Site Selectionfor New Tourism Types

in Bodrum Peninsula, MU_LA, TURKEY

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Abstract:

The strong relationship between human being and nature begins with farming, and stockbreeding. Because of the development of industry and tourism, environment becomes a big opportunity for the economies. As the natural resources are required for all these economic sectors “sustainable development” concept is born. The main purpose is to preserve non-renewable resources for future, including land, oil, and endangered species. It is important to manage the natural resources for all these activities without any damage to nature.

Tourism sites in developing countries are normally undeveloped places that have great natural scene and precious ecosystem. So suggestions for new tourism types that do not harm to nature and site selection for these activities have big importance in planning. The data like topography, land use, transportation network, population density, flora and fauna, etc. should be analyzed with the help of GIS tools (slope analysis, buffer analysis) and then over layed in order to find potential areas to do better projections and tourism plans. The case study is Bodrum Peninsula (Mu_la), south west of Turkey.

1. Introduction:

The strong relationship between human being and nature begins with farming and stockbreeding. Because of the development of industry and tourism, environment becomes a big opportunity for the economies. As the natural resources are required for all these economic sectors “sustainable development” concept is born. The main purpose is to preserve non-renewable resources for future, including land, oil, and endangered species. It is important to manage the natural resources for tourism and industry activities without any damage to nature. (Wang, Q.)

Tourism sites in developing countries are normally undeveloped places that have great natural scene and precious ecosystem. As the importance of tourism sector in economy is well-known; tourism development, and tourism plans get a bigger portion in city and regional planning. So suggestions for new tourism types that do not harm to nature and site selection for these activities have big importance in planning. “Site selection” is a powerful tool of GIS that can be used for finding suitable places for any kind of purposes. In this study the site selection application is used for finding the potential areas for new kinds of tourism types that are friendly to nature. (Jones, R.)

The data like topography, land use, transportation network, population density, flora and fauna, etc. should be analyzed with the help of GIS tools (slope analysis, buffer analysis) and then over layed in order to find potential areas to do better projections and tourism plans.

2. Study Area:

The study area is chosen as Bodrum Peninsula that is the hearth of Turkey in tourism sector. The fast and unplanned tourism development causes some problem in nature, transportation, social and technical infrastructure in Bodrum. Summer houses, hotels, and holiday villages are built up increasingly, and a big difference occurs between winter (40.000) and summer (1.500.000) population. This unplanned development may cause some damages to nature and human. The aim of the study is to suggest new tourism types that do not harm to nature in Bodrum.

3. Materials and Methods:

The data that are used in this study can be separated into four layers as Clutter layer, Elevation layer (DEM), Road Network layer and the satellite image (IKONOS) of the whole Bodrum Peninsula.

3.1. Clutter layer:

There are seven classes in the clutter layer, which are dense forest, sparse forest, built up areas, mean urban, dense urban, open land, and sea.

3.2. Elevation layer:

Digital Elevation Model is acquired with ± 15 m error in vertical mapper format and converted to ArcGIS with contours of 42 m intervals. It’s used in slope and aspect analyses.

3.3. Road network layer:

Road network layer contains all types of road (primary roads, boulevard, street, paths, and road junctions), however it does not contain the paths in the mountains and forests so they are digitized in order to use for biking analyses.

3.4. Satellite Image:

IKONOS image with 1 m resolution, which is taken in 2004, is used to digitize the paths and check the clutter classes.

The summary of data description and sources are shown in the Table 1 below.

Table 1: Source of Data

DATA	**Date (year)**	**Scale**	**Source**
Digital Elevation Model (DEM)	2000	1/100.000 ± 15 m	Russian maps & RADAR Image
Clutter	2000	1/100.000	Classified from LANDSAT image
Road Network	2000	1/100.000	Updated from Russian topographic maps
Image	2004	1 m resolution	IKONOS Image

4. Analysis:

In the analysis, ArcMap8.3, Spatial Analyst, 3D Analyst Extensions are used as software. The schedule of the project can be summarized in the following steps.

1. Problem definition
2. Defining the types of different tourism activities
3. Selecting the applicable ones
4. Literature survey for the requirements of those activities
5. Acquisition of the data
6. Analyses
7. Results

The applicable tourism types are defined as: Camping, Caravanning, Biking, Site Parachuting, Grass-skiing.

4.1. CAMPING AREAS:

The following three analyses are implemented in order to define the potential camping areas.

- Selecting the dense forest areas
- Slope analysis (to find fewer than 20% slopes)
- Buffer analysis (to find areas which are not in 500 m site around the settlements)

(Ref: Interviews with Youth and Sport Association)

The first step is to select the dense forest areas from the clutter. A new layer is created from the selected features. Then this vector file is converted to raster file.

The second step is slope analysis. TIN of the region is created from the Elevation Layer that has the contours in 42 m interval, then the slope layer is created from the TIN. Slope is defined in percentage not in degree and classified in nine classes with five percent intervals. Then the areas which have less than 20% slope are found and saved in a different layer in raster format, since that the slope is accepted as limit for food camping areas.

The last step is buffer analysis. The camping areas should be 500 m away from the settlements so "Buffer analysis" is made by taking 500 m as a measurable distance. This buffer vector file is converted to raster file. A new column is then added in which a value "1" assigned to the areas within buffers on the attribute table of this file.

Finally, with the help of "raster calculator" three layers in raster format are multiplied in order to find the intersection of suitable areas. The result in rater format is converted to vector format to show the potential camping areas, as shown in Figure 1.

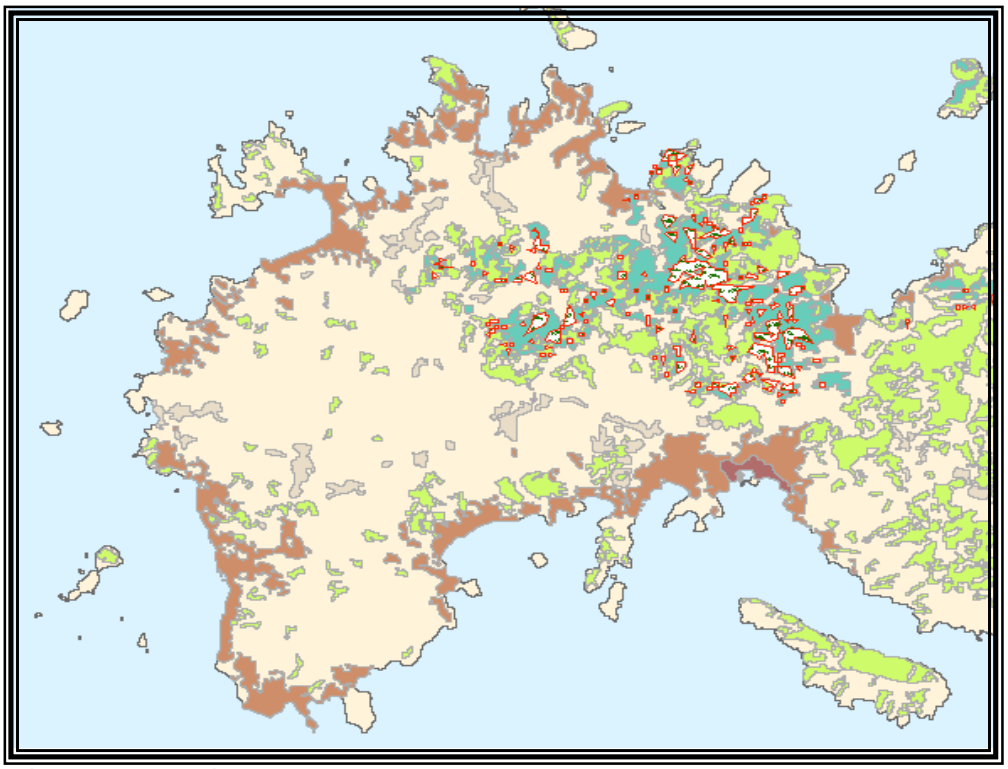

Figure 1. Camping Areas

4.2. CARAVANING AREAS:

To determine the potential caravanning areas four different analyses are performed. They are:

- Selecting the sparse forest areas
- Slope analysis to find areas with slopes less than 10%
- Buffer analysis to find areas which are in the 500m to 1000 m ring around the settlements.
-Accessibility analysis to find the areas that can be accessed with a road.

(Ref: Interview with Youth and Sport Association)

The first step is to select the sparse forest areas from the clutter. A new layer is created with the selected features. Then this vector file is converted to raster file.

The second step is slope analysis. The areas which have less than 10% slope is accepted to be suitable for caravanning. So such areas are found and saved in a different layer in raster format.

The third step is buffer analysis. The caravanning areas should be 500 m away from the settlements but not further away than 1000 m, so that water and electricity can be found in this distance from the settlements. So “Buffer analysis” is made and this buffer vector file is converted to raster file. In the attribute table of this file a new column is added where a value “1” is assigned for the second buffer which is between 500-1000 m.

The three resulting raster layers are multiplied in order to find the intersection of the suitable areas. The result in raster format is then converted to vector format.

Finally, intersection of these polygons with the roads layer is made to find the potential caravanning areas, which is given in Figure 2.

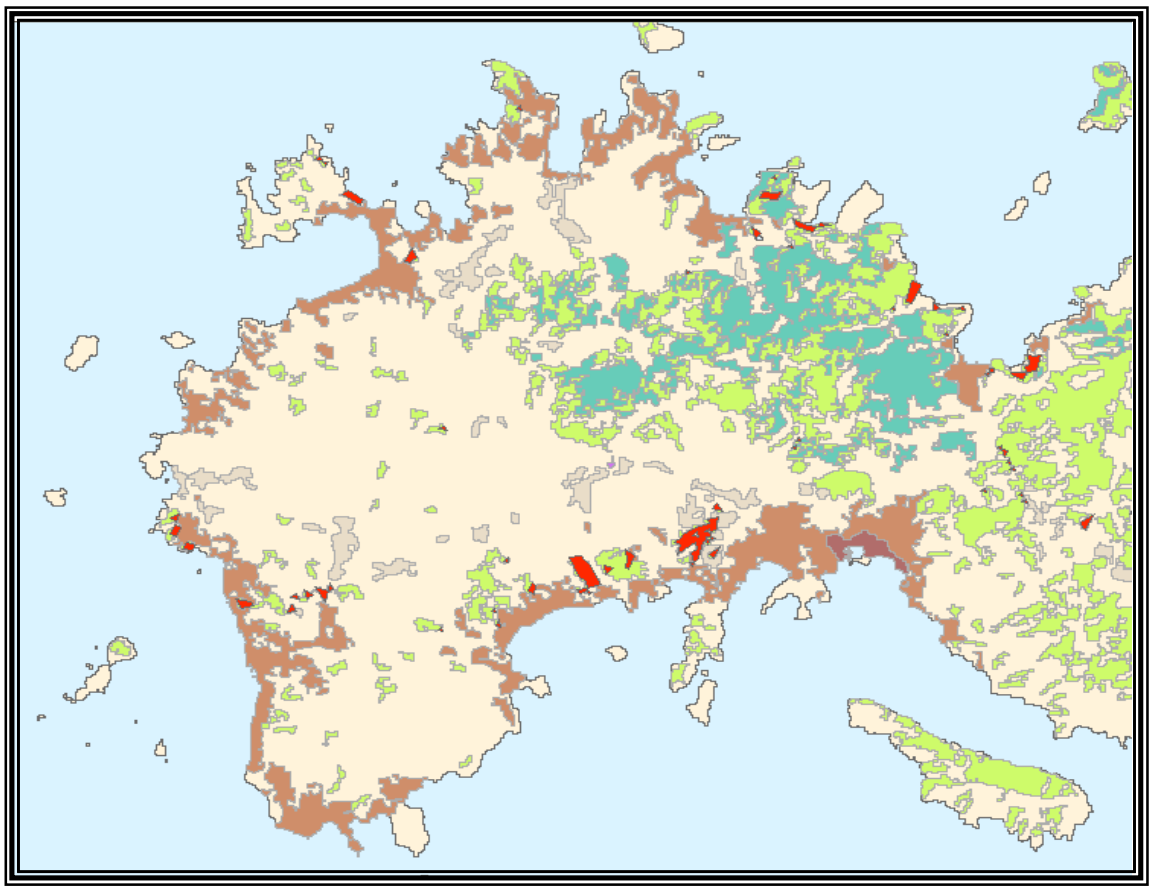

Figure 2. Caravanning Areas

4.3. BIKING AREAS:

The paths are digitized in the mountain areas in order to use defining the bike routes. After that slope analysis is implemented to find the areas less than 20% slope. After importing this shape-file to the geo-database a LENGTH column is added as automated, so that the line length and the route length can be computed.

Finally, two different bike routes are suggested which are 7700 m and 6800 m, respectively, as shown in Figure 3.

Figure 3. Biking Route1 N

4.4. SITE-PARACHUTING:

To determine the potential parachuting sites in the mountains two analyses are implemented.

- Aspect Analysis to use the wind direction information
- Slope analysis to find the areas more than 30% slopes.

(Ref: Interview with Youth and Sport Association)

The first step is obtaining an aspect layer which is generated from the TIN created using the Elevation Layer. The north-east aspect areas are selected, since the wind direction is south-west in the peninsula.

The second step is the slope analysis. Slope should be higher than 30% for site-parachuting, therefore such areas are found in slope layer.

Finally, north-east sides of the areas having more than 30% slope are found as the potential parachuting sites, as shown in Figure 4.

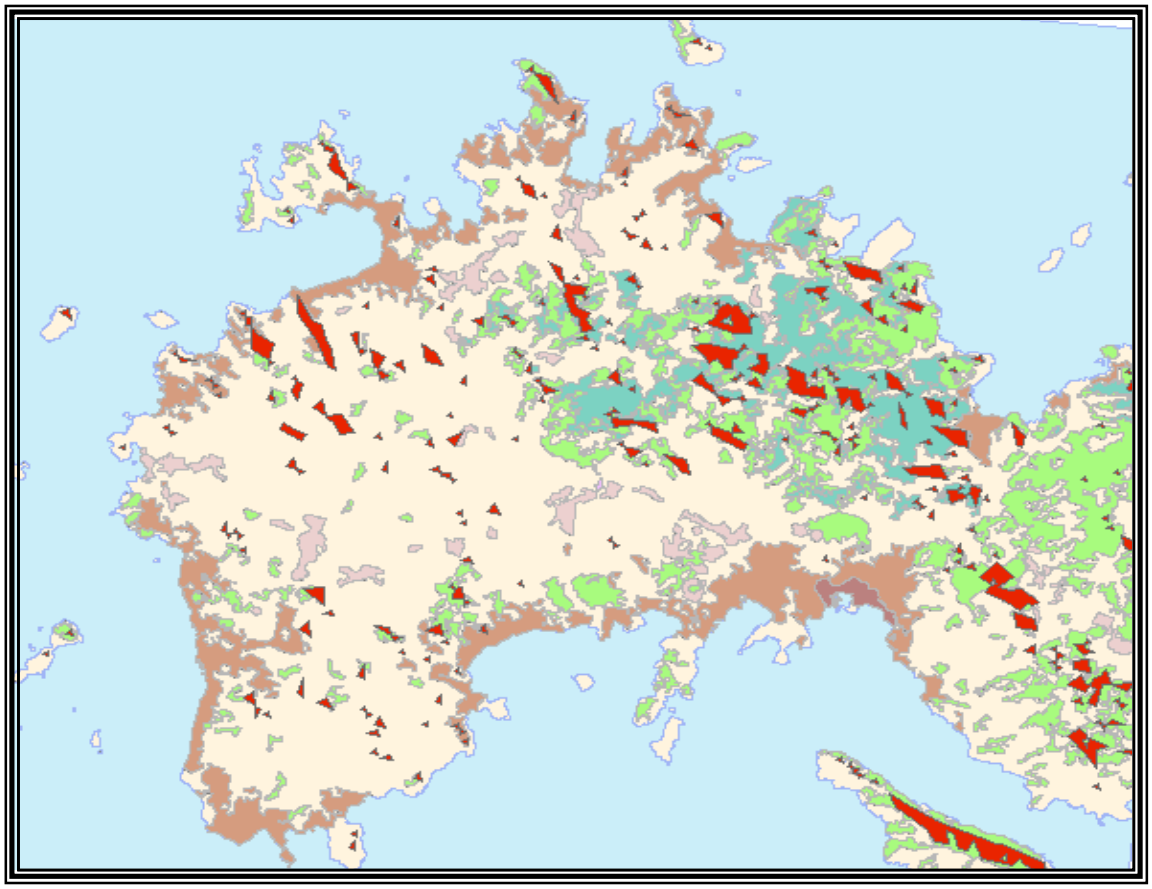

Figure4. Site-Parachuting Areas

Site-Parachuting Areas N

4.5. GRASS-SKIING:

The potential grass-skiing areas are determined by using the following there analyses.

- Selecting the “open land” areas
- Slope analysis is performed to find areas between 15% - 20% slopes.
- Buffer analysis is performed to find areas which are between 500-1000 m ring around the settlements.

(Ref: Interview with Youth and Sport Association)

The first step is to select the open land areas from the clutter. A new layer is created from the selected features. Then this vector file is then converted to raster file.

The second step is the slope analysis. The areas which have slopes between15 to 20% are suggested to be suitable for grass-skiing. So such areas are found and saved in a different layer in raster format.

The third step is the buffer analysis. The grass-skiing areas should be 500 m away from the settlements but inside 1000 m. with of the assumption that electricity can be found in this distance from the settlements. This buffer vector file having the areas with this criteria is converted to raster file. In the attribute table of this file a new column is added again where a value “1” is assigned for the second buffer which is 500-1000m.

Finally, the three layers in raster format are multiplied in order to find the intersection of suitable areas. The result in raster format is converted to a vector layer, which shows the potential grass-skiing areas, as given in Figure 5.

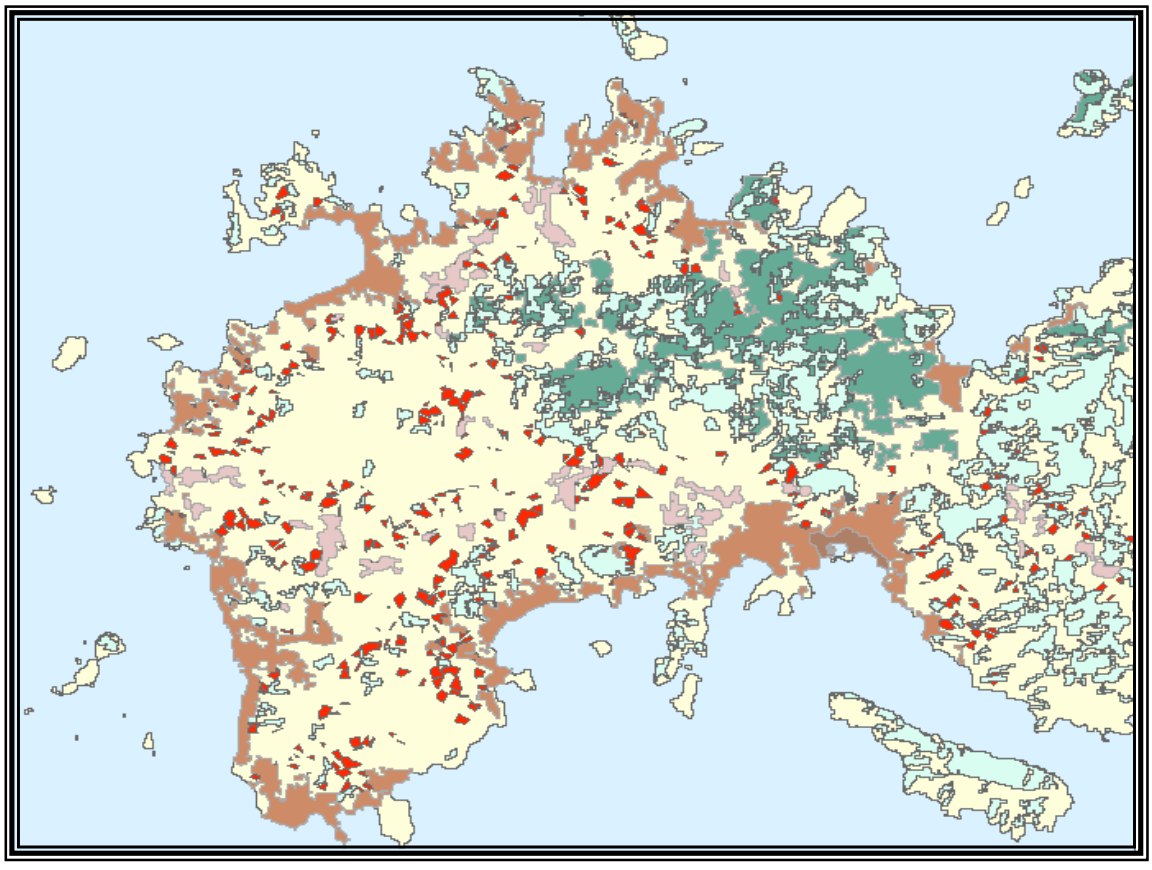

Figure 5. Grass-skiing

Grass-skiing Areas

N

5. Results and Conclusion:

In this study suitable areas are tried to be found for new tourism activities in Bodrum, Turkey. The assumed requirements of the camping, caravanning, biking, site-parachuting, and grass-skiing activities were used to find the potential areas for each of them. All the determined areas in shape files are imported to a geo-database in order to calculate the areas in hectares.

Finally,

-Potential camping areas are mostly found inside the peninsula where the dense forests are located (Figure 1). The resulting 139 polygons have an area of 643 hectares.

-Potential caravanning areas south, east and west side of the peninsula, however the large areas are located in the southern part where the sparse forest are found and can be accessed by road network (Figure 2). The resulting 58 polygons have an area of 239 hectares.

-Two different possible biking routes are suggested which have very small lengths above the limiting slope and can be reached by roads in the mountain areas (Figure 3). These lengths are 7700 m and 6800 m respectively.

-Site-parachuting activity is suggested at the north-east sides of the mountains in the peninsula, where they are not located in a specific part (Figure 4). The resulting 275 polygons have an area of 1441.3 hectares.

-Potential areas for grass-skiing activity are all small places and not intensified in a specific part of peninsula like site-parachuting (Figure 5). The resulting 753 polygons have an area of 1220 hectares.

As a result, all those potential areas of applicable tourism activities are shown on one map as shown in Figure 6. Total area for these activities is calculated as 3543.3 hectares in the whole peninsula.

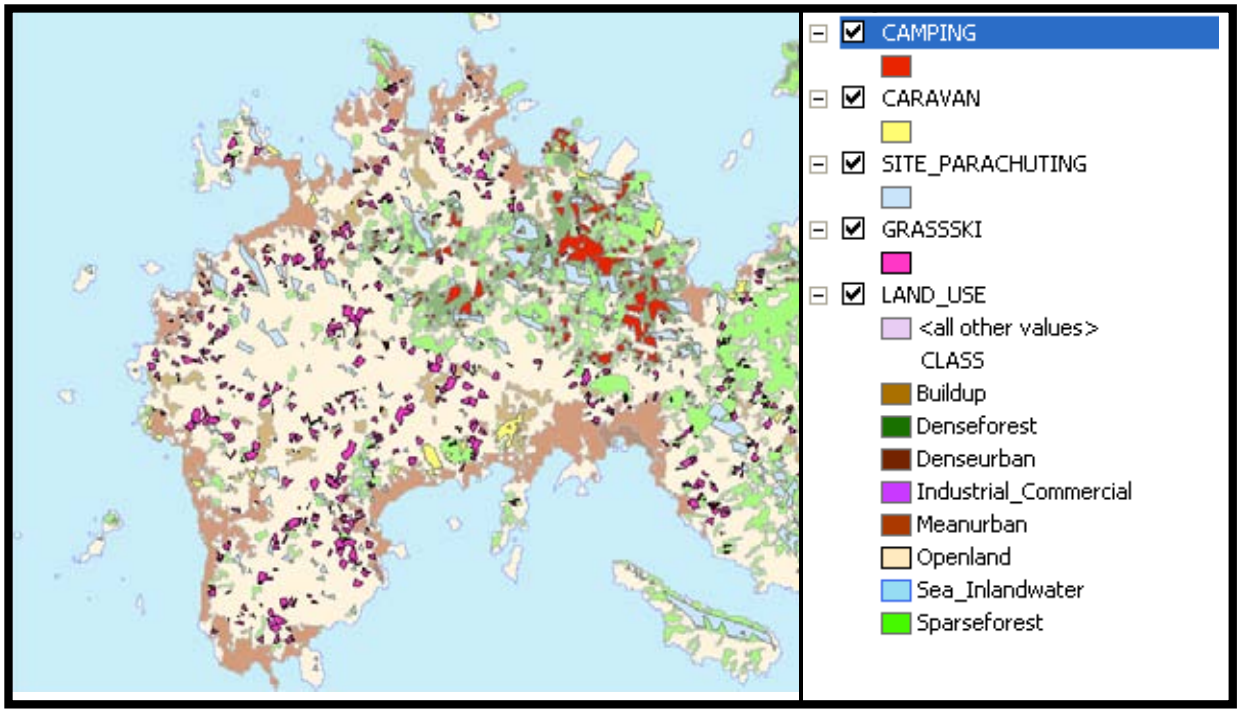

Figure 6 All Applicable Tourism Activities

As a conclusion, this study is completed as a site selection example. However it should contain more criteria for defining the areas, and it must be verified in a larger scale in order to be more realistic and applicable to real world. The intersection areas for two or more activities can be applicable are also searched, however the areas found were either very small or no intersection result was found in this scale.

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References:

- Radio-network Planning Department of Turkcell (for all the digital data)
- Youth and Sport Association
- Qian Wang, "Spatial Information Technology and Development Group Decision Support System for Tourism Plan" , University of Waterloo, 2003
- Russell Jones and Mace Baron, "Site Selection of Petroleum Pipelines: A GIS Approach to Minimize Environmental Impacts and Liabilities", 2004
- www.giscafe.com
- www.turizm.gov.tr

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