Enhancing Livability and Economic Growth in the Vicinity of USC through GIS Analysis for Finding Potential Locations for Large Shopping Malls

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Issue Statement

The immediate vicinity of the University of Southern California (USC) in Los Angeles lacks significant large-scale shopping malls, posing challenges to the convenience of local residents and limiting their mobility. This absence not only affects the daily lives of community members but also hinders potential economic development opportunities in the area. The dearth of substantial commercial spaces not only inconveniences the residents but also restricts their access to diverse retail options and services.

To address this issue and foster economic development, leveraging the capabilities of GIS (Geographic Information System) analysis through ArcGIS Pro software becomes imperative. GIS technology provides a powerful toolset for spatial analysis and decision-making. By utilizing GIS, I aim to identify suitable locations around USC for the construction of large shopping centers.

Assumptions

Residential Areas and Demand for Shopping Malls: In the analysis, if an area with a high density of residential population is identified, we may predict a higher demand for large shopping malls in that area. This may be related to a close association with residential neighborhoods, student housing, or work areas.

Competitor Analysis: By analyzing the competitive business landscape in

the surrounding area, it may be possible to guess where there may be a lack of competitors, thus providing better business opportunities for a new mall.

Land Availability: If the GIS analysis shows that there is a large amount of available land in certain areas, it can be surmised that these areas are more likely to accommodate large malls with adequate parking and pedestrian space.

Data and Methodology

During the comprehensive analysis, a variety of available secondary data sources were leveraged to gain valuable insights into potential areas for constructing large shopping centers around USC. The primary datasets utilized encompassed information on USC campus points, including building locations, land utilization details, and points of interest, all sourced from OpenStreetMap.

To refine the spatial representation and identify optimal locations, a series of geoprocessing tools within ArcGIS Pro, such as the Buffer Tool, Clip Tool, Erase Tool, Select by Attributes, and Select by Location, were employed. These tools facilitated the delineation of specific geographic ranges, filtering of relevant areas, and exclusion of unsuitable regions.

The Buffer Tool was particularly instrumental in establishing proximity zones around key points, providing a spatial context for potential retail demand. The Clip Tool enabled the extraction of pertinent geographical

features within defined boundaries, streamlining the focus on areas directly relevant to the study. The Erase Tool was applied to eliminate non-essential information, enhancing the precision of the analysis.

Analysis

To create a buffer around the USC point in ArcGIS Pro, navigate to the Analyze tab and locate the Tools group. Open the Toolbox, search for the Buffer analysis tool, and select it. In the Buffer tool, designate the USC Point Layer as the input feature and set the buffer distance to 10 kilometers. Ensure the unit of measurement is specified in kilometers. Finally, run the tool to generate a 10-kilometer buffer around the USC point. This process establishes a spatial zone that extends 10 kilometers from the specified USC location, facilitating further spatial analysis.

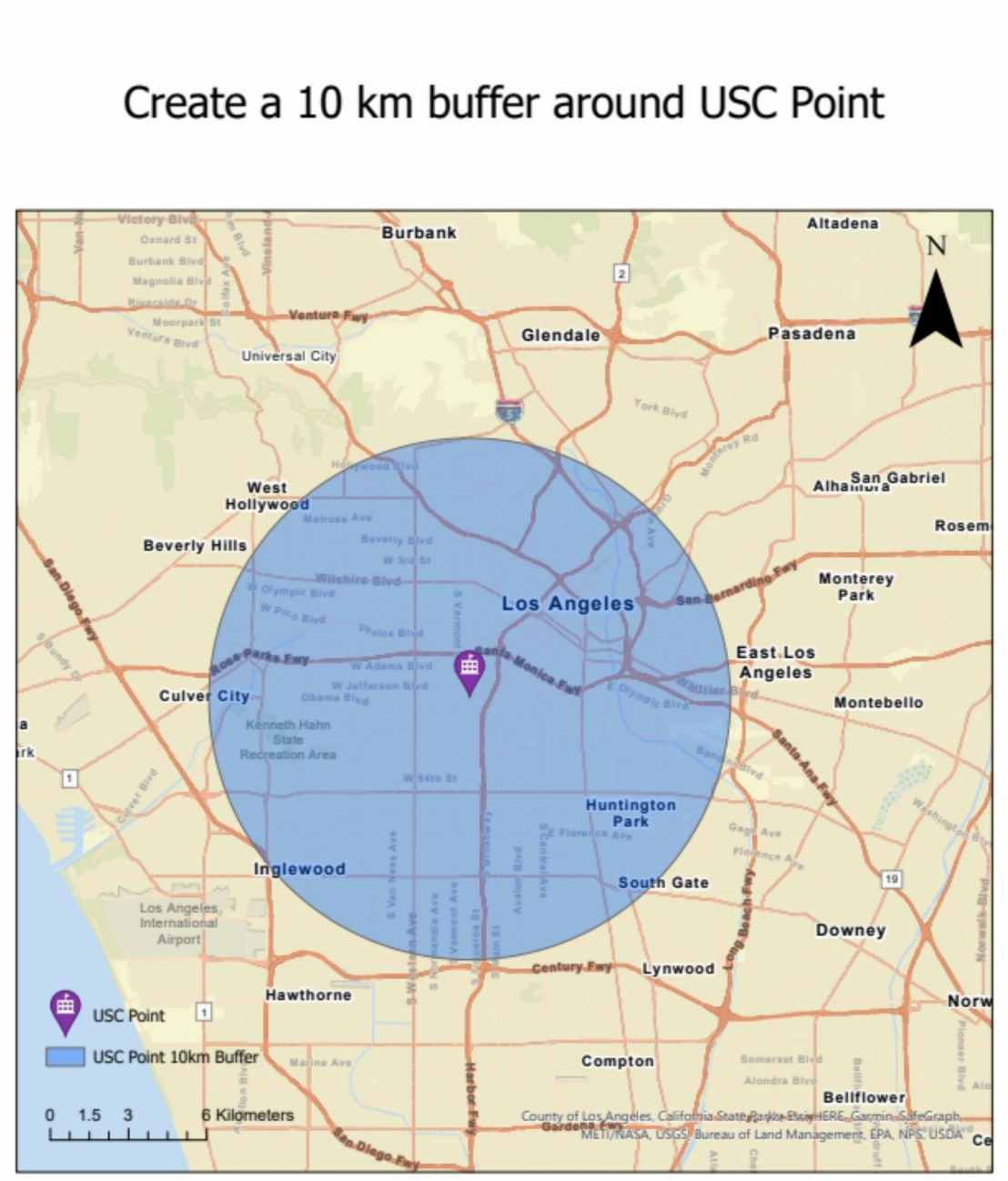

Figure 1: Create a 10 km buffer around USC Point

To refine the analysis, additional data layers such as Building, Landuse, and Points of Interest (POI) are incorporated in ArcGIS Pro. Using the Clip Tool, these datasets are selectively clipped to match the boundaries defined by the previously created 10-kilometer buffer around the USC point. This process ensures that only relevant information within the specified spatial

extent is retained for further analysis. The Clip Tool is sequentially applied to each dataset—Building, Landuse, and POI—allowing for a focused examination of features within the established buffer zone. This step enhances the precision of the analysis by narrowing down the dataset to elements directly associated with the USC vicinity.

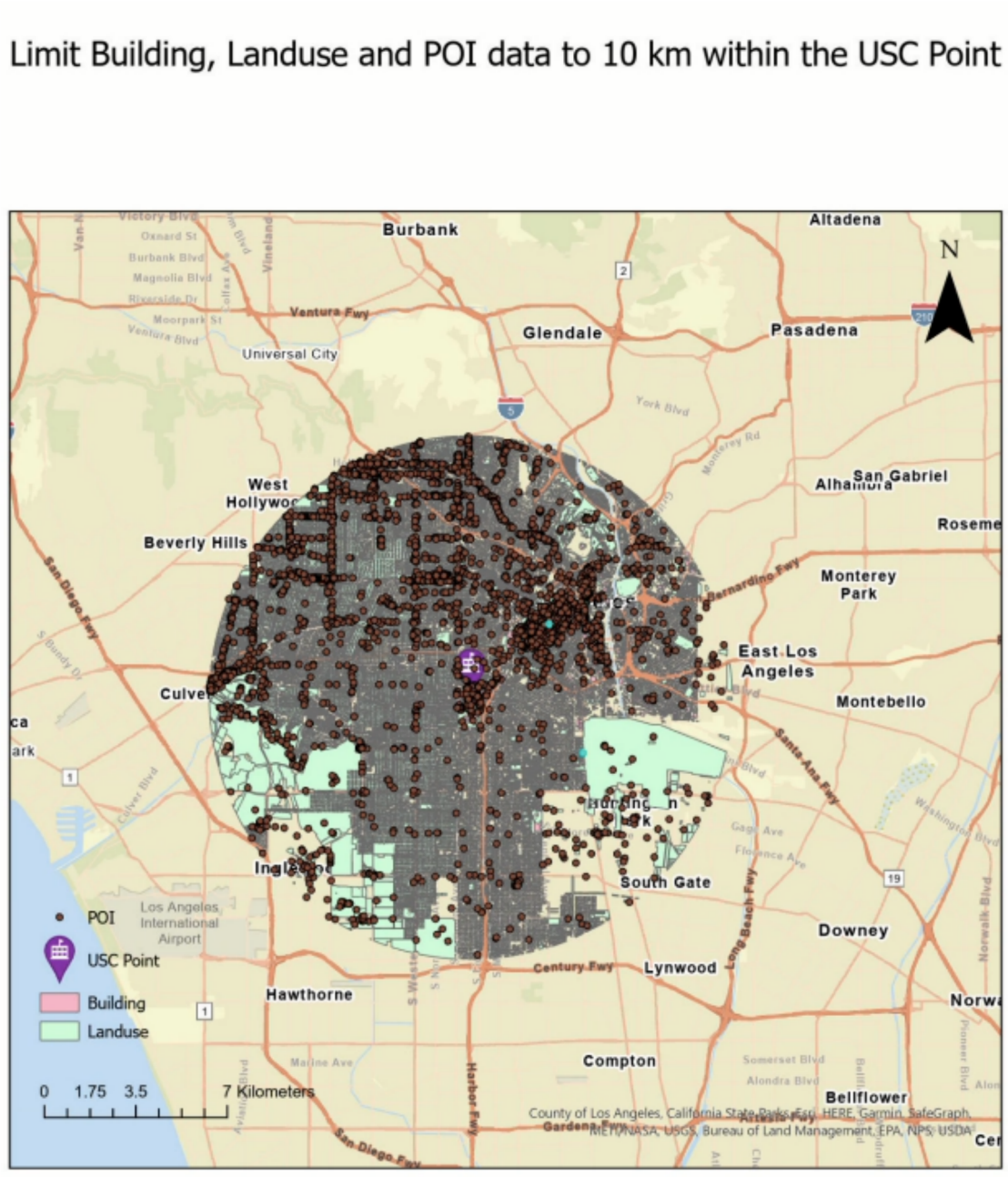

Figure 2: Limit Building, Landuse and POI data to 10 km within the USC Point buffer

Malls are filtered from the dataset and renamed as Competitors. Residential areas are then filtered out from the landuse layer, exported as a separate layer named Residential, and subsequently erased using the Erase Tool. To delineate the influence of competitors, a 2000-meter buffer is applied to the Competitors layer, and the corresponding area is erased.

Further, commercial, retail, and recreation areas are filtered from the landuse layer. The subsequent step involves erasing off the 2000-meter buffer of competitors. Commercial and residential areas cannot intersect ,as they originate from the same landuse layer.

Finally, the Select by Location tool is employed to identify areas of intersection between (1) the layer obtained after filtering commercial, retail, and recreation areas and (2) the layer resulting from erasing residential and competitor areas with a 2000-meter buffer. This selective approach refines the dataset, allowing for a more nuanced examination of areas where land use considerations, competitor influence, and buffer zones intersect.

The selection of a 2-kilometer buffer range has been carefully considered to strike a balance between the potential impact of competitors and geographical proximity. Initially, a 1-kilometer range was deemed too small, as it might not comprehensively reflect the potential influence of competitors. On the other hand, a 3-kilometer range was considered excessively large and could lead to a significant distance from the USC campus. Therefore, the choice of a 2-kilometer range provides an adequate spatial scale to capture

the potential influence of competitors on the surrounding environment.

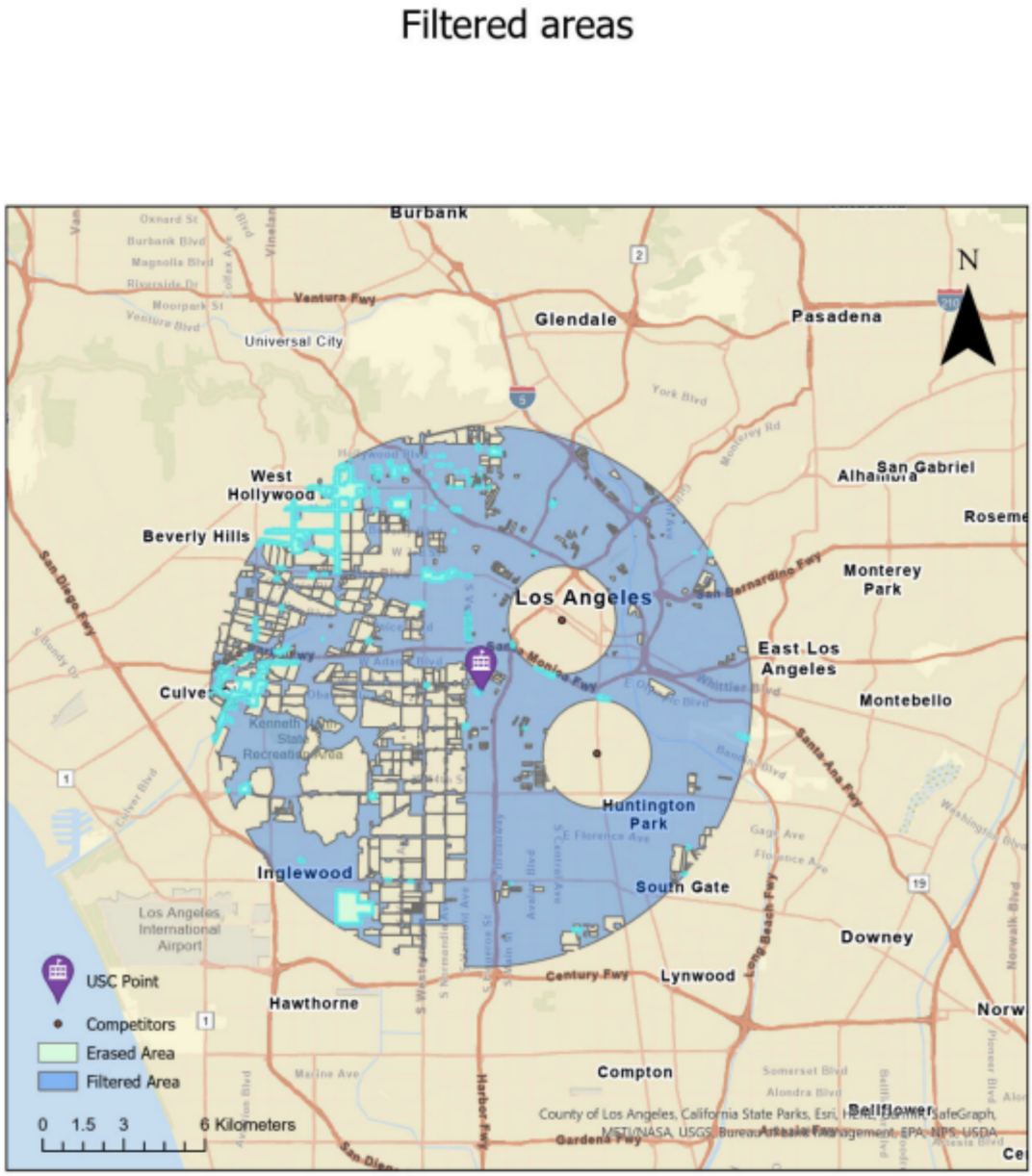

Figure 3: Filtered areas from Competitors,Residential areas, commercial, retail, and recreation areas

The resulting analysis highlights the yellow area as the optimal location for potential mall construction. This area is identified based on a comprehensive GIS analysis that considered factors such as competitor locations, residential zones, and specified buffer distances.

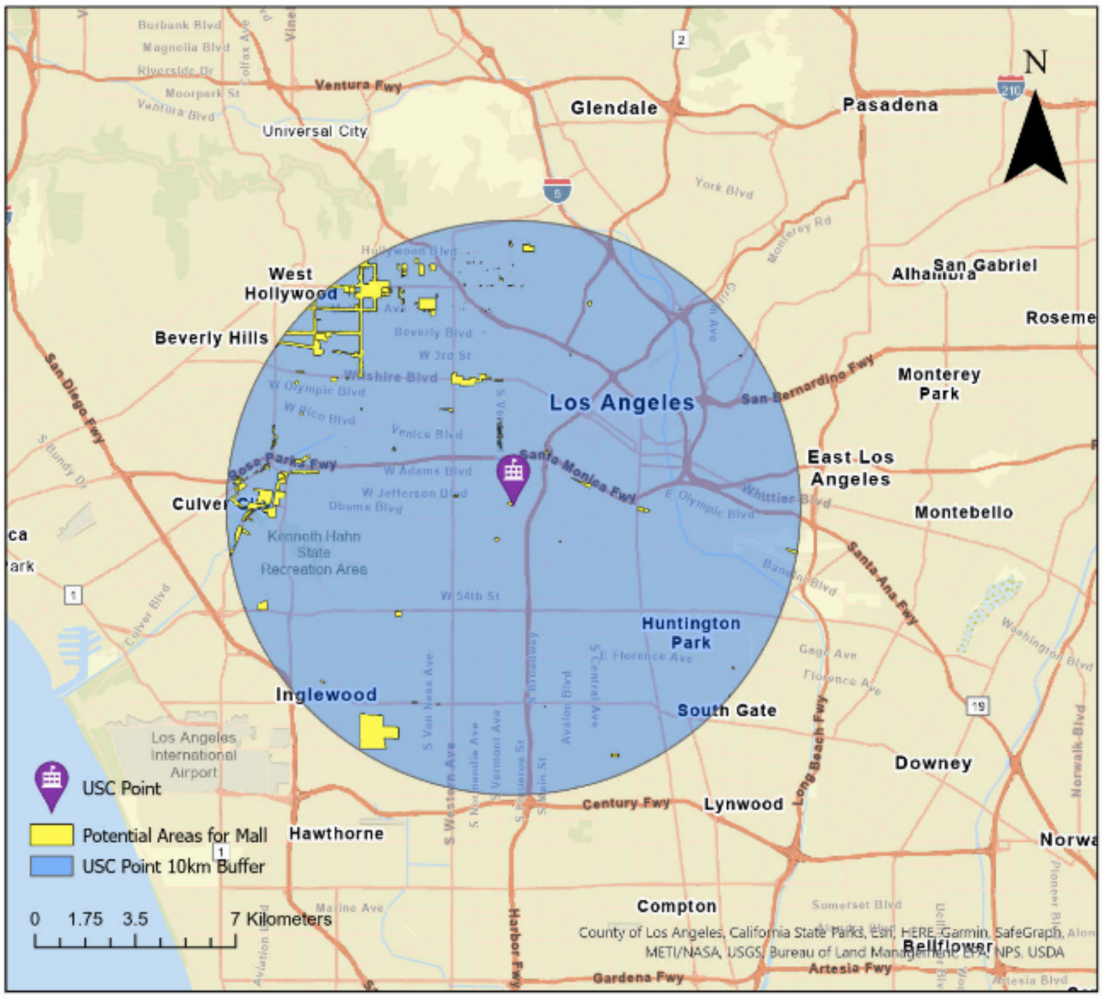

Figure 4: Potential areas for mall construction

Limitations

In the aforementioned process, despite conducting a detailed GIS analysis to identify potential areas for constructing a large shopping center around USC, the operations did not explicitly consider the convenience of transportation around the site that meets construction requirements.

Transportation accessibility is a crucial factor in the successful operation of a mall, impacting customer attraction and the vibrancy of commercial activities.

In addition, the analysis did not account for whether local policies permit the proposed restrictions on land use and construction. Policy considerations are pivotal in determining the feasibility and permissibility of large-scale commercial developments.

Conclusion

In summary, the GIS analysis conducted in ArcGIS Pro was a systematic effort to pinpoint an optimal site for potential mall construction near USC. Utilizing tools like Clip, Filter, Erase, and Select by Location, the analysis processed diverse spatial datasets. Despite its effectiveness in identifying a strategic yellow area, essential factors such as transportation convenience and local policy adherence were not adequately considered. Limitations include a lack of emphasis on real-time data, potential inaccuracies from subjective user judgments, and an absence of comprehensive integration with critical elements like traffic patterns and regulatory frameworks. Future analyses should address these limitations to ensure a more holistic and actionable understanding of optimal mall construction locations, aligning with broader urban planning objectives and fostering sustainable economic development around USC.

Reference

OpenStreetMap.(n.d.).USCPoint,Building,Landuse,POI,OSM.https://www.openstreetmap.org/