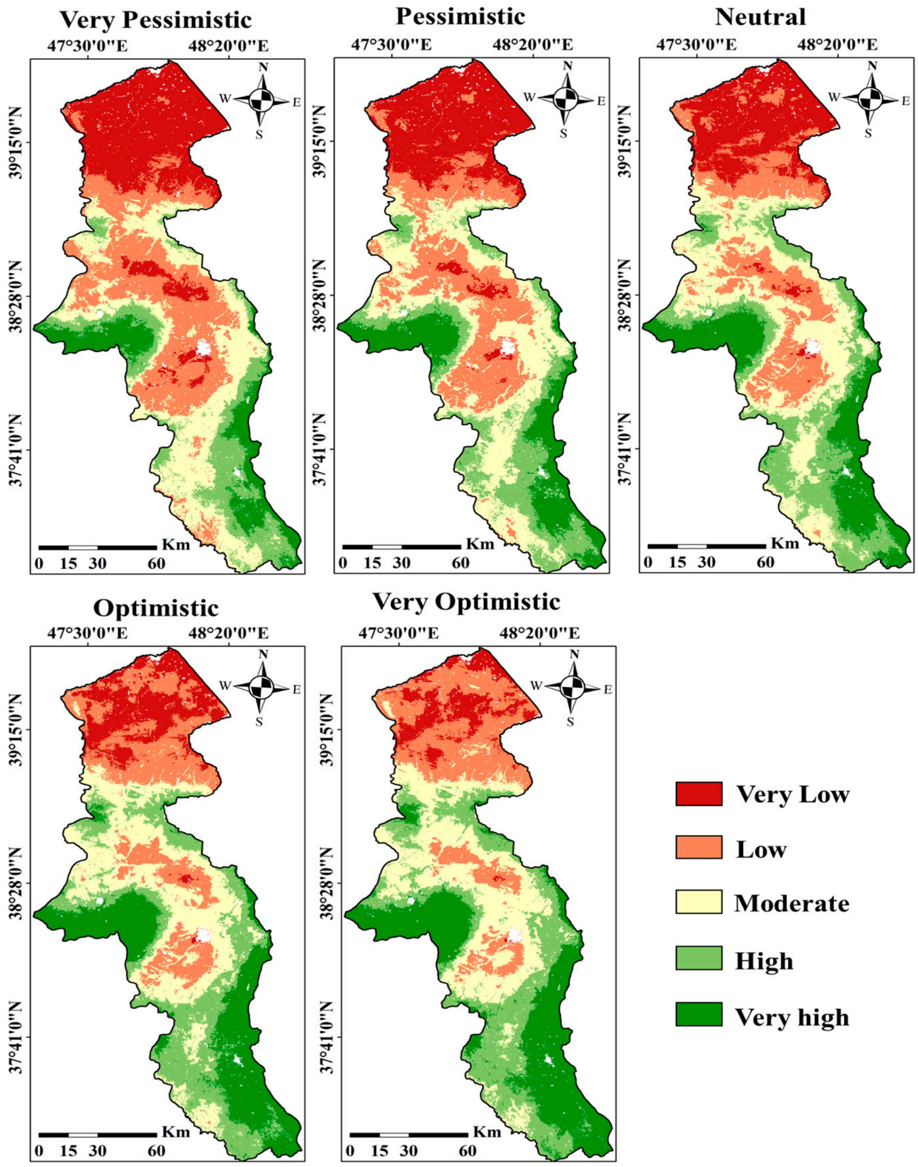

Figure 10. The potential areas maps for kinetic-based eco-wellness tourism in different scenarios.

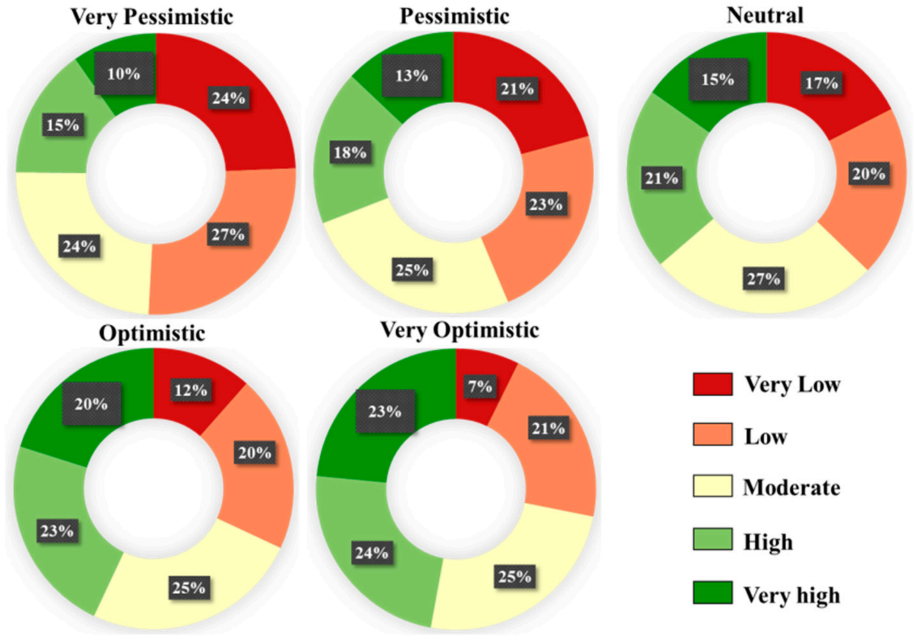

Figure 11. The percentages of potential classes for kinetic-based eco-wellness tourism in different scenarios.

5.4. Water, Climate and Kinetic: An Ensemble Approach to Eco-Wellness Tourism

Findings reveal a consistent spatial pattern; the western and southern parts of the area generally show greater suitability for three types of products across all scenarios. This result is likely due to a combination of criteria, including pleasant climatic conditions, water resources, and varied landscapes. Conversely, the northern part shows lower suitability across all scenarios (Figure 12). It suggests a geographically rooted disparity in natural resources. This disparity likely stems from the interplay of more favorable climatic conditions, abundant water resources, and diverse landscapes in the south and west, which provide a strong foundation for eco-wellness activities. The most profound finding is the areas suitable for all three products. This validates a synergistic development model. The occurrence of kinetic, climate, and water-based products in a single area provides a strategic advantage, allowing for a diversified and comprehensive tourist experience that can enhance therapeutic outcomes and provide resilience against market fluctuations.

The scenario analysis reveals a shift in eco-wellness potential, from a landscape of significant constraints to one of diversified opportunities as conditions become more favorable. The dominance of unsuitable areas in the very pessimistic scenario (85.4%) indicates the vulnerability of the area's natural resources to tourism development. However, the reduction in unsuitable areas by nearly a third in the very optimistic scenario shows that, with favorable conditions, a substantial portion of the area can be used for development. An analysis of the single-factor therapies reveals the influence of water resources. The exponential growth of water-only areas demonstrates that water is the primary factor for eco-wellness potential (Table 3). This suggests that investment and conservation efforts focused on water resources would yield the most significant returns. In contrast, climate-based tourism remains a marginal and relatively stable niche, highlighting the inherent climatic limitations of the area for this eco-wellness product. The stability of kinetic-only areas further reinforces this point.

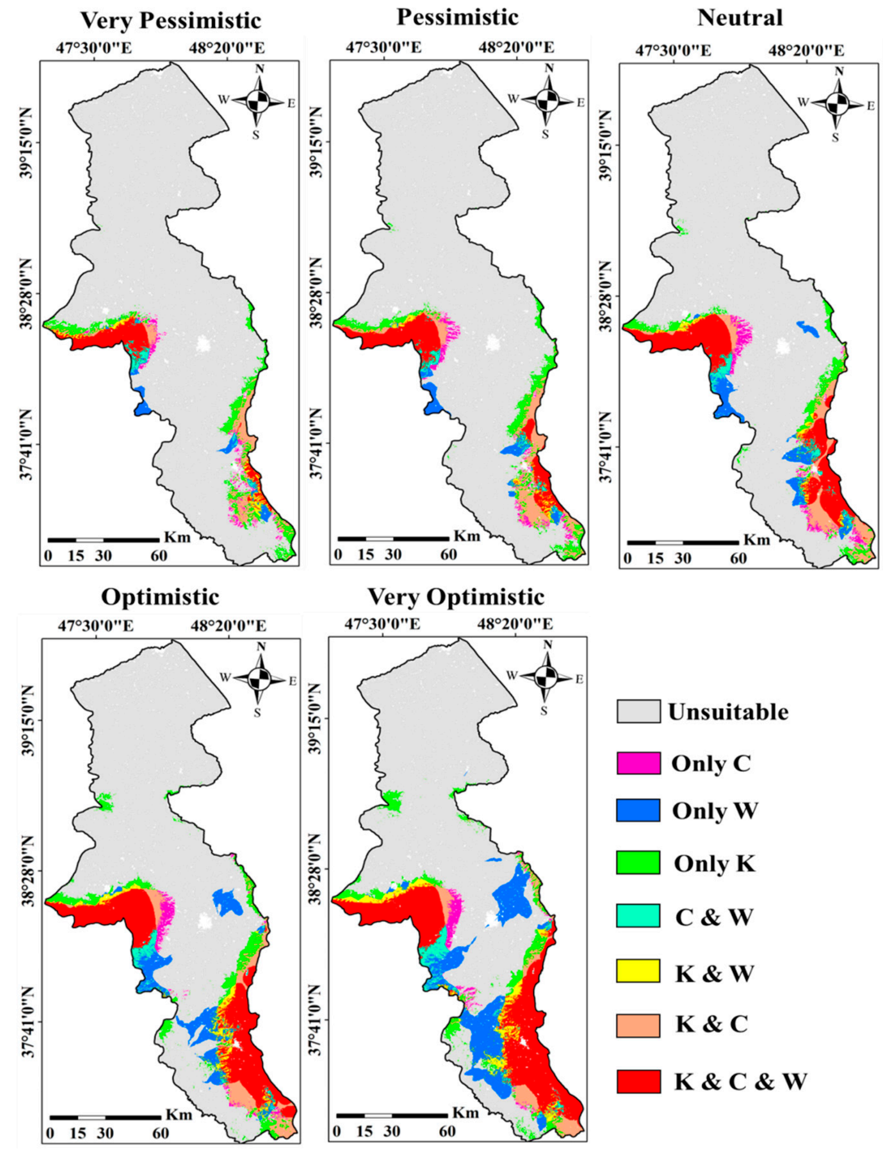

Figure 12. Ensemble maps of the very high potential class of natural-based eco-wellness in different scenarios. C: Climate, W: Water, K: Kinetic.

Table 3. The area of eco-wellness tourism potential classes for different scenarios (km^2).

	Very Pessimistic	Pessimistic	Neutral	Optimistic	Very Optimistic
Only climate	158.4	190.5	239.2	195.3	214.7
Only water	186.0	261.2	481.7	785.9	1472.4
Only kinetic	610.5	655.7	509.2	673.0	665.4
Climate and water	113.8	119.7	196.1	185.7	276.3
Water and kinetic	118.8	99.5	125.2	294.3	447.5
Kinetic and climate	411.3	635.8	609.5	554.4	459.3
Water and climate and kinetic	563.8	874.4	1418.9	1993.8	2528.1

The most important finding is the impact of integrated, multi-factor strategies. The combination of three products shows a nearly fivefold increase in suitable areas, confirming that the most significant eco-wellness opportunities lie not in isolated resources but in their overlaps. This is a powerful argument against single-purpose development. Instead of building a climate-only or water-only resort, a more resilient and attractive strategy involves leveraging areas where multiple natural resources converge. The rise in dualproduct overlaps further supports that diversified experiences are key to maximizing the areas' attractiveness and competitiveness. Therefore, strategic planning should prioritize identifying and developing the multi-product hotspots, as they represent the most promising areas for eco-wellness tourism.

6. Discussion

Given the growing interest in natural destinations offering eco-wellness experiences, this research aimed to achieve two main objectives. First, it sought to identify suitable areas for the advancement of eco-wellness tourism, utilizing MCDM methods that have proven effective in addressing various tourism-related planning challenges [61]. The methodology aligns with existing literature, which underscores the importance of integrating GIS and MCDM for effective decision-making in tourism planning and highlights the benefits of combining spatial analysis with multi-criteria evaluation [27,61]. The innovative strategy employed in this study, integrating spatial analysis, GIS, and MCDM techniques, contributes to an inclusive, responsive, and data-driven decision-making process. Second, it proposed a comprehensive framework designed to guide initiatives and investments in this field. This framework emphasizes the development of unique eco-wellness products within natural landscapes. To enhance the attractiveness and competitiveness of these areas, it is crucial to offer a variety of engaging activities, high-quality facilities, and infrastructure, and a fulfilling experience for those seeking eco-wellness [15]. These objectives aim to regulate tourism development while preserving natural resources.

The presented framework highlights three primary eco-wellness products based on water, climate, and kinetic factors. Utilizing natural resources offers a distinctive experience for health-seeking tourists. In this regard, the study found a significant relationship between natural resources and eco-wellness tourism. Springs were identified as a key factor, given their historical role in the development of eco-wellness tourism [15,48,49]. The geographical distribution of springs, lakes, and rivers played a crucial role in identifying areas suitable for eco-wellness water-based tourism. While optimistic projections suggested that a significant portion of the area has high potential, pessimistic views raised concerns about the vulnerability of water-based products to water scarcity and climate change. In contrast, climate-based eco-wellness tourism, which relies on factors such as air quality, UVB radiation, and temperature, exhibited a more complex spatial distribution [35,51,52]. The cold climate and mountainous landscapes of the study area posed challenges for climate-based products, underscoring the importance of warm climate conditions [54]. However, areas with favorable air quality were identified as promising for this type of tourism [11,55]. The results emphasize the need to consider climatic factors, particularly temperature fluctuations and the impacts of climate change, when planning climate-based initiatives. Kinetic-based activities, such as hiking, trekking, and outdoor sports, were closely linked to elevation, forest cover, and air quality. This aligns with existing literature that highlights the role of topography, green spaces, and clean air in promoting kinetic-based eco-wellness tourism [34,55]. The findings show the potential of mountains and forests to attract tourists seeking active eco-wellness experiences. The spatial distribution of suitable sites suggests that a diversified approach can significantly enhance the overall attractiveness and competitiveness of eco-wellness tourism destinations. Therefore, developing unique eco-wellness experiences by offering a set of products in extraordinary natural environments is crucial.

A policy framework, grounded in the study's data-driven, GIS-OWA methodology, is essential for the sustainable growth of eco-wellness tourism. Policy interventions can serve as the principal mechanism for guiding strategic investments and initiatives, and development toward areas with high potential while ensuring that human activities are carefully regulated for the conservation of natural resources. To this end, policies should encourage the creation of unique, nature-integrated products and mandate a commitment to providing a variety of engaging activities, high-quality amenities, and infrastructure, thereby enriching the experience for health-seeking tourists. Furthermore, an effective policy must directly confront the critical vulnerabilities identified in the analysis, such as the susceptibility of water-based tourism to climate change and water scarcity. By requiring the integration of climate change impact data into all planning stages, policies can build resilience and promote long-term sustainability. This proactive, data-informed approach directly informs how tourism development strategies must be adjusted under different scenarios. In an optimistic scenario, where climatic and water resources are sustainable, the most effective strategy is a diversified one: developing and marketing all three eco-wellness products—water, climate, and kinetic—to enhance a destination's overall appeal and competitiveness. In contrast, under a pessimistic scenario characterized by environmental stress and resource constraints, strategies must focus on more resilient and specialized offerings. For instance, in areas facing water scarcity or unfavorable temperatures, the development strategy should de-emphasize water-based or climate-based products and activities, and instead prioritize kinetic activities like hiking and trekking, which rely on more stable factors such as topography and forest cover. This flexible, scenario-based approach, which aligns investments with the unique and evolving realities of a destination's natural environment, is crucial for mitigating risks and securing the long-term viability of eco-wellness tourism.

Limitations of the Study

This study has several limitations that should be acknowledged. First, the analysis was based on a set of natural criteria. Future research could incorporate additional factors such as economic, cultural, and social aspects, accessibility, and market demand. We acknowledge that these factors are crucial for comprehensive planning. However, due to the complexity of integrating these factors into Multi-Criteria Decision-Making (MCDM) frameworks, we have focused on natural resources. Analyzing these factors often requires alternative methodologies and datasets. Therefore, considering these factors in identifying optimal locations is a crucial area for future studies. This will enhance the robustness of spatial planning models. Second, the study focused on a specific area, so further research is needed to explore the applicability of these findings to other regions with diverse natural and socio-economic contexts. Third, while the study concentrated on the spatial distribution of potential areas for wellness tourism development, it did not address the impacts of these developments, such as ecological risks or land use conflicts. Future research could investigate these impacts, particularly on local communities, before the development of such destinations.

Further, the use of the OWA operator in this study provided an effective means of incorporating both the relative importance of criteria and the decision-makers' risk attitudes, enabling the exploration of optimistic and pessimistic scenarios for eco-wellness tourism development. This flexibility distinguishes OWA from more deterministic MCDM approaches such as TOPSIS or AHP alone, as it allows the model to capture uncertainty and variability in decision preferences. Nevertheless, OWA is not without limitations. Its outcomes are sensitive to the definition of order weights, it assumes independence among criteria, and it requires scenario specification that may not fully represent complex stakeholder dynamics. Therefore, while OWA proved valuable for balancing technical rigor and decision flexibility in this study, we acknowledge these methodological constraints and recommend that future research combine OWA with participatory approaches or hybrid MCDM frameworks to further enhance the robustness and legitimacy of spatial decision-making in sustainable tourism planning.

An important consideration in the weighting process relates to the role of stakeholder participation. In this study, the weights of the criteria were derived from the judgments of 91 experts representing both academia and the tourism-related industry, some from Ardabil Province, the study area. These experts covered diverse fields, including tourism planning, health and wellness sciences, geography and spatial planning, environmental sciences, and practical stakeholders from the tourism and wellness sector. This locally embedded expert panel ensured that the weighting process reflected not only scientific expertise but also local perspectives. Nevertheless, we recognize that involving a broader range of community-level stakeholders could further strengthen the social legitimacy and contextual relevance of the model. Future research should therefore consider participatory approaches that engage local communities more directly, especially in contexts where sustainable tourism development depends on community support and collaboration.

7. Conclusions

By integrating spatial analysis and multi-criteria decision-making while focusing on three key types of eco-wellness products, the research offers a comprehensive understanding of the criteria that contribute to the success of eco-wellness tourism destinations. Combining the strengths of various natural approaches allows destinations to offer a diverse range of experiences that can attract tourists. The findings have significant implications for policymakers, tourism planners, and investors in developing and promoting sustainable and competitive eco-wellness tourism products. One key implication is the creation of unique and memorable eco-wellness experiences that benefit both tourists and local communities. This can be achieved by considering the spatial distribution of natural resources, climatic conditions, and other relevant criteria. The identified suitable areas can guide the development of targeted tourism infrastructure, including eco-wellness centers, accommodations, and transportation networks. This strategic approach will ensure that development efforts are focused on areas with the highest potential, maximizing economic benefits. The study highlights important insights from different scenarios. For instance, the very pessimistic scenario suggests that a significant portion of the area remains unsuitable for eco-wellness tourism, while the very optimistic scenario identifies a substantial increase in suitable areas, particularly for integrated therapies (climate, water, and kinetic). This shift underscores the potential for greater tourism development with improved conditions and resource management. As natural resources are crucial for maintaining the long-term viability of eco-wellness tourism, sustainable resource management practices are essential. Therefore, climate change considerations must be incorporated into all stages of planning and development to ensure the resilience and sustainability of wellness tourism destinations in the face of future challenges. However, the developed framework is flexible enough to be adapted to other regions by adjusting the input criteria and weights to reflect the characteristics of their natural resources. This allows customization of the model to each specific context, thereby facilitating a more targeted and effective approach to wellness tourism development based on each region's natural potential.

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References

1. Jónás-Berki, M.; Csapó, J.; Pálfi, A.; Aubert, A. A market and spatial perspective of health tourism destinations: The Hungarian experience. *Int. J. Tour. Res.* **2015**, *17*, 602–612. [CrossRef]
2. Lee, J.T.; Han, J.-S.; Ko, T.-G. Health-oriented tourists and sustainable domestic tourism. *Sustainability* **2020**, *12*, 4988. [CrossRef]
3. Najafinasab, M.; Agheli, L.; Sadeghi, H.; Dizaji, S.F. Identifying and prioritizing strategies for developing medical tourism in the social security organization of Iran: A SWOT-AHP hybrid approach. *Iran. J. Public Health* **2020**, *49*, 1959. [CrossRef] [PubMed]
4. Dryglas, D.; Salamaga, M. Segmentation by push motives in health tourism destinations: A case study of Polish spa resorts. *J. Destin. Mark. Manag.* **2018**, *9*, 234–246. [CrossRef]
5. Kazemi, N. Healing With Nature to Develop Health Tourism in Iran. *Sci. Cultiv.* **2023**, *14*, 55–61.
6. Sánchez-Sánchez, F.J.; Sánchez-Sánchez, A.M. Ecotourism and COVID-19: Impact on the efficiency of the Spanish hospitality industry. *J. Outdoor Recreat. Tour.* **2023**, *43*, 100680. [CrossRef]
7. Groulx, M.; Wigglesworth, J.; DeLorey, R.; Harris, N.; Harris, P.; Lamb, H.; McBride, C. Not for all: Barriers to universal accessibility in nature-based tourism and recreation spaces across British Columbia, Canada. *J. Outdoor Recreat. Tour.* **2024**, *47*, 100772. [CrossRef]
8. Liao, C.; Zuo, Y.; Xu, S.; Law, R.; Zhang, M. Dimensions of the health benefits of wellness tourism: A review. *Front. Psychol.* **2023**, *13*, 1071578. [CrossRef] [PubMed]
9. Ridderstaat, J.; Singh, D.; DeMicco, F. The impact of major tourist markets on health tourism spending in the United States. *J. Destin. Mark. Manag.* **2019**, *11*, 270–280. [CrossRef]
10. Lee, J.; Kim, H.-B. Success factors of health tourism: Cases of Asian tourism cities. *Int. J. Tour. Cities* **2015**, *1*, 216–233. [CrossRef]
11. Lee, C.-W.; Li, C. The process of constructing a health tourism destination index. *Int. J. Environ. Res. Public Health* **2019**, *16*, 4579. [PubMed]
12. Pessot, E.; Spoladore, D.; Zangiacomi, A.; Sacco, M. Natural resources in health tourism: A systematic literature review. *Sustainability* **2021**, *13*, 2661. [CrossRef]
13. Faisal, M.; Dhusia, D. Health Tourism: A New Driver for Development. *Adv. Econ. Bus. Manag.* **2020**, *7*, 50–56.
14. Mancini, M.S.; Barioni, D.; Danelutti, C.; Barnias, A.; Bračanov, V.; Pisce, G.C.; Chappaz, G.; Đuković, B.; Guarneri, D.; Lang, M.; et al. Ecological Footprint and tourism: Development and sustainability monitoring of ecotourism packages in Mediterranean Protected Areas. *J. Outdoor Recreat. Tour.* **2022**, *38*, 100513. [CrossRef]
15. Didaskalou, E.A.; Nastos, P. The role of climatic and bioclimatic conditions in the development of health tourism product. *Anatolia* **2003**, *14*, 107–126. [CrossRef]
16. Asadzadeh, M.; Vatankhah, S.; Aryankhesal, A. The main city branding dimensions in health tourism development: A scoping review. *J. Contemp. Issues Bus. Gov.* **2021**, *27*, 6446–6460.
17. Zhong, L.; Deng, B.; Morrison, A.M.; Coca-Stefaniak, J.A.; Yang, L. Medical, health and wellness tourism research—A review of the literature (1970–2020) and research agenda. *Int. J. Environ. Res. Public Health* **2021**, *18*, 10875. [CrossRef]
18. Jaksic-Stojanovic, A.; Jankovic, M.; Seric, N. Montenegro as a high-quality health tourism destination: Trends and Perspectives. *Afr. J. Hosp. Tour. Leis.* **2019**, *17*, 93–95.
19. Heydari, R.; Fathololoumi, S.; Soltanbeygi, M.; Firozjaei, M.K. A Sustainability-Oriented Spatial Multi-Criteria Decision Analysis Framework for Optimizing Recreational Ecological Park Development. *Sustainability* **2025**, *17*, 731. [CrossRef]
20. Pooya, M.R.; Hasankhani, A.; Fathololomi, S.; Karimi Firozjaei, M. A Spatial Multi-Criteria Decision-Making Approach to Evaluating Homogeneous Areas for Rainfed Wheat Yield Assessment. *Water* **2025**, *17*, 1045. [CrossRef]
21. Salehipour, M.; Kazemi, N.; Jokar Arsanjani, J.; Karimi Firozjaei, M. Developing a Multi-Criteria Decision Model to Unlock Sustainable Heritage Tourism Potential. *Sustainability* **2025**, *17*, 3703. [CrossRef]
22. Vulevic, A.; Roy, S.; Castanho, R.A.; Franco, M.; Couto, G. Exploring the Geo-Tourism Potential and Its Accessibility in Danube Region Serbia: A Geo-Statistical Approach. In *Urban Agglomeration—Extracting Lessons for Sustainable Development*; IntechOpen: Rijeka, Croatia, 2024.

23. Firozjaei, M.K.; Nematollahi, O.; Mijani, N.; Shorabeh, S.N.; Firozjaei, H.K.; Toomanian, A. An integrated GIS-based Ordered Weighted Averaging analysis for solar energy evaluation in Iran: Current conditions and future planning. *Renew. Energy* **2019**, *136*, 1130–1146. [CrossRef]
24. Mijani, N.; Alavipanah, S.K.; Hamzeh, S.; Firozjaei, M.K.; Arsanjani, J.J. Modeling thermal comfort in different condition of mind using satellite images: An Ordered Weighted Averaging approach and a case study. *Ecol. Indic.* **2019**, *104*, 1–12. [CrossRef]
25. Shorabeh, S.N.; Firozjaei, M.K.; Nematollahi, O.; Firozjaei, H.K.; Jelokhani-Niaraki, M. A risk-based multi-criteria spatial decision analysis for solar power plant site selection in different climates: A case study in Iran. *Renew. Energy* **2019**, *143*, 958–973. [CrossRef]
26. Firozjaei, M.K.; Sedighi, A.; Jelokhani-Niaraki, M. An urban growth simulation model based on integration of local weights and decision risk values. *Trans. GIS* **2020**, *24*, 1695–1721. [CrossRef]
27. Rezvani, M.; Nickravesh, F.; Astaneh, A.D.; Kazemi, N. A risk-based decision-making approach for identifying natural-based tourism potential areas. *J. Outdoor Recreat. Tour.* **2022**, *37*, 100485. [CrossRef]
28. Smith, M.; Puczkó, L. More than a special interest: Defining and determining the demand for health tourism. *Tour. Recreat. Res.* **2015**, *40*, 205–219. [CrossRef]
29. Plzáková, L.; Crespo Stupková, L. Environment as a key factor of health and well-being tourism destinations in five European countries. *IBIMA Bus. Rev.* **2019**. [CrossRef]
30. Pan, X.; Yang, Z.; Han, F.; Lu, Y.; Liu, Q. Evaluating potential areas for mountain wellness tourism: A case study of Ili, Xinjiang Province. *Sustainability* **2019**, *11*, 5668. [CrossRef]
31. Utama, I.; Nyandra, M. Health and Wellness Tourism Industry: Types and Development Potentials in Bali, Indonesia. *Int. J. Soc. Sci. Educ. Res. Stud.* **2021**, *1*, 8–12.
32. Dada, Z.A.; Baba, S.N.; Qureshi, R.A. Thermal heritage and wellness tourism development in the trans–Himalayas using GIS site suitability analysis. *Int. J. Spa Wellness* **2023**, *6*, 131–156. [CrossRef]
33. Hojcska, Á.E.; Szabó, Z. Investigating natural treatment factors and inequalities of medicinal water institutions in the aspect of tourism in Hungary. *Geo J. Tour. Geosites* **2021**, *36*, 555–562. [CrossRef]
34. Ramkissoon, H.; Majeed, S. Health, wellness and place attachment during and post health pandemics. *Front. Psychol.* **2020**, *11*, 573220. [CrossRef]
35. Amininia, K.; Abad, B.; Safarianzengir, V.; GhaffariGilandeh, A.; Sobhani, B. Investigation and analysis of climate comfort on people health tourism in Ardabil province, Iran. *Air Qual. Atmos. Health* **2020**, *13*, 1293–1303. [CrossRef]
36. Li, Y.; Zhang, S.; Han, J.; Zhao, Y.; Han, Q.; Wu, L.; Wang, X.; Qiu, Z.; Zou, T.; Fan, C. A study of the temporal and spatial variations in the suitability of the environment in Chinese cities for tourism and in strategies for optimizing the environment. *Int. J. Digit. Earth* **2022**, *15*, 527–552. [CrossRef]
37. Dunets, A.N.; Yankovskaya, V.; Plisova, A.B.; Mikhailova, M.V.; Vakhrushev, I.B.; Aleshko, R.A. Health tourism in low mountains: A case study. *Entrep. Sustain. Issues* **2020**, *7*, 2213. [CrossRef]
38. Zhang, S.; Chi, L.; Zhang, T.; Wang, Y. Spatial Pattern and Influencing Factors of Tourism Resources in Northwestern Ethnic Areas in China—A Case Study of Longde County. *Int. J. Environ. Res. Public Health* **2022**, *19*, 16684. [CrossRef]
39. Yessengabylova, A.; Bekbulatova, A.; Suraganova, S.; Bissekov, A.; Zhumanova, B. Recreational Potential of Kazakhstan and Prospects of Medical Health Tourism in This Country. *Int. J. Environ. Sci. Educ.* **2016**, *11*, 8447–8469.
40. Büyüközkan, G.; Mukul, E.; Kongar, E. Health tourism strategy selection via SWOT analysis and integrated hesitant fuzzy linguistic AHP-MABAC approach. *Socio-Econ. Plan. Sci.* **2021**, *74*, 100929. [CrossRef]
41. Wang, K.; Xu, H.; Huang, L. Wellness tourism and spatial stigma: A case study of Bama, China. *Tourism management* **2020**, *78*, 104039. [CrossRef]
42. Yan, X.; He, S. The co-evolution of therapeutic landscape and health tourism in bama longevity villages, China: An actor-network perspective. *Health Place* **2020**, *66*, 102448. [CrossRef]
43. Muhi, B.; Đurković, J.V. Analysis of health tourism in the republic of Serbia and the Czech Republic. In *Modern Management Tools and Economy of Tourism Sector in Present Era*; Udruženje Ekonomista i Menadžera Balkana: Belgrade, Serbia, 2020; pp. 227–240.
44. Fouladi, N.; Habibzadeh, S.; Barari, S.; Alimohammadi Asl, H.; Homayounfar, N.; Nemati, A. Factors affecting medical trip from the perspective of Azerbaijani tourists, Iran 2016. *J. Health Care* **2018**, *20*, 252–260. [CrossRef]
45. Chen, K.-H.; Chang, F.-H.; Wu, C. Investigating the wellness tourism factors in hot spring hotel customer service. *Int. J. Contemp. Hosp. Manag.* **2013**, *25*, 1092–1114. [CrossRef]
46. Liu, X.; Fu, Y.; Li, J. The effect of on-site experience and place attachment on loyalty: Evidence from Chinese tourists in a hot-spring resort. *Int. J. Hosp. Tour. Adm.* **2019**, *20*, 75–100. [CrossRef]
47. Backman, S.J.; Huang, Y.-C.; Chen, C.-C.; Lee, H.-Y.; Cheng, J.-S. Engaging with restorative environments in wellness tourism. *Curr. Issues Tour.* **2023**, *26*, 789–806. [CrossRef]
48. Erfurt-Cooper, P.; Cooper, M. The health and wellness concept: A global overview. In *Health and Wellness Tourism: Spas and Hot Springs*; Erfurt-Cooper, P., Cooper, M., Eds.; Channel View Publications: Bristol, UK, 2009.
49. Kazakov, S.; Oyner, O. Wellness tourism: A perspective article. *Tour. Rev.* **2021**, *76*, 58–63. [CrossRef]

50. Ebrahimzadeh, I.; Sakhavar, N.; Taghizadeh, Z. A comparative study of health tourism potentials in Iran and India. *J. Subcont. Res.* **2013**, *5*, 51–78.
51. Pu, B.; Du, F.; Zhang, L.; Qiu, Y. Subjective knowledge and health consciousness influences on health tourism intention after the COVID-19 pandemic: A prospective study. *J. Psychol. Afr.* **2021**, *31*, 131–139. [CrossRef]
52. Armaitiene, A.; Bertuzyte, R.; Vaskaitis, E. Conceptual framework for rethinking of nature heritage management and health tourism in national parks. *Procedia-Soc. Behav. Sci.* **2014**, *148*, 330–337. [CrossRef]
53. Farajzadeh, H.; Matzarakis, A. Evaluation of thermal comfort conditions in Ourmieh Lake, Iran. *Theor. Appl. Climatol.* **2012**, *107*, 451–459. [CrossRef]
54. Mrčela, N.T.; Borovac, J.A.; Vrdoljak, D.; Grazio, S.; Luetić, A.T.; Tomek-Roksandić, S. When elders choose: Which factors could influence the decision-making among elderly in the selection of health tourism services? *Med. Hypotheses* **2015**, *85*, 898–904. [CrossRef]
55. Gerami, F.; Hosseini, S.Z.; Ashtari, M.N.; Fadaei, H. Identifying the Potential of Health Tourism in Pasargadae Region, Iran. *Athens J. Tour.* **2019**, *6*, 277–292. [CrossRef]
56. Mojaradi, Z.; Bozorgi-Amiri, A.; Hashemzadeh, S. Strategic Planning for Supply Chain of Health Tourism in Iran: Razavi Hospital. *Razavi Int. J. Med.* **2021**, *9*, 21–33.
57. Calderwood, L.U.; Soshkin, M. *The Travel and Tourism Competitiveness Report 2019*; World Economic Forum: Cologny, Switzerland, 2019.
58. Khiavi, R.F. Health Tourism Development Strategies in Ardabil. *Int. J. Travel Med. Glob. Health* **2014**, *2*, 65.
59. Golshiri, Z.; Roknodineftekhari, A.; Pourtaheri, M. Modeling of health tourism development in rural areas of Iran (Hot springs). *J. Tour. Plan. Dev.* **2015**, *3*, 11–32.
60. Saaty, T.L. How to make a decision: The analytic hierarchy process. *Eur. J. Oper. Res.* **1990**, *48*, 9–26. [CrossRef]
61. Akbarian Ronizi, S.R.; Mokarram, M.; Negahban, S. Investigation of Sustainable Rural Tourism Activities With Different Risk: A GIS-MCDM Case in Isfahan, Iran. *Earth Space Sci.* **2023**, *10*, e2021EA002153. [CrossRef]