

# Spatial assessment of blue-green tourism potential and sustainable development priorities in the Central Aran economic region of Azerbaijan

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## Keywords

*Blue-green tourism, Central Aran, GIS,  
land-cover suitability, sustainable  
tourism, water proximity*

## ABSTRACT

Blue-green tourism provides prospects to merge water-based recreation opportunities, natural landscapes and sustainable regional development in places with not yet fully exploited tourism potential. Using GIS-based spatial suitability approach, this study evaluates the potential of blue-green tourism in the Central Aran economic region of Azerbaijan. The administrative boundaries, together with water features (OpenStreetMap) and land-cover data (ESA WorldCover 2021) were harmonised in a common projected coordinate system and processed using QGIS. In total, two main spatial indicators were created: water proximity suitability and green and natural land-cover suitability. Water proximity was assigned five suitability scores based on the distance to rivers, reservoirs and other water bodies and land-cover classes were reclassified using a tourism suitability scale of 5, based on the relative recreational and ecological value of tree cover, shrubland, grassland, cropland, built-up areas, sparse vegetation and wetlands. The results show a clear spatial clustering of high water-related suitability values along the Mingachevir Reservoir and along the Kura River corridor, and further local suitability values in proximity to secondary water features. Land-cover suitability exhibits a more geographically diverse pattern related to the agricultural, semi-natural and urbanised nature of the area. Overall, these spatial patterns suggest that there is a great potential for blue-green tourism development in Mingachevir, Yevlakh and Kura River corridor, while other districts need to be planned more carefully regarding landscape, infrastructure and recreational aspects. The results offer a territorial basis for prioritizing actions and investments for sustainable tourism in the region.

## INTRODUCTION

Spatial planning approaches that balance natural resource and landscape functions with economic opportunity are now a greater need for tourism development. Recreational activities can be integrated within natural or semi-natural water bodies, riparian corridors, wetlands, vegetation and other natural or semi-natural land-cover elements, at the same time providing ecosystem services and environmental resilience in the region. This view suggests that the elements which are blue and green in the landscape should not be seen as isolated tourism resources but should be seen as spatial resources influencing one another in terms of their suitability for sustainable tourism development in terms of accessibility, ecological properties and surrounding land uses. It has also been shown that green infrastructure networks have a positive impact on recreation, human health and many other ecosystem services with a particular focus on the spatial dimension and at regional scale (Maes et al., 2015).

The spatial relationships can be effectively converted to measurable indicators by using geographic information systems (GIS). GIS-based tourism assessments have the ability to combine environmental resources, land cover, accessibility, infrastructure and other territorially differentiated factors in a common analytical environment. GIS-based multicriterion approaches are proven to be useful to determine spatial variation in rural tourism potential as well as to aid public and private investment decision-making (González-Ramiro et al., 2016). More

recent studies have also demonstrated the potential of GIS for sustainable destination planning with a focus on identifying underutilized tourism resources, visualizing spatial trends, and enhancing evidence-based decision-making (Šoltésová et al., 2025). Especially in Azerbaijan, where the variability of water resources, land-use pressure, and the general green-shift are increasingly influencing regional development priorities. Recent satellite-based studies have shown the value of combining hydrological and socioeconomic data to understand Azerbaijan's Caspian Sea and strategic inland water systems, such as exposure of economic activities to water changes (Qadimli et al., 2026). At the same time, India's shift towards more eco-friendly development will need better investment mechanisms, more societal involvement, as well as spatial and ecological assessment. Research on green finance in Azerbaijan has emphasized the role of financial instruments in promoting environmentally friendly investments (Sadiqov et al., 2026), and evidence on youths' knowledge and perceptions of green finance has shown the need for awareness and engagement in advancing the social aspect of the green transition (Mammadov, 2025). The same applies to sustainable tourism, where environmental assets have to be coupled with sustainable investment and development strategies in the region. An assessment for such a landscape is suitable in the Central Aran economic region as it includes significant water resources, agricultural territories, settlements, and a (semi-)natural and diverse landscape in terms of land cover. In particular, the Mingachevir Reservoir and the

Kura River system provide a significant blue spatial structure which, in combination with green and rural space around it, can be used to develop recreation and tourism opportunities. The purpose of this study is to spatially analyze the blue-green tourism potential in the Central Aran economy region of Azerbaijan by combining water proximity, green and natural land-cover characteristics, access indicators, the tourism infrastructure, and various socioeconomic indicators within a GIS-based framework and to determine territorially differentiated priorities to develop blue-green tourism.

## LITERATURE REVIEW

The underlying concept of blue-green tourism is at the nexus of blue-space research, green infrastructure and nature-based recreation and sustainable tourism planning. Beyond their ecological value, rivers, lakes, reservoirs, wetlands and other blue spaces can offer recreation, aesthetics and other restorative functions. A systematic review by Gascon et al. (2017) revealed overall positive relations between exposure to outdoor blue spaces and mental well-being and physical activity; other meta-analytic studies have subsequently identified physical activity, restoration and social interaction as main routes by which blue spaces can create benefits for people (Georgiou et al., 2021). These results support the importance of water environments both as ecological resources and as environments that can be used to support recreation and visitors experiences.

Green infrastructure offers a complementary dimension, linking together the vegetation, semi-natural landscapes and ecosystem services, recreation and spatial quality. Ecosystem-service research (Maes et al., 2015) has a mature understanding of the recreational functions of green infrastructure. The relationship between blue and green landscape features can thus present diversified opportunities for nature observation, outdoor recreation, rural tourism and low-impact visitor activities from a tourism point of view. A spatial integrated analysis can better reflect the influence of geographical proximity and land-cover characteristics of water and terrestrial landscapes in the assessment of tourism suitability than the separate assessment of water and terrestrial landscapes.

To transform these environmental attributes into spatial tourism indicators, GIS has emerged as a valuable decision-support tool. For instance, Nino et al. (2017) integrated land cover, streams, roads, topography and natural attractions to identify ecotourism potential in Ethiopia, which showed that land-cover and landscape characteristics can be systematically incorporated into tourism suitability mapping. Similarly, Zabihi et al. (2020) integrated the GIS with fuzzy AHP method for physical, environmental and socioeconomic criteria in ecotourism zoning. Recent studies further confirm the value of using a GIS-based multicriteria analysis for the spatial identification of tourism potential (Yasin & Woldemariam, 2023; Withanage et al., 2024).

New studies also point out that suitability mapping should be based on the range of analysis and available evidence and should not include a large set of suitability criteria. Mankelkelot et al. (2026) applied land-use/land-cover, terrain, accessibility and tourism-related indicators in an integrated GIS framework, demonstrating the flexibility of the spatial suitability models and the choice of indicators based on the research objective. The evaluation in this study is intentionally limited to just two directly measurable landscape dimensions: water proximity (W) and green and natural land-cover suitability (L) and is meant to serve as a screening-level indicator for the blue-green tourism potential instead of a comprehensive tourism-development index.

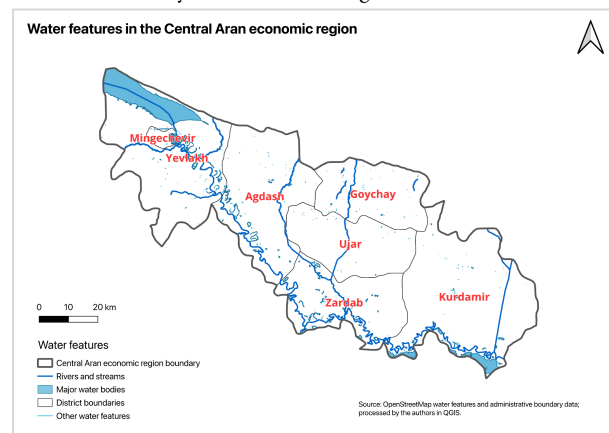
Over the last few years, spatial studies have more and more focused on the link between environmental resources and regional economic vulnerability in Azerbaijan. In 2026, Qadimli et al. showed the usefulness of the geospatial information in the evaluation of the Caspian Sea as well as the country's strategic inland water resources. But, the spatial association between inland water resources, the surrounding land cover and its potentiality for blue-green tourism in the region is relatively under-researched. The Central Aran economic region is a suitable case for covering this gap, as all mentioned elements are present in one economic region: the Mingachevir Reservoir, agricultural landscapes and semi-natural land-cover elements are located in one economic region.

## MATERIALS AND METHODS

### Study Area

The study is carried out in the Central part of the economic region of Azerbaijan – Mingachevir city and the Agdash, Goychay, Kurdamir, Ujar, Yevlakh and Zardab districts. The area is a lowland territorial system, where urban settlement, agriculture and the major inland water resources are intermingled. The Mingachevir Reservoir and the Kura River have a strong influence on its blue spatial structure, and croplands, grasslands, wetlands and sparse vegetation with locally distributed tree and shrub cover are present on the surrounding landscape. These landscape components form a basis for the assessment of possibilities for water-based and nature-oriented recreation and integrated blue-green tourism planning. The administrative structure of Central Aran was compared with regional classification of State Statistical Committee of Azerbaijan.

Spatial processing and cartographic outputs are all carried out in QGIS. Analytical data sets were reprojected to WGS 84 / UTM Zone 38N (EPSG:32638) to ensure a consistent method of calculating distances and areas. A principal water features map and administrative divisions of the study area is shown in Figure 1.



**Figure 1.** Water features in the Central Aran economic region of Azerbaijan.

### Data sources and spatial preprocessing.

Geospatial environmental data was combined with official tourism data in the assessment. Water bodies and rivers were mapped from OpenStreetMap and cropped to the extent of Central Aran. The OpenStreetMap data is used under the Open Database License and is supplied as open and freely reusable geographic data that can be used for spatial analysis. The OpenStreetMap data is used under the Open Database License and is supplied as open and freely reusable geographic data that can be used for spatial analysis (OpenStreetMap contributors, 2026). Very small ponds and minor artificial water features were removed from the water-resource layer to minimize the impact of these water features on regional tourism suitability.

Land-cover conditions were based on a global 10 m land-cover product (ESA WorldCover 2021 v200) produced from Sentinel-1 and Sentinel-2 observations (Zanaga et al., 2022). The product delivers land-cover data at 10 m spatial resolution, with a global consistency. Two WorldCover tiles were mosaicked and clipped to the study area and reprojected using nearest neighbour resampling to ensure that the original categorical land-cover information was retained.

Official tourism and accommodation indicators were obtained from the State Statistical Committee of the Republic of Azerbaijan. Tourism in Azerbaijan statistical yearbook 2013 provides indicators for hotels and similar units and other economic indicators connected with tourism, such as regional and the administrative-unit indicators. The institutional and national tourism context was provided by complementary tourism sector information from the State Tourism Agency.

**Table 1.** Data sources and indicators used in the assessment

| Data component            | Source                                                    | Spatial                                                   | Analytical use                                                       |
|---------------------------|-----------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------|
| Administrative boundaries | Official/open administrative boundary data                | District level                                            | Study-area delineation and zonal comparison                          |
| Water bodies              | OpenStreetMap                                             | Vector polygons                                           | Identification of major water resources and water proximity analysis |
| Rivers and streams        | OpenStreetMap                                             | Vector lines                                              | River-network mapping and contextual interpretation                  |
| Land cover                | ESA WorldCover 2021 v200                                  | 10 m raster                                               | Green and natural land-cover suitability assessment                  |
| Tourism accommodation     | State Statistical Committee of the Republic of Azerbaijan | Administrative-unit statistics                            | Assessment of accommodation capacity and tourism development         |
| Tourism activity          | State Statistical Committee of the Republic of Azerbaijan | Guests, overnight stays and related indicators            | Measurement of tourism intensity                                     |
| Tourism context           | State Tourism Agency of the Republic of Azerbaijan        | Official tourism statistics and institutional information | Interpretation of tourism development priorities                     |

**Source:** Compiled by the authors based on OpenStreetMap, ESA WorldCover 2021 v200, the State Statistical Committee of the Republic of Azerbaijan and the State Tourism Agency of the Republic of Azerbaijan.

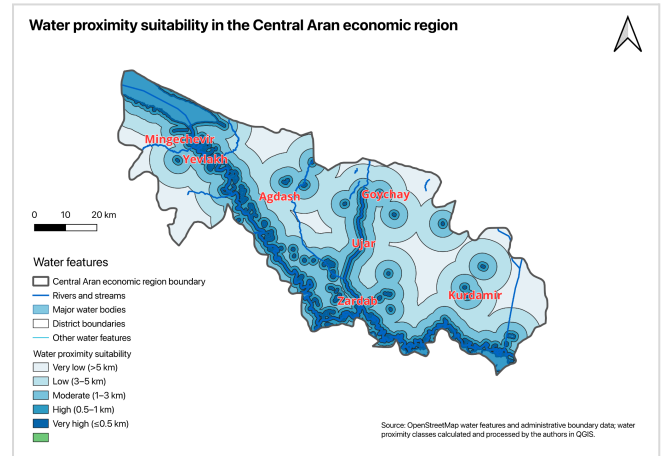
### Water proximity suitability

The proximity to water was chosen as the first spatial component (W) of blue-green tourism potential. Buffer operations in QGIS were used to create the initial proximities from vector features, based on distance (QGIS Development Team, 2026). Water bodies were selected and buffers with varying distances from water sources were created. Five non-overlapping distance zones were produced using buffer, clip and difference operations in QGIS:

- $\leq 0.5 \text{ km} = 5$  (very high suitability);
- $0.5\text{--}1 \text{ km} = 4$  (high suitability);
- $1\text{--}3 \text{ km} = 3$  (moderate suitability);

- $3\text{--}5 \text{ km} = 2$  (low suitability);
- $> 5 \text{ km} = 1$  (very low suitability).

The classification is based on the assumption that the closer to large water bodies, the more opportunities for recreation, waterfront activities and water-based tourism and that distance acts as a relative measure of spatial suitability for tourism development, not necessarily a measure of actual tourism development. Buffer operations in QGIS were used to create the initial proximities from vector features, based on distance. The classes were then combined into one Water Proximity Suitability layer (Figure 2).

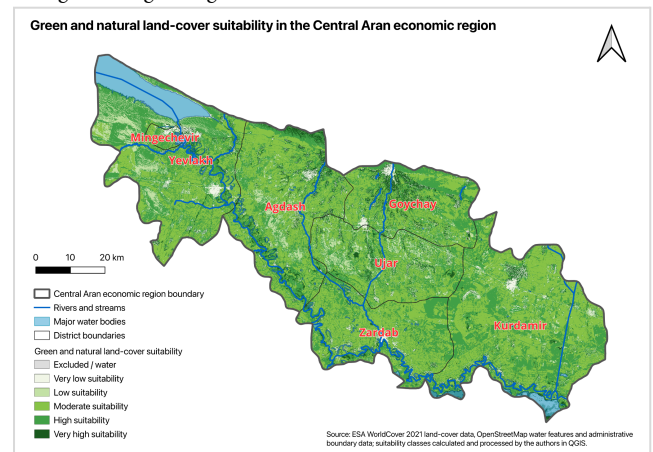


**Figure 2.** Water proximity suitability in the Central Aran economic region of Azerbaijan.

### Suitability of green and natural land-cover

The second spatial component (L) was about recreational and ecological suitability of land cover. The ESA WorldCover classes were re-classified on a 5-point scale based on their relative contribution to nature-based recreation. Tree cover and herbaceous wetlands scored the highest (5), followed by shrubland and grassland (4), cropland (3 due to its potential relevance for rural and agro-tourism), bare or sparsely vegetated areas (2) and built-up areas (1). The permanent water bodies were not included in this component to prevent double counting as water resources were being addressed with the W indicator.

The reclassification was done in QGIS using the Raster Calculator, and resulted in the Green and Natural Land-Cover Suitability raster shown in Figure 3. By using the original 10 m WorldCover data, landscape structure could be considered at a fine-grained level without having to average things down to the district level.



**Figure 3.** Green and natural land-cover suitability in the Central Aran economic region of Azerbaijan.

### Tourism-development indicators integration

The spatial results were then contrasted with the official tourism-development indicators for the seven administrative units. The current intensity of the tourism activity was described with the following indicators: accommodation capacity; accommodated persons; overnight stays; and hotel related economic indicators. Indicators were standardized where necessary to make it possible to compare across administrative areas of varying population. By comparing spatial resource suitability with tourism activity, areas that seem to be relatively underused in terms of blue-green tourism resources were highlighted and territorial differentiated sustainable tourism development priorities were formulated.

## RESULTS AND DISCUSSION

### Water resources and water proximity suitability in spatial distribution

Spatial analysis showed that the distribution of blue resources is by far not even in the Central Aran economic region. As seen in Figure 1, the main hydrological features are the Mingachevir Reservoir and Kura River corridor, which constitute the main continuous blue feature in the study area. There are smaller surface-water features scattered throughout Agdash, Goychay, Ujar, Zardab and Kurdamir, but these are not as spatially continuous.

This territorial differentiation is reflected in a water-proximity suitability assessment (Figure 2). Within 0.5 km of selected major water bodies are very-high-suitability areas, with suitability declining with distance. High suitability and very high suitability is very concentrated around Mingachevir Reservoir and along the corridor of Kura River, including within and around Mingachevir, Yevlakh and Zardab. The areas thus have a relatively good spatial foundation for water front recreation, water-based tourism and landscape oriented visitor activities.

This is in line with the overall knowledge of the inland water systems as an economic space asset as well as an ecological resource. Recent studies on Azerbaijan's strategic water systems have also pointed to the importance of taking into account hydrological conditions as well as considering socioeconomic exposure and regional development implications (Qadimli et al., 2026). Proximity to water can, then, be seen from a tourism-planning point of view as an important enabling factor, but it does not necessarily mean that tourism infrastructure is in place.

### Suitability of green and natural land-cover

The land-cover suitability assessment resulted in a more varied pattern than the water-proximity indicator (Figure 3). In Central Aran, moderate-suitability areas account for a significant portion of the land area and are mostly associated with the predominance of cropland. Agricultural landscapes were scored as intermediate, as they may offer nature-based tourism but in addition they may offer rural or agro-tourism, local food experiences and landscape-based recreation.

The high and very high suitability classes are predominantly related to tree cover, shrubland, grassland and herbaceous wetlands. These areas are spatially disjointed, but when they are near water resources these areas could add value to tourism. This aligns with the research that has identified the recreational and ecosystem-service values of green infrastructure and semi-natural landscapes (Maes et al., 2015). The spatial combination of water surfaces and wetlands is therefore even more important in the context of integrated blue-green tourism planning in conjunction with vegetated surfaces.

Results further indicate that low land-cover suitability is not necessarily linked to low overall tourism potential. Built-up areas are assigned low scores for ecological suitability in the L component, but urban centres can offer visitor services, accommodation and transport

which can offset the low natural land cover value. This favours the application of the multicriteria GIS approaches, in which the suitability of tourism is evaluated based on several factors (environmental, infrastructural and accessibility) instead of a single one (González-Ramiro et al., 2016).

### Differentiation of the blue-green tourism potential by territories

The combination of the W and L indicators demonstrates different development patterns that are geographically distinct. An important element of blue-green tourism, major water resources combined with appropriate green and semi-natural landscapes and an existing urban centre are characterized by the Mingachevir and the reservoir zone. The Mingachevir-Yevlakh region could thus become a key node point for water-based recreational activities and sustainable tourism development in the region.

Another strategic spatial axis is the Kura River corridor towards Zardab. Much of this corridor is highly suitable for water proximity tourism, and the rural and nature-based tourism opportunities are provided by the surrounding agricultural, wetland and semi-natural landscapes. The sustainable development of this corridor should focus on low impact recreation, managing access to the river and environmentally sensitive visitor facilities. This is particularly relevant as the economic potential of strategic inland waters can be impacted due to the effect of environmental and hydrological change (Qadimli et al., 2026).

The profile of Agdash and Goychay is a bit different. They are more fragmented in terms of blue resources and the agricultural and green land-cover components are relatively large. These districts might therefore be better suited for tourism models involving the rural scenery to the extent that agro-tourism and local recreational resources are involved. Larger areas with relatively low water-proximity suitability, such as Ujar and Kurdamir, show that strategies aimed at tourism alone would be less suitable and alternative rural activities, based on the culture and accessibility of the area, should be taken into consideration.

### Sustainable development implications

The spatial results suggest that Central Aran is not a single tourism destination, but rather a variety of destinations. Territorially differentiated development strategies are required as a function of the various combinations of water availability, natural land cover, agricultural landscapes and settlement structure. In this context GIS based suitability assessment can be useful as allows the systematic comparison of tourism resources and spatial constraints and can be used for more targeted regional planning (González-Ramiro et al., 2016).

Additionally, there are also needs for adequate financing mechanisms to implement the blue-green tourism priorities. Green investment products may be needed for environmentally friendly visitor facilities, landscape restoration, water-sparing infrastructure and small tourism businesses. A previous research conducted in Azerbaijan has shown the role of green finance instruments in the support of environmentally sustainable investment and the overall green transition (Sadiqov et al., 2026). Meanwhile, public awareness and involvement in environmentally oriented development are also essential elements, especially if long-term sustainability requires behavioral and societal involvement (Mammadov, 2025).

In general, the most intense spatial opportunities are related to the Mingachevir Reservoir and the Kura River system, the rest of the districts showing more and less distributed clusters of blue and green assets. The results presented here add to a differentiated approach towards the various regions, where water-oriented tourism is the focus

in the blue corridors with the best water proximity, but more intensively in rural, agro-tourism or landscape-based approaches in areas with weaker water proximity but suitable land-cover features.

## CONCLUSIONS

The purpose of this research is to assess the suitability of blue-green tourism in the Central Aran economic region of Azerbaijan from spatial aspect on the basis of two indicators: water proximity suitability and green and natural land-cover suitability with the help of GIS. The results show that this blue-green tourism resource is not evenly distributed throughout the region, but has a spatially uneven distribution. The best prospects for water are located around the Mingachevir Reservoir and on the corridor of the Kura River, especially around Mingachevir and Yevlakh, and on the way to Zardab. The land-cover analysis, however, shows a more complex picture where agricultural landscapes cover large areas, and areas of tree cover, grassland, shrubland and wetlands create localized areas of higher natural suitability.

The results corroborate the general findings from the tourism literature that underpinned by GIS, spatial variation in environmental resources can be an appropriate basis to differentiate development priorities (Nino et al., 2017; Yasin & Woldemariam, 2023; Withanage et al., 2024). Concurrently, the results should be viewed as a first preliminary spatial suitability assessment and not as an overall tourism potential index. The model does not directly measure road accessibilities, accommodation capacities, tourism demand, visitor preferences or investment feasibility. The dimensions should be considered in further studies and can be integrated into a more extensive multicriteria decision support model, as in more extensive GIS-based ecotourism assessments (Zabihi et al., 2020; Mankelkelot et al., 2026).

Despite this, the current study reveals a spatial foundation of the territorial differentiation of sustainable tourism planning. However, the Mingachevir Reservoir and the Kura River corridor may be more suitable for environmentally sensitive water-oriented recreation and the districts with less blue-resource proximity may benefit more from rural, agro-tourism and landscape-based development strategies. Field validation of W and L indicators should be included in future research together with information on tourism infrastructure, accessibility and socioeconomic indicators prior to investment-level decision making.

## AUTHOR CONTRIBUTIONS

Conceptualization, N.Q. and U.M.; methodology, U.M.; formal analysis, U.M.; data curation, U.M.; visualization, U.M.; validation, N.Q.; writing—original draft, U.M.; writing—review and editing, N.Q. and U.M.; supervision, N.Q. All authors have read and agreed to the final version of the manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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This research received no external funding.

## DATA AVAILABILITY

The spatial data used in this study were obtained from publicly available sources, including OpenStreetMap and ESA WorldCover 2021. The processed datasets and derived spatial outputs generated during the study are available from the corresponding author upon reasonable request.

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## REFERENCES

- Gascon, M., Zijlema, W., Vert, C., White, M. P., & Nieuwenhuijsen, M. J. (2017). Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. *International Journal of Hygiene and Environmental Health*, 220(8), 1207–1221. <https://doi.org/10.1016/j.ijheh.2017.08.004>
- Georgiou, M., Morison, G., Smith, N., Tiegies, Z., & Chastin, S. (2021). Mechanisms of impact of blue spaces on human health: A systematic literature review and meta-analysis. *International Journal of Environmental Research and Public Health*, 18(5), 2486. <https://doi.org/10.3390/ijerph18052486>
- González-Ramiro, A., Gonçalves, G., Sánchez-Ríos, A., & Jeong, J. S. (2016). Using a VGI and GIS-based multicriteria approach for assessing the potential of rural tourism in Extremadura (Spain). *Sustainability*, 8(11), 1144. <https://doi.org/10.3390/su8111144>
- Maes, J., Barbosa, A., Baranzelli, C., Zulian, G., Batista e Silva, F., Vandecasteele, I., Hiederer, R., Liqueste, C., Paracchini, M. L., Mubareka, S., Jacobs-Crisioni, C., Perpíña Castillo, C., & Lavalle, C. (2015). More green infrastructure is required to maintain ecosystem services under current trends in land-use change in Europe. *Landscape Ecology*, 30, 517–534. <https://doi.org/10.1007/s10980-014-0083-2>
- Mankelkelot, T. K., Ayele, N. A., Jothimani, M., & Tenzer, R. (2026). Integrating GIS and AHP for sustainable ecotourism site suitability analysis: A case study of Bahir Dar, Ethiopia. *Scientific Reports*, 16, 10261. <https://doi.org/10.1038/s41598-026-41548-6>
- Mammadov, U. (2025). An empirical analysis of youth knowledge and perceptions of green finance: Evidence from Azerbaijan. *Journal of Economics*, 2(4), 49–53. <https://doi.org/10.36719/3104-4727/5/49-53>
- Nino, K., Mamo, Y., Mengesha, G., & Kibret, K. S. (2017). GIS based ecotourism potential assessment in Munessa Shashemene Concession Forest and its surrounding area, Ethiopia. *Applied Geography*, 82, 48–58. <https://doi.org/10.1016/j.apgeog.2017.02.010>
- OpenStreetMap contributors. (2026). OpenStreetMap [Data set]. OpenStreetMap Foundation.
- Qadimli, N., Rasulov, Z., Mammadov, U., & Hasilov, E. (2026). Satellite-based assessment of water level variability and economic exposure in Azerbaijan's Caspian Sea and strategic inland water systems. *American Journal of Environmental Economics*, 5(2), 31–45. <https://doi.org/10.54536/ajee.v5i2.8204>
- QGIS.org. (2026). QGIS Geographic Information System [Computer software]. QGIS Association.
- Sadiqov, E., Qadimli, N., & Mammadov, U. (2026). Green finance instruments for supporting solar energy development in Azerbaijan. *American Journal of Energy and Natural Resources*, 5(1), 18–26. <https://doi.org/10.54536/ajenr.v5i1.7984>
- Šoltéssová, M., Iannaccone, B., Štrba, L., & Sidor, C. (2025). Application of GIS technologies in tourism planning and sustainable development: A case study of Gelnica. *ISPRS International Journal of Geo-Information*, 14(3), 120. <https://doi.org/10.3390/ijgi14030120>
- Withanage, N. C., Wijesinghe, D. C., Mishra, P. K., Abdelrahman, K., Mishra, V., & Fnais, M. S. (2024). An ecotourism suitability index for a world heritage city using GIS-multi criteria decision analysis

- techniques. *Heliyon*, 10(11), e31585.  
<https://doi.org/10.1016/j.heliyon.2024.e31585>
- Yasin, K. H., & Woldemariam, G. W. (2023). GIS-based ecotourism potentiality mapping in the East Hararghe Zone, Ethiopia. *Heliyon*, 9(8), e18567. <https://doi.org/10.1016/j.heliyon.2023.e18567>
- Zabihi, H., Alizadeh, M., Wolf, I. D., Karami, M., Ahmad, A., & Salamian, H. (2020). A GIS-based fuzzy-analytic hierarchy process (F-AHP) for ecotourism suitability decision making: A case study of Babol in Iran. *Tourism Management Perspectives*, 36, 100726.  
<https://doi.org/10.1016/j.tmp.2020.100726>
- Zanaga, D., Van De Kerchove, R., Daems, D., De Keersmaecker, W., Brockmann, C., Kirches, G., Wevers, J., Cartus, O., Santoro, M., Fritz, S., Lesiv, M., Herold, M., Tsendbazar, N. E., Xu, P., Ramoino, F., & Arino, O. (2022). ESA WorldCover 10 m 2021 v200 [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.7254221>