

## Multi-Criteria Suitability Analysis for Domino's Pizza Over Delhi Using AHP and GIS

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### Abstract

An article on ESRI's website -how reallocating a star bucks store a few 100 yards had increased its profit by 50 % inspired us to do the following study .Dominos offers pizza service in Delhi at many locations .As its gaining popularity new outlets are opening up, they should be located at the right place to maximize the profit and to cover the area in an optimum way. The paper aims at choosing the optimum location for the new outlet subject to multiple criteria's to create a well-distributed network of Domino's Pizza service.

A Multi-Criteria Decision Analysis process was developed that combines Geographical Information System (GIS) analysis with Analytical Hierarchy Process (AHP).

AHP was used to allocate weightage as accordance to a criteria's relative importance, while ArcGIS was used to perform weighted overlay of all the criteria layers & produce the final suitability map. Suitable areas have been delineated & some sites have been suggested for reallocation to maximise optimum use of area for providing pizza services.

### About the Author



#### Ms. Bakul Budhiraja

I am currently pursuing my Master's in Geoinformatics. I always had a keen interest in Science & GIS is the perfect mixture of all sciences with endless applications .I am attracted by technology & GIS gives the opportunity to develop new tools & methods and apply them to do crucial studies and analysis across many disciplines .I am looking forward to exploit GIS sector & expand its boundaries further.

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## Introduction

Domino's Pizza is an American restaurant chain and international franchise pizza delivery corporation headquartered at the Domino Farms Office Park in Michigan. Founded in 1960, Domino's is the largest worldwide, with more than 10,000 corporate and franchised stores in 70 countries [1]. The increasing popularity of Domino's pizza in urban areas of Delhi is amplifying the demand to open new outlets to cater the need. The construction of a new outlet must take these criteria's into consideration – land use pattern, transport convenience, social preferences, youth's food habits etc.

Various studies have combined Geographical Information Systems (GIS) & Analytical Hierarchy Process (AHP) for Suitability Analysis.

In the real world, it is very hard to extract precise data of input and output and tackle them with crisp numbers which reflect human's appraisals related to pair wise comparisons. Saaty has proposed the AHP approach as a decision-making method to solve unstructured problems [2]. The AHP approach is a subjective tool which is used to analyze the qualitative criteria needed to generate alternative priorities with 9-point scales. The AHP approach empowers decision makers to structure complex problems in a simple hierarchical form, and to evaluate a large number of quantitative and qualitative factors in a systematic manner. The AHP method has proven to be a powerful decision analysis technique in the sector of multi-criteria decision making (MCDM), and has been successfully applied to the tackling of MCDM problems generally. Its utilization involves tasks such as R&D planning [3], the best policy selection [4, 5], the assessment of alternatives, the allocation of resources, the determination of requirements, the prediction of outcomes, design systems, performance measurement, and the optimization and resolution of decision conflicts. In the Food service industry AHP is used widely for effective and reliable site suitability as money, efforts and company's future is at stake.

Firstly, the AHP approach was applied to effectively find relative weights as per human perception. Secondly; weighted overlay of all the criteria layers was executed. On interpretation of final suitability map, knowledge was gained about suitable sites, possible reallocation sites and latest trend of how food service industry is expanding as compared to urban development.

The results of this study will provide decision makers with the strategic approach needed to effectively expand Domino's pizza service in Delhi in an economically effective way. This paper unfolds in the following fashion: Section 2 describes the AHP and Weighted Overlay approach; Section 3 presents the execution flow chart of this study; Section 4 provides us with the results. Finally, Section 5 concludes this study.

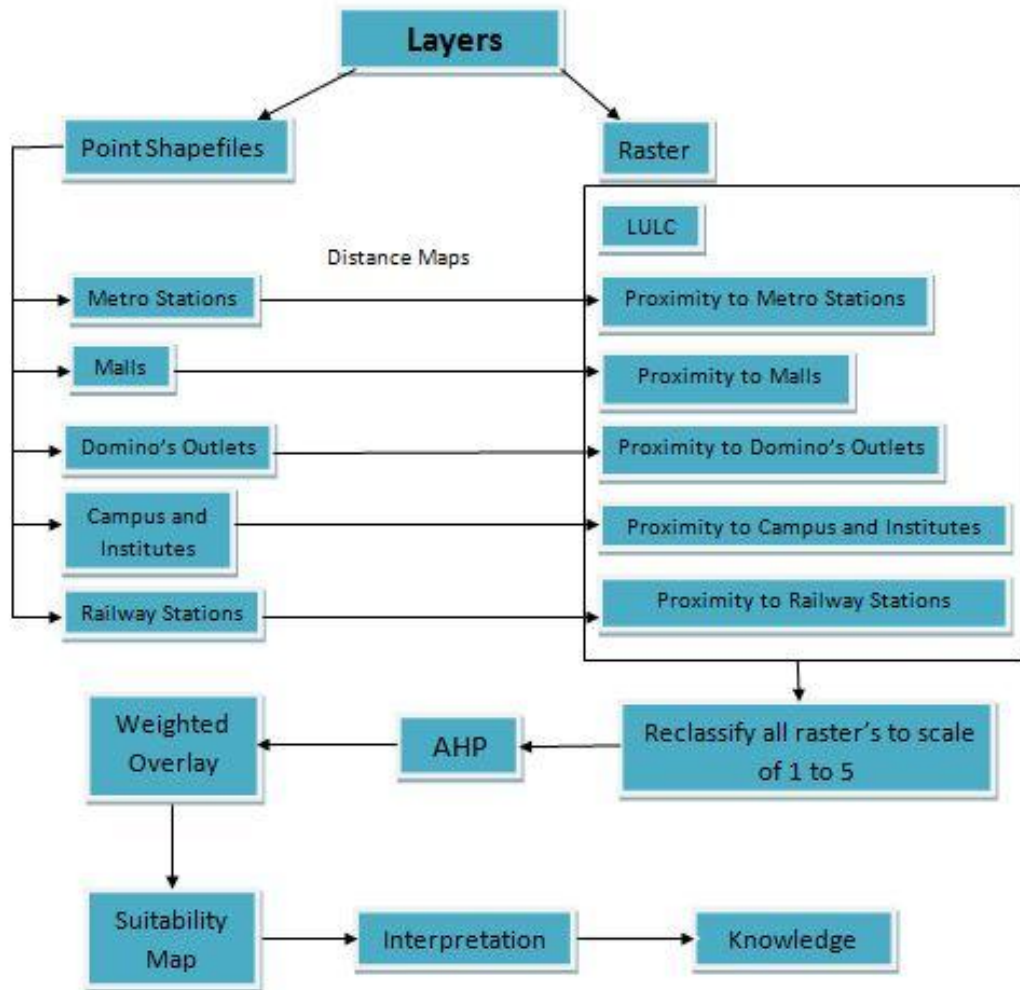
## AHP and Weighted Overlay Approach

- (i) AHP -The Analytical Hierarchy Process (AHP) is a decision-aiding method developed by Saaty (1980). It aims at quantifying relative priorities for a given set of alternatives on a ratio scale, based on the judgment of the decision-maker, and stresses the importance of the intuitive judgments of a decision-maker as well as the consistency of the comparison of alternatives in the decision-making process.  
The strength of this approach is that it organizes tangible and intangible factors in a systematic way, and provides a structured yet relatively simple solution to the decision making problems.  
In addition, by breaking a problem down in a logical fashion from the large, descending in gradual steps, to the smaller and smaller, one is able to connect, through simple paired comparison judgments, the small to the large.[2]
- (ii) Weighted Overlay -The Weighted Overlay tool applies one of the most used approaches for overlay analysis to solve multicriteria problems such as site selection and suitability models. In a weighted overlay analysis, each of the general overlay analysis steps are followed. Since the input criteria layers will be in different numbering systems with different ranges, to combine them in a single analysis, each cell for each criterion must be reclassified into a common preference scale such as 1 to 10, with 10 being the most favorable. Each of the criteria in the weighted overlay analysis may not be equal in importance. You can weight the important criteria more than the other criteria. The input criteria are multiplied by the weights and then added together.[16]

**Software Used**

- ArcGIS 10.1

**Methodology**



**Table 1**  
**Title: Weights derived using AHP**

Sl. No.	Criteria	Weights
1	Proximity to Metro Stations	0.1538
2	Proximity to Railway Stations	0.2854
3	Proximity to existing Domino's Outlets	0.1034
4	LULC Map	0.0641
5	Proximity to Campus and Institutes	0.0356
6	Proximity to Malls	0.3574

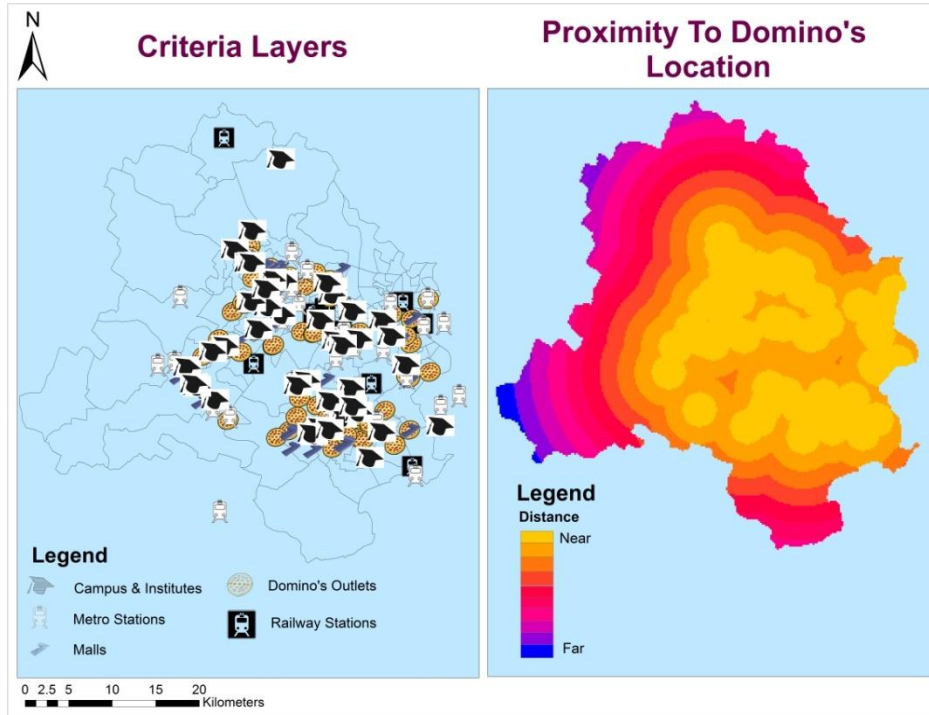


Fig: 1 – Criteria Layers and Proximity to Domino's Location

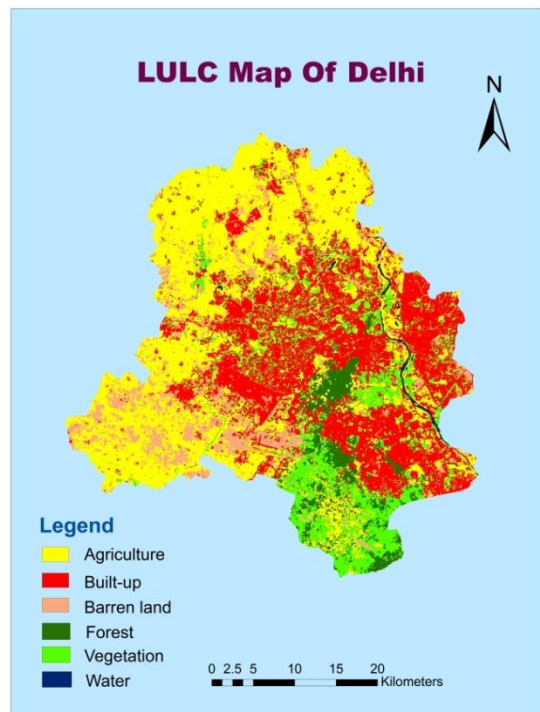
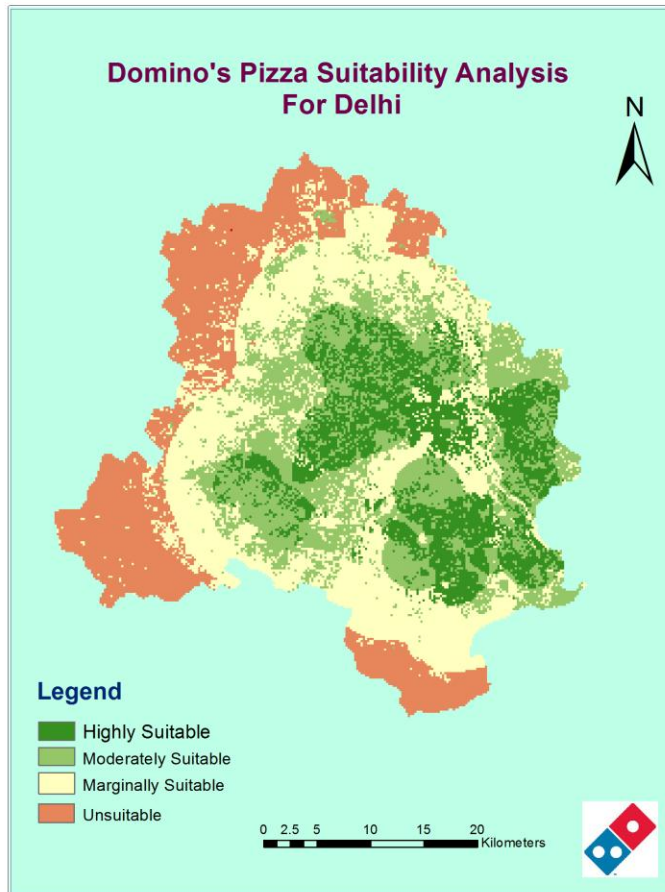


Fig: 2 – Land Use and Land Cover Map of Delhi

## Results

We get a Site Suitability Map for Domino’s Pizza with four regions ranging from Highly Suitable area to Unsuitable area.



**Fig: 3 – Suitability Map for Domino’s Pizza in Delhi**

## Conclusion

The areas shown in dark green are the most suitable for constructing a new Domino’s Pizza Outlet .These areas are located on settlement class where most of the urban population prevails, have good connectivity through metro network, are closer to malls and campus area where most of the youth population & office goers are found, therefore the demand for new outlets is high in these areas .If the new outlet is located in these highly suitable zones, chances of it grossing huge profits is high.

The region which came as Unsuitable is basically the area where there are acres of agriculture land, poor connectivity, at the outskirts of Delhi and more of rural population where food habits don’t include pizza .Further we can see that Domino’s business is expanding paralleled to urban expansion. New outlets are opening up within metro stations, along campus areas and in malls.

Also a thing to notice existing Domino’s outlets are not spatially well located .Some outlets such as

- Cp, both of them are located in Inner circle, relocating one inside Rajiv Chowk Metro Station would definitely yield enormous profit as it’s an intersection for metro lines and has lakhs of commuters daily.

- Janakpuri, Naraina Vihar and Mayur Vihar the outlets are located very close ,if relocated they could cater to more people .
- New outlet can be added at DU metro station as most students commute through metro for North Campus
- New outlet can be added to Hauz Khas metro station ,it lies between many campus areas

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