THE APPLICATION OF GIS IN SUITABILITY ANALYSIS TO IDENTIFY THE OPTIMUM SITE FOR HOSPITALITY INDUSTRY IN PALM BEACH COUNTY

Abstract

The continuous land use change taking place in Palm Beach County has impacted the decisions in considering land for commercial purposes. The purpose of the project is to obtain the quiet, calm and serene location with good commute for a new hospitality industry in Palm Beach County. There are many hospitality industries in the county but the main motto of this is to provide a peaceful and satisfied vacation stay for tourists and Floridians in 13 acres area far from the busy cities. A detailed suitability analysis was done in this project to find the optimum site to start a new hospitality industry. Herby, several factors were taken into consideration include locations close to parks, bus stops, golf courses, historically underutilized business zones (HUB), and far from schools, coastal hazard zones, schools. The reclassification of the distances of these factors are mapped. The analysis then uses hierarchy to rank these factors along with the future land use raster to weight them and the results were mapped. The con and majority filter tool were used to further refine the suitable areas. The obtained raster file is converted to polygon feature for further analysis. The locations query based on road intersects and attribute query based on the area of the polygons were used to narrow the search to single suitable site for hospitality industry.

Introduction

The increase in population numbers particularly in states having tourist as main economic basis intensify the pressure and make it hard to find a serene and peaceful location for vacation. Both the population and urbanization are making it difficult to have a pollution free and calm environment to spend holidays. In the studies it shown that the regressive population pyramids have greater difficulties for tourism growth (Sánchez-Rivero and Cárdenas-García, 2014). The tourism growth in influenced by the hospitality industry. A good location for the vacation is really important to boost the business and to boost the tourist economy in further. So, planning a suitable site to develop the commercial lands for hospitality industry is a task in populated states like Florida, and also a proper analysis is required to find the optimum site.

The GIS applications has been one of the most useful tool for planning and managing the land-use, future land use by utilizing the suitability mapping and analysis (Collins et al., 2001; Hopkins, 1977). The GIS based suitability analysis has a wide variety of applications which include ecological importance, finding suitable habitat for animals and plants, geological activities, planning, impact assessment, agriculture development, selecting best site for public sectors like schools, private sectors like hotels, industries etc. (Church, 2002; Janssen and Rietveld, 1990; Kalogirou, 2002; Miller et al., 1998; Store and Kangas, 2001). The GIS application in suitability analysis has also been utilized in finding suitable locations for different purposes.

The different application of GIS in suitability analysis include but not limited to suitable site for housing development (Boroushaki and Malczewski, 2008). Several research also has been done to find suitable schools using the suitability analysis in GIS (Lagrab and Aknin, 2017). The GIS analysis of suitable sites also has a research in finding the suitable site for new hospital construction (Vahidnia et al., 2009). Coming to developing business the key factor for any business

is Location. Though there are many other factors influence the success of business location is considered as the most dominant of all. A good location helps to boost the business.

The objective of the project is to identify the suitable location for the hospitality business in Palm beach County. As mentioned, location is the dominant influence for a successful business there are different factors that are involved in choosing a good location. The factors that are considered in this study to identify the suitable location for the hospitality business include a site that have close proximity to parks, bus stops, golf course, and a site considered to be historically underutilized business zones (HUB), and a site far from schools, and coastal hazard zones. The site for a good hospitality business has to have a good commute which was also considered as other factors and the amount of area in between 10-15 acres. The area for a newly constructed hospitality industry was chosen on the basis as such it has close parks, bus tops, commute facility, golf courses for recreation, far from schools, busy life. Also, one more consideration of historically underutilized business zones was taken because to start a business in those zones helps to develop the locality. Finally, coastal hazards zones which are the zones susceptible to category 1 hurricanes were restricted for the construction of new business to avoid any damages caused due to hurricanes and tropical storms. As, the main moto to develop the hospitality industry is to have a vacation at such a site which is pleasant, calm, and peaceful to have break from the hassle and crowdy populated locations.

The study area to find the suitable site for the business is Palm Beach County (PBC) (Figure 1). PBC is located in southeastern part of Florida state. The county is considered as 25th most populated county in United states. The area of the county has seen the increasing population trend since 19th century. The real estate has been the first largest industry in the county followed by agriculture. The total area of the county according to the US census Bureau is approximately 2000

square miles in which approximately 400 square miles is covered with water. Most of the eastern part of the county is well urbanized and populated, whereas as central and western parts are considered to be suburban and rural areas.

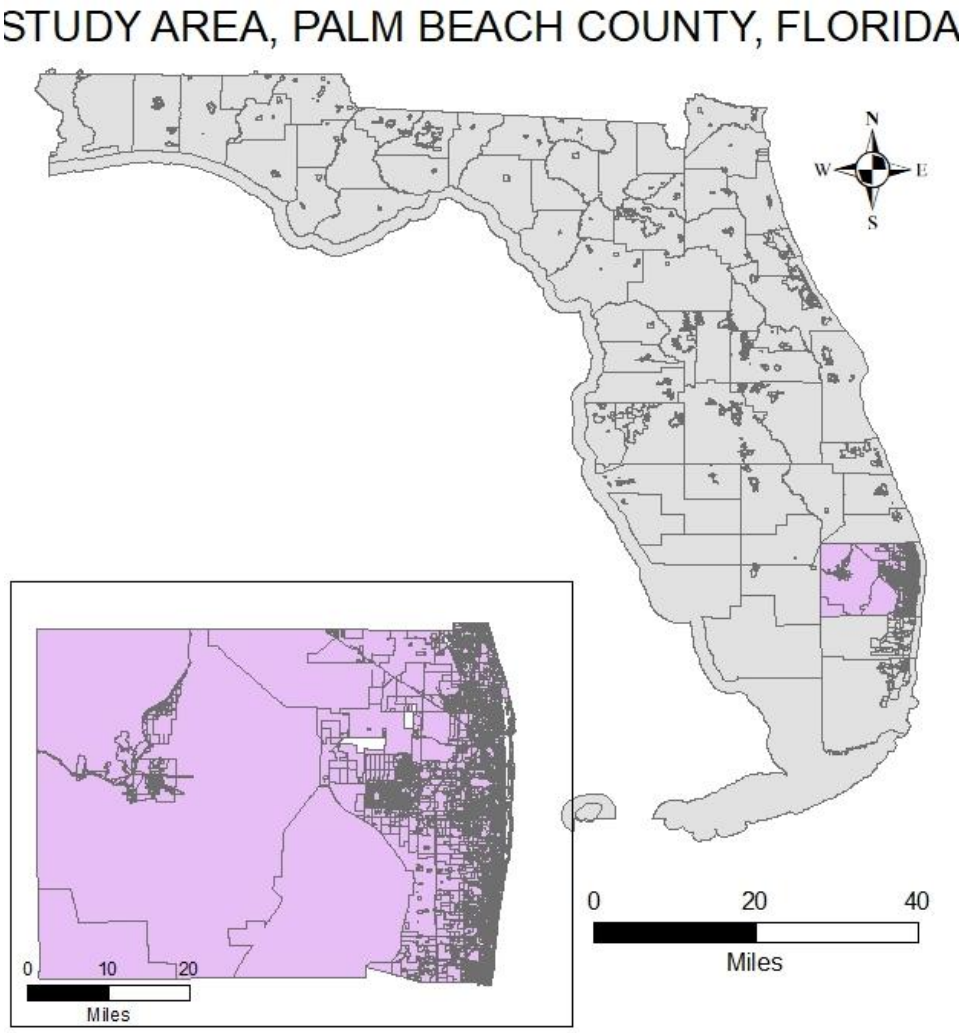

Figure 1: Study area of the project, PBC, FL.

Methods

Datasets Utilized for the analysis

Suitability analysis using ArcGIS as a tool is used to find the optimum site for the new hospitality industry of the Palm Beach County, the study area of the project. Data required for the project is downloaded from the Palm Beach County open data resource by the county (https://opendata2-pbcgov.opendata.arcgis.com/). The data downloaded includes the shapefiles of parks, bus stops, Historically Underutilized Business zones (HUB), golf course, schools and coastal hazard areas. All the files obtained were all polygon features except the bus stops which was a point feature. Future land use polygon was converted to raster which is used in weighted overlay. Road's polyline feature was also downloaded which was used in location query. A Palm Beach County boundary a polygon feature was downloaded and converted to raster using feature to raster tool. The flow chart in the figure 2 is showing the process that followed to obtain the required results.

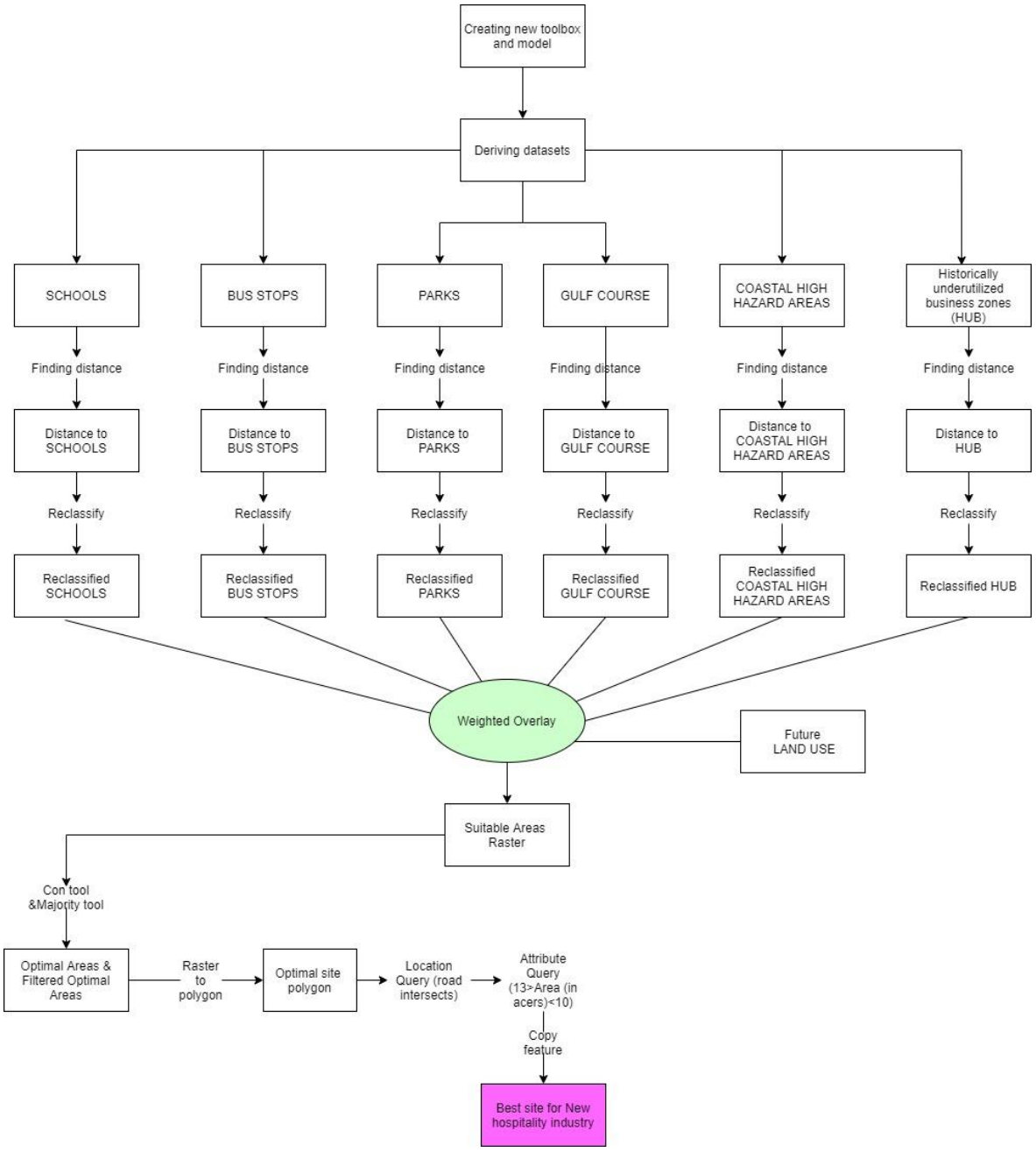

Figure 2: Workflow followed to achieve the objective of the project.

All the data files were exported to ArcMap 10.7.1 for further analysis. Model build was used for the initial analysis to obtain the most suitable sites and optimum sites. A new toolbox is created in arc map catalog in which a new model labelled find suitable location for hotel is created. The model properties were set to processing extent and raster analysis cell size was set to PBC

boundary raster file. In the model builder all shapefiles were added which include parks, bus stops, HUB, golf course, schools, and coastal hazards zones. To derive distance from these site **Euclidean distance** tool in spatial analysis was used which was added to the model builder next to each of the features. The connection was created between the six features and the six Euclidean distance tools individually. The output was saved and the added to the display and the model was ran. The resulted six outputs were connected to **reclassify** tool individually and the output were saved and added to display before the model was run again. Each factor was reclassified to equal 10 intervals. For parks, bus stops, HUB, golf course, the closest distance was given highest value that is 10 whereas the farthest distance to these attributes were set to the lowest value that is 1. Coastal hazards and schools were reclassified as if the farther distance were given largest value 10 and the closest distance were given the smallest values. The resulted reclassified maps were made for all the six factors. The six reclassified output were then together connected to the **weighted overlay** tool. The future land use raster file is also added to the weighted overlay. In the weighted overlay the values were set to future land use values were set as if the commercial, rural, industrial, and other areas suitable for hotel construction were given higher values whereas water bodies, agricultural lands, urban and populated areas were considered as restricted sites. The weighted overlay percentages were assigned to each of these factors as follows: HUB-30% Parks-22%, bustops-17%, golf course-12%, future Land use- 11%, coastal hazard areas-4%, schoosl-4%, future land use-10% which account to 100%. The output raster was saved as suitable sites and the map was created for it. The suitable sites were then connected first to **con** tool to obtain optimum site and the connected to **majority filter** tool to obtain the final suitable sites. The maps obtained from these two tools were created. The model builder with full tools which was constructed to get the final optimum sites was shown in figure 3.

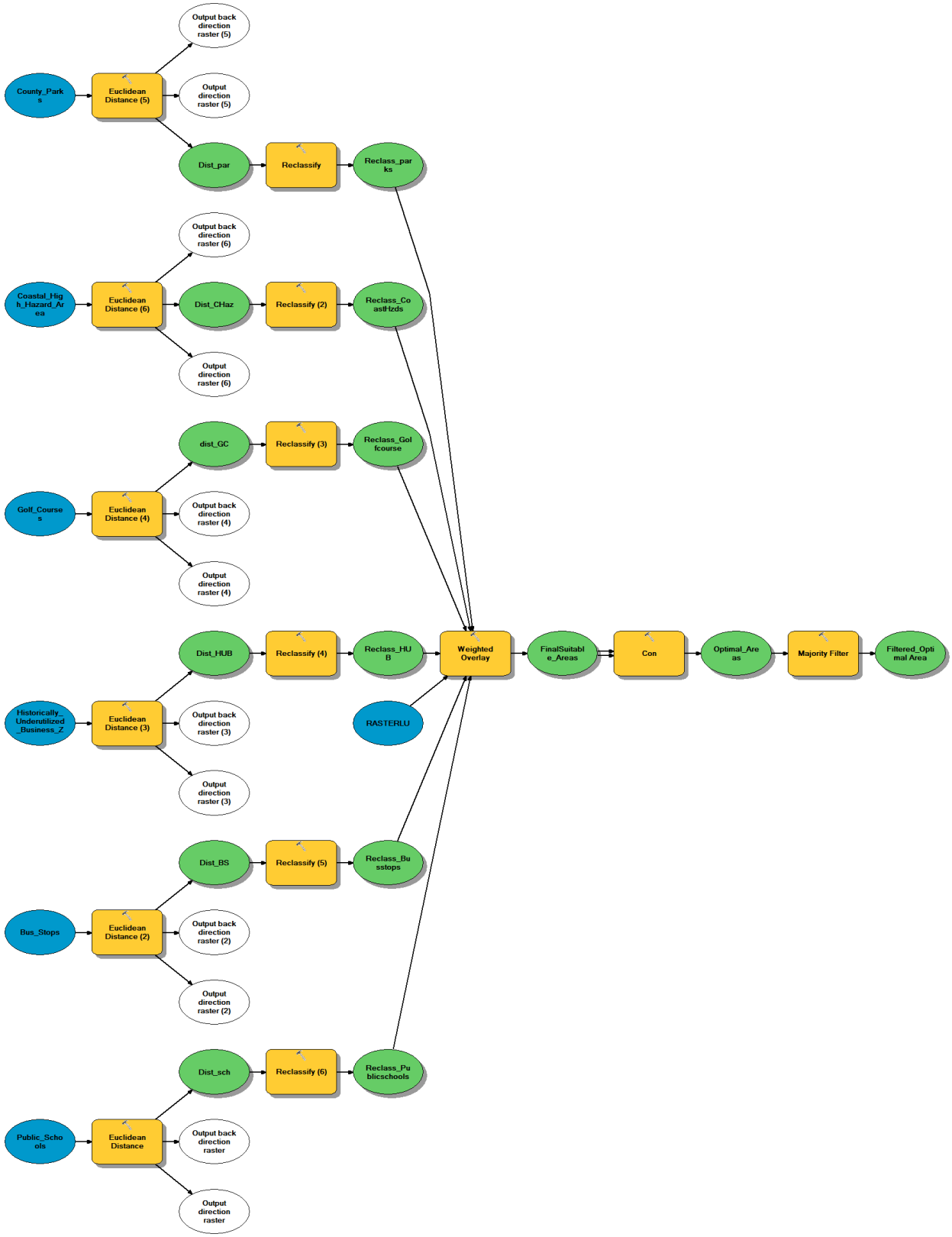

Figure 3: Model builder construction to find the reclassified sites, suitable sites, optimal sites and filtered sites,

The obtained optimum suitable sites were then converted to polygon feature using **raster to feature** tool for further analysis. The obtained polygon feature of suitable sites had 8 polygons. From these eight polygons a **location query** is used to find the sites that have insect with the road polyline features. Seven locations were found to have the road intersections. The area of the polygons was calculated using the **calculate geometry** tool in attribute table options. The **attribute query** was used to obtain the polygon that have area in between 10-15 acers. The selected final suitable site to construct a new hospitality industry was exported and a map was created.

Study Area Analysis

One of the south eastern counties of Florida state the Palm Beach County is considered as the study area to find the best suitable site for a new hospitality industry. Data required for the project is downloaded from the Palm Beach County open data resource by the county (https://opendata2-pbcgov.opendata.arcgis.com/). The data downloaded includes the shapefiles of parks, bus stops, Historically Underutilized Business zones (HUB), golf course, schools, and coastal hazard areas. All the files obtained were all polygon features except the bus stops which was a point feature. Future land use polygon was converted to raster which is used in weighted overlay. Road's polyline feature was also downloaded which was used in location query.

Results

As, shown in the flow chart after the initial analysis of Euclidean distance and reclassification the maps were created for each of the six factors as shown in the figure 4.

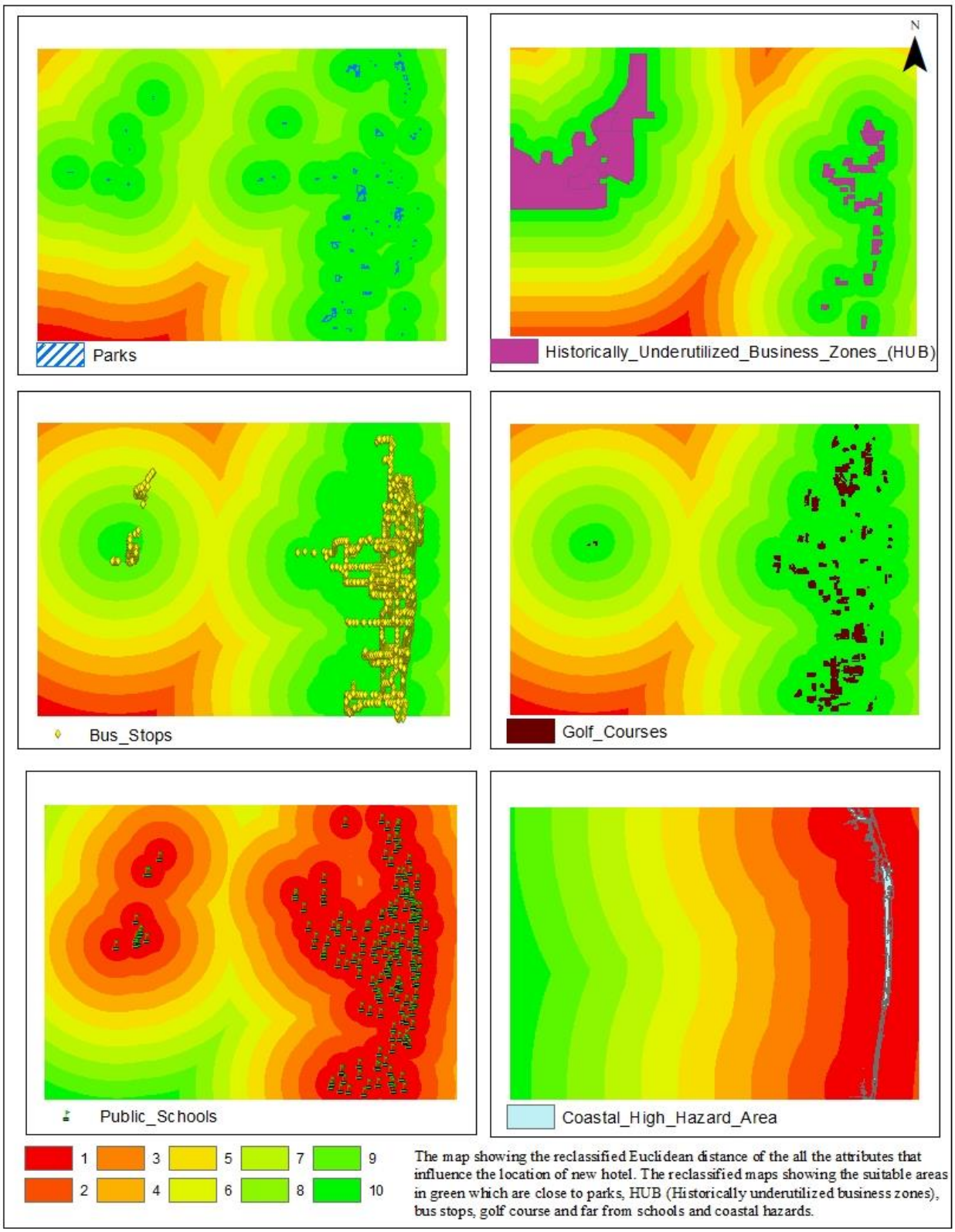

Figure 4: Reclassified maps of all six factors.

The reclassified outputs showing the areas in green are most suitable in all the six maps and red are considered to be less suitable. The weighted overlay tool output includes the consideration of all the six factors and the future land use. The resulted map is shown in Figure 5.

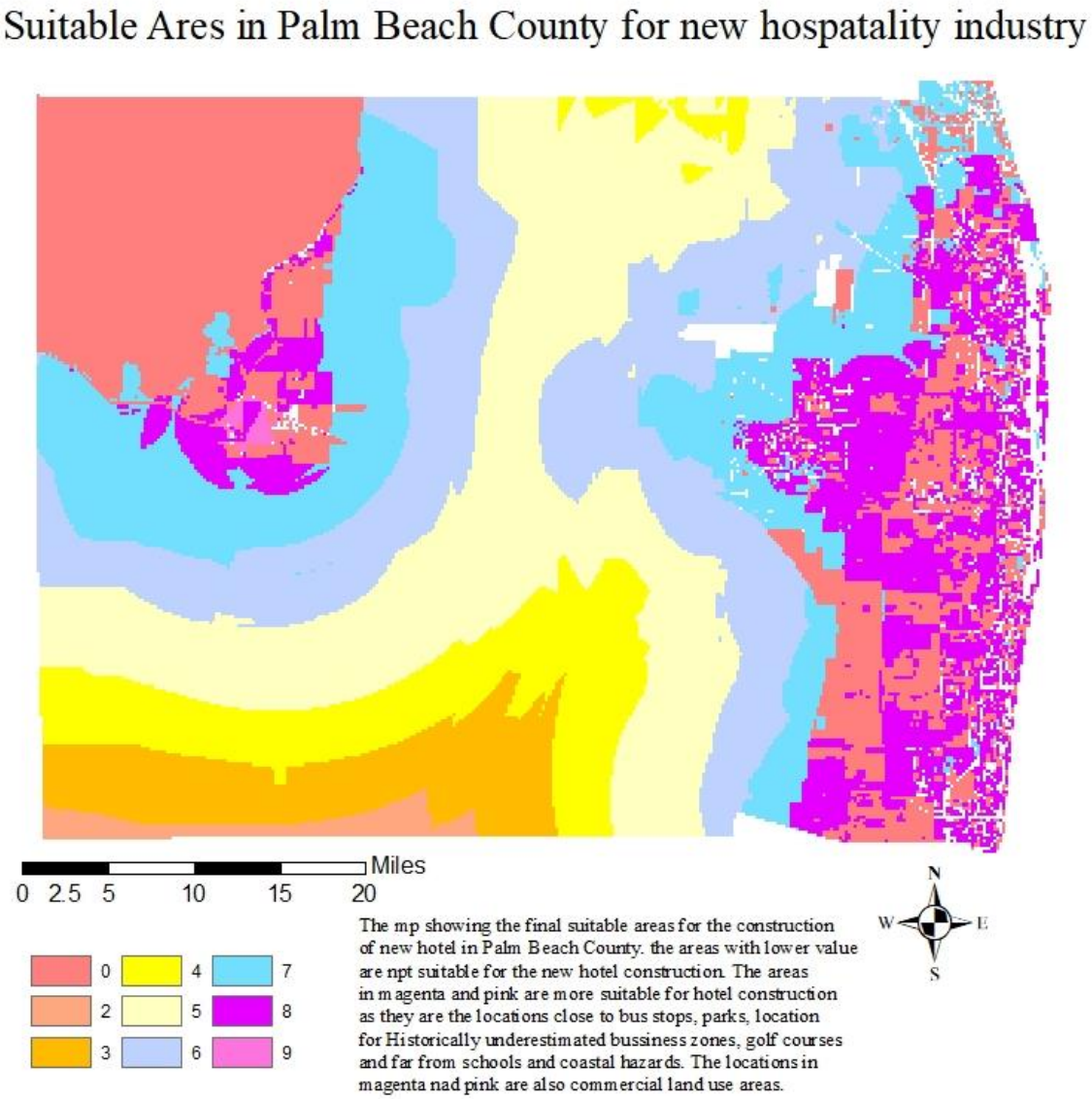

Figure 5: Suitable sites for new hospitality industry.

The con and majority filter tool has reduced the suitable sites to as less as 6 polygons after executing both the tools, the map of the resulting polygons shown in Figure 6.

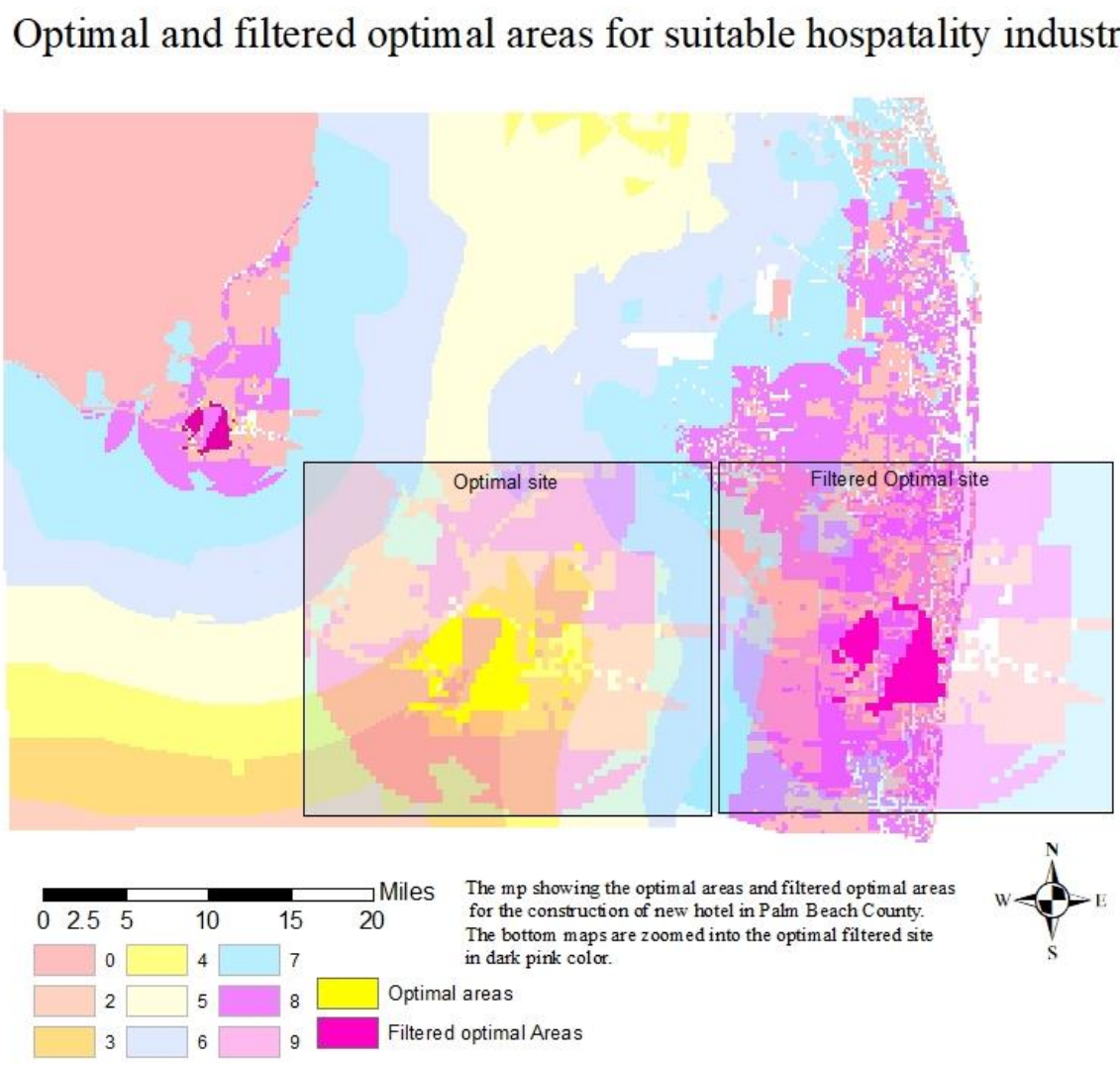

Figure 6: Optimum sites and filtered optimum sites for new hospitality industry.

After the location and attribute query the final suitable site for the business is shown in the figure 7. The final site obtained has good commute, bus stop facility, parks and golf course close by which makes it a perfect place for vacation. Also, considering about the business it is the best place as it is close to the underestimated zones for business which will help increase of economy

in the rural areas. Also, the site is far from schools and coastal hazard zones which fulfill the objective of the study.

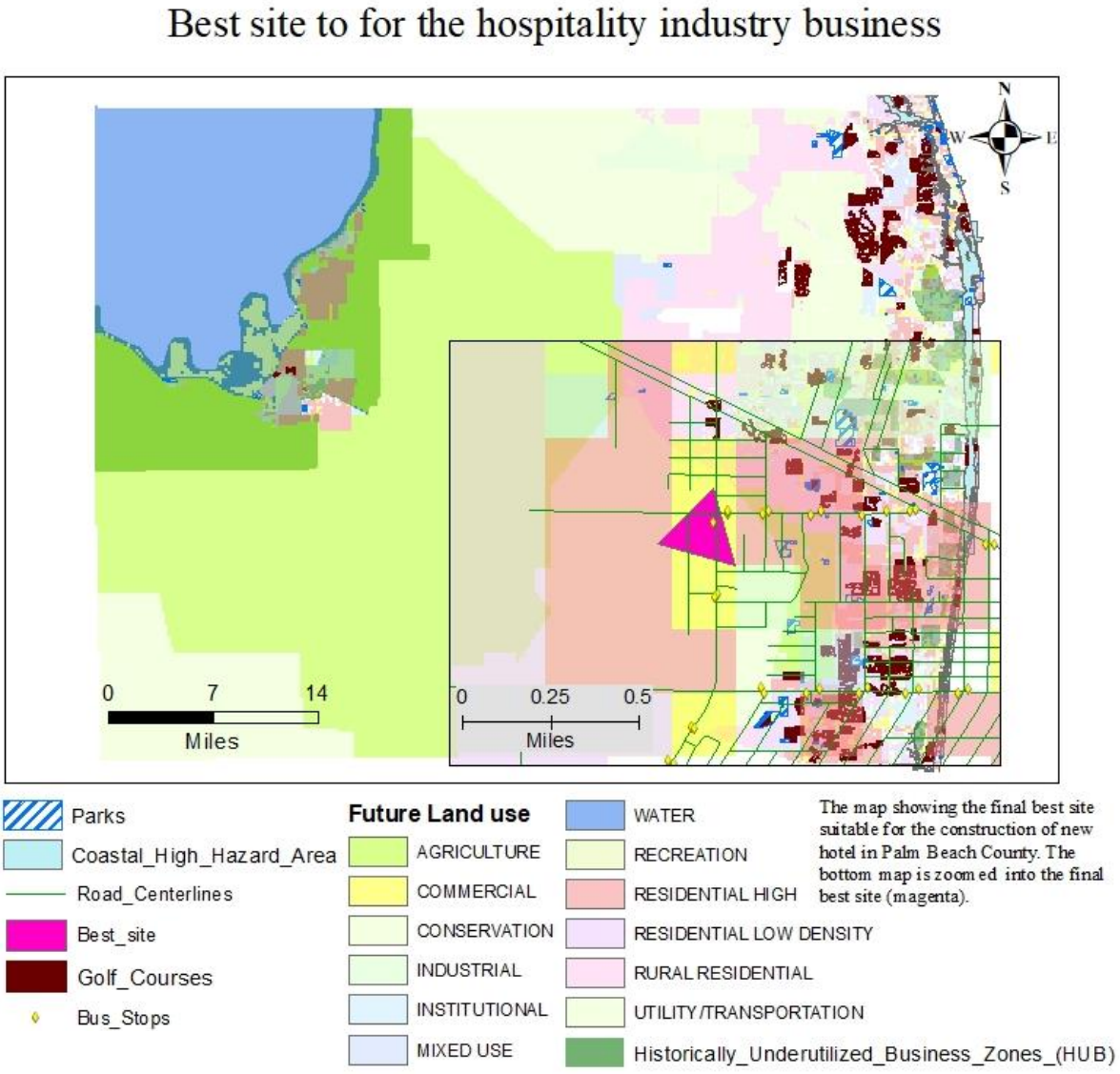

Figure 7: Final and best suitable site for new hospitality industry.

Conclusions

The growing population in Palm Beach County has increased the difficulty to find a best suitable location for any business. When it comes to hospitality industry is even more difficult as many other factors need to be considered for the profitable business. The focus of this study has

been to locate a best suitable site to build a new hospitality industry. Locating the suitable site for the industry is not only difficult but is also important to consider many other factors in the process. In this project six such important factors are considered to find the suitable location. The factors considered for the project included the site which close to parks, bus stops, has commute facility, golf course, and should be far from schools and coastal hazard zones. The location is chosen as such it in the historically underutilized business zone to develop the local economy. The higher weight was given to park, bus stops and HUB. The roads intersect and areas of the site were considered as final criteria to choose one from 6 optimum sites. In this study, GIS-based model builder techniques have been employed to evaluate the suitable location to build a new hospitality industry. Suitability analysis utilizing Arc GIS is very economical and prominent way to understand the problem and provide solution that is most efficient. The maps developed also help to visualize the area without actually visiting the site location. It has the capacity to input multi criteria which play as a powerful tool in suitability analysis. This tool helps to consider the important factors first by ranking and weighing which plays as an important tool to narrow down and find the best suitable site for any problem.

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