TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

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Thesis No: 080MSCoM015

Optimal Site Selection for Civil Servants' Medium-Rise Apartments in Kathmandu Valley: An AHP-GIS Multi-Criteria Proximity and Feasibility Ranking Approach

by

Ar. Prabin Shrestha

A THESIS

SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT

DEPARTMENT OF CIVIL ENGINEERING

LALITPUR, NEPAL

APRIL, 2026

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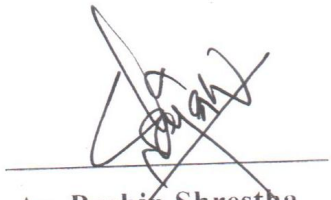
DECLARATION

I hereby declare that the thesis entitled "**Optimal Site Selection for Civil Servants' Medium-Rise Apartments in Kathmandu Valley: An AHP-GIS Multi-Criteria Proximity and Feasibility Ranking Approach**" submitted to the Department of Civil Engineering in partial fulfillment of the requirement for the degree of Master of Science in Construction Management, is a record of an original work done under the guidance of Thesis Supervisor Er. Subash Kumar Bhattarai, Visiting Faculty, Construction Management, Centre for Post Graduate Studies, Nepal Engineering College (nec-CPS). This thesis contains only work completed by me, except for the consulted material, which has been duly referenced and acknowledged.



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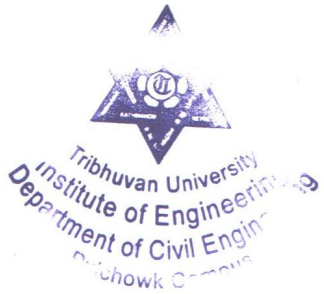

CERTIFICATE OF THESIS APPROVAL

The undersigned certify that they have read, and recommended to the Institute of Engineering for acceptance, a thesis entitled "**Optimal Site Selection for Civil Servants' Medium-Rise Apartments in Kathmandu Valley: An AHP-GIS Multi-Criteria Proximity and Feasibility Ranking Approach**" submitted by Ar. Prabin Shrestha in partial fulfillment of the requirements for the degree of Master of Science in Construction Management.

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23 April 2026

ABSTRACT

Kathmandu Valley, the administrative and political center of Kathmandu Valley, faces increasing demand for affordable and well-located housing for civil servants. High land prices near urban amenities create a trade-off between affordability and accessibility, forcing many employees to reside in distant or overcrowded housing resulting to different difficulties. Past initiatives, such as the relocation housing project at Ichangu Narayan, highlights how inappropriate site selection can lead to underutilized developments.

This study aims to identify optimal locations for medium-rise apartment development for civil servants by balancing accessibility to essential amenities with affordable land prices. A mixed-method approach was adopted, integrating questionnaire surveys, Geographic Information System (GIS) analysis, multi-criteria decision-making techniques, sensitivity analysis, and expert validation. A stratified survey was conducted to assess demand of apartments, preferred amenities, proximity requirements, relative importance of amenities, and relative importance of accessibility and land cost. The Analytical Hierarchy Process (AHP) was used to determine weights of amenities, while spatial analysis was performed in QGIS considering planning constraints such as RSLUP, buffer zones, and restrictions of aviation and heritage.

Pareto Frontier analysis identified optimal trade-offs, and TOPSIS was applied for ranking. Four optimal sites were identified, providing a robust, data-driven framework for informed housing development decisions.

Keywords: Spatial Optimization, Site Suitability, Civil Servant Apartment, Geographic Information System (GIS), Multi-Criteria Decision Making (MCDM), Kathmandu Valley

ACKNOWLEDGEMENT

This research has been accomplished with the support and guidance of many individuals, without whom it would not have been possible to complete this work in its present form. First and foremost, I express my sincere gratitude to my supervisor, Er. Subash Kumar Bhattarai, for his valuable guidance and continuous support throughout the entire period of this thesis. I extend my gratitude to our Thesis Program Coordinator, Asst. Prof. Mahendra Raj Dhital, as well as esteemed faculty members of the Construction Management Program, Assoc. Prof. Nagendra Bahadur Amatya and Er. Nemi Bhattarai, for their continuous encouragement and valuable suggestions throughout my study.

I am deeply indebted to Er. Sarun Bhomi and Er. Archana K.C. from the Department of Urban Development and Building Construction (DUDBC) for their support and assistance during my thesis journey. I am also grateful to all the civil servants who participated in the questionnaire survey, without whose cooperation this research would not have been possible. I extend my sincere thanks to Er. Binayak Bhattarai, Engineer at the Civil Aviation Authority of Nepal (CAAN), for assisting me in analyzing the height regulations of CAAN in the vicinity of Tribhuvan International Airport. Likewise, I thank the Key Informants who generously provided their time, knowledge, and valuable insights for this research.

I extend my gratitude to my family, especially my wife, Ar. Binu Shrestha for her support, encouragement, and inspiration during my thesis journey. Last but not the least, I am grateful to my friends, Ar. Vivek Shrestha, Er. Jayan Shrestha, Ar. Diksha Panta, Ar. Manish Maharjan, and Ar. Rukesh Suwal, for their continuous support, encouragement, and inspiration throughout my study period.

Ar. Prabin Shrestha

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ABBREVIATIONS AND ACRONYMS

AHP - Analytical Hierarchy Process

APF - Armed Police Force

ATM - Automated Teller Machine

CAAN - Civil Aviation Authority of Nepal

CBD - Central Business District

CI - Consistency Index

CR - Consistency Ratio

DDG - Deputy Director General

DNPR - Department of National Personnel Records (Civil)

DoLMA - Department of Land Management and Archives

DUDBC - Department of Urban Development and Building Construction

EPF - Employees' Provident Fund

GIS - Geographic Information System

GoN - Government of Nepal

KII - Key Informant Interview

km - kilometre

KVDA - Kathmandu Valley Development Authority

MCDM - Multi-Criteria Decision-Making

MOO - Multi-Objective Optimization

MoF - Ministry of Finance

MoFALD - Ministry of Federal Affairs and Local Development

MoHA - Ministry of Home Affairs

MoLJPA - Ministry of Law, Justice and Parliamentary Affairs

MoPIT - Ministry of Physical Infrastructure and Transport

MoUD - Ministry of Urban Development

OD Matrix - Origin-Destination (OD) Matrix

OSM - OpenStreetMap

PUDBC - Project Office of Urban Development and Building Construction

RI - Random Consistency Index

RSLUP - Risk Sensitive Land Use Plan

RUDP - Regional Urban Development Project

SPSS - Statistical Package for the Social Sciences

SWOT - Strengths, Weaknesses, Opportunities, and Threats

TIA - Tribhuvan International Airport

TOPSIS - Technique for Order Preference by Similarity to Ideal Solution

UNDP - United Nations Development Programme

UNESCO - United Nations Educational, Scientific, and Cultural Organization

WPS - Weighted Proximity Score

CHAPTER 1: INTRODUCTION

1.1 Background

Housing is a fundamental human necessity, and many individuals aspire to own a comfortable home in urban areas to gain access to improved services and opportunities. This aspiration is significant within the context of Nepal's economy. In response, the Employees' Provident Fund (EPF) offers housing loans to civil servants to support housing development. The number of such loans disbursed across different fiscal years is presented in Table 1-1 (EPF, 2081). The data indicate that a substantial volume of funds has been allocated by the EPF for housing construction.

Table 1-1 Housing Loans taken by civil servants from EPF

Fiscal Year	Amount of House Loan (Crore)	Increment %
2076/77	3545.61	7.72
2077/78	3621.35	2.14
2078/79	4012.99	10.81
2079/80	4365.28	5.78
2080/81	4255.20	(2.52)
Average		5.39

In Nepal, the Kathmandu Valley, as the political and administrative hub of the country, attracts many people who aspire to reside there. As a result, building construction has been increasing rapidly. This expansion of housing has led to the conversion of agricultural land into built-up areas. Consequently, to accommodate growing housing needs while preserving agricultural land, the demand for living in apartment is rising. In response, the Government of Nepal introduced a program in the "Budget Speech, 082/83 (2025/2026)" (MoF, GoN, 2081) to construct apartment units for government officials in each province.

1.2 Problem statement

As the administrative capital and political hub of Nepal, the Kathmandu Valley hosts a large number of government employees, resulting in a high demand for housing. Many of these employees face difficulties in securing housing that is comfortable, affordable, and conveniently located, primarily because well-located properties are often expensive. The trade-off between land cost and proximity to urban amenities creates a spatial challenge in selecting suitable residential sites. This issue is not limited to the Kathmandu Valley but is also evident in other regions of the country. As a result, many civil servants either live in overcrowded rental accommodations or reside far from the city center, leading to a reduced quality of life, longer commuting times, and decreased productivity, punctuality, and job satisfaction. To address these challenges, the Government of Nepal introduced a program in the Budget Speech 082/83 (2025/2026) to construct apartment units for government officers across all provinces as follows:

"350. कर्मचारी सञ्चयकोष लगायत अवकाश कोषहरूको अग्रसरता र निजी क्षेत्रको सहभागितमा सुलभ आवास कार्यक्रम सञ्चालन गरिनेछ। यस अन्तर्गत सातै प्रदेशका प्रमुख शहरी केन्द्रहरूमा एक लाख भवन तथा अपार्टमेन्ट निर्माण गरी निजामती, सुरक्षाकर्मी र शिक्षक कर्मचारीलाई सहुलियतपूर्ण ब्याजदर र किस्ताबन्दीमा उपलब्ध गराउने व्यवस्था मिलाएको छ।" (Source: (MoF, GoN, 2081)

Its unofficial translation is "An affordable housing program will be implemented through the initiative of the Employees' Provident Fund and other retirement funds, with participation from the private sector. Under this program, one hundred thousand houses and apartments will be constructed in major urban centers of all seven provinces, and arrangements have been made to provide them to civil servants, security personnel, and teachers at concessional interest rates with installment-based payment facilities." (Source: (MoF, GoN, 2081)

A comparable case can be observed in Ichangu Narayan, where the Government of Nepal developed housing for squatters. However, the project failed to serve its intended beneficiaries due to location-related issues. Through the Department of Urban Development and Building Construction (DUDBC), the government invested over Rs. 230 million (equivalent to approximately Rs. 404 million in FY 2081/82 after price index adjustment) to acquire more than 8 ropani of land and construct 227

housing units for evicted squatters. Despite completion, the displaced households did not occupy the units. The primary reason for this failure was the unsuitable location, along with several associated challenges as follows: (Gurung et al., 2019):

A. Remote and disconnected site: Ichangu Narayan is located far from major employment centers and lacks reliable access to public transportation and urban services.

B. Lack of essential infrastructure: The absence of nearby schools and healthcare facilities made the site impractical for daily living.

C. Social resistance from local residents: Existing residents were reluctant to coexist with the incoming squatters due to perceived differences in lifestyle.

D. High cost of units: The housing units were not affordable for the intended beneficiaries, indicating a mismatch between planning and economic conditions.

If not carefully researched and planned, similar apartment projects for government employees may encounter comparable challenges, leading to significant losses in time, resources, and investment. Therefore, research for construction investment and project feasibility of apartments is essential.

1.3 Research aims and objectives

Given the aforementioned background and problem statement, the primary aims and objectives of this research is selection of optimal site for civil servants' medium-rise apartments in Kathmandu valley using AHP-GIS Multi-Criteria Proximity and Feasibility Ranking Approach.

The specific aims and objectives are as follows:

I. To identify the criteria influencing the location of civil servants' medium-rise apartments in Kathmandu Valley and their preferred proximity.
II. To identify, rank and validate the feasible optimal locations for civil servants' medium-rise apartments in Kathmandu Valley.

1.4 Significance of the research

As outlined in the problem statement, the Government of Nepal introduced a program in the Budget Speech 082/83 (2025/2026) to construct apartment units for government

officers across all provinces. Although a specific budget has not yet been allocated, it is likely to be provisioned in future fiscal years. In this context, early identification of suitable sites will be instrumental in estimating the required budget. Moreover, selecting optimal locations in advance can help prevent failures similar to the Ichangu Narayan Housing Project. The findings of this study will support policymakers, planners, and housing authorities in prioritizing viable and sustainable sites, thereby enhancing the long-term success and usability of civil servant housing.

In addition to the public sector, the private sector is also actively engaged in apartment development, as indicated in Appendix 1. Identifying optimal sites will assist private developers too in selecting feasible and investment-worthy locations. Therefore, even if the government does not allocate funds for such projects in the future, the outcomes of this study will remain valuable for private sector initiatives.

As the capital city of Nepal, the Kathmandu Valley hosts a large number of government offices, leading to a significant concentration of civil servants and, consequently, a growing demand for housing. According to the 2078 BS census, Nepal's average annual population growth rate is 0.92%, whereas the growth rates for the Kathmandu Valley districts are higher: Kathmandu (1.51%), Bhaktapur (3.35%), and Lalitpur (1.58%). Compared to the national average, these figures indicate a relatively higher growth trend in the Valley, with Bhaktapur exhibiting the highest rate in Nepal. This suggests a strong likelihood of increasing demand for housing and apartment developments in the region.Accordingly, this study focuses on identifying optimal locations within high-demand areas of the Kathmandu Valley for both government and private sector housing projects.

Furthermore, the methodology and findings of this research can be extended to other regions, offering significant potential for broader application and increased relevance.

1.5 Scope and Limitations of the research

A. The Nepal Government had announced plans to build apartments for government employees. For this thesis, the apartment was being considered only for civil servants among the government employees, to limit the complexity of this research.

B. The sampling will incorporate the ratio of technical and administrative employees and that of male and female employees only. Other strata were not taken into consideration to limit the complexity of the research.

C. The input files for analysis in QGIS is obtained as OSM data via geofabrik.de. And the quality of OSM data limits the quality of the output of this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Existing Literature

Location theory draws upon multiple disciplines, including geography, engineering, mathematics, and economics, with tools such as Geographic Information Systems (GIS) and optimization techniques playing a crucial role in its application (Church and Murray, 2009). In general, individuals prefer to choose residential locations that offer comfort at a reasonable cost, although such preferences vary among users. However, in the case of apartment development, investors must exercise greater caution in site selection to ensure satisfactory returns on investment. Achieving an appropriate balance between affordability and livability requires the integrated use of the aforementioned disciplines.

Several studies highlight the critical role of location in shaping apartment purchase decisions. For instance, Bhattarai and Dhital (2021) identified site selection as the second most influential factor affecting housing project performance in the Kathmandu Valley. Key determinants of site selection include land price, the quality and accessibility of infrastructure and amenities, land topography, and government policies. The relative importance of these factors is presented in Table 2-1 (Bhattarai and Dhital, 2021). These findings underscore the significance of location, cost considerations, and proximity to amenities in ensuring the success of housing projects in the Kathmandu Valley.

Table 2-1 Relative weight of site selection of housing in Kathmandu Valley

Factors	Weightage	Rank
Price of Land	4.0008	3rd
Quality and Proximity of Infrastructures and Amenities (Location of Site)	4.0014	1st
Topography of Land	4.001	2nd
Government Policies	4.0004	4th

Windarko (2025) statistically supports the importance of location in housing decisions. In the study “Consumer Preferences in South Tangerang's Residential Housing Market: A Study of Price, Quality, and Location Factors,” the t-value for housing location (X3) was found to be 7.290 with a significance level of 0.000, which is below 0.05. This indicates that location has a strong and statistically significant positive influence on housing purchase decisions.

Similarly, in “Valuation of Residential Property: Analysis of Participant Behaviour,” the author emphasizes that location is closely associated with distance to key points of interest. Important considerations for buyers include proximity to the central business district, schools, workplaces, and retail outlets (Adair et al., 1996).

Location is also identified as a critical success factor for apartment investments. Studies suggest that occupancy rates increase significantly when apartments are situated near campuses, office areas, and commercial centers. Proximity to business districts positively affects investment value, while developments located in mixed-use areas such as integrated townships combining residential, commercial, and public facilities tend to have higher marketability and selling potential (Krisnaputri, 2021).

According to location theory, property values generally decrease with increasing distance from the city center. Accessibility plays a key role in this relationship and is influenced by distance, transportation infrastructure, and the availability, frequency, safety, and comfort of transport options. This creates a trade-off between transportation costs and land prices (Komaruljannah and Fatichah, 2024).

Lee (2016), drawing on Economic Equilibrium Theory, explains that households determine their housing location and size based on income levels and land prices. Supporting this, Windarko et al. (2025) also found that price has a significant positive effect on housing purchase decisions in South Tangerang, Indonesia.

Furthermore, Hassan (2023) highlights findings from various previous studies related to housing purchase decisions, as summarized in Table 2-2.

Table 2-2 Previous research study in Malaysia on location in a housing purchase decision

Previous Research	Author(s)	Result
Factors influencing the First Home Purchase Decision of Middle-Income Earners (M40) in Selangor, Malaysia	Mariadas et al., 2019	Location showed a positive relationship (standard beta coefficient 0.154) with the residential property purchase decision.
Factors Affecting the Housing Preferences of Home-buyers in Kuala Lumpur	Thanaraju et al., 2019	Thanaraju et al. incorporated factors such as proximity to the workplace, amenities, town center, main roads, highways, and public transportation as sub-variables of location in their study. The results revealed a significant and positive relationship between housing purchase decisions and locational factors among homebuyers in Kuala Lumpur, with a standardized beta coefficient of 0.435 ($p < 0.01$). This finding highlights the importance of strategic locations—particularly those close to workplaces, educational facilities, and essential services, along with good accessibility—as these are closely integrated with the daily lives of residents.
Housing Preferences for First Time Home Buyer in Malaysia	Khan et al., 2017	Khan et al. conceptualized location in terms of accessibility and the availability of facilities, including proximity to shopping complexes, recreational areas, and workplaces. However, their findings indicate that first-time homebuyers tend to prioritize the housing unit itself over locational attributes when making

		purchase decisions.
Understanding Factors that Influence House Purchase Intention among Consumer in Kota Kinabalu: An Application of Buyer Behaviour Model Theory	Chia et al., 2016.	Chia et al. incorporated distance to recreational centres, markets, business centres, schools, and the width of adjacent streets as sub-variables under the broader location factor. Their findings revealed a statistically significant positive relationship with house purchase intention, with a standardized beta coefficient of 0.170 ($p < .01$). This indicates that consumers in Kota Kinabalu place greater importance on proximity—particularly to schools, workplaces, and business centres—compared to locations associated with other daily activities.
Influencing Factors of Property Buyer in Hillside Residential Development	Salleh et al., 2015.	Every single respondent identified location as a critical determinant in their property acquisition, with 96% strongly agreeing and the remaining 4% agreeing. With an impressive mean score of 4.96 out of 5 on the Likert scale, location emerged as the second most significant driver of purchase decisions for hillside real estate. This aligns with professional standards, as Estate Surveyors and Valuers prioritize location as a fundamental variable when conducting the rigorous analysis required to determine market values or rental rates.
The Influence of Housing Components on Prices of Residential	Musa et al., 2015.	The impact of location on property valuation cannot be overstated. Within the housing market, proximity to essential hubs—such as the Central Business District (CBD), employment centers, public transit, and key amenities—acts as a primary value driver. Consequently, homes situated in prime, highly

Houses: A Review of Literature		accessible areas consistently command premium prices compared to equivalent structures located in less advantageous or remote positions.
First-Time Home Buyers: Factors Influencing Decision Making	Abdullah et al., 2012	In his study, Abdullah defined the "location" variable through sub-variables such as proximity to the workplace, city access, and closeness to main roads. By utilizing these specific criteria, location was identified as the primary determinant for first-time homebuyers in Malaysia, achieving the highest mean score among all decision-making factors.

Multi-objective optimization (MOO) involves the simultaneous management of multiple objectives that typically conflict with one another. Because improving one objective often necessitates a compromise in another, a single optimal solution rarely exists. Consequently, the process identifies a set of efficient solutions that represent the best possible trade-offs between these competing goals. (Jesus, 2022)

“Residential Apartments include any building or structure that provides residential units in a single building for three or more families living independently of each other. Based on the number of stories and height, apartments are categorized as follows:

A. Group S1: General Buildings, Criteria- 1 to 5 Stories or below 18m

B. Group S2: Medium Rise, Criteria- 6 to 8 Stories or between 18m to below 25m

C. Group S3: High Rise, Criteria- 9 to 39 Stories or 25m to below 100m

D. Group S3: High Rise, Criteria- 40 Stories and above or above 100m

Medium-rise buildings are those whose heights are within the reach of firehose streams. In the case of an emergency, rescue thorough stairways by firefighter are possible.” (DUDBC, 2024).

GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like). This provides a foundation for

mapping and analysis used in science and almost every industry. GIS helps users understand patterns, relationships, and the geographic context. The benefits include improved communication, efficiency, management and decision-making. (Esri)

Qgis desktop 3.44.5 was used for GIS analysis in this study and was downloaded for free from https://qgis.org/download/.

"Risk Sensitive Land Use Plan of Kathmandu Valley is shown in Figure 2-1. RSLUP has considered the following risks and maps.

i. Landslide susceptibility map

ii. Slope land unsuitable for development

iii. Flood prone areas and water recharge areas

iv. Liquefaction susceptible area

v. Existing land use map

The final output is a color-coded zoning map developed based on development constraints, which classifies valley into three categories: red, yellow, and green zones. According to the guidelines, residential apartment buildings of up to 10 storeys are permitted only within the Yellow Zone. This zoning map has been prepared for the entire Kathmandu Valley (KVDA and UNDP, 2016).

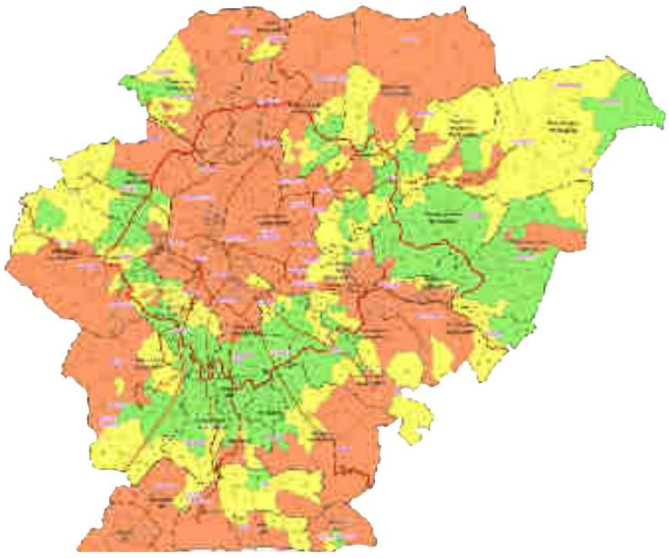


Figure 2-1 Risk Sensitive Land Use Plan of Kathmandu Valley

Solving a multi-objective optimization problem requires a decision criterion that can address multiple, often conflicting objectives. One commonly used approach is Pareto dominance. A solution is considered Pareto optimal when no other feasible solution can improve one objective without simultaneously worsening at least one other objective. In this sense, a solution is non-dominated if no alternative exists that is better across all objectives. The concept, introduced by the Italian economist Vilfredo Pareto in studies of economic efficiency and income distribution, is widely used in optimization theory. When all objectives are treated with equal importance and no prior preferences are defined, dominance becomes the key criterion for comparison. The collection of all non-dominated solutions forms the Pareto set, while their representation in the objective space is known as the Pareto frontier (ANSYS, Inc.).

The TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method is extensively applied in multi-criteria decision-making due to its simplicity, efficiency, and ease of implementation. It is widely preferred by researchers because it involves a straightforward computational procedure and can handle multiple criteria without significantly increasing complexity. Moreover, it aligns well with human decision-making behavior by selecting alternatives that are closest to the ideal solution and farthest from the worst-case scenario. In TOPSIS, the objective is to identify an alternative that is closest to the ideal solution, which represents the most desirable combination of maximum benefits and minimum costs across criteria. Conversely, the negative ideal solution represents the least desirable case, combining minimum benefits and maximum costs. The optimal choice is therefore the one that is nearest to the ideal solution and farthest from the negative ideal solution. This closeness is measured using Euclidean (geometric) distance, based on the best and worst values observed in the dataset. The method allows realistic modeling of trade-offs between criteria, enabling poor performance in one aspect to be compensated by stronger performance in another (Madanchian & Taherdoost, 2023).

Sensitivity analysis is a technique used to evaluate how variations in input variables influence outcomes under a given set of assumptions. By simulating “what-if” scenarios such as changes in a variable affecting outcomes like profit, it helps assess how sensitive results are to different factors. This approach identifies the most influential variables, supports better decision-making, and helps reduce risk. Sensitivity analysis improves understanding of relationships between variables and

clarifies how changes in inputs affect outputs. Although incorporating numerous variables can be complex, modern computational tools make such analysis more feasible, enabling more accurate and informed predictions in a dynamic environment (The Decision Lab).

2.2 Analytical Hierarchy Process

It is a multi-criteria decision-making technique used to establish a hierarchy among different factors. It supports pairwise comparisons and is commonly applied in group decision-making contexts. When decisions involve inputs from multiple respondents, their individual judgments are combined, typically using the geometric mean. This approach enables a more reliable aggregation of preferences and helps in accurately estimating relative weights. Additionally, AHP includes a consistency check to ensure the reliability of the derived weights. This is done by calculating the consistency ratio (CR), which assesses the degree of logical consistency in the judgments provided during the evaluation process.

The Consistency ratio of a matrix is calculated as in Equation 2.1.

CR = CI/RI …….. Equation 2.1

Where,

"CI" is the consistency index

"RI" is the Random consistency index

CI is calculated as shown in Equation 2.2.

$$CI(\mathbf{A}) = \frac{\lambda_{\max} - n}{n - 1}$$ ……..…… Equation 2.2

Where,

"λmax" is the maximum eigenvalue of the pairwise comparison matrix.

"n" is the total number of items being compared against each other

CR should be below 0.1 or 10% to be reliable for a set of findings. The data should be added until the CR is within this range to make the evaluation consistent, based on which decision makers can conclude the result. (Saaty, 1980)

2.3 Research Gap

Some research has been conducted on location optimization of fire stations in Kathmandu Metropolitan City and hospitals in Nepal for acute burn care. However, no research has been found regarding data-driven optimization models for optimizing the location of an apartment in the context of Nepal. This shows the existence of a knowledge gap on this topic.

CHAPTER 3: METHODOLOGY

3.1 Research Design

Research design is the overall blueprint or plan for conducting a study. It outlines the strategy for answering the research questions by specifying the methods for data collection, measurement, and analysis. It is guided by the theoretical framework and involves identifying key variables, which are then used to develop the conceptual framework.

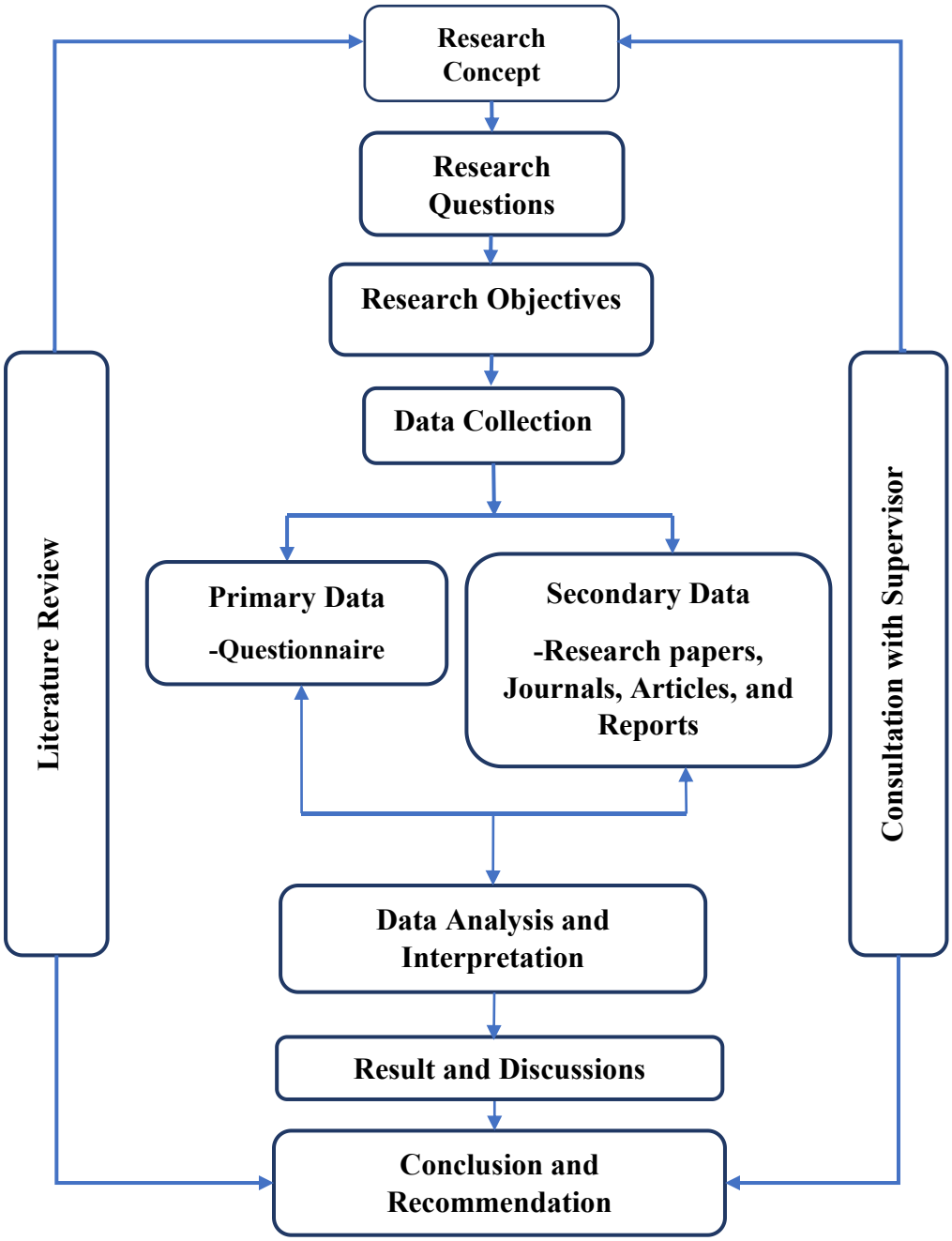


Figure 3-1 Research Design

3.2 Research Framework

The research framework is shown in Figure 3-2. First, the civil servants were surveyed. The information received from the survey was incorporated into the GIS analysis. Risk-sensitive land use plan of Kathmandu Valley, as well as buffer analyses, were done to identify candidate sites. Optimal sites were identified from those candidate sites via Pareto Front analysis, which were then ranked via TOPSIS analysis. Sensitivity analysis was done to determine the robustness of the result. Finally, the results were validated via KII.

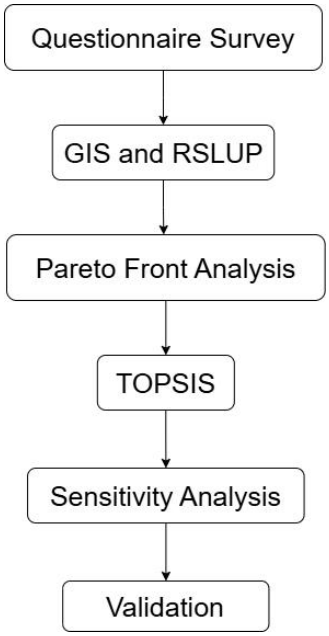


Figure 3-2 Research Framework

3.3 Study Area

The study area of this study is the Kathmandu Valley. It comprises the whole of Kathmandu and Bhaktapur districts and parts of the Lalitpur district that lie within the Valley. The map of the Kathmandu Valley is shown in Figure 3-3.

3.4 Population Sampling and Sample Design

The study population comprised civil servants within the Kathmandu Valley. However, considering the fact that civil servants within the valley are transferred outside the valley and those working outside the valley can be transferred inside the valley, the survey was conducted irrespective of their present workstations. To

calculate the minimum number of civil servants to be surveyed, the number of civil servants working inside the valley was considered.

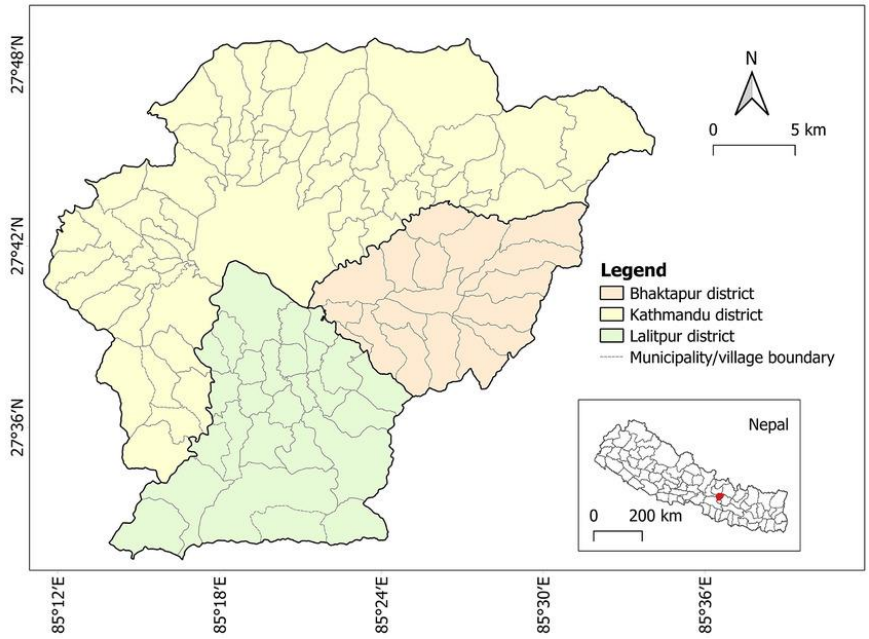


Figure 3-3 Study Area as Kathmandu Valley

"The number of civil servants in Kathmandu Valley is as follows:

- Kathmandu = 1639
- Bhaktapur = 910
- Lalitpur = 563

Hence, a total of 3112 civil servants are present in Kathmandu Valley." (DNPR, 2081)

This project being a policy level research related to building, policy level officials from DUDBC were consulted for Key Informant Interview (KII). For KII, 5 officials were consulted.

3.4.1 Sample Size

To know the number of data required from the finite population, Cochran's formula was used as given in Equation 3.1.

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 \left(N - 1\right) + z^2 \cdot p \cdot q} \quad \text{..... Equation 3.1}$$

Where,

n = Sample size

z = value obtained from table (for confidence level = 90%) = 1.645

p = estimated percentage of the population that possesses the attribute = 0.5

q = 1-p = 0.5

N = Total population, which is equal to 3112

e = level of precision desired = 10%

It gives the value of n as 66.2. Thus, the minimum sample size is 67. And, 84 civil servants were surveyed.

3.4.2 Sampling Method

The sampling method used was Stratified Sampling. The questionnaire was deployed to civil servants of different offices, ranks, ages, genders, and so on. The ratio of Male and Female employees is approximately 70:30. The ratio of Technical and Administrative employees is approximately 60:40 (DNPR, 2081). Hence, the sample was chosen such that its proportion was similar to that of the population. The minimum required number of respondents and the actual number of respondents are shown in Figure 3-4. The details of the respondents are attached in Appendix 2.

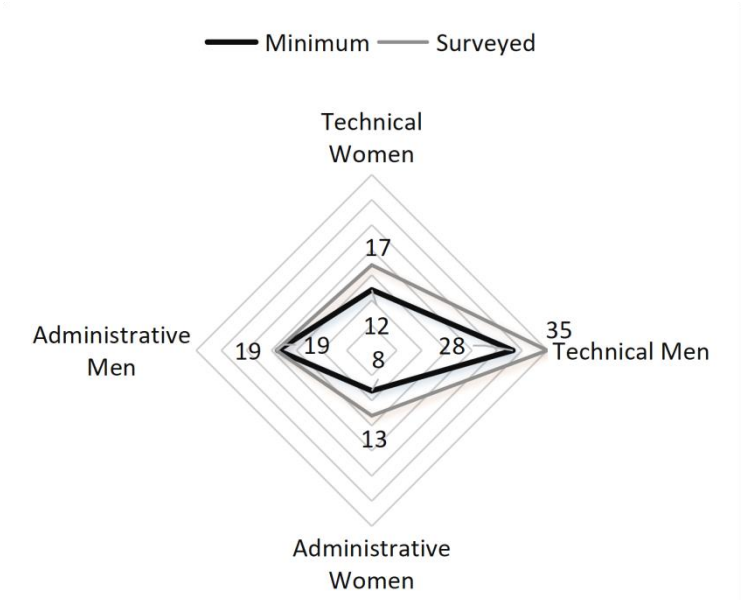


Figure 3-4 Surveyed numbers of Questionnaire Survey

3.5 Methods of Data Collection

3.5.1 Primary Data Collection

Primary data refers to information collected directly by the researcher. In this study, such data were obtained through a questionnaire survey. The questionnaire was designed to assess the demand for apartment construction in the Kathmandu Valley, identify the amenities influencing preferred location, determine acceptable distances to these amenities in relation to the price respondents are willing to pay, and evaluate the relative importance of amenities, and priority of land price and proximity.

The key amenities were identified from the literature review, with additional basic amenities included. Respondents were also given the opportunity to suggest any missing amenities and indicate their preferred distances. The questionnaire was developed in accordance with research ethics, ensuring anonymity and voluntary participation to minimize response bias. It was created using Kobo Toolbox and pretested with two respondents, confirming its suitability for further use. Subsequently, it was distributed to civil servants across different ministries, with some responses also collected through in-person surveys.

The questionnaire is included in Appendix 3, and the details of the respondents are included in Appendix 2. A KII was conducted to validate the study results.

3.5.2 Literature Review

A literature Review was conducted using different sources, such as published papers, books, and websites. Its purpose was to study the existing knowledge of the terms used in this study. The knowledge gained from the literature review was applied in this study.

3.6 Data Analysis

The raw data obtained from the questionnaire survey were analyzed using Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. QGIS was employed to identify candidate sites based on the survey results, where an iso-area analysis was conducted.

Following this, factors such as RSLUP, the locations of brick kilns, and parks were incorporated into the analysis. The identified sites were then further screened based on minimum land area requirements, height restrictions imposed by Civil Aviation Authority of Nepal, and the buffer zones of World Heritage Sites.

The shortlisted candidate sites were subsequently evaluated using Pareto Frontier analysis to determine the optimal options, and TOPSIS was applied to rank these optimal sites. Finally, a sensitivity analysis was carried out to assess the robustness of the results. A KII was conducted to validate the study results.

3.7 Research Matrix

Table 3-1 Research Matrix

Objectives	Research Questions	Data Required	Methods/ Tools	Expected Output
To identify the criteria influencing the location of civil servants' medium-rise apartments in Kathmandu Valley and their preferred proximity.	What are the key criteria that influence location selection for civil servant housing in Kathmandu Valley and how much are their preferred proximity?	- Civil servants' preferences of amenities - Preferred distances	Questionnaire survey	List of amenities influencing site selection of apartment and their preferred proximity
To identify, rank and validate feasible optimal locations for civil servants' medium-rise apartments in Kathmandu Valley.	Which locations in Kathmandu Valley are preferable for civil servants' apartments regarding accessibility, affordability, risk sensitiveness, CAAN Height Restrictions, location of brick kilns, World Heritage Site Buffer Zones?	- GIS data of administrative boundary, location of amenities, brick kilns - Weights of amenities, weight of land rice and proximity - Risk-sensitive land-use maps - Land price data	- GIS - AHP matrix - Pareto front analysis - TOPSIS ranking - Sensitivity analysis - KII	Optimized locations ranked and validated for development of civil servants' apartments in Kathmandu Valley

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Identification of the criteria influencing the location of civil servants' medium-rise apartments in Kathmandu Valley and their preferred proximity.

The first objective of this study was to identify the criteria influencing the location of civil servants' medium-rise apartments in Kathmandu Valley and their preferred proximity. Civil servants were questionnaire surveyed to identify them.

4.1.1 Demand Analysis of Apartments

From the questionnaire survey, the demand for apartments was known as follows:

- People wanting to buy: 32.1 %
- People wanting to rent: 21.4 %
- Total percentage of civil servants demanding an apartment: 53.6 %

This showed that there is sufficient demand for this research to proceed.

4.1.2 Identification of preferred amenities

Eight amenities were included in the questionnaire. Respondents were asked if there were any other amenities they preferred to have near their apartments. The details of the extra amenities demanded by the respondents are given in Table 4-1. More than one-fifth of the respondents demanded parks. Hence, it was considered for further analysis.

Table 4-1 Details of extra amenities demanded by the respondents

Amenities	Preferred Distance (km)																		Average distance (km)	Demand number	Demand %
Agriculture Market	1																			1	1.19
Open Green Space, Park	2	1	1.25	1.5	1	2	1	1	2	2	1	1	2	2	1	1	1	3	1.5	1.49	19	22.62

Commercial centres	1																		1	1.19
Community	2	4	1	1	4													2.40	5	5.95
Gym	1.25	1	1	1	1	3												1.38	6	7.14
Peaceful, Less crowded	4	4																	2	2.38
Police	2																		1	1.19

The percentage of demand for each amenity is presented in Figure 4-1. The bar graph shows that all the amenities included in the questionnaire had considerable demand. Hence, it was concluded that all amenities were in demand.

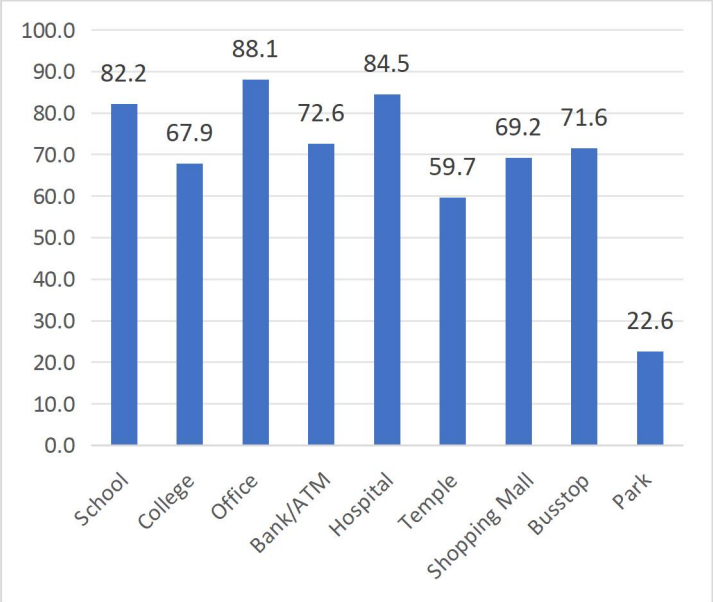


Figure 4-1 Demand percentage of different amenities

4.1.3 Identifying preferred distance

The number of respondents preferring different distances for different amenities is presented in Figure 4-2. The details are provided in Appendix 4. In the figure, the X-axis represents distance in km and the Y-axis represents the number of respondents. From this figure, it is known that preference is positively skewed. Hence, the median

is a better measure of the preferred distance for each type of amenity. After calculating the median, the preferred distances of different amenities were obtained, as in Table 4-2.

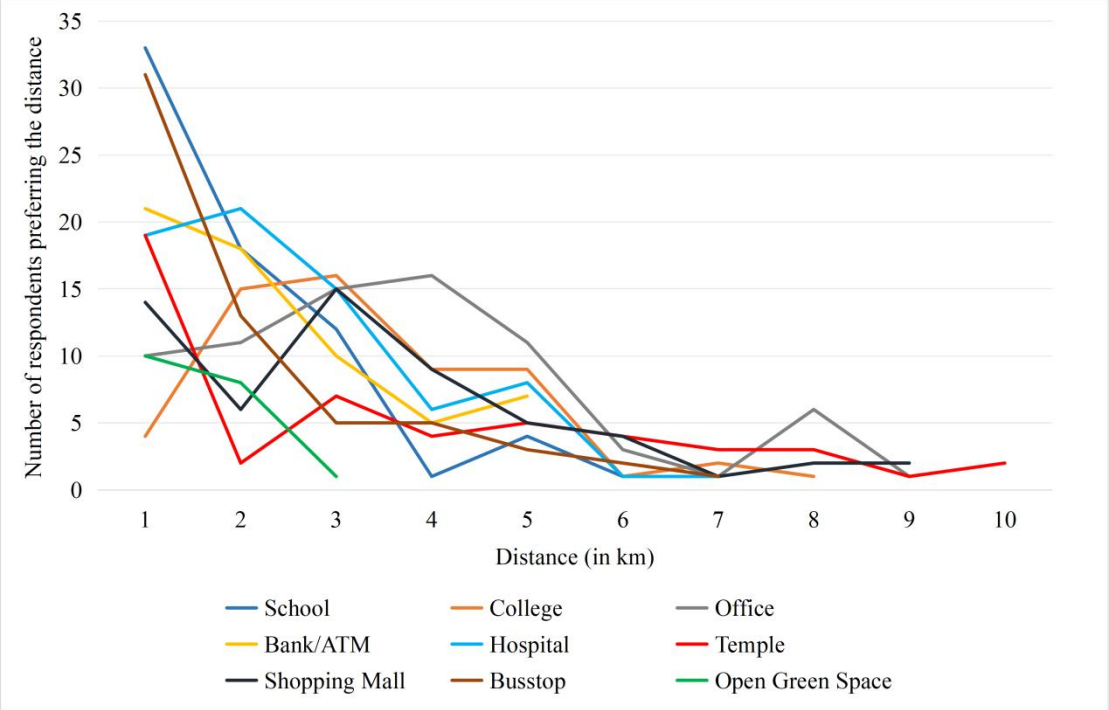


Figure 4-2 Number of respondents preferring different distances for different amenities

Table 4-2 Preferred distance from different amenities

S.N.	Amenity	Preferred Distance (km)
1	School	2.0
2	College	3.0
3	Office	4.0
4	Bank/ATM	2.0
5	Hospital	2.0
6	Temple	3.0
7	Shopping Mall	3.0
8	Bus stop	1.0
9	Park	1.0

4.2 To identify, rank and validate the feasible optimal locations for civil servants' medium-rise apartments in Kathmandu Valley.

4.2.1 Priority of Amenities

The priority of the amenities was assessed using a questionnaire survey. Priority data were obtained from 22 respondents, as shown in Appendix 5. The final weight of each amenity was calculated using the geometric mean of the weights from the accepted responses. The weightage of each amenity obtained from the AHP analysis is shown in Table 4-3 and Figure 4-3. The CR value of the calculation was 0.001992, which was less than 0.1. Hence, the obtained weightage was found to be sufficiently reliable.

Table 4-3 Weightage of different amenities

Amenities	Average Weight	Lamda	C.I	R.C.I.	C.R
School	0.191565	8.018	0.002809	1.41	0.001992
College	0.091193	8.016			
Office	0.077505	8.012			
Bank/ATM	0.153201	8.015			
Hospital	0.130690	8.015			
Temple	0.108020	8.014			
Shopping Mall	0.085532	8.014			
Bus stop	0.162294	8.020			
Sum	1.000000	8.020			OK

4.2.2 Relative Importance of Land Price and Proximity

Respondents were asked, "Which is more important for selecting the optimum location of an apartment? Land Price or Proximity to Amenities: Based on the responses of 39 participants, 40% preferred land price, whereas 60% preferred proximity to amenities. Hence, it can be concluded that the weight of land price is 0.4, while that for proximity to amenities is 0.6.

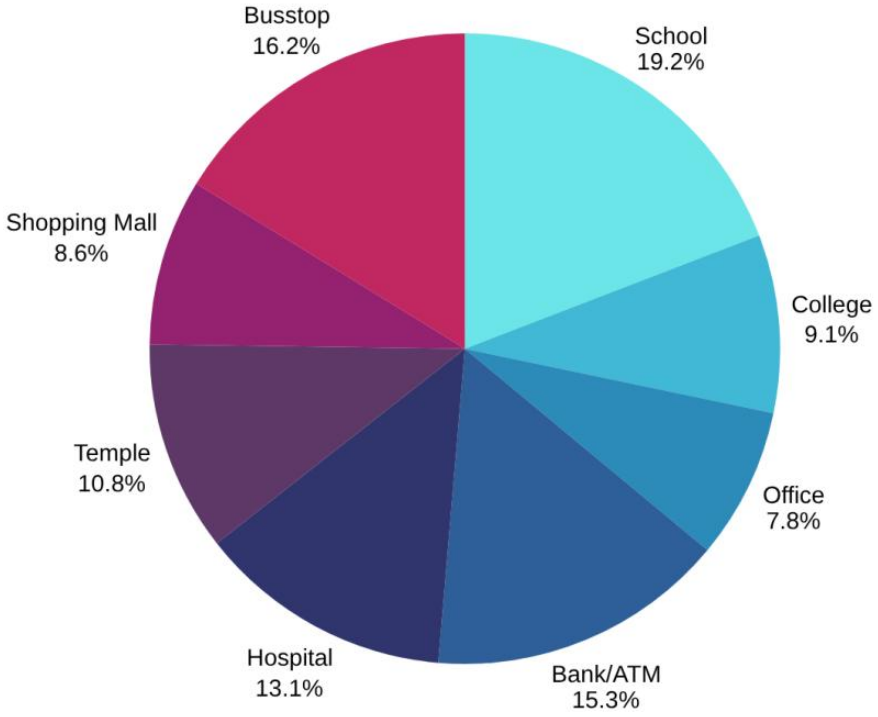
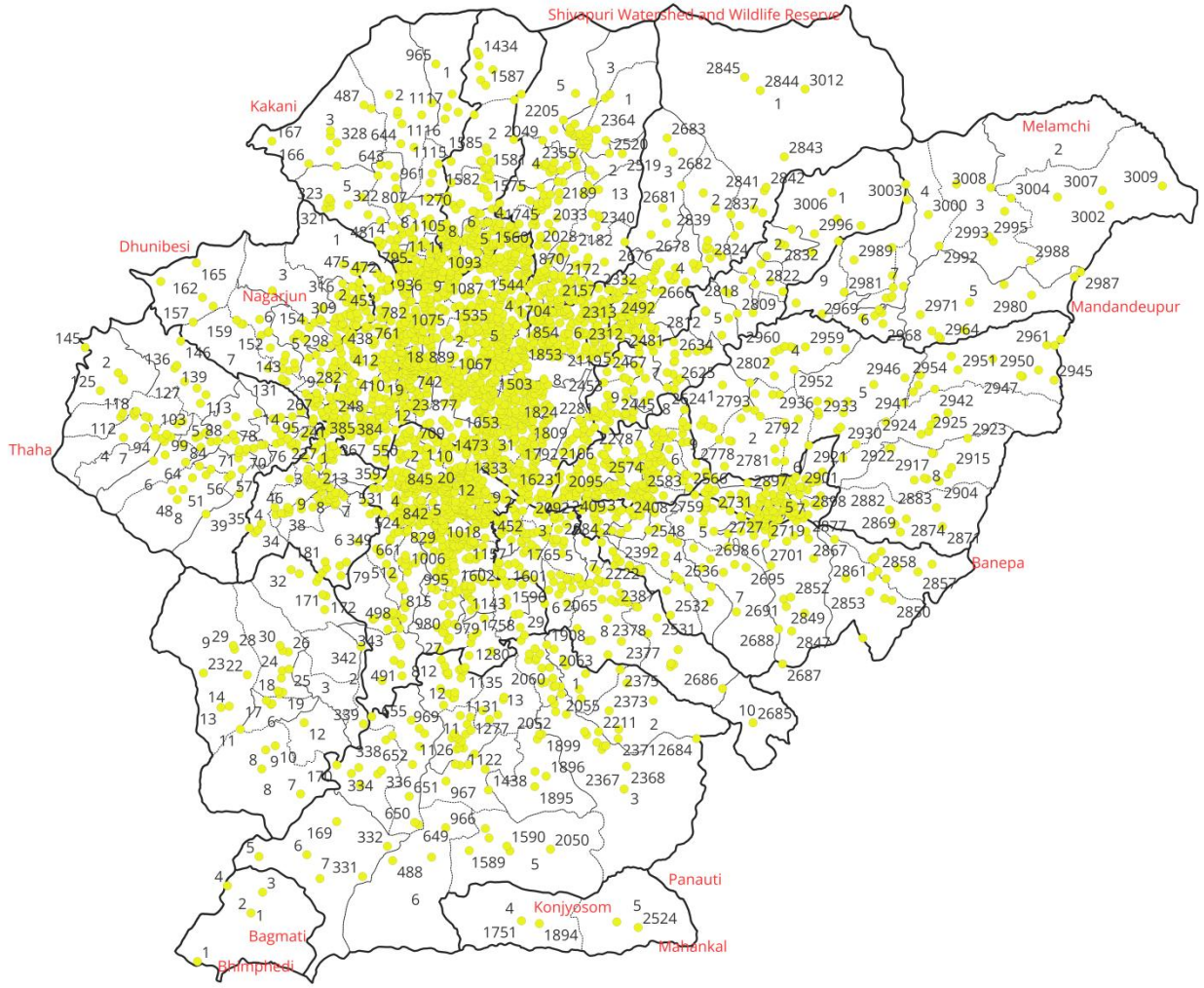


Figure 4-3 Weightage of different amenities

4.2.3 Geographic Information System

4.2.3.1 *Locating Amenities*

The OSM data of different amenities and the road network of Kathmandu Valley were obtained mainly from geofabrik.de as OSM data. The data thus obtained were then grouped into different layers for each amenity in QGIS. The obtained data were cleaned and purged, and only the required points were retained in each layer. All these amenities were snapped to the nearest road network. The road layer was converted into a single part. The validity of the road layer was checked. The final OSM data for each amenity and road layer are shown in Figure 4-4 to Figure 4-13.



NORTH

Figure 4-4 OSM data of the Schools in Kathmandu Valley

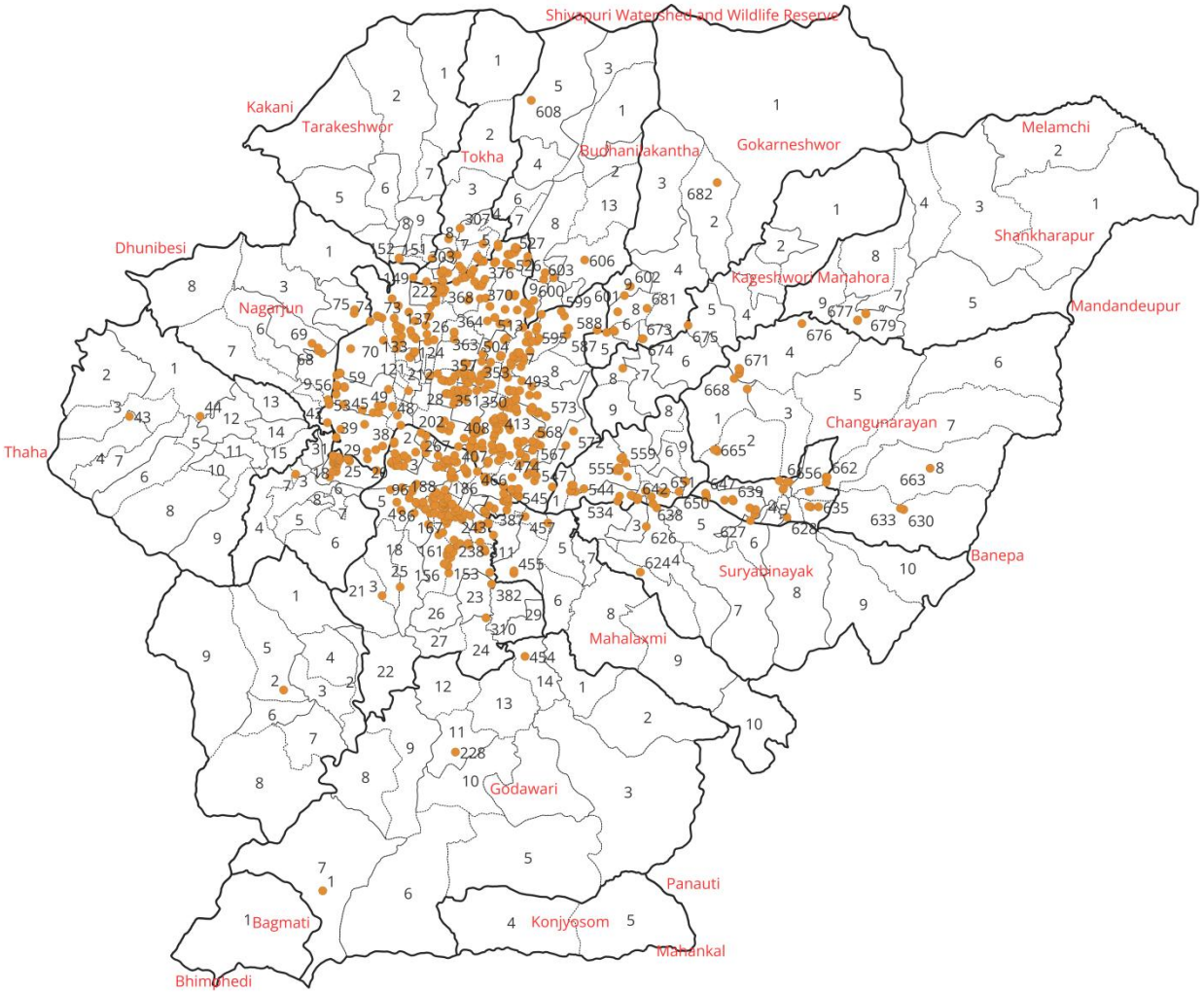


Figure 4-5 OSM data of the Colleges in Kathmandu Valley

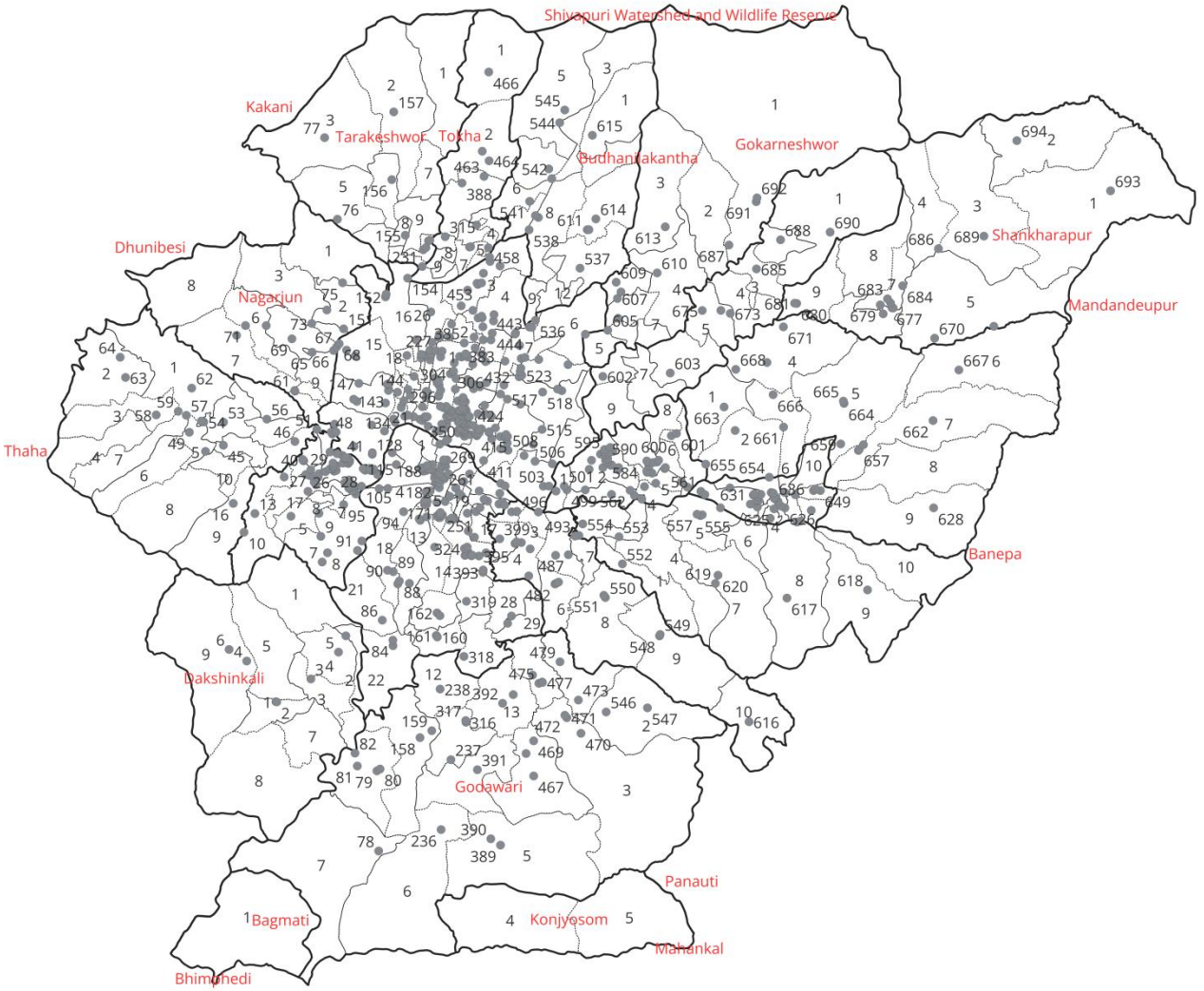


Figure 4-6 OSM data of the Offices in Kathmandu Valley

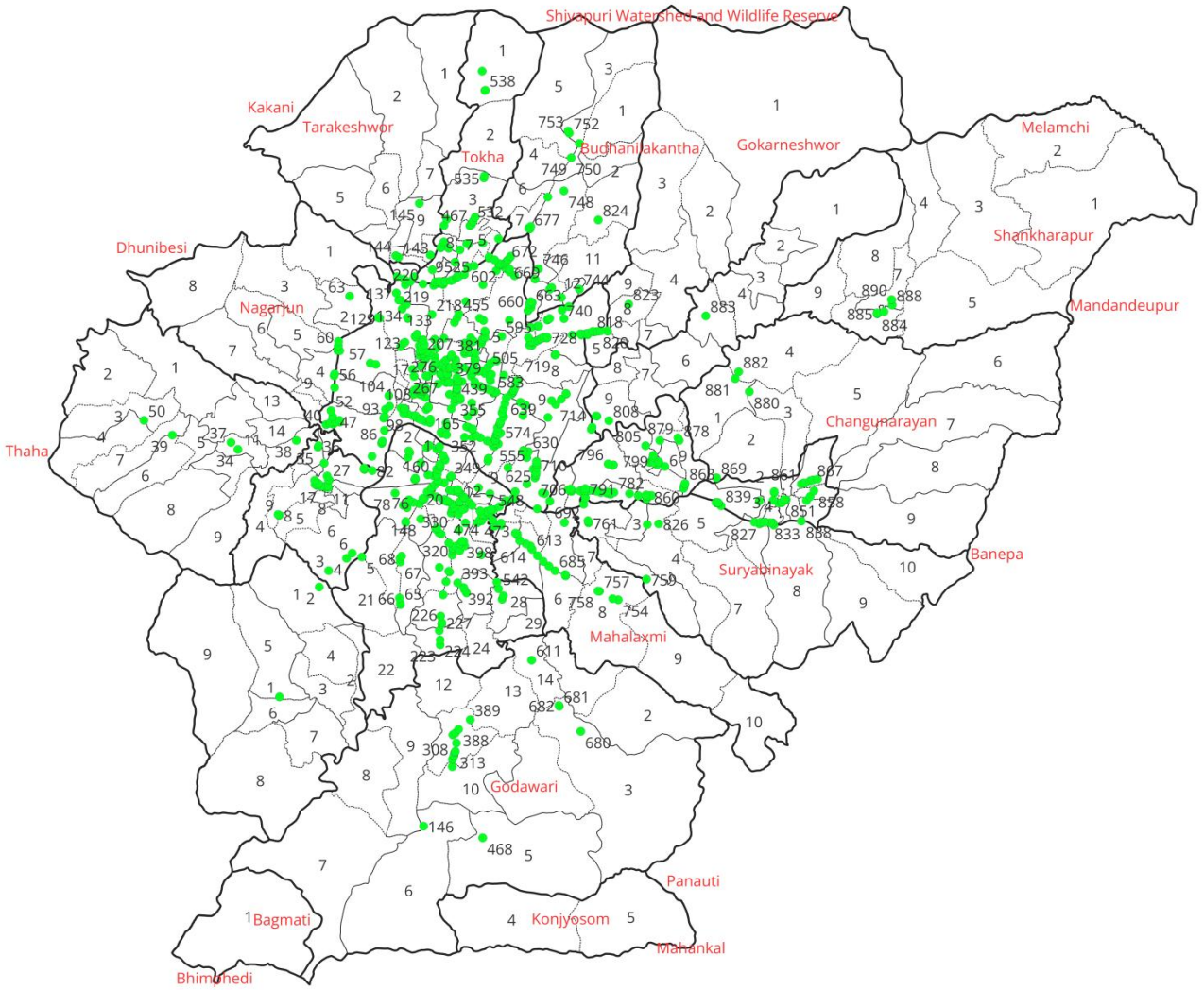
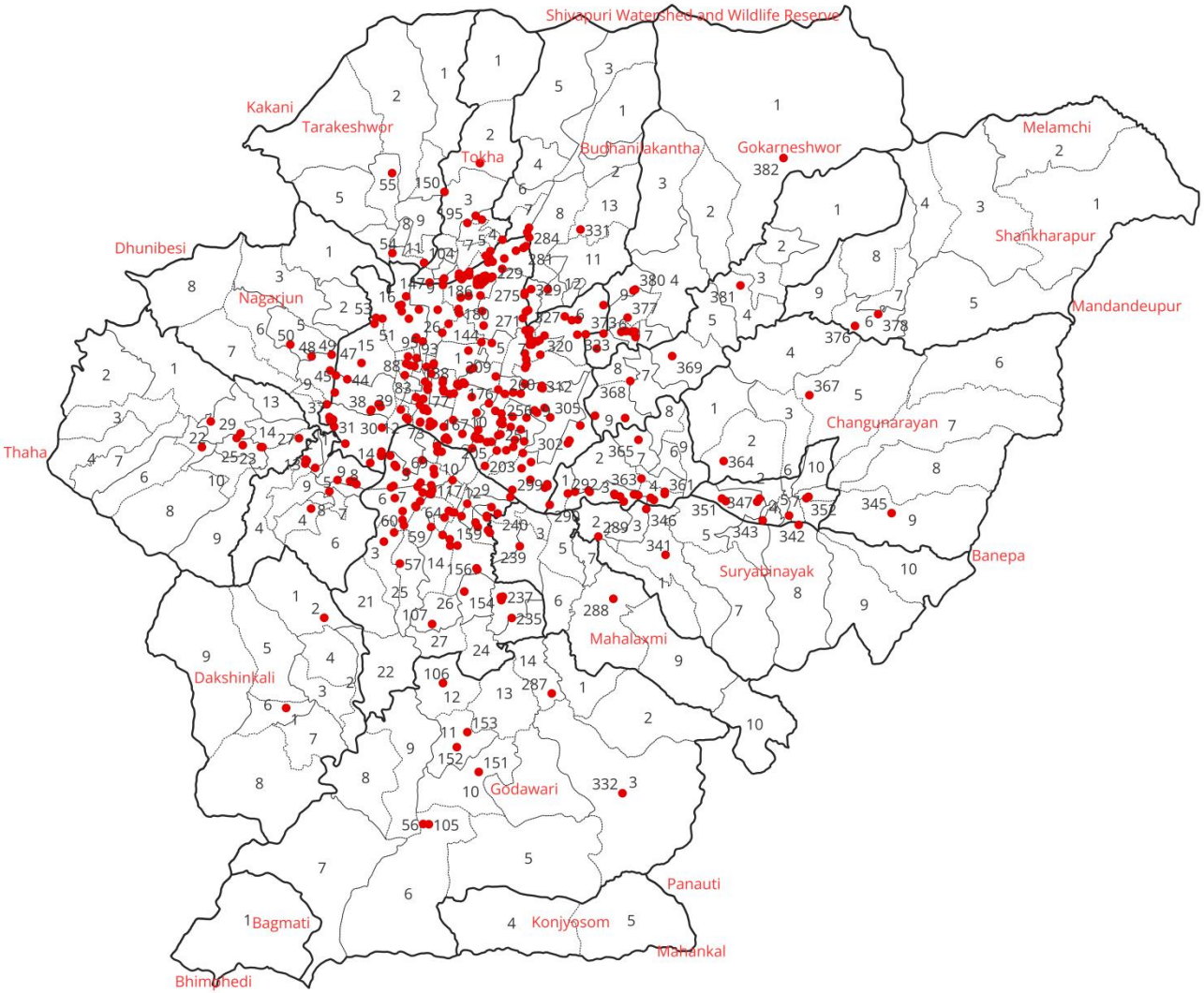


Figure 4-7 OSM data of the Banks in Kathmandu Valley



NORTH

Figure 4-8 OSM data of the Hospitals in Kathmandu Valley

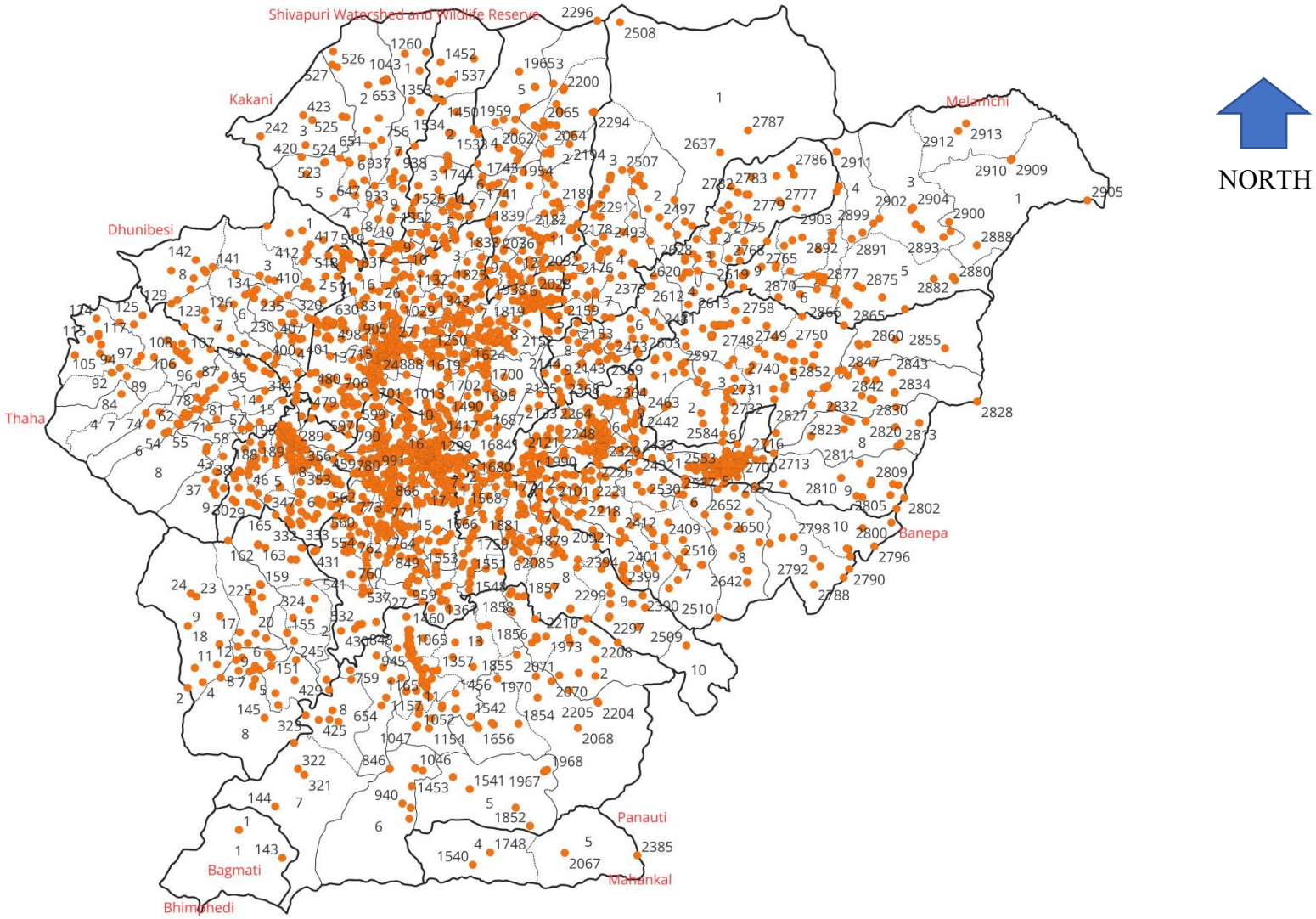
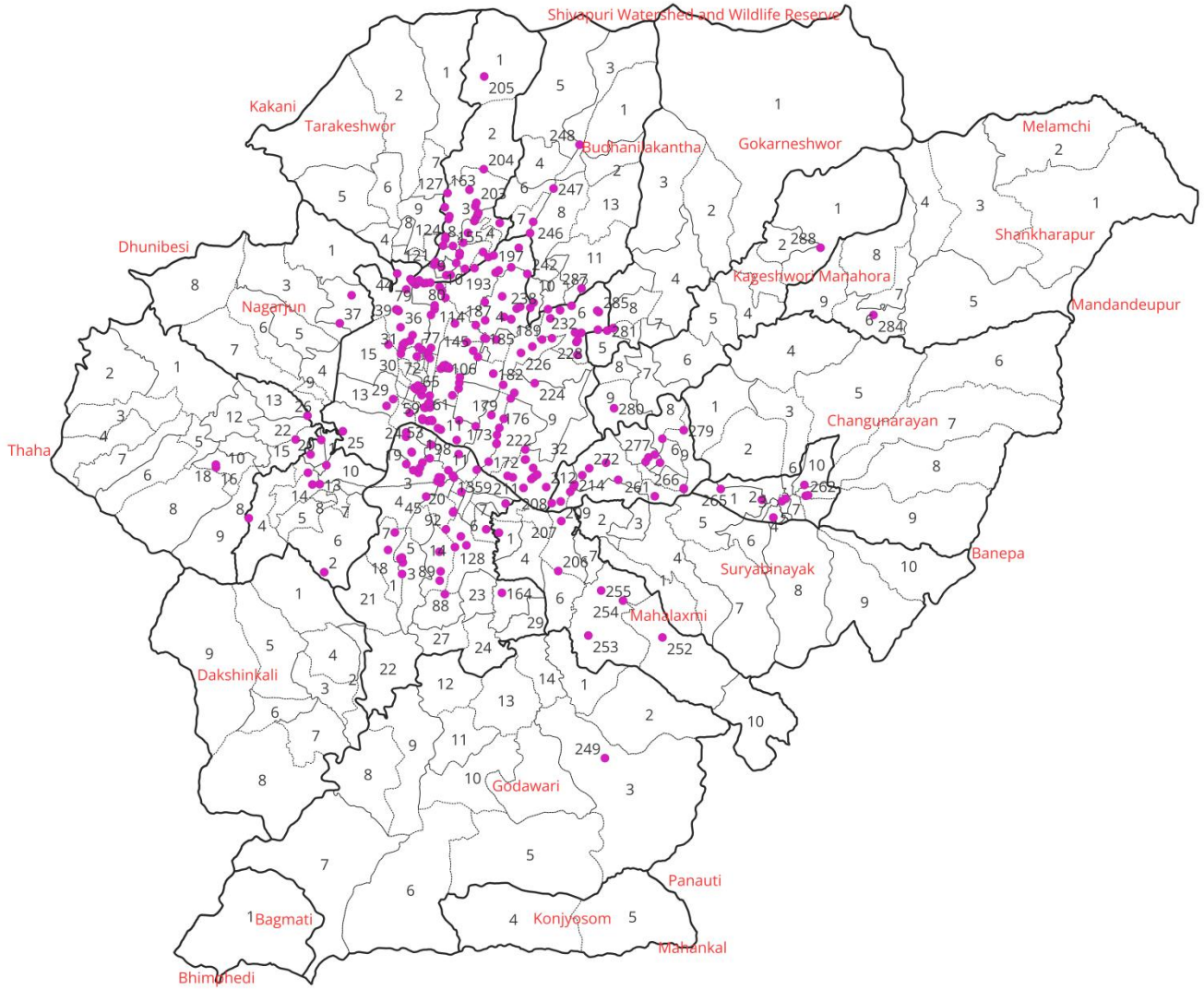


Figure 4-9 OSM data of the Religious Places in Kathmandu Valley



NORTH

Figure 4-10 OSM data of the Shopping Malls in Kathmandu Valley

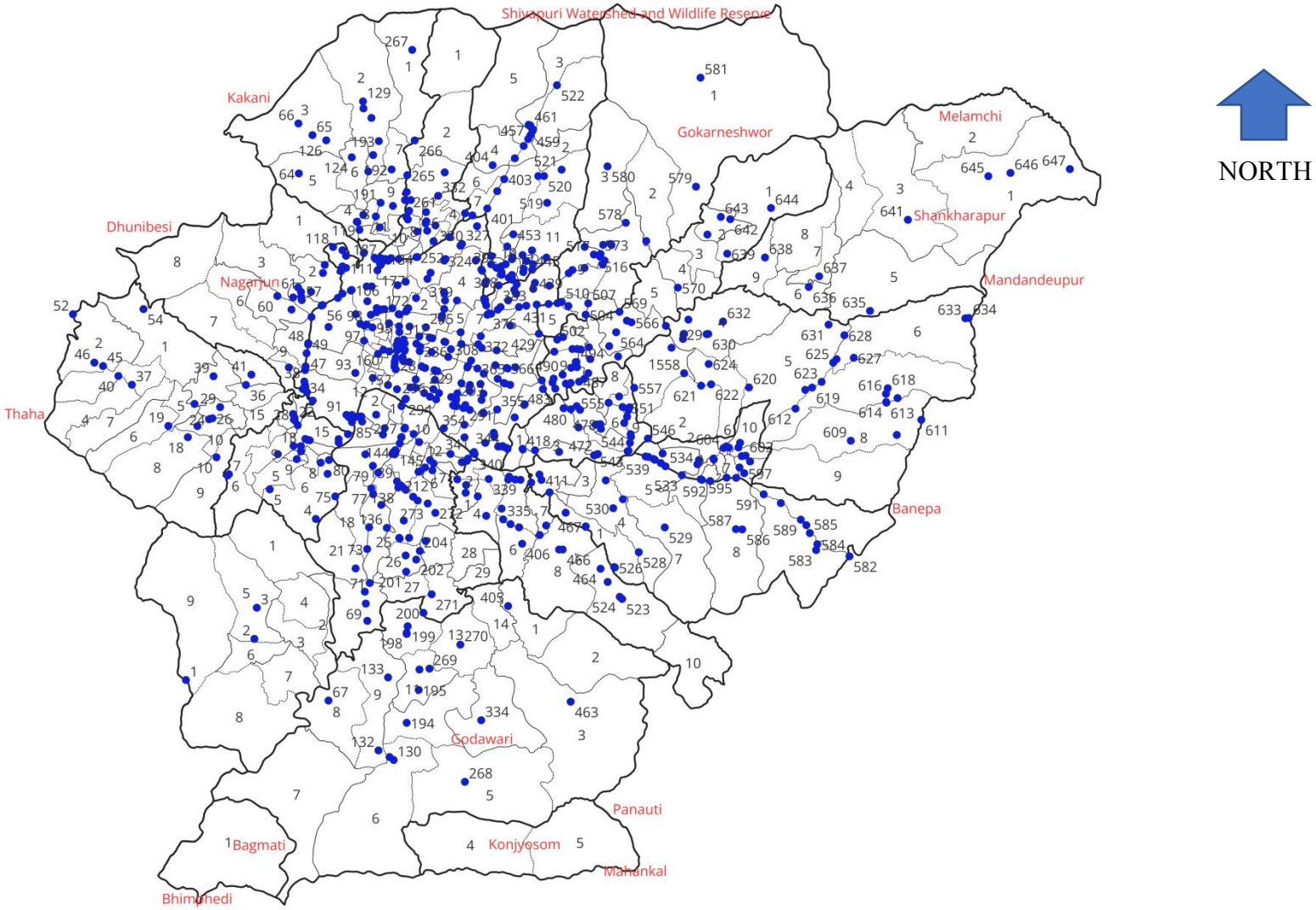


Figure 4-11 OSM data of the Bus stops in Kathmandu Valley

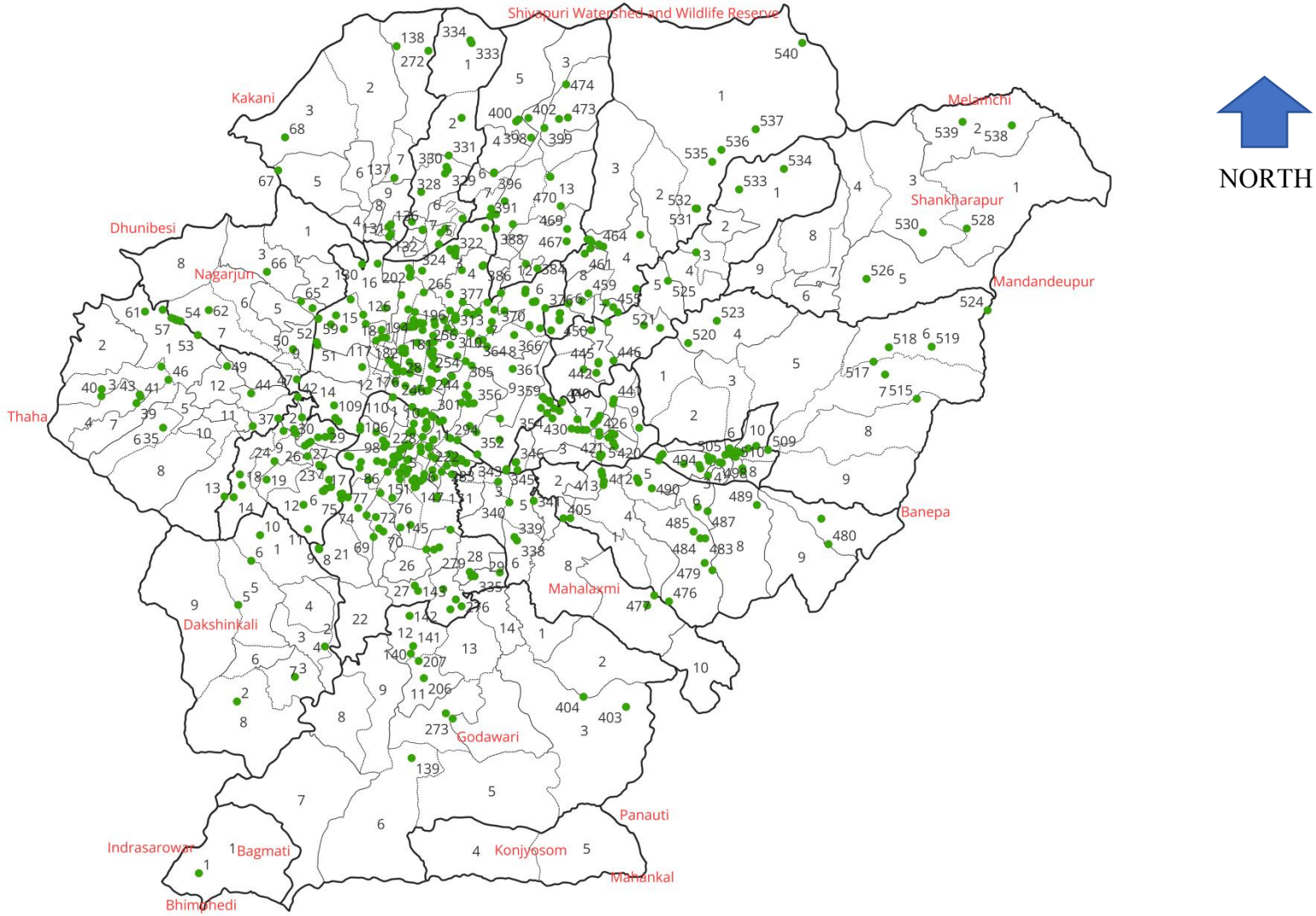


Figure 4-12 OSM data of the Parks in Kathmandu Valley

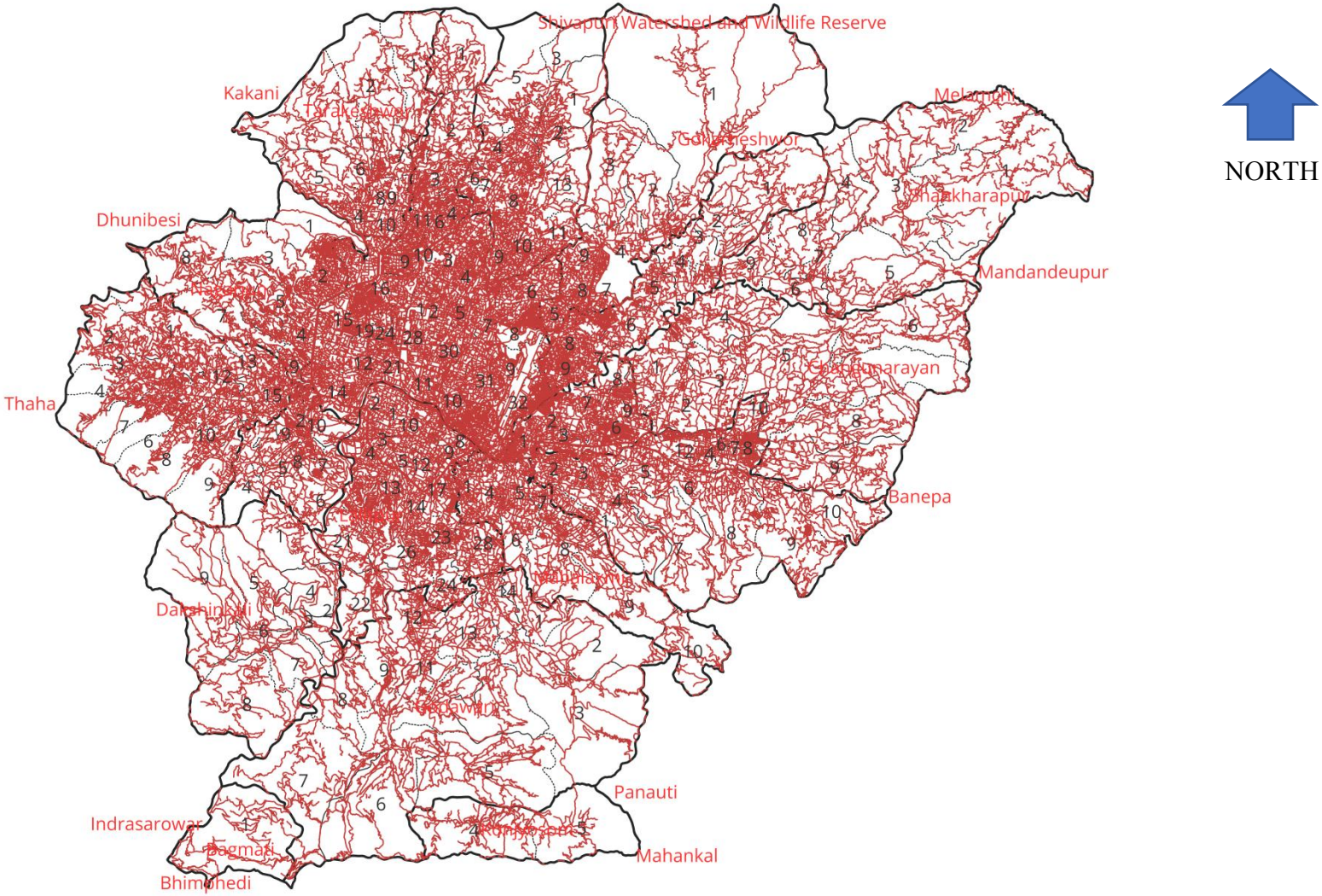


Figure 4-13 Road Network of Kathmandu Valley

4.2.3.2 *Iso-area Analysis*

Then, to conduct the site suitability analysis, an Iso-area analysis was performed for each amenity, and interpolation data were obtained for each amenity. The road layer was used as a network layer for the Iso-area analysis. The size of the Iso area was taken as the preferred distance (in km) obtained for each amenity from the questionnaire survey. The contour interval was taken as one-fifth of the preferred distance of the respective amenity. The default speed was set at 5 km/hr for bus stops and parks while 40 km/hr for other amenities. This is because bus stops and parks are generally approached on foot. The output of the Iso-area analysis for each amenity is shown in Figure 4-14 to Figure 4-22.

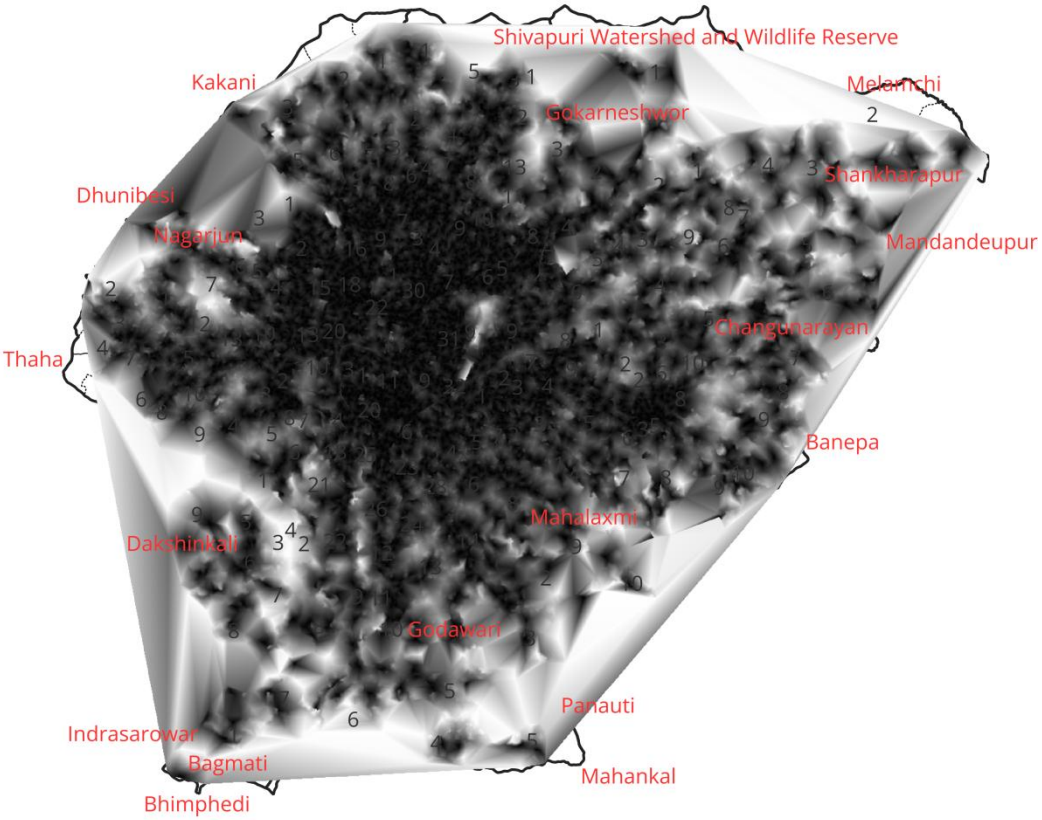


Figure 4-14 Iso-area Analysis of Schools

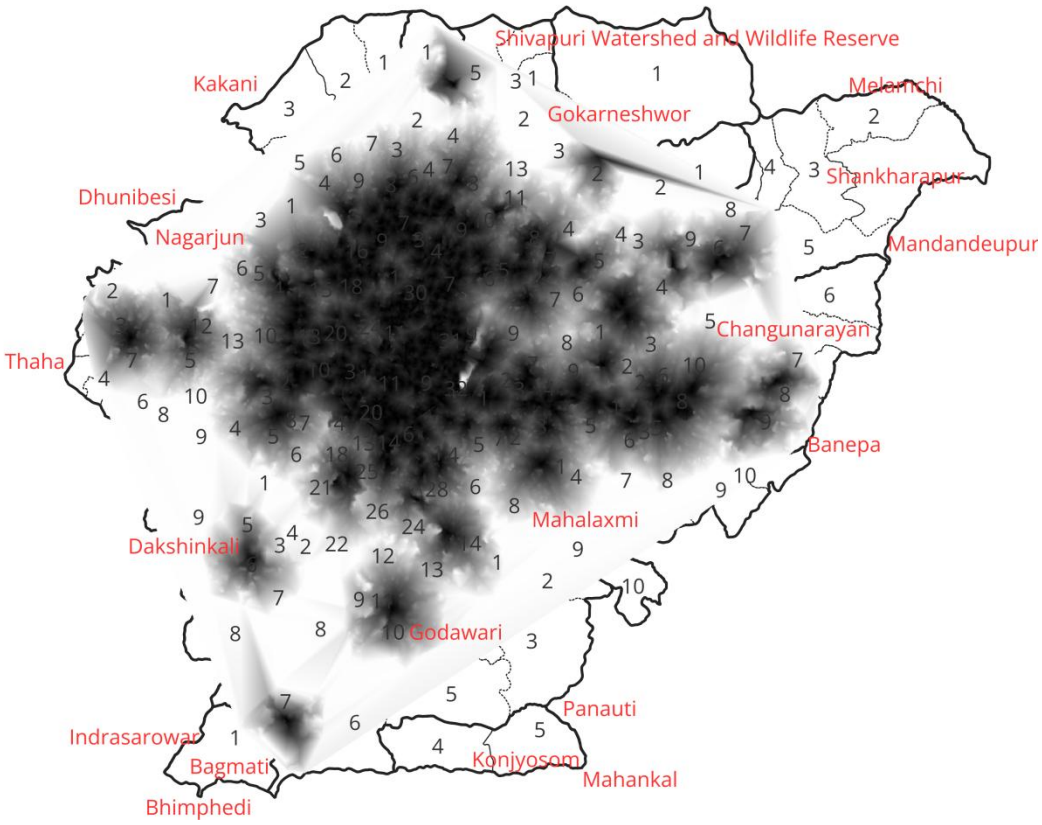


Figure 4-15 Iso-area Analysis of Colleges

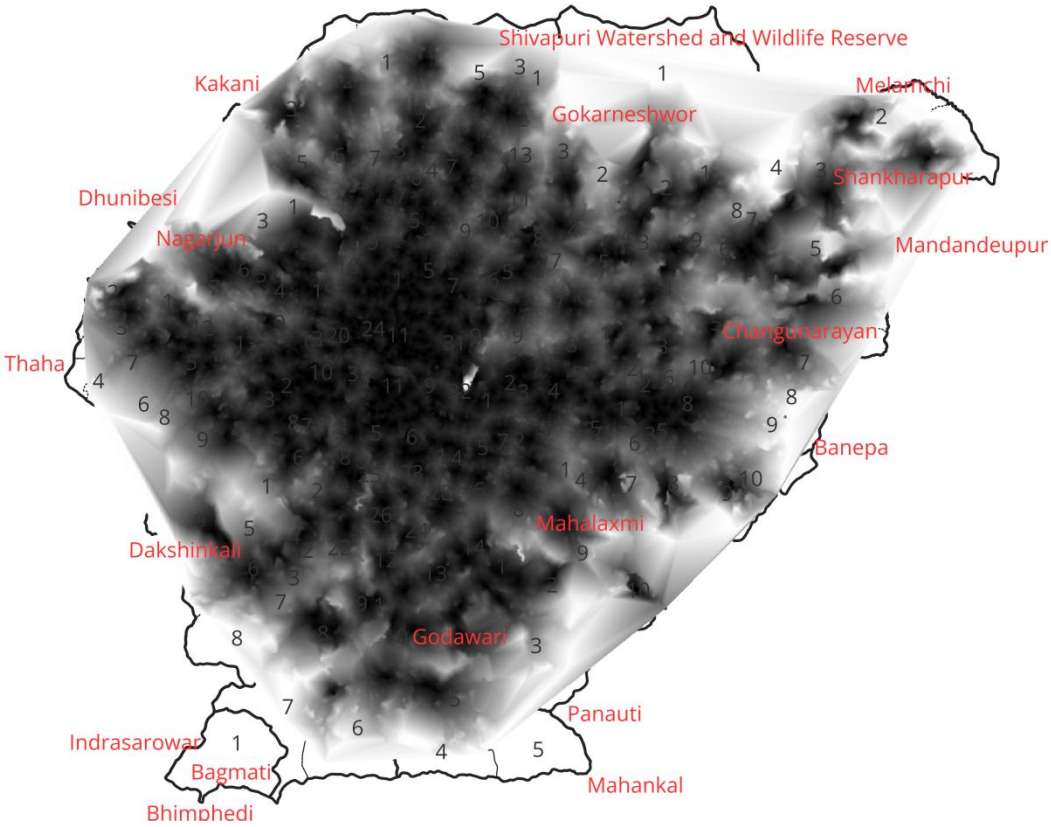


Figure 4-16 Iso-area Analysis of Offices

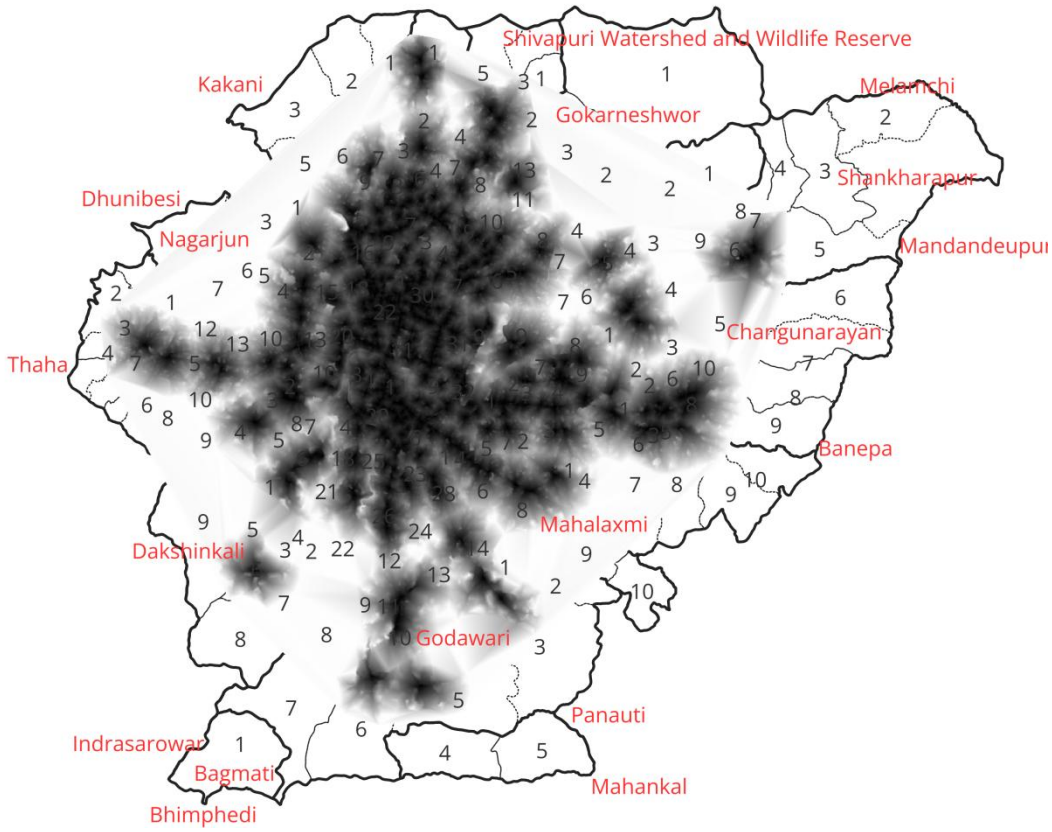


Figure 4-17 Iso-area Analysis of Banks

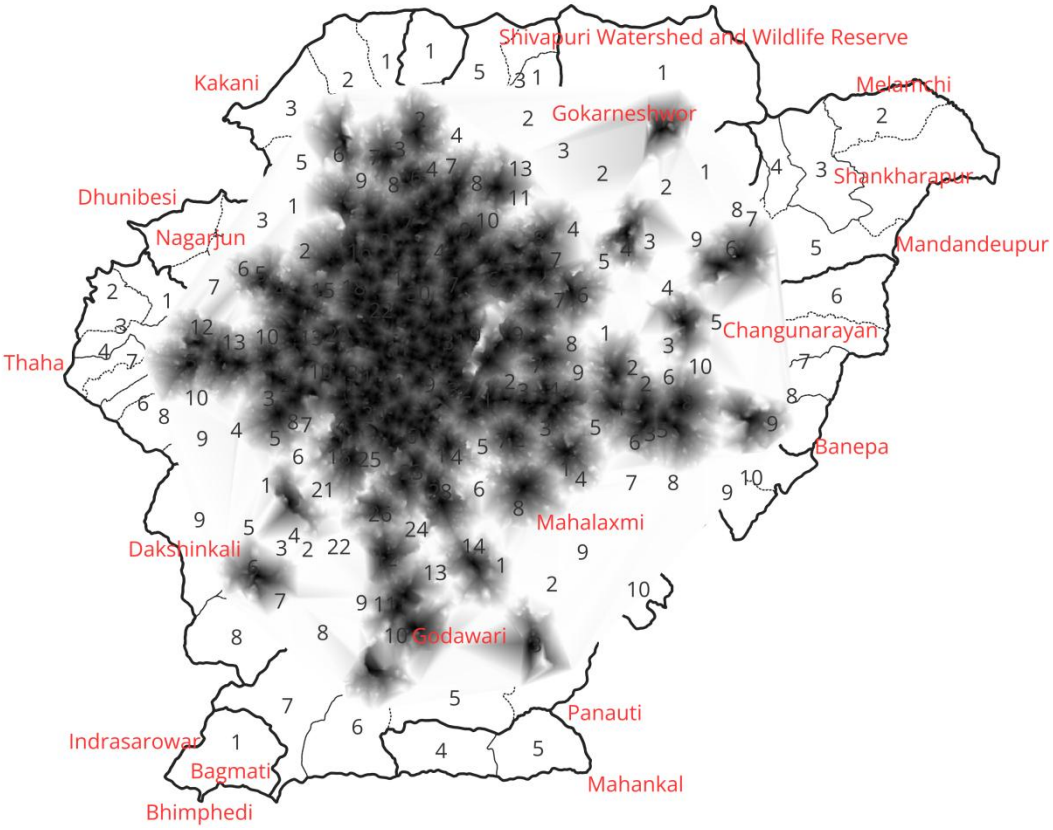


Figure 4-18 Iso-area Analysis of Hospitals

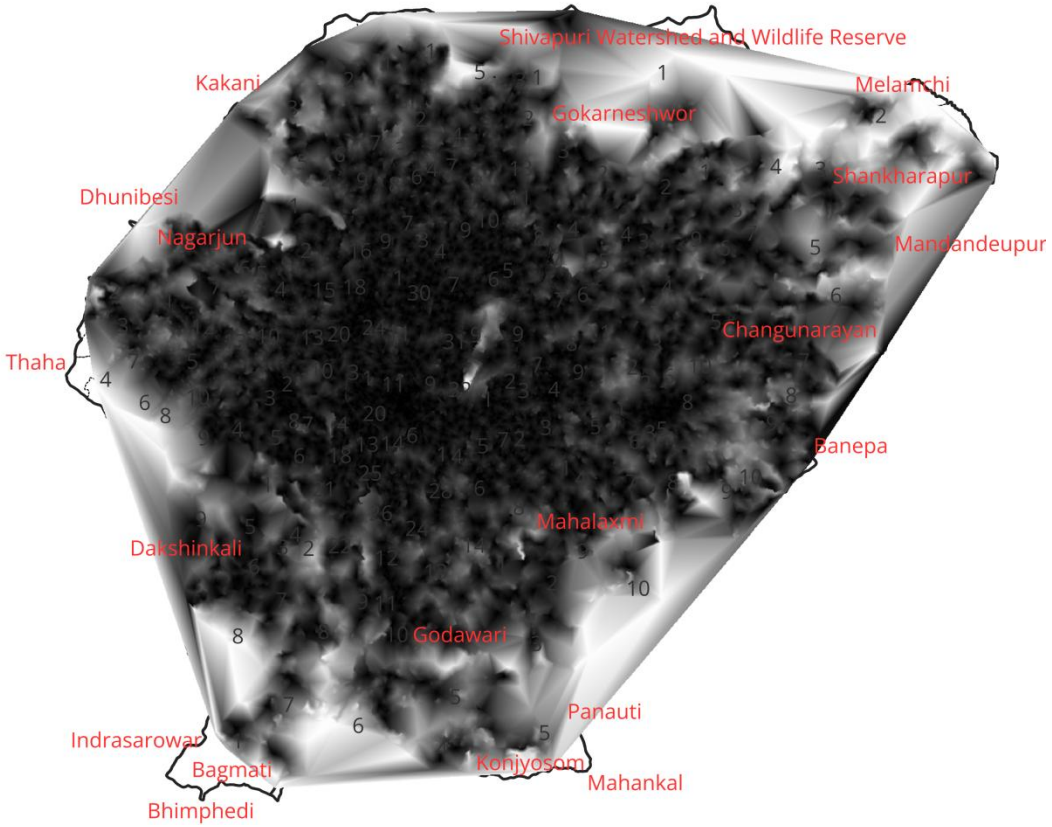


Figure 4-19 Iso-area Analysis of Religious Places

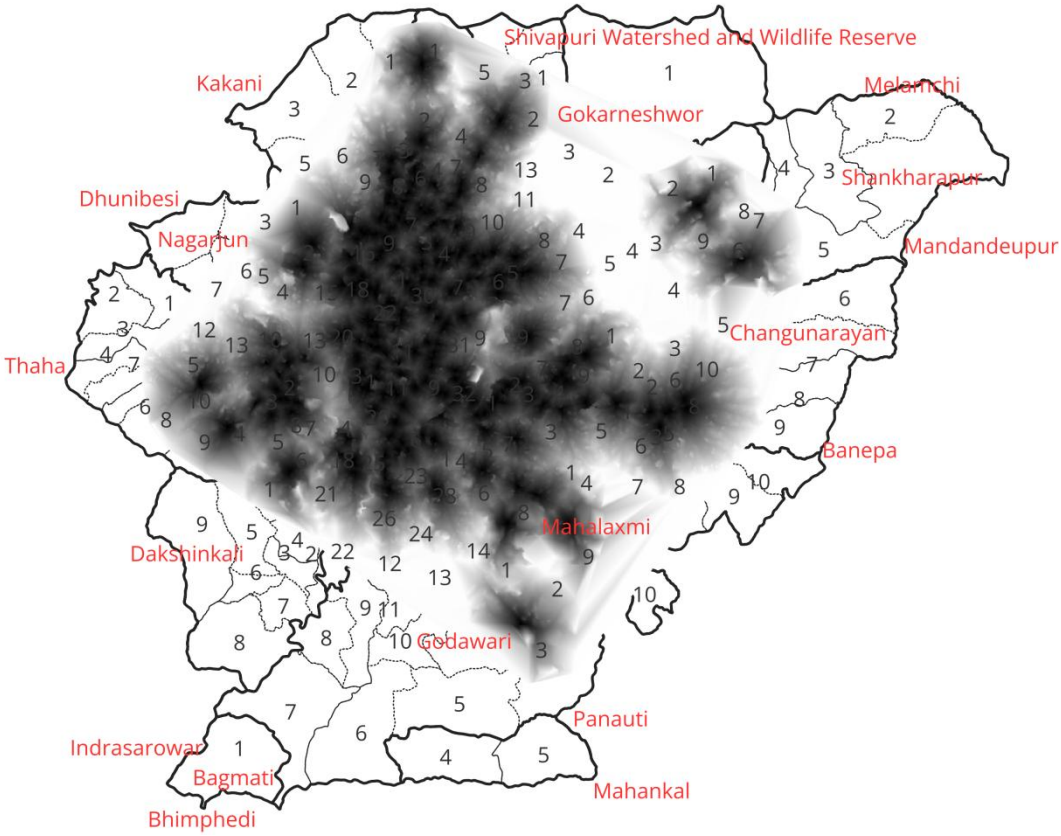


Figure 4-20 Iso-area Analysis of Shopping Malls

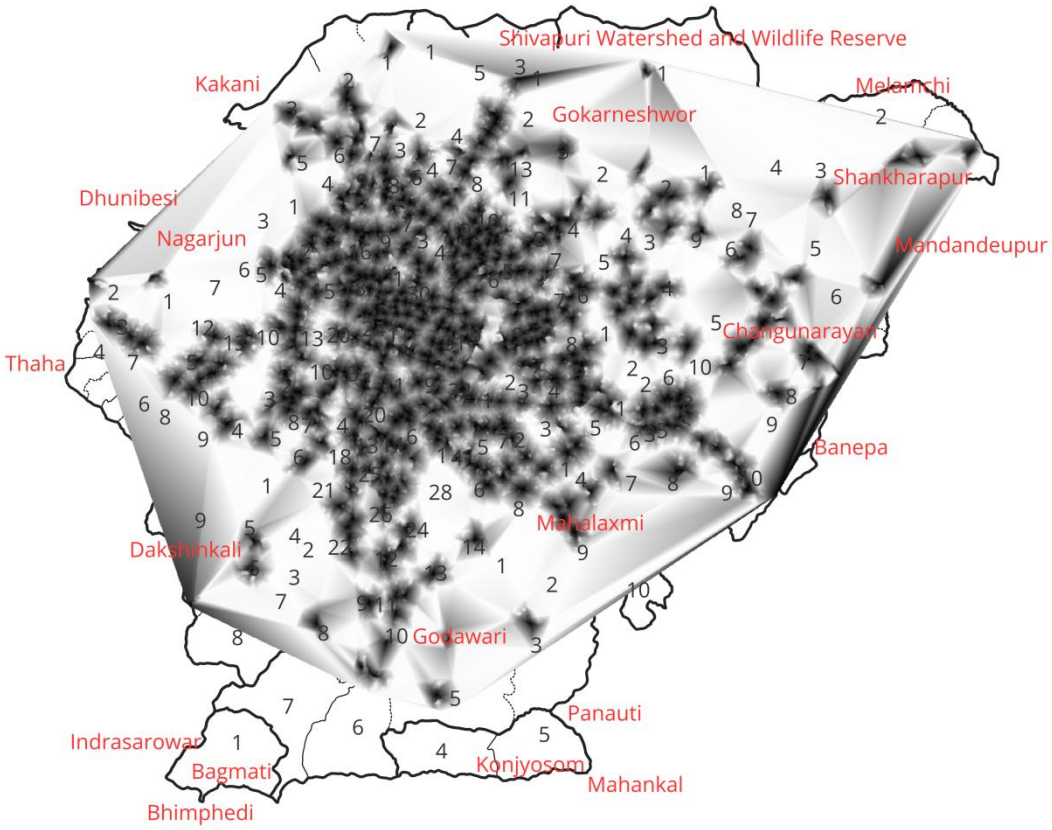


Figure 4-21 Iso-area Analysis of Bus stops

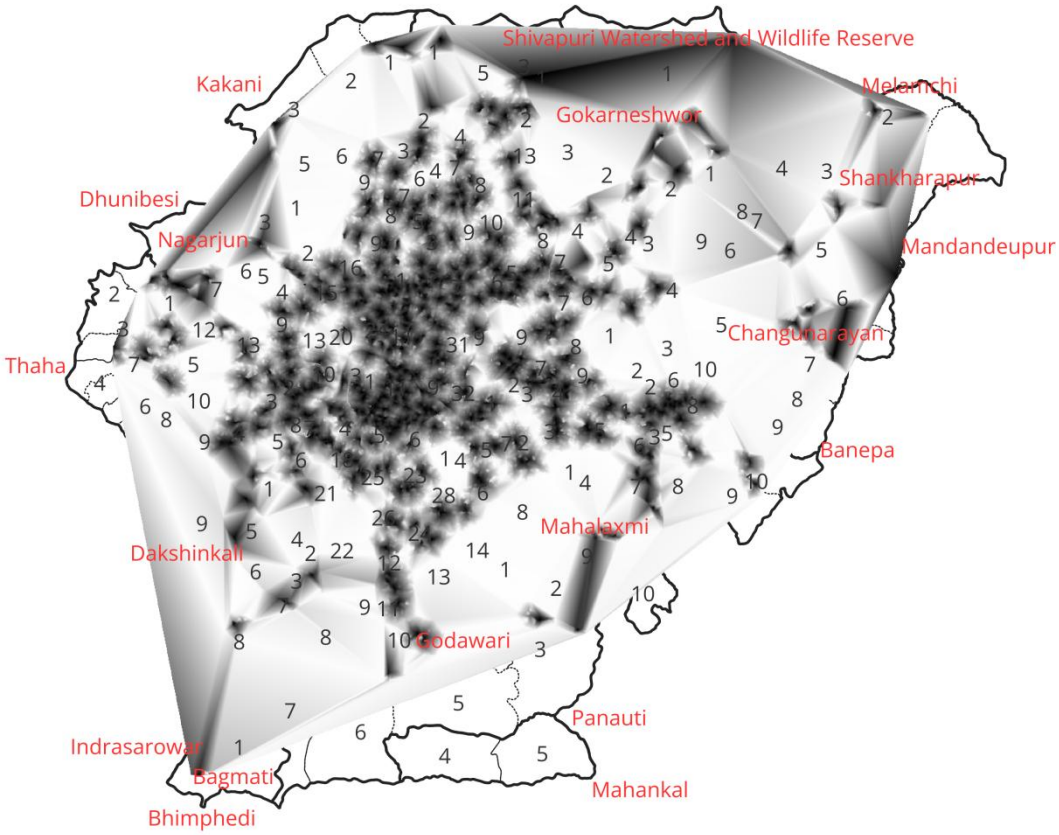


Figure 4-22 Iso-area Analysis of Parks

4.2.3.3 *Identification of Highly Suitable Sites*

Raster analysis was performed with all amenities except for "Park." The amenity "Park" is an additional amenity identified only after the completion of the questionnaire survey. Hence, its pair wise comparison with other amenities was not possible. The weights for each amenity was taken from Table 4-3. The combined interpolation obtained is shown in Figure 4-23.

The symbology of the obtained interpolation is displayed with "quantile" mode and three classes, as in Figure 4-24. This provided us with three categories of suitable sites: with values under 757 as "Highly Suitable," values under 1361 as "Moderately Suitable," and the remaining values as "Less Suitable." The obtained raster was then reclassified to extract the "Highly Suitable" sites only, as in Figure 4-25. The raster of the "Highly Suitable" sites was then polygonized.

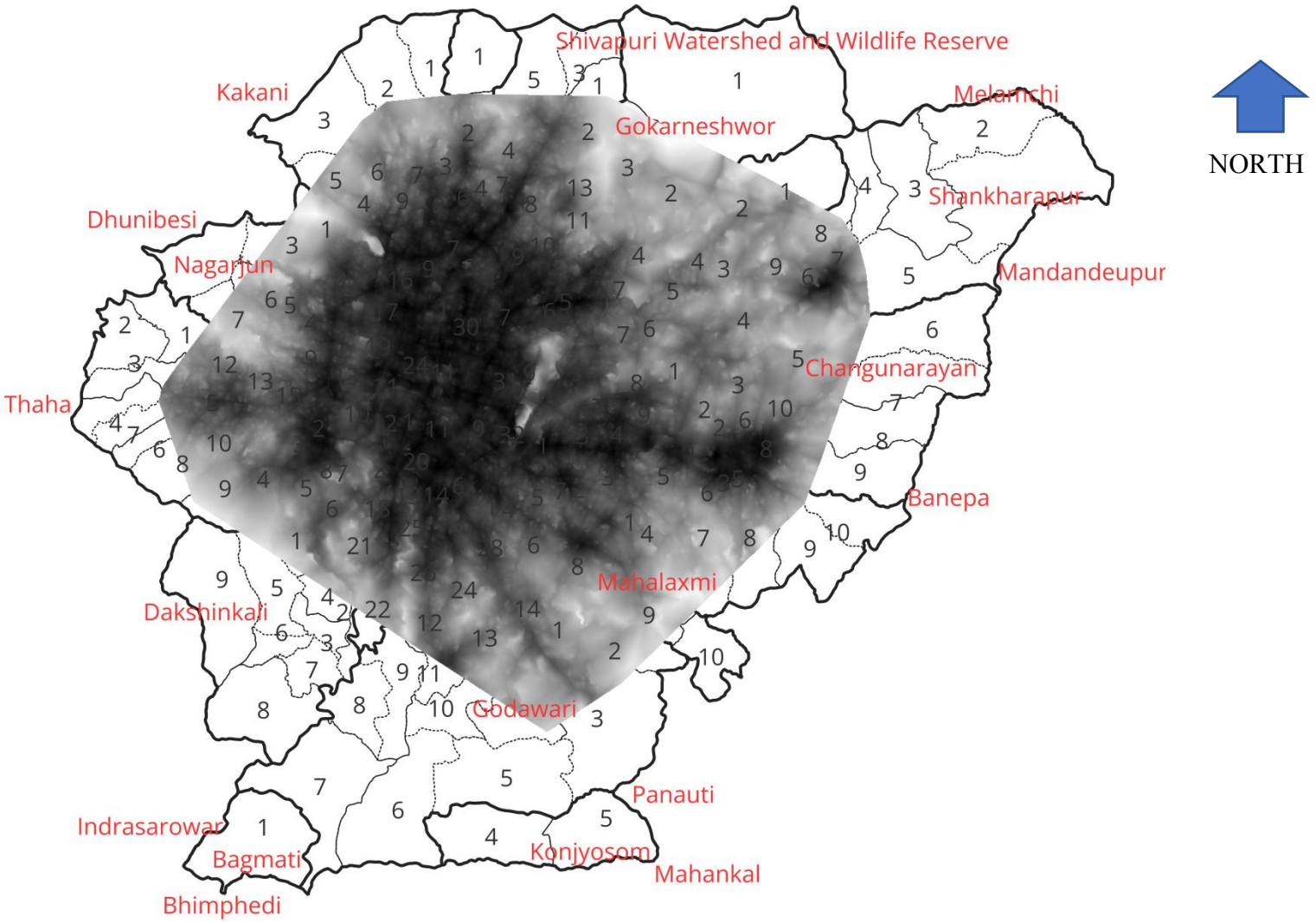


Figure 4-23 Combined Interpolation of Iso-area Analysis

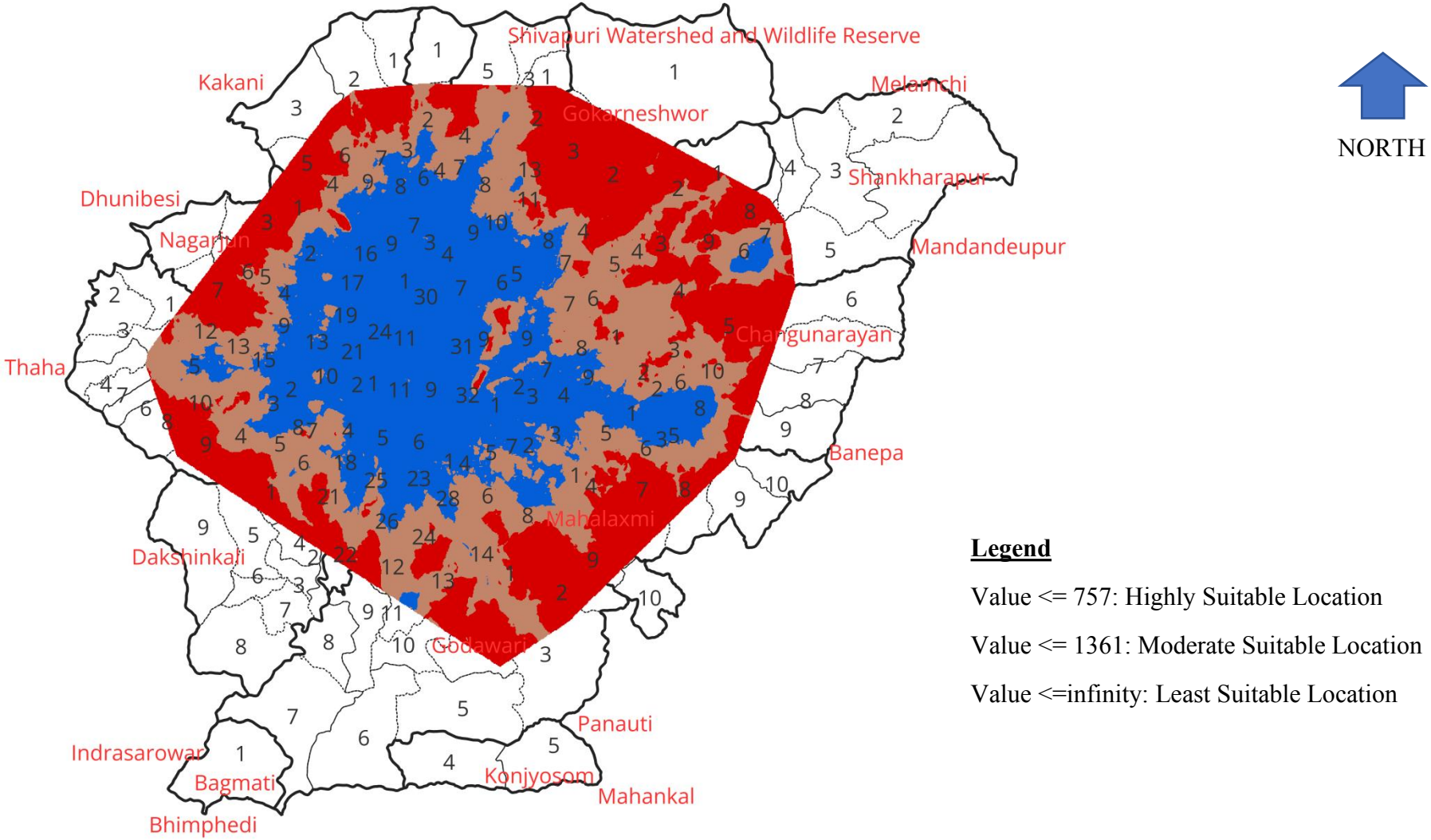


Figure 4-24 Iso-area Analysis with three categories

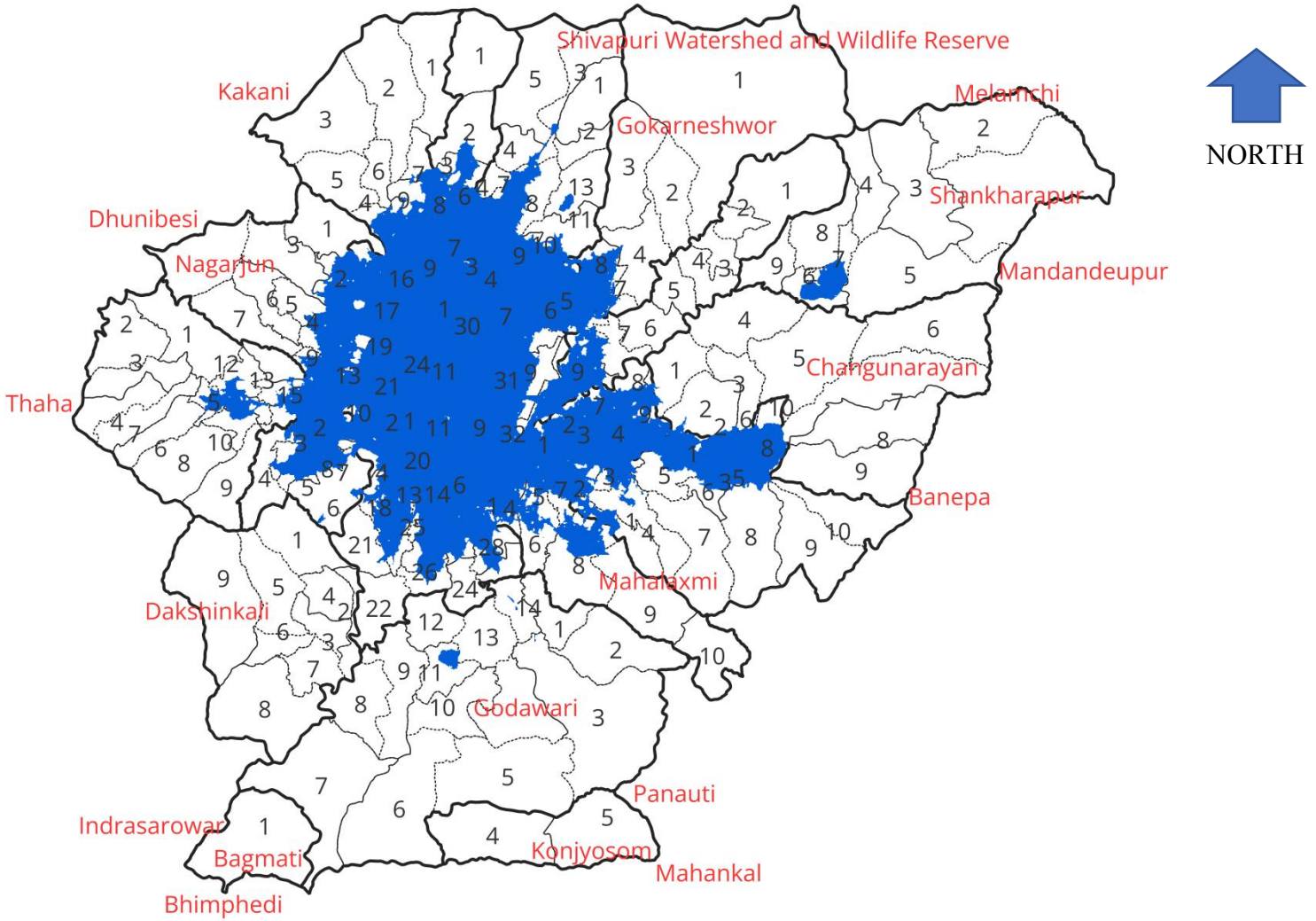


Figure 4-25 Highly Suitable Sites only

4.2.3.4 *Risk Sensitive Land Use Plan of Kathmandu Valley*

The yellow zones were extracted from the overall color zone map as in Figure 4-26 and then polygonized. Then, the layers of highly suitable sites and yellow zones were clipped to obtain areas fulfilling both types of suitability. The obtained suitable sites are shown in Figure 4-27.

4.2.3.5 *Screening by location of brick kilns*

The locations of the brick kilns were obtained from the OSM data. The minimum distance of populated areas from brick kilns is 500 m-1 km (Islam et al., 2024). Hence, a 1 km buffer for the brick kilns was calculated in QGIS, as in Figure 4-28. The differences between the recently obtained highly suitable sites were analyzed.

4.2.3.6 *Screening by location of parks*

Respondents preferred a distance of 1 km from parks. Hence, the Iso-area analysis for parks was performed with a distance of 1 km, as in Figure 4-29. The polygon layer obtained from the Iso-area analysis was clipped with recently obtained highly suitable sites. Subsequently, the opacity of the recent layer of highly suitable sites decreased.

4.2.3.7 *Identification of vacant lands*

Google Map layer was added and was placed below the layer of recently obtained highly suitable sites. The opacity of the layer of recently obtained highly suitable sites was decreased and the vacant lands in highly suitable areas were drawn as polygons to obtain candidate sites.

4.2.3.8 *Minimum area of sites*

The minimum area of an apartment in hilly areas is 1000 sq. m. (MoUD, 2071). The candidate sites were screened according to the minimum area. All candidate sites passed this screening.

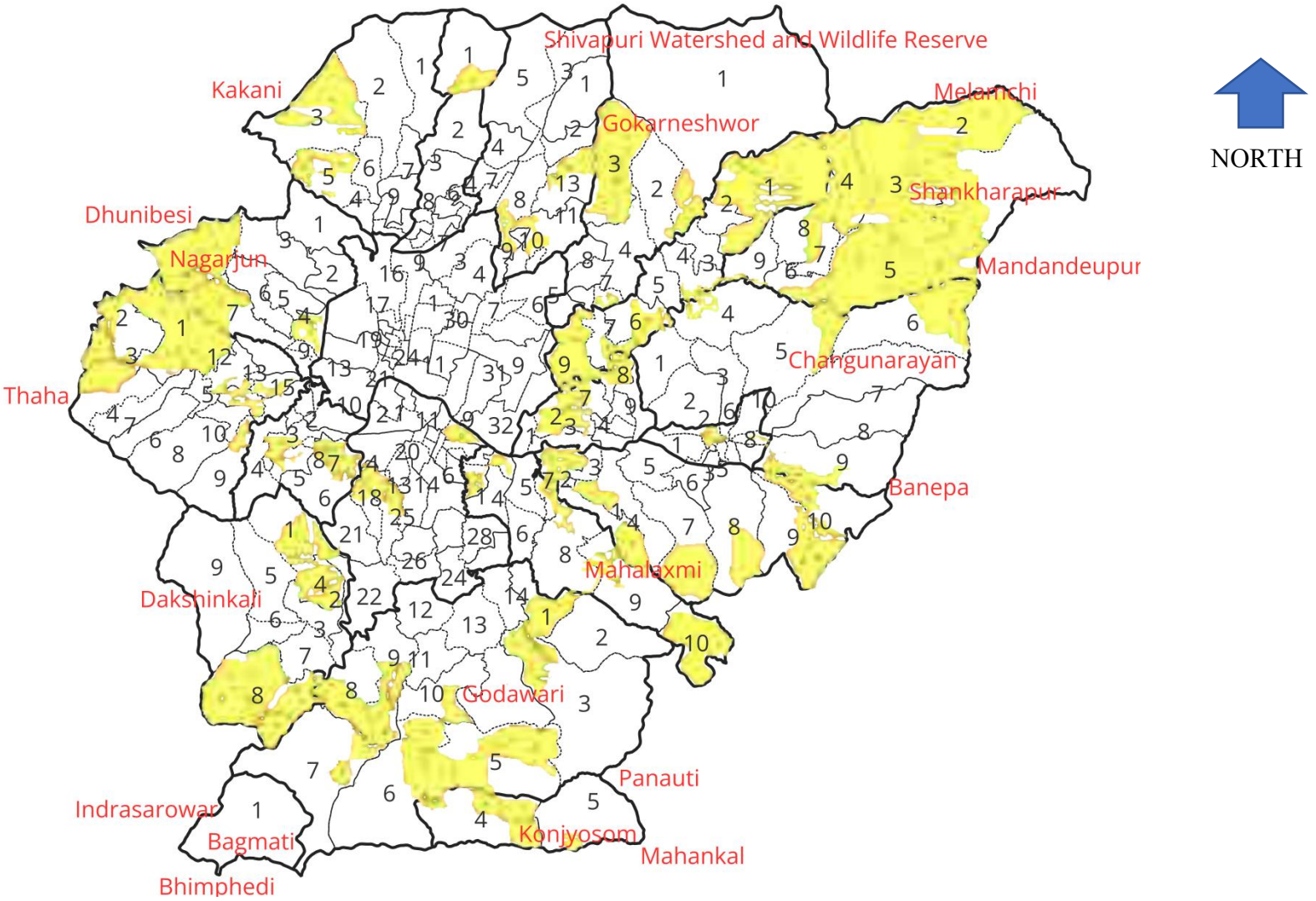


Figure 4-26 Yellow zones in Kathmandu Valley as per RSLUP

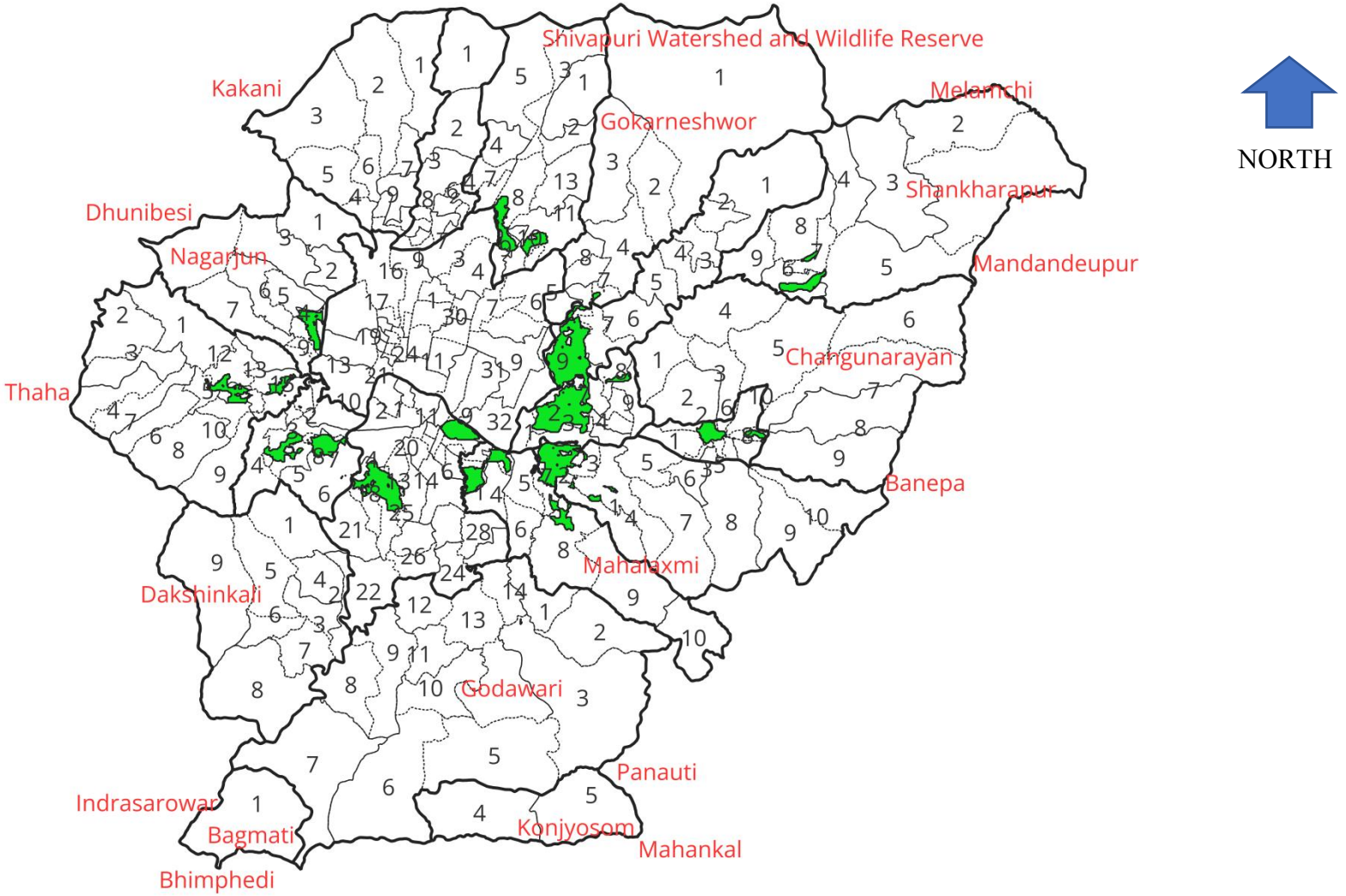


Figure 4-27 Initial Candidate Sites

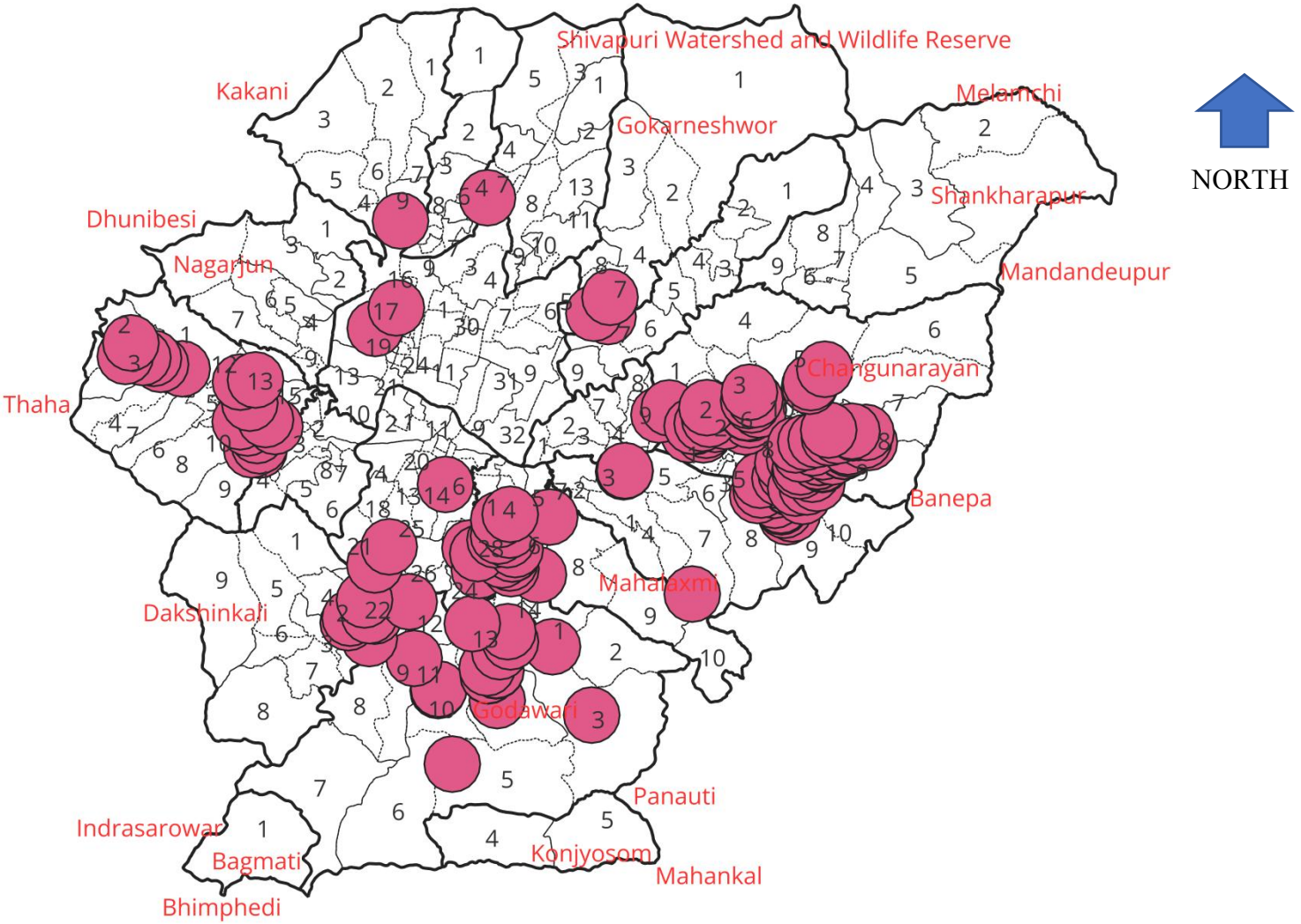


Figure 4-28 One km buffer from brick kilns

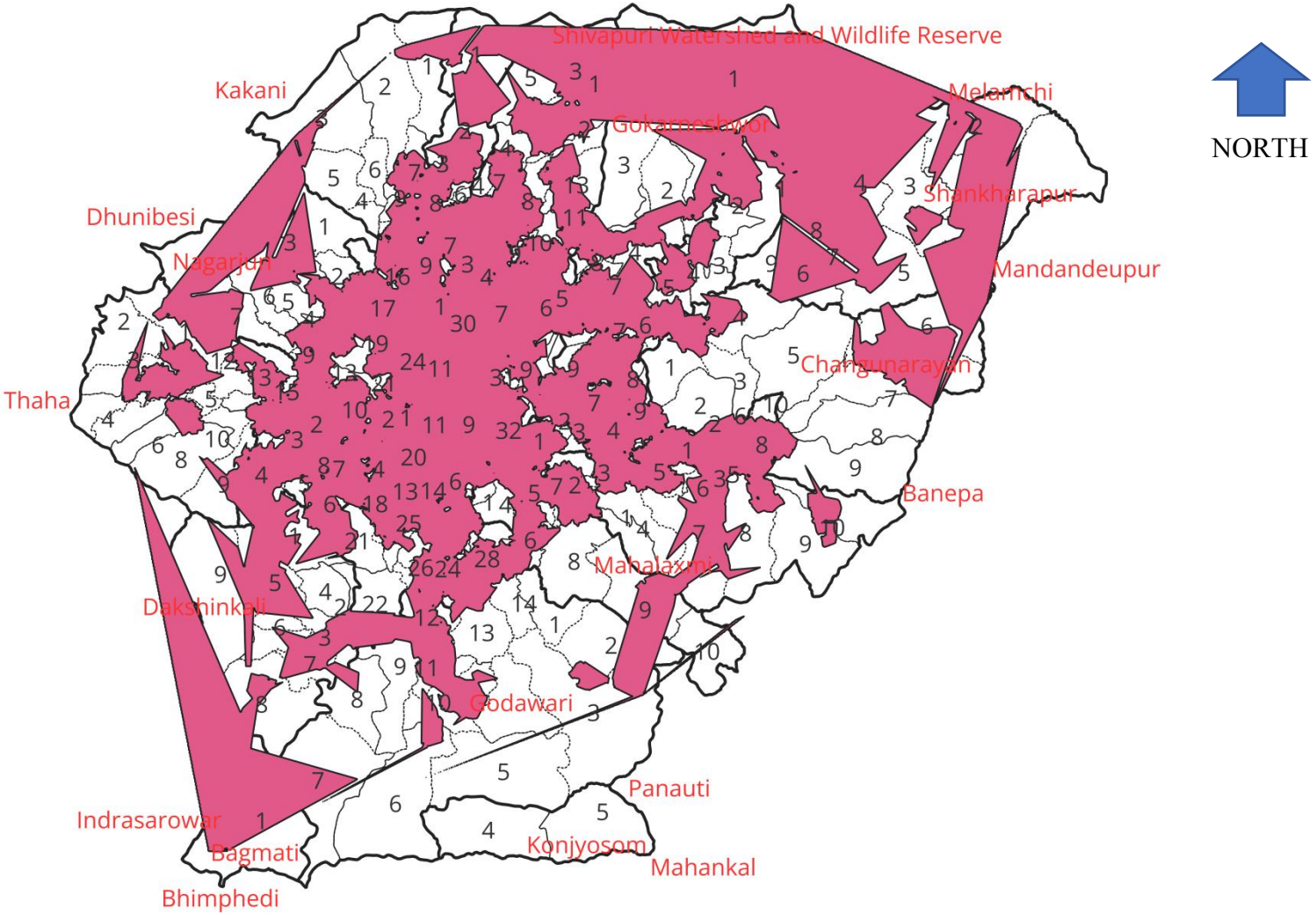


Figure 4-29 Iso area polygon of park

4.2.3.9 *Screening by Height restrictions of CAAN*

The centroids of each candidate site were calculated using QGIS. The sites were then checked to see if any of them lie within the 2% slope within 3000 m from each side of the runway, as shown in Figure 4-30. No sites were found in this region. Subsequently, they were checked if they lay within 2.5% within the next 3600 m. Site 13 was located in this region. It was checked whether a medium-rise apartment could be built there, and it was found OK according to the CAAN height restriction. Next, the 14.3% check for the transitional aspect was checked for Site 34, which is the nearest site to the side of the TIA Runway. It was found acceptable to build a medium-rise apartment here as per the CAAN Height Restriction. The calculations are presented in Appendix 6.

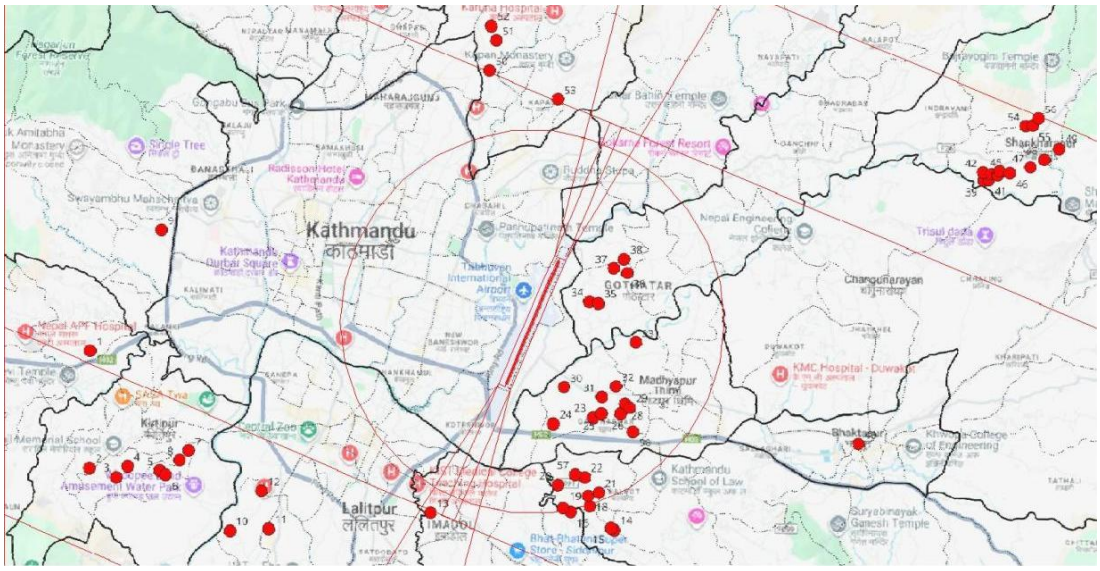


Figure 4-30 Calculation of Height Restrictions by CAAN from TIA

Then, the "Sample Raster Values" tool was used to determine the elevation of each centroid, both sides, and the center point of the runway of Tribhuvan International Airport. A circle with a radius of 4000 m was drawn with its center as the center of the runway. The sites lying within this circle were identified, and their elevations were analyzed to determine whether constructing a medium-rise apartment exceeded a plane 45 m above the midpoint of the TIA Runway (CAAN, 2021). All candidate sites passed this screening, as shown in Appendix 7. Hence, all candidate sites passed the height restriction as per the provision of "Civil Aviation Requirements for Aerodrome - CAR - 14, Part 1.

4.2.3.10 *Screening by Buffer Zone of World Heritage Sites*

The candidate sites were checked to determine whether they lie within the World Heritage Buffer Zones. This is because there are height restrictions in these zones, which will not allow apartments to be constructed here. The Buffer Zone of Bhaktapur Durbar Square is shown in Figure 4-31 (UNESCO, 2006). One site was found in this area. Hence, this site was removed from further analysis.

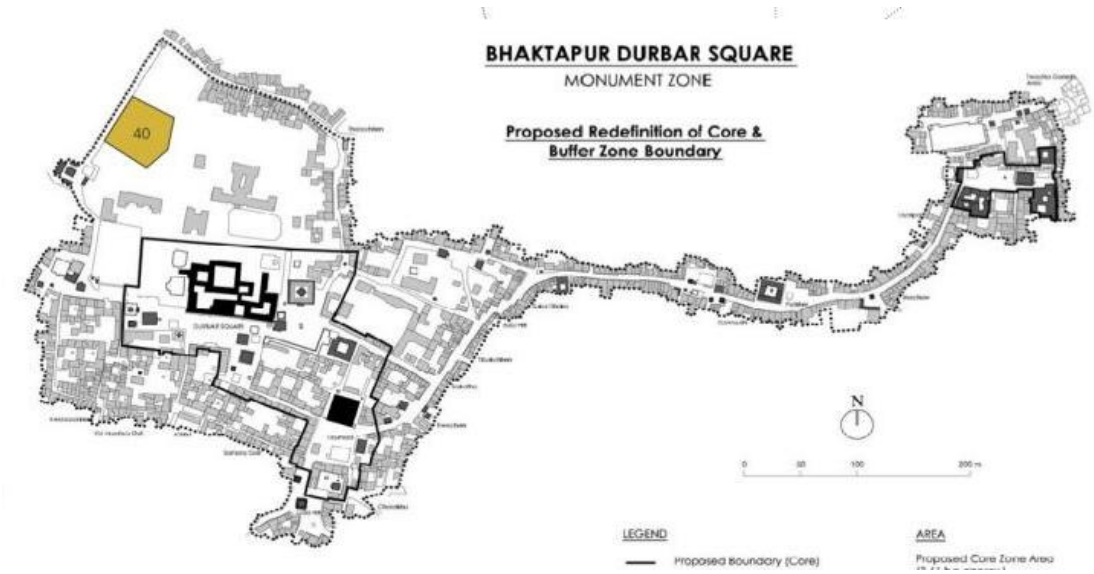


Figure 4-31 Buffer Zone of Bhaktapur Durbar Square

The location of the final candidate sites obtained is shown as a red dot in Figure 4-32.

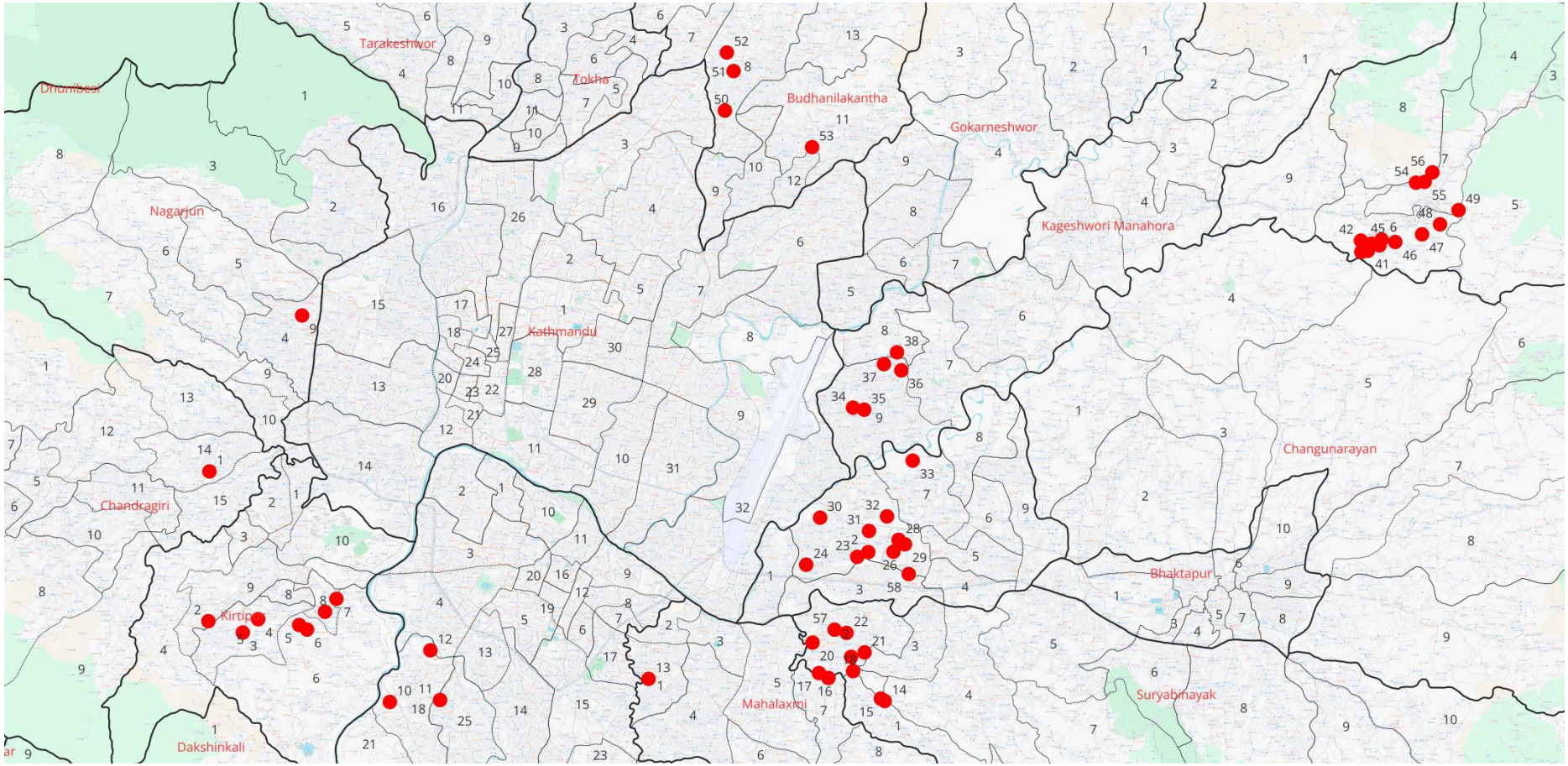


Figure 4-32 Location of Candidate Sites within Kathmandu Valley

4.2.4 OD Matrix

The OD Matrix was used in QGIS to determine the road distance from each candidate site to the nearest amenity of each type of amenity. The total distance from each candidate site to all amenities was calculated. The results obtained are presented in Table 4-4.

Table 4-4: Distance from each candidate site to the each nearest amenity

Candidate Sites	School	College	Office	Bank	Hospital	Temple	Shopping	Bus stop	Park	Total Distance (m)
1	144	1883	670	633	788	706	624	1364	990	7800
2	163	2149	450	258	1265	650	1419	949	389	7692
3	402	2076	265	800	628	486	1476	687	557	7378
4	429	1790	591	1125	341	408	1247	761	883	7574
5	411	1520	589	1049	861	466	1254	706	742	7599
6	475	1584	546	1113	925	431	1318	770	806	7967
7	692	1778	424	1330	1281	423	1695	256	371	8249
8	399	1499	325	1051	956	286	1313	453	338	6619
9	518	790	914	702	511	294	2120	726	883	7458
10	237	1756	559	1208	731	282	674	531	523	6503
11	475	1466	955	511	665	617	585	677	492	6442
12	387	1472	1296	935	261	356	289	615	746	6357
13	220	430	50	632	848	287	326	318	1270	4381
14	282	1371	529	1531	1010	158	1841	366	456	7543
15	290	1379	497	1498	977	166	1849	374	464	7494
16	430	1988	746	677	430	401	1443	432	836	7383
17	557	1853	611	804	557	325	1308	559	700	7273
18	154	1730	718	761	207	316	1587	251	1224	6948
19	260	1783	760	611	309	372	1621	352	1325	7393
20	458	1426	121	271	876	557	882	270	1057	5918

21	252	1286	639	878	656	287	1908	700	1507	8112
22	244	1265	602	452	649	107	1482	440	1605	6846
23	369	708	609	570	755	294	570	696	962	5533
24	330	330	475	357	518	287	377	456	1253	4383
25	414	512	618	808	877	369	375	894	766	5633
26	189	340	480	799	787	454	305	625	629	4609
28	466	259	474	786	944	185	675	307	335	4432
29	537	257	472	898	779	365	673	487	515	4983
30	576	1166	478	905	1029	713	787	967	475	7098
31	202	788	317	202	1684	363	329	911	424	5221
32	158	405	379	373	1323	669	667	550	294	4818
33	427	1407	1292	897	515	470	1212	571	1017	7808
34	173	1394	1106	648	550	201	499	380	988	5941
35	85	1666	1242	644	818	257	264	240	843	6058
36	226	838	1221	1431	392	257	952	310	550	6179
37	329	773	841	1506	528	446	1027	272	923	6644
38	244	552	969	1904	268	186	1425	186	868	6601
39	515	396	1283	998	202	587	814	1080	3595	9470
41	413	294	1181	896	160	485	711	977	3653	8769
42	577	458	1345	1060	108	567	876	1142	3817	9951
43	292	351	1060	775	273	365	591	857	3533	8098
44	349	581	969	684	503	416	500	765	3441	8208
45	174	460	867	582	508	246	398	664	3339	7237
46	415	600	918	673	684	405	489	755	3430	8370
47	323	1057	328	385	581	481	747	481	2862	7245
48	844	1576	408	641	1100	429	1266	727	2228	9219
49	767	1498	331	564	1023	129	1189	650	1786	7936
50	545	716	1139	613	1198	361	1226	638	493	6929
51	284	1299	669	714	791	519	915	761	548	6499

52	395	1222	375	419	496	410	620	466	399	4802
53	486	1105	590	563	1341	312	1292	401	650	6740
54	267	1372	446	524	897	219	1063	487	2890	8166
55	348	1453	527	589	978	300	1144	568	2971	8877
56	537	1643	716	779	1167	490	1333	758	3160	10583
57	54	1276	725	560	905	265	1412	432	1499	7128
58	196	265	205	196	484	44	1026	783	726	3926

The variation in total distance of the candidate site is shown in Figure 4-33.

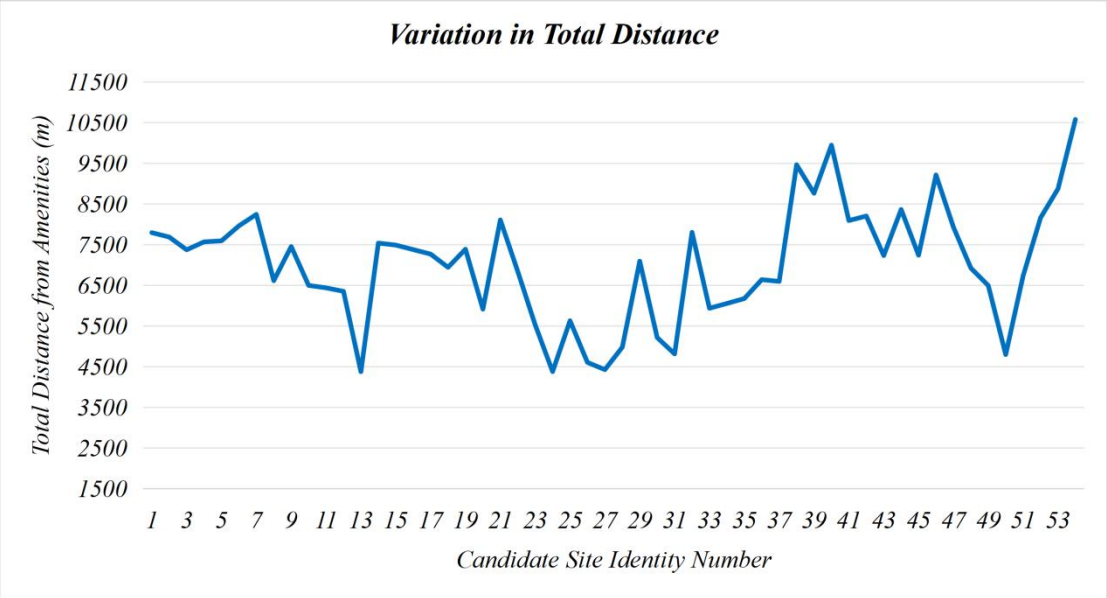


Figure 4-33 Variation of total distance from each candidate site to each nearest amenity

4.2.5 Government Land Price

Subsequently, the government land rate for all candidate sites was recorded for the fiscal year 082/83 (2025/2026). The market rate is very volatile and is prone to frequent fluctuations and the government land rate is stable and authentic. Hence, only the government land rate was used for the valuation of the candidate sites. In addition, many valuers are found to take the market land rate as certain times more than the government rate. In such a case, the use of the market rate provides a scatter plot similar to that using the government rate only. The list of land rates for each candidate site is shown in Table 4-5 (DoLMA, 2082).

Table 4-5 Government Land Rate of Candidate Sites

Candidate Sites	Location	Government Valuation (Per Ana)
1	Chandragiri-14	1,100,000
2	Kirtipur-9	535,000
3	Kirtipur-5	600,000
4	Kirtipur-5	600,000
5	Kirtipur-6	600,000
6	Kirtipur-6	600,000
7	Kirtipur-6	600,000
8	Kirtipur-7	600,000
9	Nagarjun-4	1,500,000
10	Lalitpur-18	1,075,000
11	Lalitpur-25	1,075,000
12	Lalitpur-18	1,075,000
13	Mahalaxmi-1	1,590,000
14	Suryabinayak-4	1,865,000
15	Suryabinayak-2	1,865,000
16	Suryabinayak-2	1,865,000
17	Suryabinayak-2	1,865,000
18	Suryabinayak-2	2,165,000
19	Suryabinayak-2	1,865,000
20	Suryabinayak-2	1,865,000
21	Suryabinayak-2	1,865,000
22	Suryabinayak-2	1,865,000
23	Madhyapur Thimi-2	1,590,000
24	Madhyapur Thimi-2	1,272,000
25	Madhyapur Thimi-2	1,590,000
26	Madhyapur Thimi-2	1,590,000
28	Madhyapur Thimi-2	1,590,000

29	Madhyapur Thimi-2	1,590,000
30	Madhyapur Thimi-2	1,446,900
31	Madhyapur Thimi-2	1,749,000
32	Madhyapur Thimi-2	1,749,000
33	Madhyapur Thimi-7	1,017,600
34	Kageshwori Manohara-9	1,650,000
35	Kageshwori Manohara-9	1,650,000
36	Kageshwori Manohara-9	1,650,000
37	Kageshwori Manohara-9	1,015,000
38	Kageshwori Manohara-8	1,015,000
39	Shakarapur-6	929,196
41	Shakarapur-6	929,196
42	Shakarapur-6	929,196
43	Shakarapur-6	929,196
44	Shakarapur-6	929,196
45	Shakarapur-6	929,196
46	Shakarapur-6	929,196
47	Shakarapur-6	929,196
48	Shakarapur-6	929,196
49	Shakarapur-7	1,431,000
50	Buddhanilkantha-8	1,900,000
51	Buddhanilkantha-8	1,520,000
52	Buddhanilkantha-8	1,520,000
53	Buddhanilkantha-11	1,900,000
54	Shakarapur-7	929,196
55	Shakarapur-7	929,196
56	Shakarapur-8	929,196
57	Suryabinayak-2	1,865,000
58	Madhyapur Thimi-2	1,272,000

4.2.6 Pareto Frontier

The total distance to all amenities from each site and the corresponding government land rate were plotted in a scatter diagram using Microsoft Excel. To identify the Pareto Frontier, both total distance and land price for the candidate sites were compiled in a single table, with the objective of minimizing both criteria. The table was then sorted in ascending order of total distance. The first (topmost) site was considered part of the Pareto Frontier. Subsequently, any site with a lower land price than the previously selected Pareto-optimal site was also identified as belonging to the Pareto Frontier. This stepwise process was continued until all sites were evaluated. The sites identified through this method are considered non-dominated, as no other site performs better in both criteria simultaneously. The table used to determine the Pareto Frontier is presented in Table 4-6.

Table 4-6 Identification of Sites in Pareto Frontier

Candidate Site	Total Distance (m)	Land Price, Government Rate (NRs per Ana)	Dominated/Non-dominated?
58	3,926	1,272,000	Non-dominated
13	4,381	1,590,000	Dominated
24	4,383	1,272,000	Dominated
28	4,432	1,590,000	Dominated
26	4,609	1,590,000	Dominated
52	4,802	1,520,000	Dominated
32	4,818	1,749,000	Dominated
29	4,983	1,590,000	Dominated
31	5,221	1,749,000	Dominated
23	5,533	1,590,000	Dominated
25	5,633	1,590,000	Dominated
20	5,918	1,865,000	Dominated
34	5,941	1,650,000	Dominated
35	6,058	1,650,000	Dominated
36	6,179	1,650,000	Dominated

12	6,357	1,075,000	Non-dominated
11	6,442	1,075,000	Dominated
51	6,499	1,520,000	Dominated
10	6,503	1,075,000	Dominated
38	6,601	1,015,000	Dominated
8	6,619	600,000	Non-dominated
37	6,644	1,015,000	Dominated
53	6,740	1,900,000	Dominated
22	6,846	1,865,000	Dominated
50	6,929	1,900,000	Dominated
18	6,948	2,165,000	Dominated
30	7,098	1,446,900	Dominated
57	7,128	1,865,000	Dominated
45	7,237	929,196	Dominated
47	7,245	929,196	Dominated
17	7,273	1,865,000	Dominated
3	7,378	600,000	Dominated
16	7,383	1,865,000	Dominated
19	7,393	1,865,000	Dominated
9	7,458	1,500,000	Dominated
15	7,494	1,865,000	Dominated
14	7,543	1,865,000	Dominated
4	7,574	600,000	Dominated
5	7,599	600,000	Dominated
2	7,692	535,000	Non-dominated
1	7,800	1,100,000	Dominated
33	7,808	1,017,600	Dominated
49	7,936	1,431,000	Dominated
6	7,967	600,000	Dominated

43	8,098	929,196	Dominated
21	8,112	1,865,000	Dominated
54	8,166	929,196	Dominated
44	8,208	929,196	Dominated
7	8,249	600,000	Dominated
46	8,370	929,196	Dominated
41	8,769	929,196	Dominated
55	8,877	929,196	Dominated
48	9,219	929,196	Dominated
39	9,470	929,196	Dominated
42	9,951	929,196	Dominated
56	10,583	929,196	Dominated

A scatter plot diagram showing the Pareto Frontier is presented in Figure 4-34. Studying the Pareto Frontier, we see that reducing the distance to amenities increases the land price. Hence, decision-makers must choose based on an acceptable trade-off between accessibility and affordability.

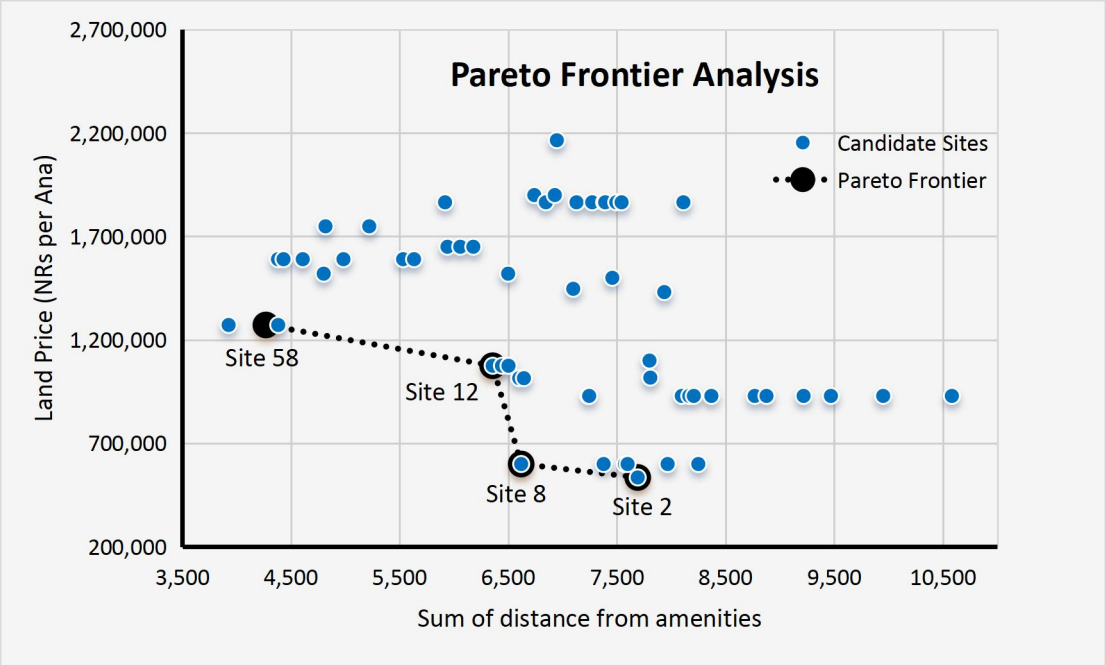


Figure 4-34 Scatter Plot diagram showing the Pareto Frontier

The optimal sites identified from the Pareto Frontier analysis is shown in Table 4-7.

Table 4-7 Details of Optimal Sites identified from the study

Optimal Site Id	Location	Total Distance from amenities (m)	Land Price, Government Rate (NRs per Ana)
2	Kirtipur-9, near Nepal APF School	7,692	535,000
8	Kirtipur-7, Panga	6,619	600,000
12	Lalitpur-18, near Nepal Mediciti Hospital	6,357	1,075,000
58	Madhyapur Thimi-2, Gatthaghar	3,926	1,272,000

The locations of these sites within the Kathmandu Valley are shown in Figure 4-35. Google images of these sites are shown in Appendix 8. The amenities near these sites are listed in Appendix 9.

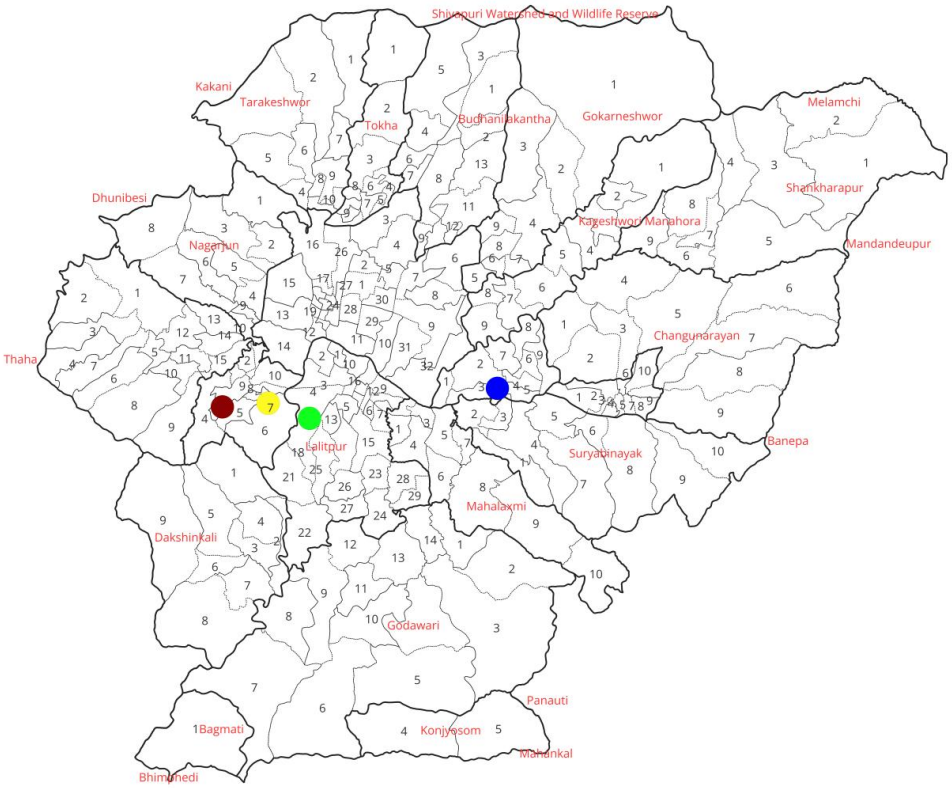


Figure 4-35 Optimized locations for the apartment

4.2.7 TOPSIS

TOPSIS analysis was performed to rank the sites identified from the Pareto frontier. For this, the distance from the nearest amenities, land price, and weights derived from the AHP were used as inputs to rank the candidate sites. The ranking of the sites obtained from TOPSIS analysis is shown in Table 4-8.

Table 4-8 TOPSIS Analysis

Candidate Site	Proximity to Amenities									Land Price Per Ana
	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Total Distance (m)	
Site 2	163	2149	450	258	1265	650	1419	949	7303	535,000
Site 8	399	1499	325	1051	956	286	1313	453	6281	600,000
Site 12	387	1472	1296	935	261	356	289	615	5611	1,075,000
Site 58	196	265	205	196	484	44	1026	783	3200	1,272,000

Normalization

Candidate Site	Proximity to Amenities									Land Price Per Ana
	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Total Distance (m)	
Site 2	163	2149	450	258	1265	650	1419	949	7303	535,000
Site 8	399	1499	325	1051	956	286	1313	453	6281	600,000
Site 12	387	1472	1296	935	261	356	289	615	5611	1,075,000
Site 58	196	265	205	196	484	44	1026	783	3200	1,272,000
$\sqrt{\sum_{i=1}^{m}(x_{ij})^2}$	612	3017	1425	1443	1679	795	2207	1448	11598	1849279

Candidate Site	Proximity to Amenities									Land Price Per Ana
	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Total Distance (m)	
Site 2	0.266	0.712	0.316	0.179	0.754	0.817	0.643	0.656	0.630	0.289
Site 8	0.653	0.497	0.228	0.728	0.570	0.359	0.595	0.313	0.542	0.324
Site 12	0.632	0.488	0.910	0.648	0.156	0.448	0.131	0.425	0.484	0.581
Site 58	0.321	0.088	0.144	0.136	0.288	0.056	0.465	0.541	0.276	0.688

Weighted Normalized Decision Matrix and identification of ideal best and ideal worst

Candidate Site	Proximity to Amenities									Land Price Per Ana	$S_i^+ = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^*)^2}$	$S_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^-)^2}$
	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Total Distance (m)			
Weight	0.192	0.091	0.078	0.153	0.131	0.108	0.086	0.162	0.506	0.494		
Site and Adjusted Weight	0.096936457	0.046145778	0.0392196 39	0.07752302 2	0.066132271	0.05466097	0.043281452	0.082124506	0.51	0.49		
Site 2	0.026	0.033	0.012	0.014	0.050	0.045	0.028	0.054	0.319	0.143	0.074	0.206

Site 8	0.063	0.023	0.009	0.056	0.038	0.020	0.026	0.026	0.274	0.160	0.075	0.186
Site 12	0.061	0.023	0.036	0.050	0.010	0.024	0.006	0.035	0.245	0.287	0.159	0.076
Site 58	0.031	0.004	0.006	0.011	0.019	0.003	0.020	0.044	0.140	0.340	0.199	0.088
Type	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost		
Ideal Best (vj*)	0.026	0.004	0.006	0.011	0.010	0.003	0.006	0.026	0.140	0.143		
Ideal Worst (vj-)	0.063	0.033	0.036	0.056	0.050	0.045	0.028	0.054	0.319	0.340		

Relative Closeness to the Ideal Solution and Rank Determination					
Site	Si+	Si-	Si+ + Si-	Ci	Rank
Site 2	0.074	0.206	0.280	0.736	1
Site 8	0.075	0.186	0.261	0.713	2
Site 12	0.159	0.076	0.235	0.322	3
Site 58	0.199	0.088	0.286	0.307	4

The rank of the sites as obtained from TOPSIS analysis is as follows:

Rank 1: Site 2: Kirtipur-9, Near Nepal APF School

Rank 2: Site 8: Kirtipur-7, Panga

Rank 3: Site 12: Lalitpur-18, Near Nepal Mediciti Hospital

Rank 4: Site 58: Madhyapur Thimi-2, Gatthaghar

4.2.8 Sensitivity Analysis

The weights of different amenities was changed by ± 10 %, ± 20 %, ± 30 %, ± 40 %, ± 50 %, ± 60 %, ± 70 %, ± 80 %, ± 90 %, ± 100 %. A similar approach is used for the weights of proximity and land price. When the weight of one factor was changed, the weights of the remaining factors were adjusted by equal changes. The details of the change in weight are provided in Appendix 10. The ranks of the sites were then recorded. With the change in weights, the ranking of the sites changed.

The summary of change in ranks of sites with change in weights is shown in Table 4-9. From the table, it is confirmed that the ranks of the sites do not change easily. The change in the ranks of sites 2 and 8 started only with a 50% change in the weight of Bank, and that of sites 12 and 58 started only with a 40% change in the weight of Land Price. Hence, the output is reliable for investments.

The sensitivity analysis, conducted by varying the weights of amenity-related criteria, demonstrates the robustness of site rankings against changes in stakeholder preferences over time. Although the analysis does not explicitly incorporate the addition of new amenities as separate criteria, the observed sensitivity behavior provides an indirect indication of how the results may respond to evolving urban conditions. Because the result is less sensitive to changes in the weights of amenities, it suggests that the inclusion of additional amenities does not significantly influence the suitability of the final sites.

Table 4-9 Change in ranks of sites with change in weights

S. N.	Change of Weight in %	No. of Counts for		Change in rank due to change in weight of…..by….	No. of Counts for		Change in rank due to
		Site 2 and Rank 1	Site 8 as Rank 2		Site 12 as Rank 3	Site 58 as Rank 4	
1	10	19	19		19	19	
2	20	19	19		19	19	
3	30	19	19		19	19	
4	40	19	19		18	18	Land Price -40%
5	50	18	18	Bank -50%	17	17	Bank +50%
6	60	18	18		17	17	
7	70	18	18		17	17	
8	80	17	17	Bus stop +80%	17	17	
9	90	17	17		15	15	School +90% Office +90%
10	100	16	16	Hospital+100%	14	14	Hospital-100%

4.2.9 Key Informant Interview (KII)

Different policy level officials from the DUDBC were interviewed for the KII as shown in Appendix 11. From the KII, all the identified sites were found to be appropriate for the construction of civil servant apartments. Among these sites, Site 12, near Mediciti Hospital, was preferred by 3 out of 5 experts because the location was being developed as a high-class residential area, had convenient access from the site to the city area, and was in proximity to the ring road. Site 4 at Gatthaghar was preferred by 1 out of 5 experts because it was approximately equidistant from government offices of all three districts of the Valley.

4.3 Discussion

Four optimal locations for civil servants' apartments were identified, as presented in Table 4-7. Among these, Site 2 has the lowest land cost but involves greater travel distances. In contrast, Site 58 offers the highest level of accessibility, though at a considerably higher land price. Sites 8 and 12 represent compromise solutions, balancing both cost and accessibility.

The sites obtained from the quantitative analysis were further assessed using qualitative insights from Key Informant Interviews (KII). The preferences derived from KII differed from those of the quantitative results. Since expert opinions often reflect socioeconomic, political, and practical considerations, greater weight can be given to the KII findings. Accordingly, Site 12 (near Nepal Mediciti Hospital) can be considered the most suitable location, followed by Site 58 (Gatthaghar).

Furthermore, the AHP analysis indicated that proximity to amenities was assigned a higher weight than land price, highlighting a strong preference for convenience and accessibility among respondents. In an urban setting such as the Kathmandu Valley, where traffic congestion and infrastructure constraints significantly impact daily mobility, proximity to essential services becomes a key factor in residential location decisions.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The findings indicate that proximity to essential amenities such as transport nodes, schools, banking services, healthcare facilities, and religious sites plays a more influential role than land price in residential location decisions. This underscores the growing importance of accessibility and convenience in urban settings like the Kathmandu Valley, where traffic congestion and infrastructural limitations significantly affect daily mobility.

The quantitative analysis identified four optimal sites, each reflecting a different trade-off between cost and accessibility. Site 2 emerged as the most cost-effective option, while Site 58 provided the highest level of accessibility. Sites 8 and 12 offered balanced alternatives. However, when qualitative insights from key experts were incorporated, the results were further refined. Site 12 (near Nepal Mediciti Hospital) was identified as the most suitable location, followed by Site 58 (Gatthaghar).

5.2 Recommendation from this study

For the construction of apartments for civil servants within the Kathmandu Valley, it is recommended that development be carried out at the locations identified from this study, as they provide data-driven assurance of the project's financial viability. Additionally, a more detailed site-specific assessment such as a SWOT analysis is recommended prior to actual construction to ensure informed decision-making.

To evaluate alternative sites within the valley, this study proposes a Weighted Proximity Score (WPS) framework. The proximity score for each amenity can be calculated as presented in Equation 5.1:

$$\text{Proximity Score}_i = \frac{D_{\text{preferred},i}}{D_{\text{actual},i}} \quad \text{…….. Equation 5.1}$$

Where,

Dpreferred,i is the preferred distance to amenity "i" identified in this study, and Dactual,i is the actual distance from the proposed site to that amenity. The proximity score was calculated for each amenity. The overall Weighted Proximity Score (WPS) for a given location is then calculated as shown in Equation 5.2.

$$\text{WPS} = \sum(w_i \times \text{Proximity Score}_i \quad \text{..... Equation 5.2}$$

Where,

w_i represents the AHP-derived weight of amenity "i".

Higher WPS values indicate more desirable locations. Accordingly, the proposed sites can be systematically compared to identify the most suitable alternatives. These findings have important implications for investors and housing developers, as they provide a structured decision-support tool for selecting optimal locations for apartment development and facilitating sound investment decisions.

5.3 Recommendations for further study

Following recommendations are provided for further study.

A. To address the limitations of this study, future research should verify the accuracy of data from OpenStreetMap.

B. After identifying optimal sites, surveys can be conducted among local residents near these locations to assess their acceptance of apartment development.

C. Additionally, a GIS-based model such as one developed using Model Builder or similar tools in QGIS can be created to automate the sequence of analytical steps applied in this study, thereby improving efficiency, consistency, and scalability in site suitability analysis.

D. Furthermore, similar studies can be extended to other regions of Nepal experiencing high population growth. This would support data-driven investment decisions and enhance the reliability of expected returns on investment.

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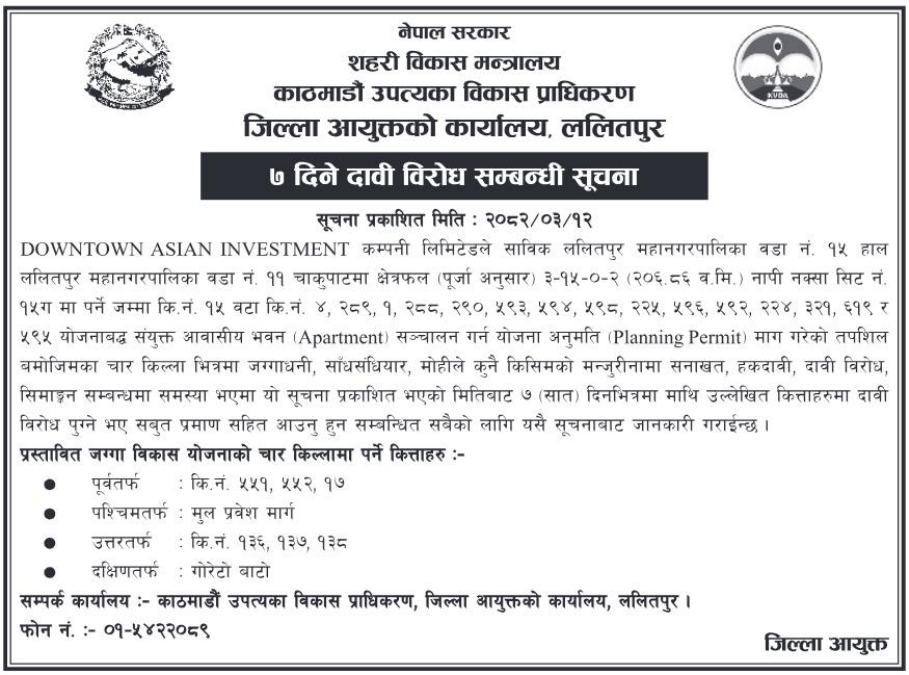
APPENDIX 1: Notices regarding apartment construction by the private sector



नेपाल सरकार
शहरी विकास मन्त्रालय
काठमाडौं उपत्यका विकास प्राधिकरण
जिल्ला आयुक्तको कार्यालय, ललितपुर

७ दिने दावी विरोध सम्बन्धी सूचना

सूचना प्रकाशित मिति : २०८२/०३/१२

DOWNTOWN ASIAN INVESTMENT कम्पनी लिमिटेडले साबिक ललितपुर महानगरपालिका वडा नं. १५ हाल ललितपुर महानगरपालिका वडा नं. ११ चाकुपाटमा क्षेत्रफल (पूर्जा अनुसार) ३-१५-०-२ (२०६.८६ व.मि.) नापी नक्सा सिट नं. १५ग मा पर्ने जम्मा कि.नं. १५ वटा कि.नं. ४, २८९, १, २८८, २९०, ५९३, ५९४, ५९८, २२५, ५९६, ५९२, २२४, ३२१, ६१९ र ५९५ योजनाबद्ध संयुक्त आवासीय भवन (Apartment) सञ्चालन गर्न योजना अनुमति (Planning Permit) माग गरेको तपशिल बमोजिमका चार किल्ला भित्रमा जग्गाधनी, साँधसंधियार, मोहीले कुनै किसिमको मन्जुरीनामा सनाखत, हकदावी, दावी विरोध, सिमाङ्कन सम्बन्धमा समस्या भएमा यो सूचना प्रकाशित भएको मितिबाट ७ (सात) दिनभित्रमा माथि उल्लेखित कित्ताहरुमा दावी विरोध पुग्ने भए सबुत प्रमाण सहित आउनु हुन सम्बन्धित सबैको लागि यसै सूचनाबाट जानकारी गराईन्छ ।

प्रस्तावित जग्गा विकास योजनाको चार किल्लामा पर्ने कित्ताहरु :-

- पूर्वतर्फ : कि.नं. ५५१, ५५२, १७
- पश्चिमतर्फ : मुल प्रवेश मार्ग
- उत्तरतर्फ : कि.नं. १३६, १३७, १३८
- दक्षिणतर्फ : गोरेटो बाटो

सम्पर्क कार्यालय :- काठमाडौं उपत्यका विकास प्राधिकरण, जिल्ला आयुक्तको कार्यालय, ललितपुर ।

फोन नं. :- ०१-५४२२०८९

जिल्ला आयुक्त

Figure 1-1 News about apartment construction (Source: Gorkhapatra, 2082 Asadh 12)

नेपाल सरकार
शहरी विकास मन्त्रालय
काठमाडौं उपत्यका विकास प्राधिकरण
जिल्ला आयुक्तको कार्यालय, ललितपुर

७ दिने दावी विरोध सम्बन्धी सूचना

सूचना प्रकाशित मिति : २०८२/०३/१३

PRIME CAPITAL AFFAIRS Pvt. Ltd. ले साबिक ललितपुर महानगरपालिका वडा नं. ६क हाल ललितपुर महानगरपालिका वडा नं. १७ ग्वार्कोमा क्षेत्रफल (पूर्जा अनुसार) ६-१०-१-१ नापी नक्सा सिट नं. ६क जम्मा कि.नं. ८ वटा कि.नं. १४२७, १४२९, १४३३, १४३४, १४३५, १४३६, १६५०, २०२६ योजनाबद्ध संयुक्त आवासीय भवन सञ्चालन गर्न योजना अनुमति (Planning Permit) माग गरेको तपशिल बमोजिमका चार किल्ला भित्रमा जग्गाधनी, साँधसंधियार, मोहीले कुनै किसिमको मन्जुरीनामा सनाखत, हकदावी, दावी विरोध, सिमाङ्कन सम्बन्धमा समस्या भएमा यो सूचना प्रकाशित भएको मितिबाट ७ (सात) दिनभित्रमा माथि उल्लेखित कित्ताहरुमा दावी विरोध पुग्ने भए सबुत प्रमाण सहित आउनु हुन सम्बन्धित सबैको लागि यसै सूचनाबाट जानकारी गराईन्छ ।

प्रस्तावित जग्गा विकास योजनाको चार किल्लामा पर्ने कित्ताहरु :-

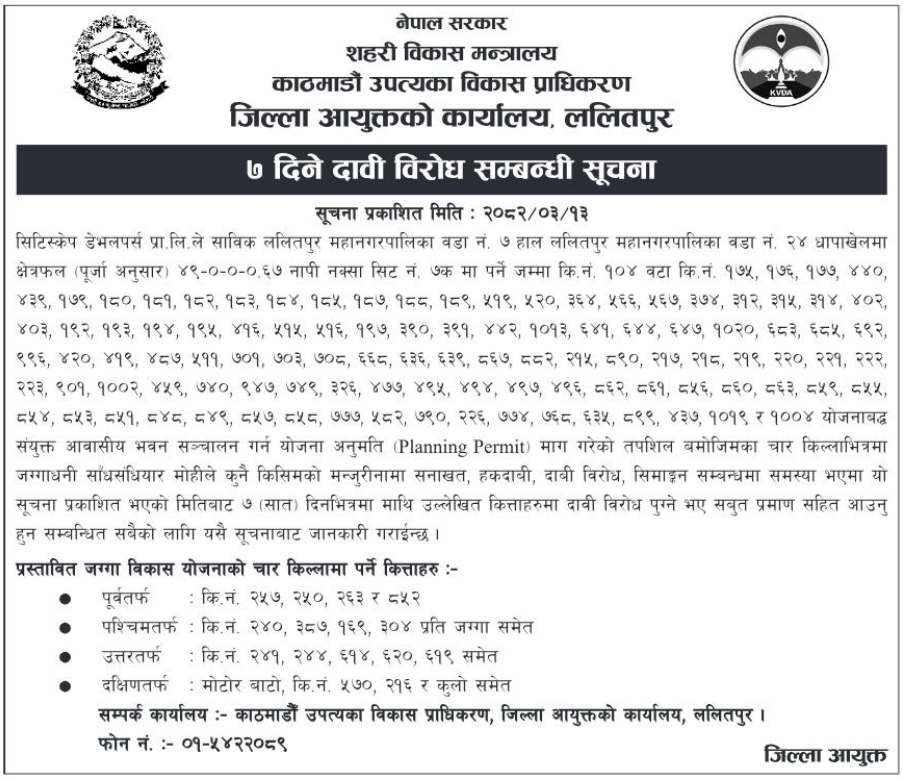
- पूर्वतर्फ : कि.नं. ८१३, ५६, ५९
- पश्चिमतर्फ : कि.नं. १५९५, २००४
- उत्तरतर्फ : कि.नं. १२४४, १२४३, १२४२, १२४१, १२४०, १२३९, १२३८
- दक्षिणतर्फ : कि.नं. २०२७, १९८८, १९८९, १११७, १११६

सम्पर्क कार्यालय :- काठमाडौं उपत्यका विकास प्राधिकरण, जिल्ला आयुक्तको कार्यालय, ललितपुर ।

फोन नं. :- ०१-५४२२०८९

जिल्ला आयुक्त

Figure 1-2 News about apartment construction (Source: Gorkhapatra, 2082 Asadh 13)



नेपाल सरकार
शहरी विकास मन्त्रालय
काठमाडौं उपत्यका विकास प्राधिकरण
जिल्ला आयुक्तको कार्यालय, ललितपुर

७ दिने दावी विरोध सम्बन्धी सूचना

सूचना प्रकाशित मिति : २०८२/०३/१३

सिटिस्केप डेभलपर्स प्रा.लि.ले साविक ललितपुर महानगरपालिका वडा नं. ७ हाल ललितपुर महानगरपालिका वडा नं. २४ धापाखेलमा क्षेत्रफल (पूर्जा अनुसार) ४९-०-०-०.६७ नापी नक्सा सिट नं. ७क मा पर्ने जम्मा कि.नं. १०४ वटा कि.नं. १७५, १७६, १७७, ४४०, ४३९, १७९, १८०, १८१, १८२, १८३, १८४, १८५, १८७, १८८, १८९, ५१९, ५२०, ३६४, ५६६, ५६७, ३७४, ३१२, ३१५, ३१४, ४०२, ४०३, १९२, १९३, १९४, १९५, ४१६, ५१५, ५१६, १९७, ३९०, ३९१, ४४२, १०१३, ६४१, ६४४, ६४७, १०२०, ६८३, ६८५, ६९२, ९९६, ४२०, ४१९, ४८७, ५११, ७०१, ७०३, ७०८, ६६८, ६३६, ६३९, ८६७, ८८२, २१५, ८९०, २१७, २१८, २१९, २२०, २२१, २२२, २२३, ९०१, १००२, ४५९, ७४०, ९४७, ७४९, ३२६, ४७७, ४९५, ४९४, ४९७, ४९६, ८६२, ८६१, ८५६, ८६०, ८६३, ८५९, ८५५, ८५४, ८५३, ८५१, ८४८, ८४९, ८५७, ८५८, ७७७, ५८२, ७९०, २२६, ७७४, ७६८, ६३५, ८९९, ४३७, १०१९ र १००४ योजनाबद्ध संयुक्त आवासीय भवन सञ्चालन गर्न योजना अनुमति (Planning Permit) माग गरेको तपशिल बमोजिमका चार किल्लाभित्रमा जग्गाधनी साँधसंधियार मोहीले कुनै किसिमको मन्जुरीनामा सनाखत, हकदावी, दावी विरोध, सिमाङ्कन सम्बन्धमा समस्या भएमा यो सूचना प्रकाशित भएको मितिबाट ७ (सात) दिनभित्रमा माथि उल्लेखित कित्ताहरुमा दावी विरोध पुर्‍याई भए सबुत प्रमाण सहित आउनु हुन सम्बन्धित सबैको लागि यसै सूचनाबाट जानकारी गराईन्छ ।

प्रस्तावित जग्गा विकास योजनाको चार किल्लामा पर्ने कित्ताहरु :-

- पूर्वतर्फ : कि.नं. २५७, २५०, २६३ र ८५२
- पश्चिमतर्फ : कि.नं. २४०, ३८७, १६९, ३०४ प्रति जग्गा समेत
- उत्तरतर्फ : कि.नं. २४१, २४४, ६१४, ६२०, ६१९ समेत
- दक्षिणतर्फ : मोटोर बाटो, कि.नं. ५७०, २१६ र कुलो समेत

सम्पर्क कार्यालय :- काठमाडौं उपत्यका विकास प्राधिकरण, जिल्ला आयुक्तको कार्यालय, ललितपुर ।
फोन नं. :- ०१-५४२२०८९

जिल्ला आयुक्त

Figure 1-3 News about apartment construction (Source: Gorkhapatra, 2082 Asadh 13)

कान्तिपथमा डेढ अर्ब लगानीमा बहुप्रयोजनको 'वन वर्ल्ड अपार्टमेन्ट' निर्माण गर्दै शाक्य र श्रेष्ठ

बिजमाण्डू २०८२ असार १३ गते ०९:५५ | Jun 27, 2025

Figure 1-4 News about apartment construction (Source: Bizmandu, 2082 Asadh 13)

APPENDIX 2: Details of respondents of questionnaire survey (Only the respondents who disclosed their names in the questionnaire survey are listed here.)

S. N.	Name of Respondent	Office
1	Durga Baniya	DUDBC
2	Abhay Kumar Gupta	Urlabari Municipality, Morang
3	Saurav Kumar Gupta	Nepal Electricity Authority
4	Sujata Gautam	Department of Water Resources and Irrigation
5	Bishow Ram Prajapati	DUDBC
6	Paramatma Baniya	Ministry of Energy, Water Resources, and Irrigation
7	Safal Shrestha	KVDA
8	Prabin Shrestha	PUDBC, Gorkha
9	Shiva Ram Maharjan	Department of Archaeology
10	Santosh Giri	Kathmandu Metropolitan City
11	Rachana Shrestha	Ministry of Health and Population
12	Prabesh Raj Baniya	Department of Water Resources and Irrigation
13	Injaya Kumar Manandhar	Nepal Bureau of Standards and Meteorology
14	Raju Neupane	PUDBC, Banke
15	Trilok Joshi	DUDBC
16	Krishna Kumar Maharjan	PUDBC, Chitwan
17	Raj Kiran Basukala	Rastriya Prasaran Grid Company Limited
18	Manju Basi	Department of Hydrology and Meteorology
19	Arjun Kushwaha	DUDBC
20	Balram Marasini	DUDBC
21	Nilu Katuwal	DUDBC
22	Er. Suman Kumar Mishra	RUDP

23	Ashish Shrestha	Public Procurement Monitoring Office
24	Sijan Shrestha	PUDBC, Chitwan
25	Ashmita Shakya	DUDBC
26	Umesh Kumar Mahato	Ministry of Energy, Water Resources and Irrigation
27	Astha Acharya	Ministry of Urban Development
28	Pujan Neupane	Ministry of Urban Development
29	Sujit	Ministry of Agriculture and Livestock Development
30	G.P. Gorkhaly	MoUD
31	Sachindra Kumar Deo	Ministry of Urban Development
32	Shree Narayan Jha	DUDBC
33	Balkumar Nepal	DUDBC
34	Sundar Shrestha	DUDBC
35	Tilak Acharya	DUDBC
36	Pooja Nepal	DUDBC
37	Ashok Bhandari	Ministry of Foreign Affairs
38	Kapil Mani Ghimire	Ministry of Foreign Affairs, Singhadurbar
39	Narayan Prasad Adhikari	MoHA
40	Sandip Kumar Singh	Ministry of Women, Children, and Senior Citizens
41	Ruby Koju	Ministry of Physical Infrastructure and Transport
42	Babita Sharma	MoPIT
43	Dr. Sarita Phuyal	MoFALD
44	Asmita Aryal	Ministry of Law, Justice and Parliamentary Affairs
45	Bikram Limbu	MoHA

46	Mahesh Bahadur Singh	Ministry of Urban Development
47	Balkrishna Guragain	Ministry of Forest and Environment
48	Helina Shrestha	Ministry of Land Management, Cooperation and Poverty Alleviation
49	Mahima Timalsina	MoLJPA
50	Rabin Kumar Yadav	Ministry of Federal Affairs and General Administration
51	Nishchhal Shresth	Federal Parliament Secretariat
52	Ram Krishna Bhetuwal	Federal Parliament Secretariat
53	Prativa Koirala	Federal Parliament Secretariat

APPENDIX 3: Questionnaire

Preference of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley

* Namaste, I am conducting this survey for my Master's Thesis; "Optimization of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley". I kindly request you to provide your valuable input for this survey. All responses will be confidential and will only be used for academic purposes. Please click "OK" to confirm explicit consent to fill this questionnaire. Thank you for your valuable time and input.

- ◯ OK

Q1 Name of the respondent (Optional)

_____

Q2 Name of Current Office

_____

Q3 Are you Technical or Administrative staff?

- ◯ Technical (प्राविधिक)
- ◯ Administrative (प्रशासनिक)
- ◯ Other (अन्य)

Q4 Rank

- ◯ Gazetted 1st Class
- ◯ Gazetted 2nd Class
- ◯ Gazetted 3rd Class
- ◯ Non-Gazetted 1st Class
- ◯ Non-Gazetted 2nd Class
- ◯ Others

Q5 Age

- ◯ Below 18
- ◯ 18 - 30
- ◯ 31 - 45
- ◯ Above 45

Q6 Gender

- ◯ Male
- ◯ Female
- ◯ Others

Q7 If Nepal Government constructs apartment in location optimum to you, are you willing to buy or rent in? If you do not need apartment now too, please fill in your requirements in next questions considering purchase of apartments in the future.

- ◯ Buy
- ◯ Rent
- ◯ May consider buying in the future
- ◯ May consider renting in the future
- ◯ None of the above

Q8 If you are willing to buy the apartment at your desired location, upto how much are you willing to pay for the land only (excluding apartment building)?

- ◯ Upto 10 lakh per ana
- ◯ 11-20 lakh per ana
- ◯ 21-30 lakh per ana
- ◯ 31-40 lakh per ana
- ◯ 41-50 lakh per ana
- ◯ Above 50 lakh per ana

Q9 If you are willing to rent the apartment, how much are you willing to pay for a room of 12 feet x 12 feet. The room will have all required facilities like water, internet, electricity, etc.

- ◯ Upto 3000 per month
- ◯ 3001-5000 per month
- ◯ 5001-8000 per month
- ◯ 8001-11000 per month
- ◯ Above 11000 per month

Q10 In your opinion, which amenities influence the location of apartment for civil servants? You can choose more than one option. Please answer the next questions as per your choices in this question.

- ☐ School
- ☐ College
- ☐ Office
- ☐ Bank/ATM
- ☐ Hospital
- ☐ Temple
- ☐ Shopping Mall
- ☐ Buspark/Bus stop

Q11 Considering the price you are ready to pay for land/rent, how far (in Kilometer) do you prefer the following amenities from your apartment? If you did not choose certain amenities in Q10, you do not need to assign distance for them.	1	2	3	4	5	6	7	8	9	> 9
School	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
College	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Office	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Bank/ATM	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Hospital	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Temple	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Q12 Please rate the importance of one amenity compared to other. If you did not choose certain amenities in Q10, you do not need to compare the pairs involving those amenities. The scale is defined as follows. Equally important: 1, Moderately more: 3, Strongly more: 5, Very strongly more: 7 and Extremely more: 9. For example, in the first question "School vs College", if school is "strongly more" important than college, assign the value "5" at right side of "1" and if college is "strongly more" important than school, please assign the value "5" at left side of "1". Please rotate your mobile screen for showing all rankings.	Extremely more: 9	Very strongly more: 7	Strongly more: 5	Moderately more: 3	Equally important: 1	Moderately more: 3	Strongly more: 5	Very strongly more: 7	Extremely more: 9
School vs College	◯	◯	◯	◯	◯	◯	◯	◯	◯
School vs Office	◯	◯	◯	◯	◯	◯	◯	◯	◯
School vs Bank/ATM	◯	◯	◯	◯	◯	◯	◯	◯	◯
School vs Hospital	◯	◯	◯	◯	◯	◯	◯	◯	◯
School vs Temple	◯	◯	◯	◯	◯	◯	◯	◯	◯
School vs Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯
School vs Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯
College vs Office	◯	◯	◯	◯	◯	◯	◯	◯	◯

College vs Bank/ATM	◯	◯	◯	◯	◯	◯	◯	◯	◯
College vs Hospital	◯	◯	◯	◯	◯	◯	◯	◯	◯
College vs Temple	◯	◯	◯	◯	◯	◯	◯	◯	◯
College vs Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯
College vs Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯
Office vs Bank/ATM	◯	◯	◯	◯	◯	◯	◯	◯	◯
Office vs Hospital	◯	◯	◯	◯	◯	◯	◯	◯	◯
Office vs Temple	◯	◯	◯	◯	◯	◯	◯	◯	◯
Office vs Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯
Office vs Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯
Bank/ATM vs Hospital	◯	◯	◯	◯	◯	◯	◯	◯	◯
Bank/ATM vs Temple	◯	◯	◯	◯	◯	◯	◯	◯	◯
Bank/ATM vs Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯
Bank/ATM vs Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯
Hospital vs Temple	◯	◯	◯	◯	◯	◯	◯	◯	◯
Hospital vs Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯
Hospital vs Buspark/ Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯
Temple vs Shopping Mall	◯	◯	◯	◯	◯	◯	◯	◯	◯
Temple vs Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯
Shopping Mall vs Buspark/Bus stop	◯	◯	◯	◯	◯	◯	◯	◯	◯

Q13 Which is more important for selection of optimum location of apartment?

- ◯ Land Price
- ◯ Proximity to Amenities

Q14 If there are other amenities that might influence the selection of location of apartments, please mention them.

_____

Q15 Please mention the preferred distance (in KM) of the amenities in Q14 from the apartment.

_____

Q16 In Kathmandu Valley, where do you want the apartment to be located in?

_____

APPENDIX 4: Preferred Distance of different amenities from Questionnaire Survey

Table a: Preferred distance from School

Distance (km)	Frequency	Percent
1	33	39.3
2	18	21.4
3	12	14.3
4	1	1.2
5	4	4.8
6	1	1.2
Total	69	82.2

Table b: Preferred distance from College

Distance (km)	Frequency	Percent
1	4	4.8
2	15	17.9
3	16	19
4	9	10.7
5	9	10.7
6	1	1.2
8	2	2.4
9	1	1.2
Total	57	67.9

Table c: Preferred distance from Office

Distance (km)	Frequency	Percent
1	10	11.9
2	11	13.1
3	15	17.9
4	16	19
5	11	13.1
6	3	3.6
7	1	1.2
9	6	7.1
10	1	1.2
Total	74	88.1

Table d: Preferred distance from Bank/ATM

Distance (km)	Frequency	Percent
1	21	25
2	18	21.4
3	10	11.9
4	5	6
5	7	8.3
Total	61	72.6

Table e: Preferred distance from Hospital

Distance (km)	Frequency	Percent
1	19	22.6
2	21	25
3	15	17.9
4	6	7.1
5	8	9.5
6	1	1.2
7	1	1.2
Total	71	84.5

Table f: Preferred distance from Religious Places

Distance (km)	Frequency	Percent
1	19	22.6
2	2	2.4
3	7	8.3
4	4	4.8
5	5	6
6	4	4.8
7	3	3.6
8	3	3.6
9	1	1.2
10	2	2.4
Total	50	59.7

Table g: Preferred distance from Shopping Mall

Distance (km)	Frequency	Percent
1	14	16.7
2	6	7.1
3	15	17.9
4	9	10.7
5	5	6
6	4	4.8
7	1	1.2
9	2	2.4
10	2	2.4
Total	58	69.2

Table h: Preferred distance from Bus stop

Distance (km)	Frequency	Percent
1	31	36.9
2	13	15.5
3	5	6
4	5	6
5	3	3.6
6	2	2.4
7	1	1.2
Total	60	71.6

Table i: Preferred distance from Parks

Distance (km)	Frequency	Percent
1	10	11.9
2	8	9.5
3	1	1.2
Total	19	22.6

APPENDIX 5: Valid AHP data obtained from different respondents

Name of Respondent: -

Office Name: Department of Roads

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.000	0.333	0.333	1.000	0.333	0.111	0.111	0.111
College	3.000	1.000	1.000	1.000	1.000	0.143	0.333	0.333
Office	3.000	1.000	1.000	1.000	0.333	0.111	0.333	0.333
Bank/ATM	1.000	1.000	1.000	1.000	0.333	0.200	0.200	0.200
Hospital	3.000	1.000	3.000	3.000	1.000	0.143	0.143	0.143
Temple	9.000	7.000	9.000	5.000	7.000	1.000	1.000	1.000
Shopping Mall	9.000	3.000	3.000	5.000	7.000	1.000	1.000	1.000
Busstop	9.000	3.000	3.000	5.000	7.000	1.000	1.000	1.000
Sum	**38.000**	**17.333**	**21.333**	**22.000**	**24.000**	**3.708**	**4.121**	**4.121**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Weight	Lamda	C.I	R.C.I	C.R
School	0.026	0.019	0.016	0.045	0.014	0.030	0.027	0.027	0.0255512	8.318			
College	0.079	0.058	0.047	0.045	0.042	0.039	0.081	0.081	0.0588688	8.437			
Office	0.079	0.058	0.047	0.045	0.014	0.030	0.081	0.081	0.0543264	8.108			
Bank/ATM	0.026	0.058	0.047	0.045	0.014	0.054	0.049	0.049	0.0426547	8.311	0.12481	1.41	0.08852
Hospital	0.079	0.058	0.141	0.136	0.042	0.039	0.035	0.035	0.0703950	8.577			
Temple	0.237	0.404	0.422	0.227	0.292	0.270	0.243	0.243	0.2920696	8.851			
Shopping Mall	0.237	0.173	0.141	0.227	0.292	0.270	0.243	0.243	0.2280672	8.874			
Busstop	0.237	0.173	0.141	0.227	0.292	0.270	0.243	0.243	0.2280672	8.874			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.0000000**	**8.874**			**OK**

Name of Respondent: Raju Neupane

Office Name: PUDBC Banke

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.000	7.000	1.000	7.000	5.000	5.000	5.000	3.000
College	0.143	1.000	0.333	1.000	1.000	1.000	1.000	0.333
Office	1.000	3.000	1.000	5.000	5.000	5.000	5.000	3.000
Bank/ATM	0.143	1.000	0.200	1.000	1.000	1.000	1.000	1.000
Hospital	0.200	1.000	0.200	1.000	1.000	1.000	1.000	1.000
Temple	0.200	1.000	0.200	1.000	1.000	1.000	1.000	1.000
Shopping Mall	0.200	1.000	0.200	1.000	1.000	1.000	1.000	1.000
Busstop	0.333	3.000	0.333	1.000	1.000	1.000	1.000	1.000
Sum	**3.219**	**18.000**	**3.467**	**18.000**	**16.000**	**16.000**	**16.000**	**11.333**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Weight	Lamda	C.I	R.C.I	C.R
School	0.311	0.389	0.288	0.389	0.313	0.313	0.313	0.265	0.322	8.228	0.03254	1.41	0.02308
College	0.044	0.056	0.096	0.056	0.063	0.063	0.063	0.029	0.059	8.168			
Office	0.311	0.167	0.288	0.278	0.313	0.313	0.313	0.265	0.281	8.179			
Bank/ ATM	0.044	0.056	0.058	0.056	0.063	0.063	0.063	0.088	0.061	8.166			
Hospital	0.062	0.056	0.058	0.056	0.063	0.063	0.063	0.088	0.063	8.171			
Temple	0.062	0.056	0.058	0.056	0.063	0.063	0.063	0.088	0.063	8.171			
Shopping Mall	0.062	0.056	0.058	0.056	0.063	0.063	0.063	0.088	0.063	8.171			
Busstop	0.104	0.167	0.096	0.056	0.063	0.063	0.063	0.088	0.087	8.200			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.228**			**OK**

Name of Respondent: -

Office Name: DUDBC

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.000	0.333	1.000	0.111	1.000	0.111	0.333	0.200
College	3.000	1.000	1.000	0.200	1.000	0.143	1.000	0.333
Office	1.000	1.000	1.000	0.111	1.000	0.111	0.333	0.333
Bank/ATM	9.000	5.000	9.000	1.000	9.000	1.000	5.000	3.000
Hospital	1.000	1.000	1.000	0.111	1.000	0.111	0.333	0.200
Temple	9.000	7.000	9.000	1.000	9.000	1.000	3.000	3.000
Shopping Mall	3.000	1.000	3.000	0.200	3.000	0.333	1.000	1.000
Busstop	5.000	3.000	3.000	0.333	5.000	0.333	1.000	1.000
Sum	**32.000**	**19.333**	**28.000**	**3.067**	**30.000**	**3.143**	**12.000**	**9.067**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.031	0.017	0.036	0.036	0.033	0.035	0.028	0.022	0.030	8.149	0.03538	1.41	0.02509
College	0.094	0.052	0.036	0.065	0.033	0.045	0.083	0.037	0.056	8.172			
Office	0.031	0.052	0.036	0.036	0.033	0.035	0.028	0.037	0.036	8.248			
Bank/ ATM	0.281	0.259	0.321	0.326	0.300	0.318	0.417	0.331	0.319	8.242			
Hospital	0.031	0.052	0.036	0.036	0.033	0.035	0.028	0.022	0.034	8.207			
Temple	0.281	0.362	0.321	0.326	0.300	0.318	0.250	0.331	0.311	8.233			
Shopping Mall	0.094	0.052	0.107	0.065	0.100	0.106	0.083	0.110	0.090	8.221			
Busstop	0.156	0.155	0.107	0.109	0.167	0.106	0.083	0.110	0.124	8.207			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.248**			**OK**

Name of Respondent: -

Office Name: Department of Forests and Soil Conservation

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	0.14286	0.14286	0.14286	0.14286	0.33333	0.33333	0.33333
College	7.00000	1.00000	1.00000	1.00000	1.00000	3.00000	3.00000	3.00000
Office	7.00000	1.00000	1.00000	1.00000	1.00000	3.00000	3.00000	3.00000
Bank/ATM	7.00000	1.00000	1.00000	1.00000	1.00000	3.00000	3.00000	3.00000
Hospital	7.00000	1.00000	1.00000	1.00000	1.00000	3.00000	3.00000	3.00000
Temple	3.00000	0.33333	0.33333	0.33333	0.33333	1.00000	1.00000	1.00000
Shopping Mall	3.00000	0.33333	0.33333	0.33333	0.33333	1.00000	1.00000	1.00000
Busstop	3.00000	0.33333	0.33333	0.33333	0.33333	1.00000	1.00000	1.00000
Sum	**38.000**	**5.143**	**5.143**	**5.143**	**5.143**	**15.333**	**15.333**	**15.333**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.026	0.028	0.028	0.028	0.028	0.022	0.022	0.022	0.025	8.002	0.00253	1.41	0.00180
College	0.184	0.194	0.194	0.194	0.194	0.196	0.196	0.196	0.194	8.018			
Office	0.184	0.194	0.194	0.194	0.194	0.196	0.196	0.196	0.194	8.018			
Bank/ATM	0.184	0.194	0.194	0.194	0.194	0.196	0.196	0.196	0.194	8.018			
Hospital	0.184	0.194	0.194	0.194	0.194	0.196	0.196	0.196	0.194	8.018			
Temple	0.079	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.067	8.007			
Shopping Mall	0.079	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.067	8.007			
Busstop	0.079	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.067	8.007			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.018**			**OK**

Name of Respondent: -

Office Name: DUDBC

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	5.00000	1.00000	3.00000	1.00000	1.00000	1.00000
College	1.00000	1.00000	1.00000	0.20000	0.33333	0.33333	0.33333	0.20000
Office	0.20000	1.00000	1.00000	0.20000	0.33333	0.20000	0.20000	0.20000
Bank/ATM	1.00000	5.00000	5.00000	1.00000	3.00000	1.00000	1.00000	1.00000
Hospital	0.33333	3.00000	3.00000	0.33333	1.00000	0.33333	0.33333	0.33333
Temple	1.00000	3.00000	5.00000	1.00000	3.00000	1.00000	1.00000	1.00000
Shopping Mall	1.00000	3.00000	5.00000	1.00000	3.00000	1.00000	1.00000	1.00000
Busstop	1.00000	5.00000	5.00000	1.00000	3.00000	1.00000	1.00000	1.00000
Sum	**6.533**	**22.000**	**30.000**	**5.733**	**16.667**	**5.867**	**5.867**	**5.733**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.153	0.045	0.167	0.174	0.180	0.170	0.170	0.174	0.154	8.279	0.07591	1.41	0.05383
College	0.153	0.045	0.033	0.035	0.020	0.057	0.057	0.035	0.054	8.226			
Office	0.031	0.045	0.033	0.035	0.020	0.034	0.034	0.035	0.033	8.375			
Bank/ ATM	0.153	0.227	0.167	0.174	0.180	0.170	0.170	0.174	0.177	8.445			
Hospital	0.051	0.136	0.100	0.058	0.060	0.057	0.057	0.058	0.072	8.531			
Temple	0.153	0.136	0.167	0.174	0.180	0.170	0.170	0.174	0.166	8.368			
Shopping Mall	0.153	0.136	0.167	0.174	0.180	0.170	0.170	0.174	0.166	8.368			
Busstop	0.153	0.227	0.167	0.174	0.180	0.170	0.170	0.174	0.177	8.445			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.531**			**OK**

Name of Respondent: Nilu Katuwal

Office Name: DUDBC

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	3.00000	3.00000	3.00000	1.00000	7.00000	7.00000
College	1.00000	1.00000	3.00000	3.00000	3.00000	1.00000	7.00000	7.00000
Office	0.33333	0.33333	1.00000	1.00000	1.00000	0.33333	5.00000	5.00000
Bank/ATM	0.33333	0.33333	1.00000	1.00000	1.00000	0.33333	5.00000	5.00000
Hospital	0.33333	0.33333	1.00000	1.00000	1.00000	0.33333	5.00000	5.00000
Temple	1.00000	1.00000	3.00000	3.00000	3.00000	1.00000	7.00000	7.00000
Shopping Mall	0.14286	0.14286	0.20000	0.20000	0.20000	0.14286	1.00000	1.00000
Busstop	0.14286	0.14286	0.20000	0.20000	0.20000	0.14286	1.00000	1.00000
Sum	**4.286**	**4.286**	**12.400**	**12.400**	**12.400**	**4.286**	**38.000**	**38.000**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.233	0.233	0.242	0.242	0.242	0.233	0.184	0.184	0.224	8.273	0.03893	1.41	0.02761
College	0.233	0.233	0.242	0.242	0.242	0.233	0.184	0.184	0.224	8.273			
Office	0.078	0.078	0.081	0.081	0.081	0.078	0.132	0.132	0.092	8.152			
Bank/ATM	0.078	0.078	0.081	0.081	0.081	0.078	0.132	0.132	0.092	8.152			
Hospital	0.078	0.078	0.081	0.081	0.081	0.078	0.132	0.132	0.092	8.152			
Temple	0.233	0.233	0.242	0.242	0.242	0.233	0.184	0.184	0.224	8.273			
Shopping Mall	0.033	0.033	0.016	0.016	0.016	0.033	0.026	0.026	0.025	8.029			
Busstop	0.033	0.033	0.016	0.016	0.016	0.033	0.026	0.026	0.025	8.029			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.273**			**OK**

Name of Respondent: Ashish Shrestha

Office Name: Public Procurement Monitoring OFfice

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	9.00000	9.00000	5.00000	1.00000	3.00000	5.00000	5.00000
College	0.11111	1.00000	0.33333	0.33333	0.11111	0.20000	0.33333	0.20000
Office	0.11111	3.00000	1.00000	1.00000	0.33333	0.33333	1.00000	0.33333
Bank/ATM	0.20000	3.00000	1.00000	1.00000	0.14286	0.33333	1.00000	0.33333
Hospital	1.00000	9.00000	3.00000	7.00000	1.00000	5.00000	7.00000	7.00000
Temple	0.33333	5.00000	3.00000	3.00000	0.20000	1.00000	3.00000	3.00000
Shopping Mall	0.20000	3.00000	1.00000	1.00000	0.14286	0.33333	1.00000	1.00000
Busstop	0.20000	5.00000	3.00000	3.00000	0.14286	0.33333	1.00000	1.00000
Sum	**3.156**	**38.000**	**21.333**	**21.333**	**3.073**	**10.533**	**19.333**	**17.867**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Bus stop	Average	Lamda	C.I	R.C.I	C.R
School	0.317	0.237	0.422	0.234	0.325	0.285	0.259	0.280	0.295	8.749	0.13604	1.41	0.09648
College	0.035	0.026	0.016	0.016	0.036	0.019	0.017	0.011	0.022	8.311			
Office	0.035	0.079	0.047	0.047	0.108	0.032	0.052	0.019	0.052	8.196			
Bank/ATM	0.063	0.079	0.047	0.047	0.046	0.032	0.052	0.019	0.048	8.186			
Hospital	0.317	0.237	0.141	0.328	0.325	0.475	0.362	0.392	0.322	8.952			
Temple	0.106	0.132	0.141	0.141	0.065	0.095	0.155	0.168	0.125	8.832			
Shopping Mall	0.063	0.079	0.047	0.047	0.046	0.032	0.052	0.056	0.053	8.508			
Busstop	0.063	0.132	0.141	0.141	0.046	0.032	0.052	0.056	0.083	8.381			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.952**			**OK**

Name of Respondent:

Office Name: Ministry of Forest and Environment

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.000	9.000	3.000	9.000	1.000	9.000	3.000	9.000
College	0.111	1.000	0.333	3.000	0.200	1.000	0.333	1.000
Office	0.333	3.000	1.000	9.000	1.000	5.000	1.000	5.000
Bank/ATM	0.111	0.333	0.111	1.000	0.111	0.333	0.143	1.000
Hospital	1.000	5.000	1.000	9.000	1.000	5.000	1.000	7.000
Temple	0.111	1.000	0.200	3.000	0.200	1.000	0.200	1.000
Shopping Mall	0.333	3.000	1.000	7.000	1.000	5.000	1.000	5.000
Busstop	0.111	1.000	0.200	1.000	0.143	1.000	0.200	1.000
Sum	**3.111**	**23.333**	**6.844**	**42.000**	**4.654**	**27.333**	**6.876**	**30.000**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.321	0.386	0.438	0.214	0.215	0.329	0.436	0.300	0.330	8.375	0.0536	1.41	0.03798
College	0.036	0.043	0.049	0.071	0.043	0.037	0.048	0.033	0.045	8.237			
Office	0.107	0.129	0.146	0.214	0.215	0.183	0.145	0.167	0.163	8.217			
Bank/ATM	0.036	0.014	0.016	0.024	0.024	0.012	0.021	0.033	0.023	8.172			
Hospital	0.321	0.214	0.146	0.214	0.215	0.183	0.145	0.233	0.209	8.211			
Temple	0.036	0.043	0.029	0.071	0.043	0.037	0.029	0.033	0.040	8.169			
Shopping Mall	0.107	0.129	0.146	0.167	0.215	0.183	0.145	0.167	0.157	8.242			
Busstop	0.036	0.043	0.029	0.024	0.031	0.037	0.029	0.033	0.033	8.297			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.375**			**OK**

Name of Respondent: Rabin Kumar Yadav

Office Name: Ministry of Federal Affairs and General Administration

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	5.00000	1.00000	7.00000	3.00000	3.00000	9.00000	5.00000
College	0.20000	1.00000	0.33333	3.00000	1.00000	1.00000	7.00000	3.00000
Office	1.00000	3.00000	1.00000	5.00000	3.00000	3.00000	9.00000	7.00000
Bank/ATM	0.14286	0.33333	0.20000	1.00000	0.33333	0.33333	3.00000	1.00000
Hospital	0.33333	1.00000	0.33333	3.00000	1.00000	1.00000	3.00000	3.00000
Temple	0.33333	1.00000	0.33333	3.00000	1.00000	1.00000	5.00000	3.00000
Shopping Mall	0.11111	0.14286	0.11111	0.33333	0.33333	0.20000	1.00000	0.33333
Busstop	0.20000	0.33333	0.14286	1.00000	0.33333	0.33333	3.00000	1.00000
Sum	**3.321**	**11.810**	**3.454**	**23.333**	**10.000**	**9.867**	**40.000**	**23.333**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.301	0.423	0.290	0.300	0.300	0.304	0.225	0.214	0.295	8.446	0.06378	1.41	0.04523
College	0.060	0.085	0.097	0.129	0.100	0.101	0.175	0.129	0.109	8.223			
Office	0.301	0.254	0.290	0.214	0.300	0.304	0.225	0.300	0.274	8.301			
Bank/ATM	0.043	0.028	0.058	0.043	0.033	0.034	0.075	0.043	0.045	8.111			
Hospital	0.100	0.085	0.097	0.129	0.100	0.101	0.075	0.129	0.102	8.305			
Temple	0.100	0.085	0.097	0.129	0.100	0.101	0.125	0.129	0.108	8.252			
Shopping Mall	0.033	0.012	0.032	0.014	0.033	0.020	0.025	0.014	0.023	8.101			
Busstop	0.060	0.028	0.041	0.043	0.033	0.034	0.075	0.043	0.045	8.123			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.446**			**OK**

Name of Respondent:

Office Name: MoFAGA

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	7.00000	5.00000	1.00000	7.00000	9.00000	1.00000	1.00000
College	0.14286	1.00000	1.00000	0.20000	1.00000	3.00000	0.142857143	0.142857143
Office	0.20000	1.00000	1.00000	0.20000	1.00000	7.00000	0.142857143	0.142857143
Bank/ATM	1.00000	5.00000	5.00000	1.00000	3.00000	9.00000	1.00000	1.00000
Hospital	0.14286	1.00000	1.00000	0.33333	1.00000	7.00000	0.142857143	0.142857143
Temple	0.11111	0.33333	0.14286	0.11111	0.14286	1.00000	0.142857143	0.142857143
Shopping Mall	1.00000	7.00000	7.00000	1.00000	7.00000	7.00000	1.00000	1.00000
Busstop	1.00000	7.00000	7.00000	1.00000	7.00000	7.00000	1.00000	1.00000
Sum	**4.597**	**29.333**	**27.143**	**4.844**	**27.143**	**50.000**	**4.571**	**4.571**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.218	0.239	0.184	0.206	0.258	0.180	0.219	0.219	0.215	8.750			
College	0.031	0.034	0.037	0.041	0.037	0.060	0.031	0.031	0.038	8.629			
Office	0.044	0.034	0.037	0.041	0.037	0.140	0.031	0.031	0.049	8.393			
Bank/ATM	0.218	0.170	0.184	0.206	0.111	0.180	0.219	0.219	0.188	8.511			
Hospital	0.031	0.034	0.037	0.069	0.037	0.140	0.031	0.031	0.051	8.334	0.12277	1.41	0.08707
Temple	0.024	0.011	0.005	0.023	0.005	0.020	0.031	0.031	0.019	8.105			
Shopping Mall	0.218	0.239	0.258	0.206	0.258	0.140	0.219	0.219	0.219	8.859			
Busstop	0.218	0.239	0.258	0.206	0.258	0.140	0.219	0.219	0.219	8.859			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.859**			**OK**

Name of Respondent: Balkumar Nepal

Office Name: DUDBC

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	3.00000	0.33333	0.33333	0.33333	3.00000	0.33333
College	1.00000	1.00000	3.00000	0.33333	0.33333	0.33333	3.00000	0.33333
Office	0.33333	0.33333	1.00000	0.20000	0.20000	0.20000	1.00000	0.20000
Bank/ATM	3.00000	3.00000	5.00000	1.00000	1.00000	1.00000	5.00000	1.00000
Hospital	3.00000	3.00000	5.00000	1.00000	1.00000	1.00000	5.00000	1.00000
Temple	3.00000	3.00000	5.00000	1.00000	1.00000	1.00000	5.00000	1.00000
Shopping Mall	0.33333	0.33333	1.00000	0.20000	0.20000	0.20000	1.00000	0.20000
Busstop	3.00000	3.00000	5.00000	1.00000	1.00000	1.00000	5.00000	1.00000
Sum	**14.667**	**14.667**	**28.000**	**5.067**	**5.067**	**5.067**	**28.000**	**5.067**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.068	0.068	0.107	0.066	0.066	0.066	0.107	0.066	0.077	8.065	0.01908	1.41	0.01353
College	0.068	0.068	0.107	0.066	0.066	0.066	0.107	0.066	0.077	8.065			
Office	0.023	0.023	0.036	0.039	0.039	0.039	0.036	0.039	0.034	8.019			
Bank/ATM	0.205	0.205	0.179	0.197	0.197	0.197	0.179	0.197	0.194	8.134			
Hospital	0.205	0.205	0.179	0.197	0.197	0.197	0.179	0.197	0.194	8.134			
Temple	0.205	0.205	0.179	0.197	0.197	0.197	0.179	0.197	0.194	8.134			
Shopping Mall	0.023	0.023	0.036	0.039	0.039	0.039	0.036	0.039	0.034	8.019			
Busstop	0.205	0.205	0.179	0.197	0.197	0.197	0.179	0.197	0.194	8.134			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.134**			**OK**

Name of Respondent: Sundar Shrestha

Office Name: DUDBC

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	9.00000	9.00000	1.00000	5.00000	1.00000	1.00000	1.00000
College	0.11111	1.00000	1.00000	0.11111	0.20000	0.11111	0.11111	0.11111
Office	0.11111	1.00000	1.00000	0.11111	0.20000	0.11111	0.11111	0.11111
Bank/ATM	1.00000	9.00000	9.00000	1.00000	5.00000	1.00000	1.00000	1.00000
Hospital	0.20000	5.00000	5.00000	0.20000	1.00000	0.20000	0.20000	0.20000
Temple	1.00000	9.00000	9.00000	1.00000	5.00000	1.00000	1.00000	1.00000
Shopping Mall	1.00000	9.00000	9.00000	1.00000	5.00000	1.00000	1.00000	1.00000
Busstop	1.00000	9.00000	9.00000	1.00000	5.00000	1.00000	1.00000	1.00000
Sum	**5.422**	**52.000**	**52.000**	**5.422**	**26.400**	**5.422**	**5.422**	**5.422**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.184	0.173	0.173	0.184	0.189	0.184	0.184	0.184	0.182	8.256	0.03655	1.41	0.02592
College	0.020	0.019	0.019	0.020	0.008	0.020	0.020	0.020	0.019	8.012			
Office	0.020	0.019	0.019	0.020	0.008	0.020	0.020	0.020	0.019	8.012			
Bank/ ATM	0.184	0.173	0.173	0.184	0.189	0.184	0.184	0.184	0.182	8.256			
Hospital	0.037	0.096	0.096	0.037	0.038	0.037	0.037	0.037	0.052	8.097			
Temple	0.184	0.173	0.173	0.184	0.189	0.184	0.184	0.184	0.182	8.256			
Shopping Mall	0.184	0.173	0.173	0.184	0.189	0.184	0.184	0.184	0.182	8.256			
Busstop	0.184	0.173	0.173	0.184	0.189	0.184	0.184	0.184	0.182	8.256			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.256**			**OK**

Name of Respondent: -

Office Name: MoHA

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	3.00000	5.00000	3.00000	3.00000	1.00000	5.00000	9.00000
College	0.33333	1.00000	3.00000	1.00000	1.00000	0.33333	3.00000	5.00000
Office	0.20000	0.33333	1.00000	0.33333	0.33333	0.20000	1.00000	3.00000
Bank/ATM	0.33333	1.00000	3.00000	1.00000	1.00000	0.33333	3.00000	5.00000
Hospital	0.33333	1.00000	3.00000	1.00000	1.00000	0.33333	3.00000	5.00000
Temple	1.00000	3.00000	5.00000	3.00000	3.00000	1.00000	5.00000	9.00000
Shopping Mall	0.20000	0.33333	1.00000	0.33333	0.33333	0.20000	1.00000	3.00000
Busstop	0.11111	0.20000	0.33333	0.20000	0.20000	0.11111	0.33333	1.00000
Sum	**3.511**	**9.867**	**21.333**	**9.867**	**9.867**	**3.511**	**21.333**	**40.000**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.285	0.304	0.234	0.304	0.304	0.285	0.234	0.225	0.272	8.235	0.03361	1.41	0.02384
College	0.095	0.101	0.141	0.101	0.101	0.095	0.141	0.125	0.113	8.173			
Office	0.057	0.034	0.047	0.034	0.034	0.057	0.047	0.075	0.048	8.019			
Bank/ ATM	0.095	0.101	0.141	0.101	0.101	0.095	0.141	0.125	0.113	8.173			
Hospital	0.095	0.101	0.141	0.101	0.101	0.095	0.141	0.125	0.113	8.173			
Temple	0.285	0.304	0.234	0.304	0.304	0.285	0.234	0.225	0.272	8.235			
Shopping Mall	0.057	0.034	0.047	0.034	0.034	0.057	0.047	0.075	0.048	8.019			
Busstop	0.032	0.020	0.016	0.020	0.020	0.032	0.016	0.025	0.023	8.095			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.235**			**OK**

Name of Respondent: Prativa Koirala

Office Name: Federal Parliament Secretariat

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	5.00000	0.33333	3.00000	5.00000	3.00000	0.33333
College	1.00000	1.00000	5.00000	0.33333	3.00000	5.00000	3.00000	0.33333
Office	0.20000	0.20000	1.00000	0.14286	0.33333	1.00000	0.33333	0.14286
Bank/ATM	3.00000	3.00000	7.00000	1.00000	5.00000	7.00000	5.00000	1.00000
Hospital	0.33333	0.33333	3.00000	0.20000	1.00000	3.00000	1.00000	0.20000
Temple	0.20000	0.20000	1.00000	0.14286	0.33333	1.00000	0.33333	0.14286
Shopping Mall	0.33333	0.33333	3.00000	0.20000	1.00000	3.00000	1.00000	0.20000
Busstop	3.00000	3.00000	7.00000	1.00000	5.00000	7.00000	5.00000	1.00000
Sum	**9.067**	**9.067**	**32.000**	**3.352**	**18.667**	**32.000**	**18.667**	**3.352**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.110	0.110	0.156	0.099	0.161	0.156	0.161	0.099	0.132	8.349	0.06348	1.41	0.04502
College	0.110	0.110	0.156	0.099	0.161	0.156	0.161	0.099	0.132	8.349			
Office	0.022	0.022	0.031	0.043	0.018	0.031	0.018	0.043	0.028	8.082			
Bank/ ATM	0.331	0.331	0.219	0.298	0.268	0.219	0.268	0.298	0.279	8.444			
Hospital	0.037	0.037	0.094	0.060	0.054	0.094	0.054	0.060	0.061	8.072			
Temple	0.022	0.022	0.031	0.043	0.018	0.031	0.018	0.043	0.028	8.082			
Shopping Mall	0.037	0.037	0.094	0.060	0.054	0.094	0.054	0.060	0.061	8.072			
Busstop	0.331	0.331	0.219	0.298	0.268	0.219	0.268	0.298	0.279	8.444			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.444**			**OK**

Name of Respondent: -

Office Name: Ministry of Home Affairs

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	3.00000	5.00000	0.33333	0.33333	0.33333	0.33333	0.33333
College	0.33333	1.00000	3.00000	0.20000	0.20000	0.20000	0.20000	0.20000
Office	0.20000	0.33333	1.00000	0.14286	0.14286	0.14286	0.14286	0.14286
Bank/ATM	3.00000	5.00000	7.00000	1.00000	1.00000	1.00000	1.00000	1.00000
Hospital	3.00000	5.00000	7.00000	1.00000	1.00000	1.00000	1.00000	1.00000
Temple	3.00000	5.00000	7.00000	1.00000	1.00000	1.00000	1.00000	1.00000
Shopping Mall	3.00000	5.00000	7.00000	1.00000	1.00000	1.00000	1.00000	1.00000
Busstop	3.00000	5.00000	7.00000	1.00000	1.00000	1.00000	1.00000	1.00000
Sum	**16.533**	**29.333**	**44.000**	**5.676**	**5.676**	**5.676**	**5.676**	**5.676**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.060	0.102	0.114	0.059	0.059	0.059	0.059	0.059	0.071	8.150	0.02378	1.41	0.01686
College	0.020	0.034	0.068	0.035	0.035	0.035	0.035	0.035	0.037	8.026			
Office	0.012	0.011	0.023	0.025	0.025	0.025	0.025	0.025	0.022	8.021			
Bank/ ATM	0.181	0.170	0.159	0.176	0.176	0.176	0.176	0.176	0.174	8.166			
Hospital	0.181	0.170	0.159	0.176	0.176	0.176	0.176	0.176	0.174	8.166			
Temple	0.181	0.170	0.159	0.176	0.176	0.176	0.176	0.176	0.174	8.166			
Shopping Mall	0.181	0.170	0.159	0.176	0.176	0.176	0.176	0.176	0.174	8.166			
Busstop	0.181	0.170	0.159	0.176	0.176	0.176	0.176	0.176	0.174	8.166			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.166**			**OK**

Name of Respondent: Mahima Timalsina

Office Name: MoLJPA

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	5.00000	5.00000	0.33333	1.00000	7.00000	3.00000	0.33333
College	0.20000	1.00000	1.00000	0.14286	0.20000	3.00000	0.33333	0.14286
Office	0.20000	1.00000	1.00000	0.14286	0.20000	3.00000	0.33333	0.14286
Bank/ATM	3.00000	7.00000	7.00000	1.00000	3.00000	9.00000	5.00000	1.00000
Hospital	1.00000	5.00000	5.00000	0.33333	1.00000	7.00000	3.00000	0.33333
Temple	0.14286	0.33333	0.33333	0.11111	0.14286	1.00000	0.20000	0.11111
Shopping Mall	0.33333	3.00000	3.00000	0.20000	0.33333	5.00000	1.00000	0.20000
Busstop	3.00000	7.00000	7.00000	1.00000	3.00000	9.00000	5.00000	1.00000
Sum	**8.876**	**29.333**	**29.333**	**3.263**	**8.876**	**44.000**	**17.867**	**3.263**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.113	0.170	0.170	0.102	0.113	0.159	0.168	0.102	0.137	8.552	0.08764	1.41	0.06216
College	0.023	0.034	0.034	0.044	0.023	0.068	0.019	0.044	0.036	8.061			
Office	0.023	0.034	0.034	0.044	0.023	0.068	0.019	0.044	0.036	8.061			
Bank/ATM	0.338	0.239	0.239	0.306	0.338	0.205	0.280	0.306	0.281	8.613			
Hospital	0.113	0.170	0.170	0.102	0.113	0.159	0.168	0.102	0.137	8.552			
Temple	0.016	0.011	0.011	0.034	0.016	0.023	0.011	0.034	0.020	8.136			
Shopping Mall	0.038	0.102	0.102	0.061	0.038	0.114	0.056	0.061	0.071	8.244			
Busstop	0.338	0.239	0.239	0.306	0.338	0.205	0.280	0.306	0.281	8.613			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.613**			**OK**

Name of Respondent: Helina Shrestha

Office Name: Ministry of Land Management, Cooperation and Poverty Alleviation

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	3.00000	3.00000	3.00000	5.00000	5.00000	1.00000
College	1.00000	1.00000	3.00000	3.00000	3.00000	5.00000	5.00000	1.00000
Office	0.33333	0.33333	1.00000	1.00000	1.00000	3.00000	3.00000	0.33333
Bank/ATM	0.33333	0.33333	1.00000	1.00000	1.00000	3.00000	3.00000	0.33333
Hospital	0.33333	0.33333	1.00000	1.00000	1.00000	3.00000	3.00000	0.33333
Temple	0.20000	0.20000	0.33333	0.33333	0.33333	1.00000	1.00000	0.20000
Shopping Mall	0.20000	0.20000	0.33333	0.33333	0.33333	1.00000	1.00000	0.20000
Busstop	1.00000	1.00000	3.00000	3.00000	3.00000	5.00000	5.00000	1.00000
Sum	**4.400**	**4.400**	**12.667**	**12.667**	**12.667**	**26.000**	**26.000**	**4.400**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.227	0.227	0.237	0.237	0.237	0.192	0.192	0.227	0.222	8.164	0.02343	1.41	0.01662
College	0.227	0.227	0.237	0.237	0.237	0.192	0.192	0.227	0.222	8.164			
Office	0.076	0.076	0.079	0.079	0.079	0.115	0.115	0.076	0.087	8.081			
Bank/ATM	0.076	0.076	0.079	0.079	0.079	0.115	0.115	0.076	0.087	8.081			
Hospital	0.076	0.076	0.079	0.079	0.079	0.115	0.115	0.076	0.087	8.081			
Temple	0.045	0.045	0.026	0.026	0.026	0.038	0.038	0.045	0.037	8.026			
Shopping Mall	0.045	0.045	0.026	0.026	0.026	0.038	0.038	0.045	0.037	8.026			
Busstop	0.227	0.227	0.237	0.237	0.237	0.192	0.192	0.227	0.222	8.164			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.164**			**OK**

Name of Respondent:

Office Name: MoHA

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	1.00000	3.00000	1.00000	5.00000	5.00000	5.00000
College	1.00000	1.00000	1.00000	3.00000	1.00000	5.00000	5.00000	5.00000
Office	1.00000	1.00000	1.00000	3.00000	1.00000	5.00000	5.00000	5.00000
Bank/ATM	0.33333	0.33333	0.33333	1.00000	0.33333	3.00000	3.00000	3.00000
Hospital	1.00000	1.00000	1.00000	3.00000	1.00000	5.00000	5.00000	5.00000
Temple	0.20000	0.20000	0.20000	0.33333	0.20000	1.00000	1.00000	1.00000
Shopping Mall	0.20000	0.20000	0.20000	0.33333	0.20000	1.00000	1.00000	1.00000
Busstop	0.20000	0.20000	0.20000	0.33333	0.20000	1.00000	1.00000	1.00000
Sum	**4.933**	**4.933**	**4.933**	**14.000**	**4.933**	**26.000**	**26.000**	**26.000**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.203	0.203	0.203	0.214	0.203	0.192	0.192	0.192	0.200	8.110	0.01568	1.41	0.01112
College	0.203	0.203	0.203	0.214	0.203	0.192	0.192	0.192	0.200	8.110			
Office	0.203	0.203	0.203	0.214	0.203	0.192	0.192	0.192	0.200	8.110			
Bank/ATM	0.068	0.068	0.068	0.071	0.068	0.115	0.115	0.115	0.086	8.048			
Hospital	0.203	0.203	0.203	0.214	0.203	0.192	0.192	0.192	0.200	8.110			
Temple	0.041	0.041	0.041	0.024	0.041	0.038	0.038	0.038	0.038	8.014			
Shopping Mall	0.041	0.041	0.041	0.024	0.041	0.038	0.038	0.038	0.038	8.014			
Busstop	0.041	0.041	0.041	0.024	0.041	0.038	0.038	0.038	0.038	8.014			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.110**			**OK**

Name of Respondent: -

Office Name: Department of Roads, Lalitpur

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	5.00000	9.00000	1.00000	3.00000	1.00000	5.00000	1.00000
College	0.20000	1.00000	5.00000	0.20000	0.33333	0.20000	1.00000	0.20000
Office	0.11111	0.20000	1.00000	0.11111	0.14286	0.11111	0.20000	0.11111
Bank/ATM	1.00000	5.00000	9.00000	1.00000	3.00000	1.00000	5.00000	1.00000
Hospital	0.33333	3.00000	7.00000	0.33333	1.00000	0.33333	3.00000	0.33333
Temple	1.00000	5.00000	9.00000	1.00000	3.00000	1.00000	5.00000	1.00000
Shopping Mall	0.20000	1.00000	5.00000	0.20000	0.33333	0.20000	1.00000	0.20000
Busstop	1.00000	5.00000	9.00000	1.00000	3.00000	1.00000	5.00000	1.00000
Sum	**4.844**	**25.200**	**54.000**	**4.844**	**13.810**	**4.844**	**25.200**	**4.844**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.206	0.198	0.167	0.206	0.217	0.206	0.198	0.206	0.201	8.349	0.05134	1.41	0.03641
College	0.041	0.040	0.093	0.041	0.024	0.041	0.040	0.041	0.045	8.107			
Office	0.023	0.008	0.019	0.023	0.010	0.023	0.008	0.023	0.017	8.039			
Bank/ ATM	0.206	0.198	0.167	0.206	0.217	0.206	0.198	0.206	0.201	8.349			
Hospital	0.069	0.119	0.130	0.069	0.072	0.069	0.119	0.069	0.089	8.359			
Temple	0.206	0.198	0.167	0.206	0.217	0.206	0.198	0.206	0.201	8.349			
Shopping Mall	0.041	0.040	0.093	0.041	0.024	0.041	0.040	0.041	0.045	8.107			
Busstop	0.206	0.198	0.167	0.206	0.217	0.206	0.198	0.206	0.201	8.349			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.359**			**OK**

Name of Respondent: Kapil Mani Ghimire

Office Name: Ministry of Foreign Affairs, Singhadurbar

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	7.00000	1.00000	0.33333	1.00000	3.00000	5.00000	0.33333
College	0.14286	1.00000	0.14286	0.11111	0.14286	0.20000	0.33333	0.11111
Office	1.00000	7.00000	1.00000	0.33333	1.00000	3.00000	5.00000	0.33333
Bank/ATM	3.00000	9.00000	3.00000	1.00000	3.00000	5.00000	7.00000	1.00000
Hospital	1.00000	7.00000	1.00000	0.33333	1.00000	3.00000	5.00000	0.33333
Temple	0.33333	5.00000	0.33333	0.20000	0.33333	1.00000	3.00000	0.20000
Shopping Mall	0.20000	3.00000	0.20000	0.14286	0.20000	0.33333	1.00000	0.14286
Busstop	3.00000	9.00000	3.00000	1.00000	3.00000	5.00000	7.00000	1.00000
Sum	**9.676**	**48.000**	**9.676**	**3.454**	**9.676**	**20.533**	**33.333**	**3.454**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.103	0.146	0.103	0.097	0.103	0.146	0.150	0.097	0.118	8.430	0.06851	1.41	0.04859
College	0.015	0.021	0.015	0.032	0.015	0.010	0.010	0.032	0.019	8.102			
Office	0.103	0.146	0.103	0.097	0.103	0.146	0.150	0.097	0.118	8.430			
Bank/ ATM	0.310	0.188	0.310	0.290	0.310	0.244	0.210	0.290	0.269	8.480			
Hospital	0.103	0.146	0.103	0.097	0.103	0.146	0.150	0.097	0.118	8.430			
Temple	0.034	0.104	0.034	0.058	0.034	0.049	0.090	0.058	0.058	8.167			
Shopping Mall	0.021	0.063	0.021	0.041	0.021	0.016	0.030	0.041	0.032	8.034			
Busstop	0.310	0.188	0.310	0.290	0.310	0.244	0.210	0.290	0.269	8.480			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.480**			**OK**

Name of Respondent: Sandip Kumar Singh

Office Name: Ministry of Women, Children and Senior Citizens

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	3.00000	9.00000	5.00000	3.00000	7.00000	5.00000	1.00000
College	0.33333	1.00000	7.00000	3.00000	1.00000	5.00000	3.00000	0.33333
Office	0.11111	0.14286	1.00000	0.20000	0.14286	0.33333	0.20000	0.11111
Bank/ATM	0.20000	0.33333	5.00000	1.00000	0.33333	3.00000	1.00000	0.20000
Hospital	0.33333	1.00000	7.00000	3.00000	1.00000	5.00000	3.00000	0.33333
Temple	0.14286	0.20000	3.00000	0.33333	0.20000	1.00000	0.33333	0.14286
Shopping Mall	0.20000	0.33333	5.00000	1.00000	0.33333	3.00000	1.00000	0.20000
Busstop	1.00000	3.00000	9.00000	5.00000	3.00000	7.00000	5.00000	1.00000
Sum	**3.321**	**9.010**	**46.000**	**18.533**	**9.010**	**31.333**	**18.533**	**3.321**

Normalized Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R.C.I	C.R
School	0.301	0.333	0.196	0.270	0.333	0.223	0.270	0.301	0.278	8.572	0.08175	1.41	0.05798
College	0.100	0.111	0.152	0.162	0.111	0.160	0.162	0.100	0.132	8.531			
Office	0.033	0.016	0.022	0.011	0.016	0.011	0.011	0.033	0.019	8.129			
Bank/ATM	0.060	0.037	0.109	0.054	0.037	0.096	0.054	0.060	0.063	8.215			
Hospital	0.100	0.111	0.152	0.162	0.111	0.160	0.162	0.100	0.132	8.531			
Temple	0.043	0.022	0.065	0.018	0.022	0.032	0.018	0.043	0.033	8.039			
Shopping Mall	0.060	0.037	0.109	0.054	0.037	0.096	0.054	0.060	0.063	8.215			
Busstop	0.301	0.333	0.196	0.270	0.333	0.223	0.270	0.301	0.278	8.572			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.572**			**OK**

Name of Respondent: Pooja Nepal

Office Name: DUDBC

Crisp Comparasion Matrix

	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.00000	1.00000	3.00000	3.00000	5.00000	7.00000	7.00000	0.33333
College	1.00000	1.00000	3.00000	3.00000	5.00000	7.00000	7.00000	0.33333
Office	0.33333	0.33333	1.00000	1.00000	3.00000	5.00000	5.00000	0.20000
Bank/ATM	0.33333	0.33333	1.00000	1.00000	3.00000	5.00000	5.00000	0.20000
Hospital	0.20000	0.20000	0.33333	0.33333	1.00000	3.00000	3.00000	0.14286
Temple	0.14286	0.14286	0.20000	0.20000	0.33333	1.00000	1.00000	0.11111
Shopping Mall	0.14286	0.14286	0.20000	0.20000	0.33333	1.00000	1.00000	0.11111
Busstop	3.00000	3.00000	5.00000	5.00000	7.00000	9.00000	9.00000	1.00000
Sum	**6.152**	**6.152**	**13.733**	**13.733**	**24.667**	**38.000**	**38.000**	**2.432**

Normalized Matrix

	School	College	Office	Bank/ ATM	Hospital	Temple	Shopping Mall	Busstop	Average	Lamda	C.I	R. C.I	C.R
School	0.163	0.163	0.218	0.218	0.203	0.184	0.184	0.137	0.184	8.639	0.09426	1.41	0.06685
College	0.163	0.163	0.218	0.218	0.203	0.184	0.184	0.137	0.184	8.639			
Office	0.054	0.054	0.073	0.073	0.122	0.132	0.132	0.082	0.090	8.298			
Bank/ ATM	0.054	0.054	0.073	0.073	0.122	0.132	0.132	0.082	0.090	8.298			
Hospital	0.033	0.033	0.024	0.024	0.041	0.079	0.079	0.059	0.046	8.022			
Temple	0.023	0.023	0.015	0.015	0.014	0.026	0.026	0.046	0.023	8.143			
Shopping Mall	0.023	0.023	0.015	0.015	0.014	0.026	0.026	0.046	0.023	8.143			
Busstop	0.488	0.488	0.364	0.364	0.284	0.237	0.237	0.411	0.359	8.660			
Sum	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**8.660**			**OK**

Geometric Mean

Crisp Comparasion Matrix

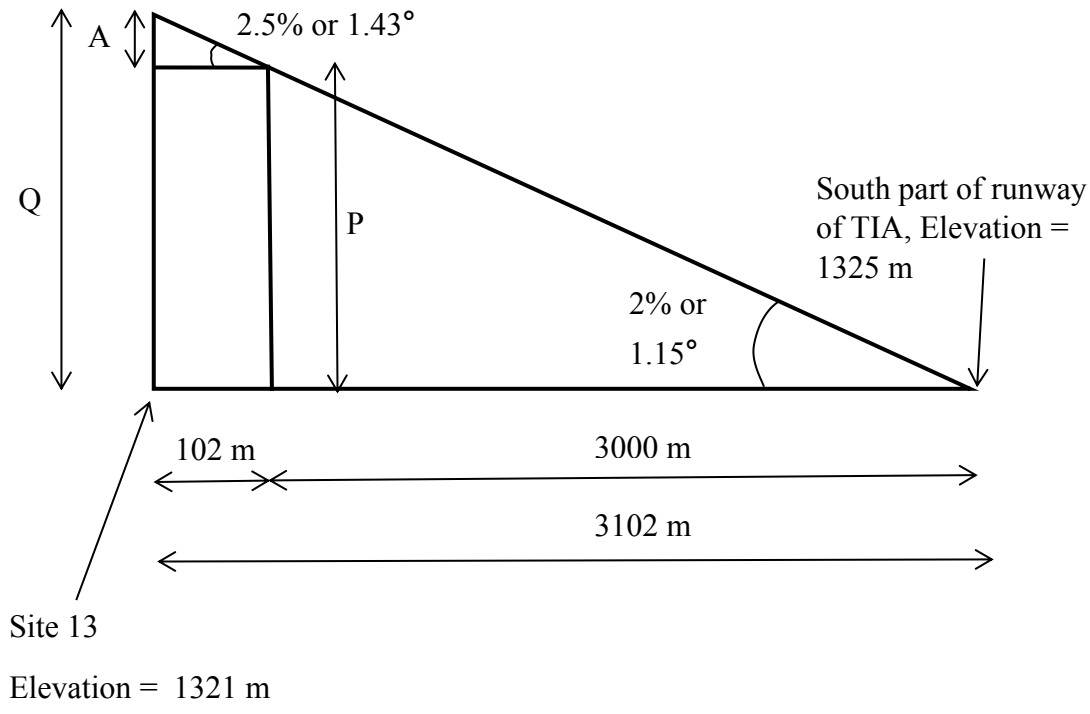
	School	College	Office	Bank/ATM	Hospital	Temple	Shopping Mall	Busstop
School	1.000	2.108	2.585	1.264	1.598	1.747	2.252	1.035
College	0.474	1.000	1.279	0.634	0.665	0.828	1.105	0.504
Office	0.387	0.782	1.000	0.516	0.570	0.797	0.877	0.514
Bank/ATM	0.791	1.577	1.938	1.000	1.170	1.365	1.990	0.977
Hospital	0.626	1.504	1.754	0.855	1.000	1.294	1.538	0.749
Temple	0.572	1.208	1.255	0.733	0.773	1.000	1.216	0.760
Shopping Mall	0.444	0.905	1.140	0.503	0.650	0.822	1.000	0.574
Busstop	0.966	1.984	1.946	1.024	1.335	1.316	1.742	1.000
Sum	**5.261**	**11.068**	**12.897**	**6.527**	**7.761**	**9.169**	**11.720**	**6.113**

Normalized Matrix

Amenities	**School**	**College**	**Office**	**Bank/ATM**	**Hospital**	**Temple**	**Shopping Mall**	**Busstop**	**Weight**	**Lamda**	**C.I**	**R.C.I**	**C.R**
School	0.190	0.190	0.200	0.194	0.206	0.191	0.192	0.169	0.191565	8.018	0.002809	1.41	0.001992
College	0.090	0.090	0.099	0.097	0.086	0.090	0.094	0.082	0.091193	8.016			
Office	0.074	0.071	0.078	0.079	0.073	0.087	0.075	0.084	0.077505	8.012			
Bank/ATM	0.150	0.143	0.150	0.153	0.151	0.149	0.170	0.160	0.153201	8.015			
Hospital	0.119	0.136	0.136	0.131	0.129	0.141	0.131	0.123	0.130690	8.015			
Temple	0.109	0.109	0.097	0.112	0.100	0.109	0.104	0.124	0.108020	8.014			
Shopping Mall	0.084	0.082	0.088	0.077	0.084	0.090	0.085	0.094	0.085532	8.014			
Busstop	0.184	0.179	0.151	0.157	0.172	0.144	0.149	0.164	0.162294	8.020			
Sum	**1.000000**	**1.000000**	**1.000000**	**1.000000**	**1.000000**	**1.000000**	**1.000000**	**1.000000**	**1.000000**	**8.020**			**OK**

APPENDIX 6: Analysis of Height Restriction of CAAN for Sites 13 and 34

Analysis for Site 13



Now,

Tan1.15° = P/3000

or, P = 60.22 m

And,

Tan 1.43° = A/102

Or, A = 2.54 m

Then,

Q = P+A

= 60.22+2.54

Or, Q = 62.76 m

And,

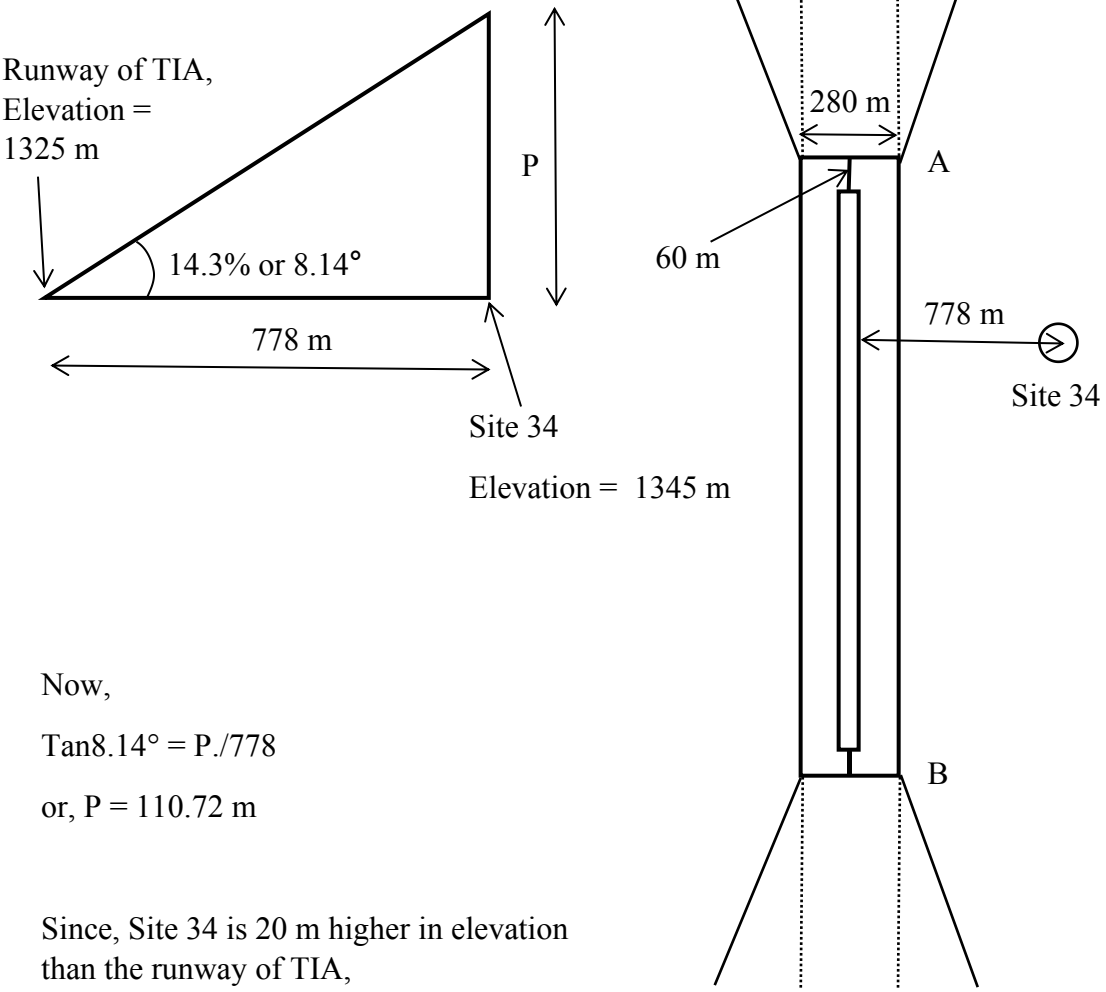
Since Site 13 is 4 m lower in elevation than the south part of runway of TIA, permissible height of apartment at site 13

= 62.75 + 4

= 66.76 m > 25 m

Hence, medium-rise apartment is permissible to be built at Site 13 as per CAAN Height Restriction.

Analysis for Site 34



Now,

Tan8.14° = P./778

or, P = 110.72 m

Since, Site 34 is 20 m higher in elevation than the runway of TIA,

Permissible height of apartment = 110.72-20

80.72 m > 25 m

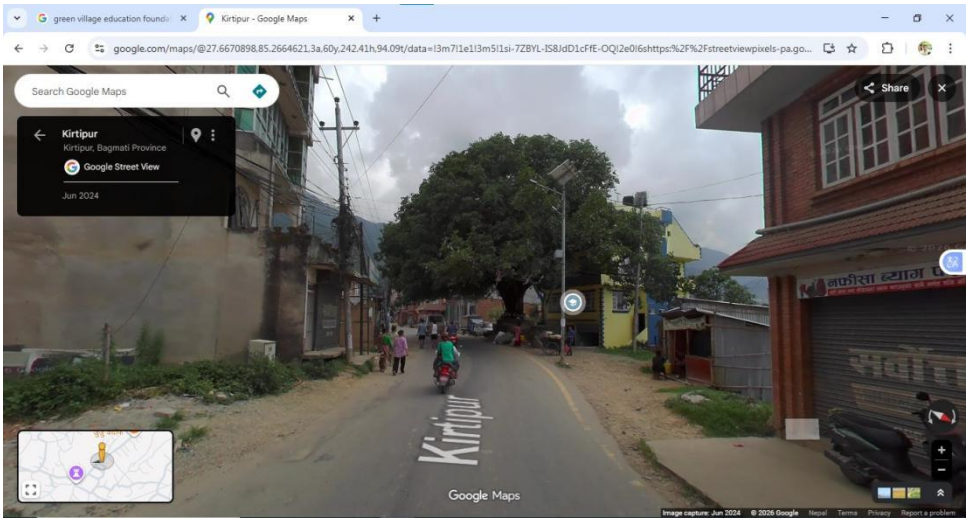
Hence, medium-rise apartment is permissible to be built at Site 34 as per CAAN Height Restriction.

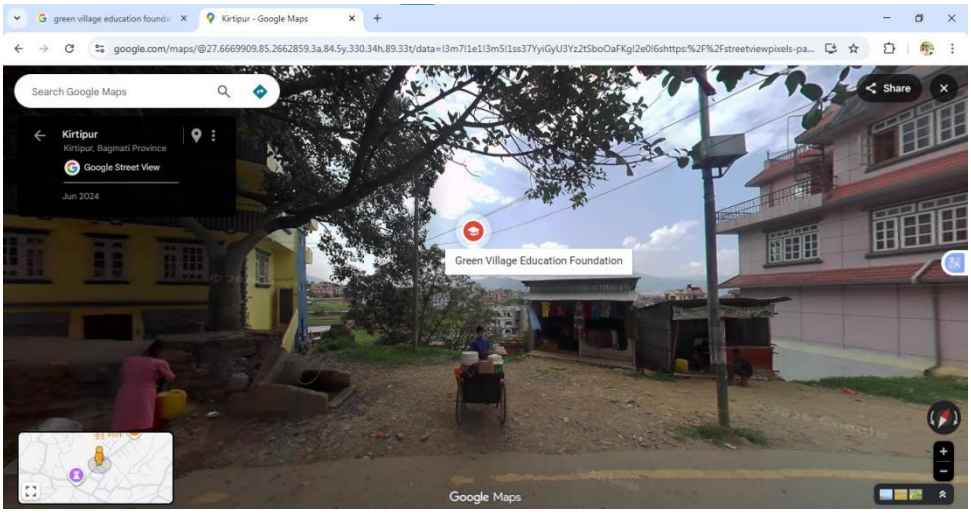
APPENDIX 7: Permissible height for Candidate Sites that are within 4000 m from mid point of Runway of Airport (Elevation of the mid point = 1325 m)

Candidate Site Id	Elevation (m)	Permissible height of the apartment (m)
14	1321	= 1325+45-1321 = 49
15	1321	= 1325+45-1321 = 49
16	1321	= 1325+45-1321 = 49
17	1321	= 1325+45-1321 = 49
18	1321	= 1325+45-1321 = 49
19	1321	= 1325+45-1321 = 49
20	1321	= 1325+45-1321 = 49
21	1321	= 1325+45-1321 = 49
22	1321	= 1325+45-1321 = 49
23	1321	= 1325+45-1321 = 49
24	1321	= 1325+45-1321 = 49
25	1323	= 1325+45-1321 = 47
26	1331	= 1325+45-1331 = 39
28	1337	= 1325+45-1337 = 33
29	1338	= 1325+45-1338 = 32
30	1321	= 1325+45-1321 = 49
31	1340	= 1325+45-1340 = 30
32	1340	= 1325+45-1340 = 30
33	1321	= 1325+45-1321 = 49
34	1345	= 1325+45-1345 = 25
35	1345	= 1325+45-1345 = 25
36	1344	= 1325+45-1344 = 26
37	1336	= 1325+45-1336 = 34
38	1342	= 1325+45-1342 = 28
57	1321	= 1325+45-1321 = 49
58	1323	= 1325+45-1323 = 47

APPENDIX 8: Google images of Final Sites

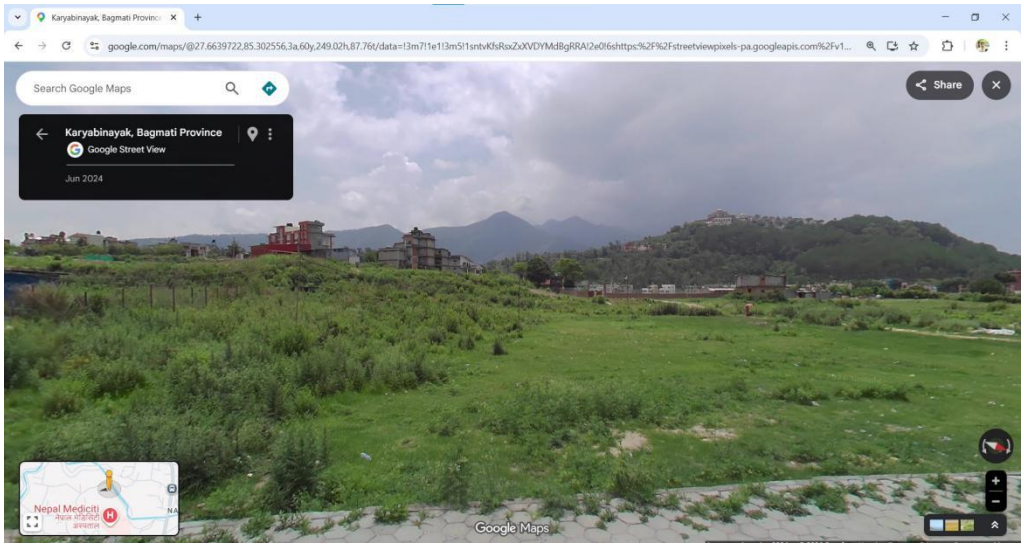
Rank 1: Site 2: Kirtipur-9, Near Nepal APF School



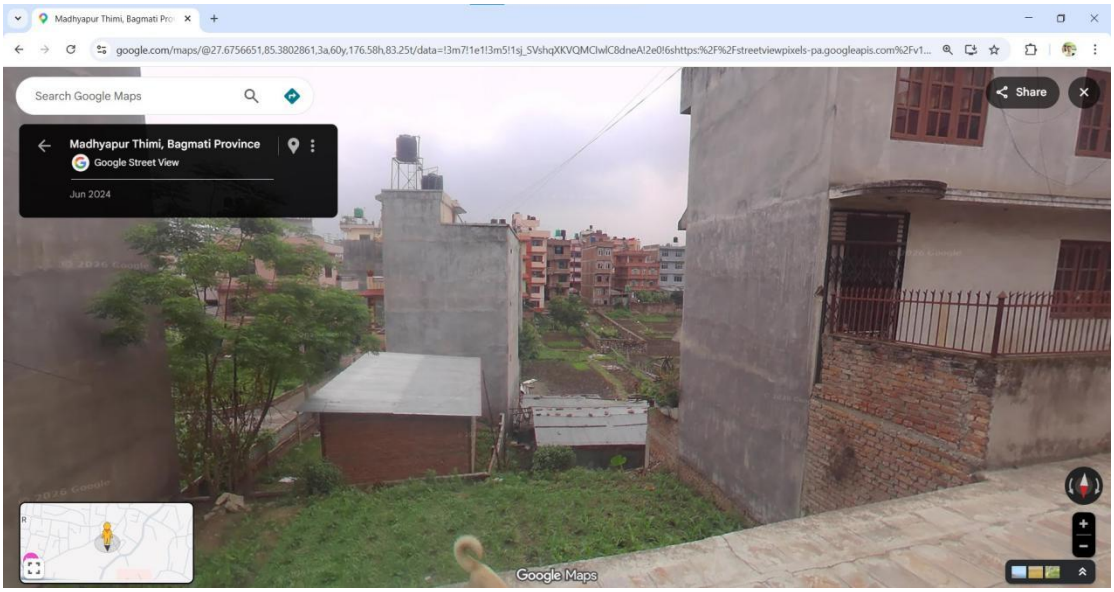


Rank 2: Site 8: Kirtipur-7, Panga

Rank 3: Site 12: Lalitpur-18, Near Nepal Mediciti Hospital

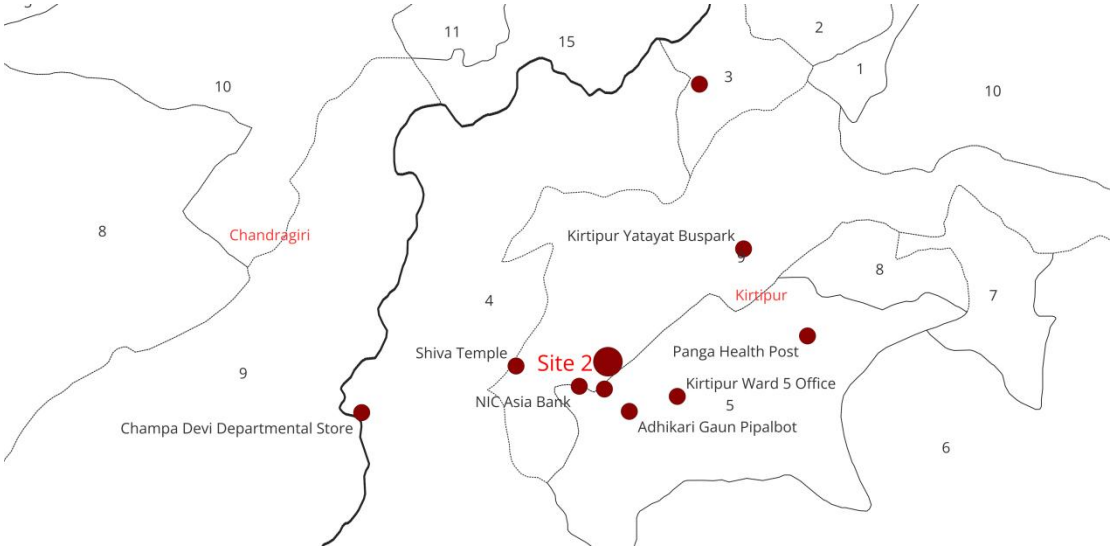


Rank 4: Site 58: Madhyapur Thimi-2, Gatthaghar

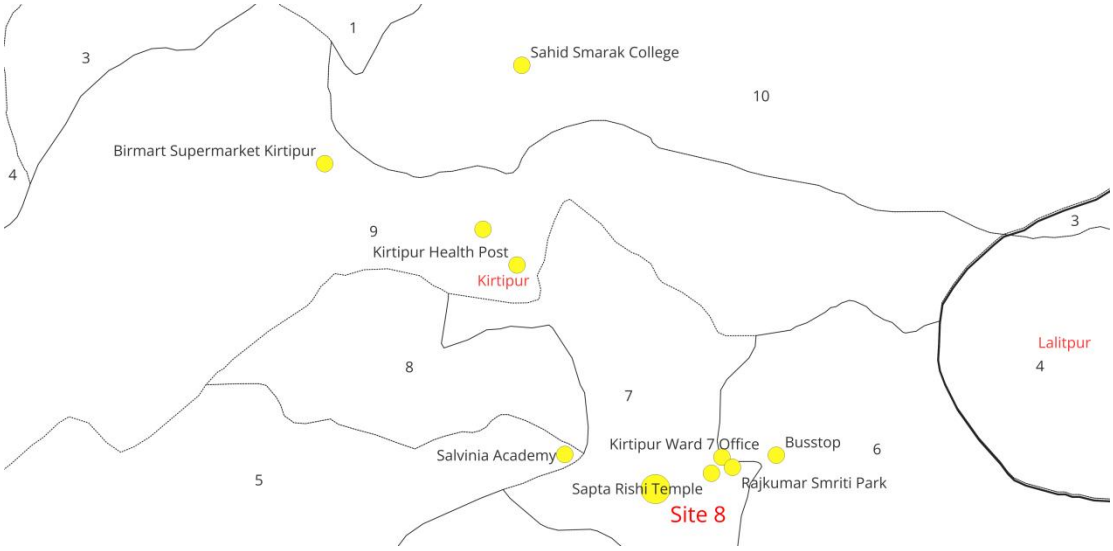


APPENDIX 9: Amenities near Optimal Sites

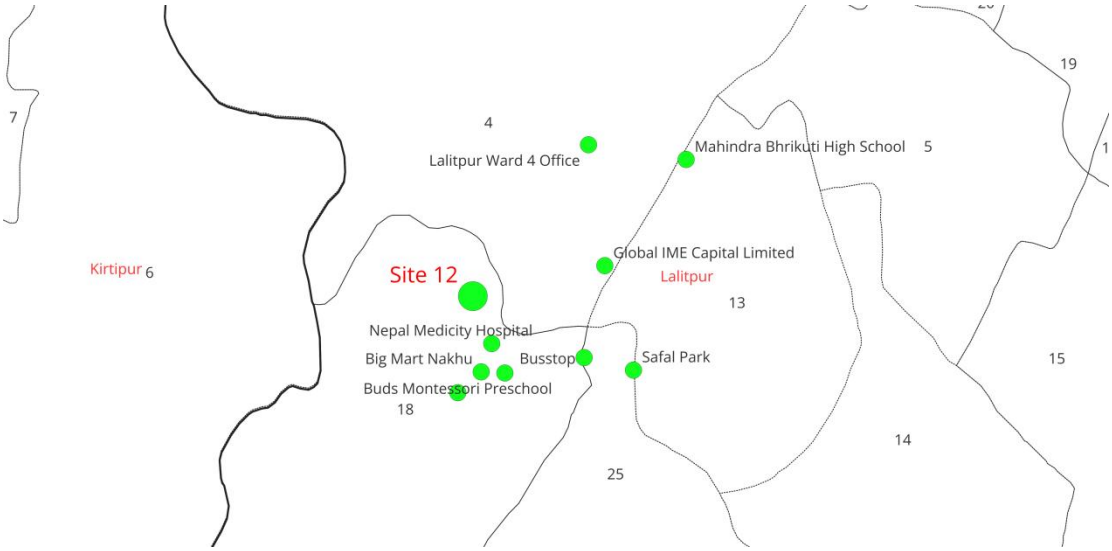
Amenities near Site 2



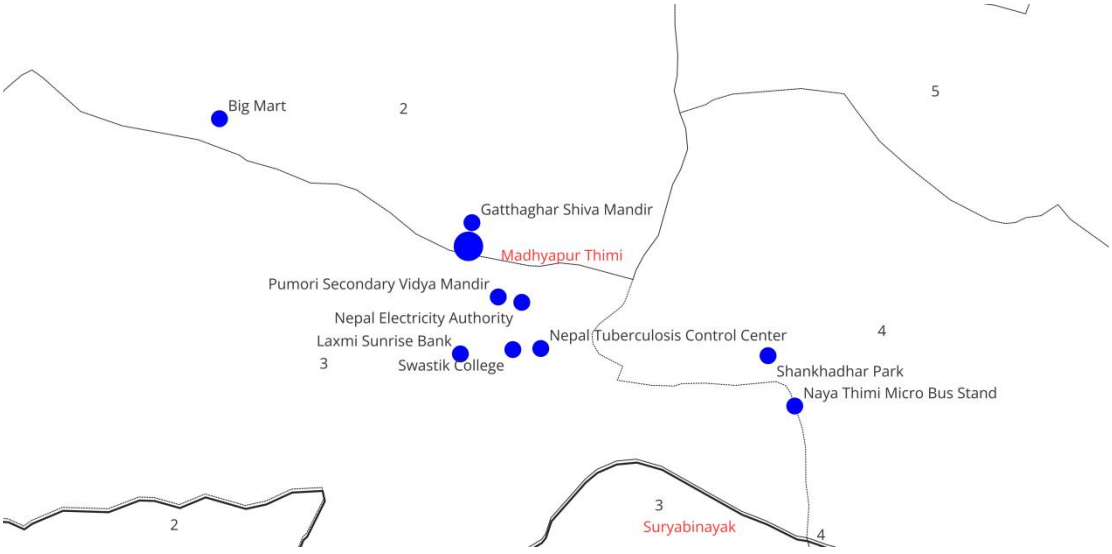
Amenities near Site 8



Amenities near Site 12



Amenities near Site 58



APPENDIX 10: Different cases of change in weight

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +10%	0.2107	0.0885	0.0748	0.1505	0.1280	0.1053	0.0828	0.1596	0.506024096	0.493975904	0.01915649	0.002737
3	School -10%	0.1724	0.0939	0.0802	0.1559	0.1334	0.1108	0.0883	0.1650	0.506024096	0.493975904	0.01915649	0.002737
4	College +10%	0.1903	0.1003	0.0762	0.1519	0.1294	0.1067	0.0842	0.1610	0.506024096	0.493975904	0.009119285	0.001303
5	College -10%	0.1929	0.0821	0.0788	0.1545	0.1320	0.1093	0.0868	0.1636	0.506024096	0.493975904	0.009119285	0.001303
6	Office +10%	0.1905	0.0901	0.0853	0.1521	0.1296	0.1069	0.0844	0.1612	0.506024096	0.493975904	0.007750548	0.001107
7	Office -10%	0.1927	0.0923	0.0698	0.1543	0.1318	0.1091	0.0866	0.1634	0.506024096	0.493975904	0.007750548	0.001107
8	Bank +10%	0.1894	0.0890	0.0753	0.1685	0.1285	0.1058	0.0833	0.1601	0.506024096	0.493975904	0.015320026	0.002189
9	Bank -10%	0.1938	0.0934	0.0797	0.1379	0.1329	0.1102	0.0877	0.1645	0.506024096	0.493975904	0.015320026	0.002189
10	Hospital+10%	0.1897	0.0893	0.0756	0.1513	0.1438	0.1062	0.0837	0.1604	0.506024096	0.493975904	0.013068996	0.001867
11	Hospital -10%	0.1934	0.0931	0.0794	0.1551	0.1176	0.1099	0.0874	0.1642	0.506024096	0.493975904	0.013068996	0.001867
12	Temple +10%	0.1900	0.0896	0.0760	0.1517	0.1291	0.1188	0.0840	0.1608	0.506024096	0.493975904	0.010802049	0.001543
13	Temple -10%	0.1931	0.0927	0.0790	0.1547	0.1322	0.0972	0.0871	0.1638	0.506024096	0.493975904	0.010802049	0.001543
14	Shopping +10%	0.1903	0.0900	0.0763	0.1520	0.1295	0.1068	0.0941	0.1611	0.506024096	0.493975904	0.008553239	0.001222
15	Shopping -10%	0.1928	0.0924	0.0787	0.1544	0.1319	0.1092	0.0770	0.1635	0.506024096	0.493975904	0.008553239	0.001222
16	Bus stop +10%	0.1892	0.0889	0.0752	0.1509	0.1284	0.1057	0.0832	0.1785	0.506024096	0.493975904	0.016229367	0.002318
17	Bus stop -10%	0.1939	0.0935	0.0798	0.1555	0.1330	0.1103	0.0879	0.1461	0.506024096	0.493975904	0.016229367	0.002318
18	Land Price +10%									0.456626506	0.543373494	0.04939759	0.049398
19	Land Price -10%									0.555421687	0.444578313	0.04939759	0.049398

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +20%	0.2299	0.0857	0.0720	0.1477	0.1252	0.1025	0.0801	0.1568	0.506024096	0.493975904	0.038312981	0.005473283
3	School -20%	0.1533	0.0967	0.0830	0.1587	0.1362	0.1135	0.0910	0.1678	0.506024096	0.493975904	0.038312981	0.005473283
4	College +20%	0.1890	0.1094	0.0749	0.1506	0.1281	0.1054	0.0829	0.1597	0.506024096	0.493975904	0.01823857	0.00260551
5	College -20%	0.1942	0.0730	0.0801	0.1558	0.1333	0.1106	0.0881	0.1649	0.506024096	0.493975904	0.01823857	0.00260551
6	Office +20%	0.1894	0.0890	0.0930	0.1510	0.1285	0.1058	0.0833	0.1601	0.506024096	0.493975904	0.015501096	0.002214442
7	Office -20%	0.1938	0.0934	0.0620	0.1554	0.1329	0.1102	0.0877	0.1645	0.506024096	0.493975904	0.015501096	0.002214442
8	Bank +20%	0.1872	0.0868	0.0731	0.1838	0.1263	0.1036	0.0812	0.1579	0.506024096	0.493975904	0.030640052	0.00437715
9	Bank -20%	0.1959	0.0956	0.0819	0.1226	0.1351	0.1124	0.0899	0.1667	0.506024096	0.493975904	0.030640052	0.00437715
10	Hospital+20%	0.1878	0.0875	0.0738	0.1495	0.1568	0.1043	0.0818	0.1586	0.506024096	0.493975904	0.026137993	0.003733999
11	Hospital -20%	0.1953	0.0949	0.0812	0.1569	0.1046	0.1118	0.0893	0.1660	0.506024096	0.493975904	0.026137993	0.003733999
12	Temple +20%	0.1885	0.0881	0.0744	0.1501	0.1276	0.1296	0.0824	0.1592	0.506024096	0.493975904	0.021604098	0.0030863
13	Temple -20%	0.1947	0.0943	0.0806	0.1563	0.1338	0.0864	0.0886	0.1654	0.506024096	0.493975904	0.021604098	0.0030863
14	Shopping +20%	0.1891	0.0887	0.0751	0.1508	0.1282	0.1056	0.1026	0.1598	0.506024096	0.493975904	0.017106479	0.002443783
15	Shopping -20%	0.1940	0.0936	0.0799	0.1556	0.1331	0.1105	0.0684	0.1647	0.506024096	0.493975904	0.017106479	0.002443783
16	Bus stop +20%	0.1869	0.0866	0.0729	0.1486	0.1261	0.1034	0.0809	0.1948	0.506024096	0.493975904	0.032458733	0.004636962
17	Bus stop -20%	0.1962	0.0958	0.0821	0.1578	0.1353	0.1127	0.0902	0.1298	0.506024096	0.493975904	0.032458733	0.004636962
18	Land Price +20%									0.407228916	0.592771084	0.098795181	0.098795181
19	Land Price -20%									0.604819277	0.395180723	0.098795181	0.098795181

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +30%	0.2490	0.0830	0.0693	0.1450	0.1225	0.0998	0.0773	0.1541	0.506024096	0.493975904	0.057469471	0.008209924
3	School -30%	0.1341	0.0994	0.0857	0.1614	0.1389	0.1162	0.0937	0.1705	0.506024096	0.493975904	0.057469471	0.008209924
4	College +30%	0.1877	0.1186	0.0736	0.1493	0.1268	0.1041	0.0816	0.1584	0.506024096	0.493975904	0.027357854	0.003908265
5	College -30%	0.1955	0.0638	0.0814	0.1571	0.1346	0.1119	0.0894	0.1662	0.506024096	0.493975904	0.027357854	0.003908265
6	Office +30%	0.1882	0.0879	0.1008	0.1499	0.1274	0.1047	0.0822	0.1590	0.506024096	0.493975904	0.023251643	0.003321663
7	Office -30%	0.1949	0.0945	0.0543	0.1565	0.1340	0.1113	0.0889	0.1656	0.506024096	0.493975904	0.023251643	0.003321663
8	Bank +30%	0.1850	0.0846	0.0709	0.1992	0.1241	0.1015	0.0790	0.1557	0.506024096	0.493975904	0.045960077	0.006565725
9	Bank -30%	0.1981	0.0978	0.0841	0.1072	0.1373	0.1146	0.0921	0.1689	0.506024096	0.493975904	0.045960077	0.006565725
10	Hospital+30%	0.1860	0.0856	0.0719	0.1476	0.1699	0.1024	0.0799	0.1567	0.506024096	0.493975904	0.039206989	0.005600998
11	Hospital -30%	0.1972	0.0968	0.0831	0.1588	0.0915	0.1136	0.0911	0.1679	0.506024096	0.493975904	0.039206989	0.005600998
12	Temple +30%	0.1869	0.0866	0.0729	0.1486	0.1261	0.1404	0.0809	0.1577	0.506024096	0.493975904	0.032406147	0.00462945
13	Temple -30%	0.1962	0.0958	0.0821	0.1578	0.1353	0.0756	0.0902	0.1669	0.506024096	0.493975904	0.032406147	0.00462945
14	Shopping +30%	0.1879	0.0875	0.0738	0.1495	0.1270	0.1044	0.1112	0.1586	0.506024096	0.493975904	0.025659718	0.003665674
15	Shopping -30%	0.1952	0.0949	0.0812	0.1569	0.1344	0.1117	0.0599	0.1660	0.506024096	0.493975904	0.025659718	0.003665674
16	Bus stop +30%	0.1846	0.0842	0.0706	0.1462	0.1237	0.1011	0.0786	0.2110	0.506024096	0.493975904	0.0486881	0.006955443
17	Bus stop -30%	0.1985	0.0981	0.0845	0.1602	0.1376	0.1150	0.0925	0.1136	0.506024096	0.493975904	0.0486881	0.006955443
18	Land Price +30%									0.357831325	0.642168675	0.148192771	0.148192771
19	Land Price -30%									0.654216867	0.345783133	0.148192771	0.148192771

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +40%	0.2682	0.0802	0.0666	0.1423	0.1197	0.0971	0.0746	0.1513	0.506024096	0.493975904	0.076625961	0.010946566
3	School -40%	0.1149	0.1021	0.0885	0.1641	0.1416	0.1190	0.0965	0.1732	0.506024096	0.493975904	0.076625961	0.010946566
4	College +40%	0.1864	0.1277	0.0723	0.1480	0.1255	0.1028	0.0803	0.1571	0.506024096	0.493975904	0.036477139	0.00521102
5	College -40%	0.1968	0.0547	0.0827	0.1584	0.1359	0.1132	0.0907	0.1675	0.506024096	0.493975904	0.036477139	0.00521102
6	Office +40%	0.1871	0.0868	0.1085	0.1488	0.1263	0.1036	0.0811	0.1579	0.506024096	0.493975904	0.031002191	0.004428884
7	Office -40%	0.1960	0.0956	0.0465	0.1576	0.1351	0.1124	0.0900	0.1667	0.506024096	0.493975904	0.031002191	0.004428884
8	Bank +40%	0.1828	0.0824	0.0688	0.2145	0.1219	0.0993	0.0768	0.1535	0.506024096	0.493975904	0.061280103	0.0087543
9	Bank -40%	0.2003	0.0999	0.0863	0.0919	0.1394	0.1168	0.0943	0.1710	0.506024096	0.493975904	0.061280103	0.0087543
10	Hospital+40%	0.1841	0.0837	0.0700	0.1457	0.1830	0.1006	0.0781	0.1548	0.506024096	0.493975904	0.052275986	0.007467998
11	Hospital -40%	0.1990	0.0987	0.0850	0.1607	0.0784	0.1155	0.0930	0.1698	0.506024096	0.493975904	0.052275986	0.007467998
12	Temple +40%	0.1854	0.0850	0.0713	0.1470	0.1245	0.1512	0.0794	0.1561	0.506024096	0.493975904	0.043208195	0.006172599
13	Temple -40%	0.1977	0.0974	0.0837	0.1594	0.1369	0.0648	0.0917	0.1685	0.506024096	0.493975904	0.043208195	0.006172599
14	Shopping +40%	0.1867	0.0863	0.0726	0.1483	0.1258	0.1031	0.1197	0.1574	0.506024096	0.493975904	0.034212958	0.004887565
15	Shopping -40%	0.1965	0.0961	0.0824	0.1581	0.1356	0.1129	0.0513	0.1672	0.506024096	0.493975904	0.034212958	0.004887565
16	Bus stop +40%	0.1823	0.0819	0.0682	0.1439	0.1214	0.0987	0.0763	0.2272	0.506024096	0.493975904	0.064917466	0.009273924
17	Bus stop -40%	0.2008	0.1005	0.0868	0.1625	0.1400	0.1173	0.0948	0.0974	0.506024096	0.493975904	0.064917466	0.009273924
18	Land Price +40%									0.308433735	0.691566265	0.197590361	0.197590361
19	Land Price -40%									0.703614458	0.296385542	0.197590361	0.197590361

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +50%	0.2873	0.0775	0.0638	0.1395	0.1170	0.0943	0.0718	0.1486	0.506024096	0.493975904	0.095782451	0.013683207
3	School -50%	0.0958	0.1049	0.0912	0.1669	0.1444	0.1217	0.0992	0.1760	0.506024096	0.493975904	0.095782451	0.013683207
4	College +50%	0.1851	0.1368	0.0710	0.1467	0.1242	0.1015	0.0790	0.1558	0.506024096	0.493975904	0.045596424	0.006513775
5	College -50%	0.1981	0.0456	0.0840	0.1597	0.1372	0.1145	0.0920	0.1688	0.506024096	0.493975904	0.045596424	0.006513775
6	Office +50%	0.1860	0.0857	0.1163	0.1477	0.1252	0.1025	0.0800	0.1568	0.506024096	0.493975904	0.038752739	0.005536106
7	Office -50%	0.1971	0.0967	0.0388	0.1587	0.1362	0.1136	0.0911	0.1678	0.506024096	0.493975904	0.038752739	0.005536106
8	Bank +50%	0.1806	0.0802	0.0666	0.2298	0.1197	0.0971	0.0746	0.1514	0.506024096	0.493975904	0.076600129	0.010942876
9	Bank -50%	0.2025	0.1021	0.0884	0.0766	0.1416	0.1190	0.0965	0.1732	0.506024096	0.493975904	0.076600129	0.010942876
10	Hospital+50%	0.1822	0.0819	0.0682	0.1439	0.1960	0.0987	0.0762	0.1530	0.506024096	0.493975904	0.065344982	0.009334997
11	Hospital -50%	0.2009	0.1005	0.0868	0.1625	0.0653	0.1174	0.0949	0.1716	0.506024096	0.493975904	0.065344982	0.009334997
12	Temple +50%	0.1838	0.0835	0.0698	0.1455	0.1230	0.1620	0.0778	0.1546	0.506024096	0.493975904	0.054010244	0.007715749
13	Temple -50%	0.1993	0.0989	0.0852	0.1609	0.1384	0.0540	0.0932	0.1700	0.506024096	0.493975904	0.054010244	0.007715749
14	Shopping +50%	0.1855	0.0851	0.0714	0.1471	0.1246	0.1019	0.1283	0.1562	0.506024096	0.493975904	0.042766197	0.006109457
15	Shopping -50%	0.1977	0.0973	0.0836	0.1593	0.1368	0.1141	0.0428	0.1684	0.506024096	0.493975904	0.042766197	0.006109457
16	Bus stop +50%	0.1800	0.0796	0.0659	0.1416	0.1191	0.0964	0.0739	0.2434	0.506024096	0.493975904	0.081146833	0.011592405
17	Bus stop -50%	0.2032	0.1028	0.0891	0.1648	0.1423	0.1196	0.0971	0.0811	0.506024096	0.493975904	0.081146833	0.011592405
18	Land Price +50%									0.259036145	0.740963855	0.246987952	0.246987952
19	Land Price -50%									0.753012048	0.246987952	0.246987952	0.246987952

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +60%	0.3065	0.0748	0.0611	0.1368	0.1143	0.0916	0.0691	0.1459	0.506024096	0.493975904	0.114938942	0.016419849
3	School -60%	0.0766	0.1076	0.0939	0.1696	0.1471	0.1244	0.1020	0.1787	0.506024096	0.493975904	0.114938942	0.016419849
4	College +60%	0.1837	0.1459	0.0697	0.1454	0.1229	0.1002	0.0777	0.1545	0.506024096	0.493975904	0.054715709	0.00781653
5	College -60%	0.1994	0.0365	0.0853	0.1610	0.1385	0.1158	0.0933	0.1701	0.506024096	0.493975904	0.054715709	0.00781653
6	Office +60%	0.1849	0.0845	0.1240	0.1466	0.1240	0.1014	0.0789	0.1557	0.506024096	0.493975904	0.046503287	0.006643327
7	Office -60%	0.1982	0.0978	0.0310	0.1598	0.1373	0.1147	0.0922	0.1689	0.506024096	0.493975904	0.046503287	0.006643327
8	Bank +60%	0.1784	0.0781	0.0644	0.2451	0.1176	0.0949	0.0724	0.1492	0.506024096	0.493975904	0.091920155	0.013131451
9	Bank -60%	0.2047	0.1043	0.0906	0.0613	0.1438	0.1212	0.0987	0.1754	0.506024096	0.493975904	0.091920155	0.013131451
10	Hospital+60%	0.1804	0.0800	0.0663	0.1420	0.2091	0.0968	0.0743	0.1511	0.506024096	0.493975904	0.078413979	0.011201997
11	Hospital -60%	0.2028	0.1024	0.0887	0.1644	0.0523	0.1192	0.0967	0.1735	0.506024096	0.493975904	0.078413979	0.011201997
12	Temple +60%	0.1823	0.0819	0.0682	0.1439	0.1214	0.1728	0.0763	0.1530	0.506024096	0.493975904	0.064812293	0.009258899
13	Temple -60%	0.2008	0.1005	0.0868	0.1625	0.1399	0.0432	0.0948	0.1716	0.506024096	0.493975904	0.064812293	0.009258899
14	Shopping +60%	0.1842	0.0839	0.0702	0.1459	0.1234	0.1007	0.1369	0.1550	0.506024096	0.493975904	0.051319436	0.007331348
15	Shopping -60%	0.1989	0.0985	0.0848	0.1605	0.1380	0.1154	0.0342	0.1696	0.506024096	0.493975904	0.051319436	0.007331348
16	Bus stop +60%	0.1777	0.0773	0.0636	0.1393	0.1168	0.0941	0.0716	0.2597	0.506024096	0.493975904	0.0973762	0.013910886
17	Bus stop -60%	0.2055	0.1051	0.0914	0.1671	0.1446	0.1219	0.0994	0.0649	0.506024096	0.493975904	0.0973762	0.013910886
18	Land Price +60%									0.209638554	0.790361446	0.296385542	0.296385542
19	Land Price -60%									0.802409639	0.197590361	0.296385542	0.296385542

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +70%	0.3257	0.0720	0.0583	0.1340	0.1115	0.0889	0.0664	0.1431	0.506024096	0.493975904	0.134095432	0.01915649
3	School -70%	0.0575	0.1103	0.0967	0.1724	0.1498	0.1272	0.1047	0.1815	0.506024096	0.493975904	0.134095432	0.01915649
4	College +70%	0.1824	0.1550	0.0684	0.1441	0.1216	0.0989	0.0764	0.1532	0.506024096	0.493975904	0.063834994	0.009119285
5	College -70%	0.2007	0.0274	0.0866	0.1623	0.1398	0.1171	0.0947	0.1714	0.506024096	0.493975904	0.063834994	0.009119285
6	Office +70%	0.1838	0.0834	0.1318	0.1454	0.1229	0.1003	0.0778	0.1545	0.506024096	0.493975904	0.054253834	0.007750548
7	Office -70%	0.1993	0.0989	0.0233	0.1610	0.1384	0.1158	0.0933	0.1700	0.506024096	0.493975904	0.054253834	0.007750548
8	Bank +70%	0.1762	0.0759	0.0622	0.2604	0.1154	0.0927	0.0702	0.1470	0.506024096	0.493975904	0.107240181	0.015320026
9	Bank -70%	0.2069	0.1065	0.0928	0.0460	0.1460	0.1233	0.1009	0.1776	0.506024096	0.493975904	0.107240181	0.015320026
10	Hospital+70%	0.1785	0.0781	0.0644	0.1401	0.2222	0.0950	0.0725	0.1492	0.506024096	0.493975904	0.091482975	0.013068996
11	Hospital -70%	0.2046	0.1043	0.0906	0.1663	0.0392	0.1211	0.0986	0.1754	0.506024096	0.493975904	0.091482975	0.013068996
12	Temple +70%	0.1808	0.0804	0.0667	0.1424	0.1199	0.1836	0.0747	0.1515	0.506024096	0.493975904	0.075614342	0.010802049
13	Temple -70%	0.2024	0.1020	0.0883	0.1640	0.1415	0.0324	0.0963	0.1731	0.506024096	0.493975904	0.075614342	0.010802049
14	Shopping +70%	0.1830	0.0826	0.0690	0.1446	0.1221	0.0995	0.1454	0.1537	0.506024096	0.493975904	0.059872676	0.008553239
15	Shopping -70%	0.2001	0.0997	0.0861	0.1618	0.1392	0.1166	0.0257	0.1708	0.506024096	0.493975904	0.059872676	0.008553239
16	Bus stop +70%	0.1753	0.0750	0.0613	0.1370	0.1145	0.0918	0.0693	0.2759	0.506024096	0.493975904	0.113605566	0.016229367
17	Bus stop -70%	0.2078	0.1074	0.0937	0.1694	0.1469	0.1242	0.1018	0.0487	0.506024096	0.493975904	0.113605566	0.016229367
18	Land Price +70%									0.160240964	0.839759036	0.345783133	0.345783133
19	Land Price -70%									0.851807229	0.148192771	0.345783133	0.345783133

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +80%	0.3448	0.0693	0.0556	0.1313	0.1088	0.0861	0.0636	0.1404	0.506024096	0.493975904	0.153251922	0.021893132
3	School -80%	0.0383	0.1131	0.0994	0.1751	0.1526	0.1299	0.1074	0.1842	0.506024096	0.493975904	0.153251922	0.021893132
4	College +80%	0.1811	0.1641	0.0671	0.1428	0.1203	0.0976	0.0751	0.1519	0.506024096	0.493975904	0.072954278	0.01042204
5	College -80%	0.2020	0.0182	0.0879	0.1636	0.1411	0.1184	0.0960	0.1727	0.506024096	0.493975904	0.072954278	0.01042204
6	Office +80%	0.1827	0.0823	0.1395	0.1443	0.1218	0.0992	0.0767	0.1534	0.506024096	0.493975904	0.062004382	0.008857769
7	Office -80%	0.2004	0.1001	0.0155	0.1621	0.1395	0.1169	0.0944	0.1712	0.506024096	0.493975904	0.062004382	0.008857769
8	Bank +80%	0.1741	0.0737	0.0600	0.2758	0.1132	0.0905	0.0680	0.1448	0.506024096	0.493975904	0.122560207	0.017508601
9	Bank -80%	0.2091	0.1087	0.0950	0.0306	0.1482	0.1255	0.1030	0.1798	0.506024096	0.493975904	0.122560207	0.017508601
10	Hospital+80%	0.1766	0.0763	0.0626	0.1383	0.2352	0.0931	0.0706	0.1474	0.506024096	0.493975904	0.104551972	0.014935996
11	Hospital -80%	0.2065	0.1061	0.0924	0.1681	0.0261	0.1230	0.1005	0.1772	0.506024096	0.493975904	0.104551972	0.014935996
12	Temple +80%	0.1792	0.0788	0.0652	0.1409	0.1183	0.1944	0.0732	0.1499	0.506024096	0.493975904	0.086416391	0.012345199
13	Temple -80%	0.2039	0.1035	0.0899	0.1655	0.1430	0.0216	0.0979	0.1746	0.506024096	0.493975904	0.086416391	0.012345199
14	Shopping +80%	0.1818	0.0814	0.0677	0.1434	0.1209	0.0982	0.1540	0.1525	0.506024096	0.493975904	0.068425915	0.009775131
15	Shopping -80%	0.2013	0.1010	0.0873	0.1630	0.1405	0.1178	0.0171	0.1721	0.506024096	0.493975904	0.068425915	0.009775131
16	Bus stop +80%	0.1730	0.0726	0.0590	0.1347	0.1121	0.0895	0.0670	0.2921	0.506024096	0.493975904	0.129834933	0.018547848
17	Bus stop -80%	0.2101	0.1097	0.0961	0.1717	0.1492	0.1266	0.1041	0.0325	0.506024096	0.493975904	0.129834933	0.018547848
18	Land Price +80%									0.110843373	0.889156627	0.395180723	0.395180723
19	Land Price -80%									0.901204819	0.098795181	0.395180723	0.395180723

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +90%	0.3640	0.0666	0.0529	0.1286	0.1061	0.0834	0.0609	0.1377	0.506024096	0.493975904	0.172408412	0.024629773
3	School -90%	0.0192	0.1158	0.1021	0.1778	0.1553	0.1327	0.1102	0.1869	0.506024096	0.493975904	0.172408412	0.024629773
4	College +90%	0.1798	0.1733	0.0658	0.1415	0.1190	0.0963	0.0738	0.1506	0.506024096	0.493975904	0.082073563	0.011724795
5	College -90%	0.2033	0.0091	0.0892	0.1649	0.1424	0.1197	0.0973	0.1740	0.506024096	0.493975904	0.082073563	0.011724795
6	Office +90%	0.1816	0.0812	0.1473	0.1432	0.1207	0.0981	0.0756	0.1523	0.506024096	0.493975904	0.06975493	0.00996499
7	Office -90%	0.2015	0.1012	0.0078	0.1632	0.1407	0.1180	0.0955	0.1723	0.506024096	0.493975904	0.06975493	0.00996499
8	Bank +90%	0.1719	0.0715	0.0578	0.2911	0.1110	0.0883	0.0658	0.1426	0.506024096	0.493975904	0.137880232	0.019697176
9	Bank -90%	0.2113	0.1109	0.0972	0.0153	0.1504	0.1277	0.1052	0.1820	0.506024096	0.493975904	0.137880232	0.019697176
10	Hospital+90%	0.1748	0.0744	0.0607	0.1364	0.2483	0.0912	0.0687	0.1455	0.506024096	0.493975904	0.117620968	0.016802995
11	Hospital -90%	0.2084	0.1080	0.0943	0.1700	0.0131	0.1248	0.1023	0.1791	0.506024096	0.493975904	0.117620968	0.016802995
12	Temple +90%	0.1777	0.0773	0.0636	0.1393	0.1168	0.2052	0.0716	0.1484	0.506024096	0.493975904	0.09721844	0.013888349
13	Temple -90%	0.2055	0.1051	0.0914	0.1671	0.1446	0.0108	0.0994	0.1762	0.506024096	0.493975904	0.09721844	0.013888349
14	Shopping +90%	0.1806	0.0802	0.0665	0.1422	0.1197	0.0970	0.1625	0.1513	0.506024096	0.493975904	0.076979155	0.010997022
15	Shopping -90%	0.2026	0.1022	0.0885	0.1642	0.1417	0.1190	0.0086	0.1733	0.506024096	0.493975904	0.076979155	0.010997022
16	Bus stop +90%	0.1707	0.0703	0.0566	0.1323	0.1098	0.0872	0.0647	0.3084	0.506024096	0.493975904	0.1460643	0.020866329
17	Bus stop -90%	0.2124	0.1121	0.0984	0.1741	0.1516	0.1289	0.1064	0.0162	0.506024096	0.493975904	0.1460643	0.020866329
18	Land Price +90%									0.061445783	0.938554217	0.444578313	0.444578313
19	Land Price -90%									0.95060241	0.04939759	0.444578313	0.444578313

Case	Scenario	School	College	Office	Bank	Hospital	Temple	Shopping Mall	Bus stop	Amenity Sum	Land Price	Change in weight	Adjustment per amenity
1	Base Weight	0.1916	0.0912	0.0775	0.1532	0.1307	0.1080	0.0855	0.1623	0.506024096	0.493975904		
2	School +100%	0.3831	0.0638	0.0501	0.1258	0.1033	0.0807	0.0582	0.1349	0.506024096	0.493975904	0.191564903	0.027366415
3	School -100%	0.0000	0.1186	0.1049	0.1806	0.1581	0.1354	0.1129	0.1897	0.506024096	0.493975904	0.191564903	0.027366415
4	College +100%	0.1785	0.1824	0.0645	0.1402	0.1177	0.0950	0.0725	0.1493	0.506024096	0.493975904	0.091192848	0.01302755
5	College -100%	0.2046	0.0000	0.0905	0.1662	0.1437	0.1210	0.0986	0.1753	0.506024096	0.493975904	0.091192848	0.01302755
6	Office +100%	0.1805	0.0801	0.1550	0.1421	0.1196	0.0969	0.0745	0.1512	0.506024096	0.493975904	0.077505478	0.011072211
7	Office -100%	0.2026	0.1023	0.0000	0.1643	0.1418	0.1191	0.0966	0.1734	0.506024096	0.493975904	0.077505478	0.011072211
8	Bank +100%	0.1697	0.0693	0.0556	0.3064	0.1088	0.0861	0.0636	0.1404	0.506024096	0.493975904	0.153200258	0.021885751
9	Bank -100%	0.2135	0.1131	0.0994	0.0000	0.1526	0.1299	0.1074	0.1842	0.506024096	0.493975904	0.153200258	0.021885751
10	Hospital+100%	0.1729	0.0725	0.0588	0.1345	0.2614	0.0894	0.0669	0.1436	0.506024096	0.493975904	0.130689965	0.018669995
11	Hospital -100%	0.2102	0.1099	0.0962	0.1719	0.0000	0.1267	0.1042	0.1810	0.506024096	0.493975904	0.130689965	0.018669995
12	Temple +100%	0.1761	0.0758	0.0621	0.1378	0.1153	0.2160	0.0701	0.1469	0.506024096	0.493975904	0.108020489	0.015431498
13	Temple -100%	0.2070	0.1066	0.0929	0.1686	0.1461	0.0000	0.1010	0.1777	0.506024096	0.493975904	0.108020489	0.015431498
14	Shopping +100%	0.1793	0.0790	0.0653	0.1410	0.1185	0.0958	0.1711	0.1501	0.506024096	0.493975904	0.085532394	0.012218913
15	Shopping -100%	0.2038	0.1034	0.0897	0.1654	0.1429	0.1202	0.0000	0.1745	0.506024096	0.493975904	0.085532394	0.012218913
16	Bus stop +100%	0.1684	0.0680	0.0543	0.1300	0.1075	0.0848	0.0623	0.3246	0.506024096	0.493975904	0.162293666	0.023184809
17	Bus stop -100%	0.2147	0.1144	0.1007	0.1764	0.1539	0.1312	0.1087	0.0000	0.506024096	0.493975904	0.162293666	0.023184809
18	Land Price +100%									0.012048193	0.987951807	0.493975904	0.493975904
19	Land Price -100%									1	0	0.493975904	0.493975904

APPENDIX 11: Key Informant Interview (KII)

Respected Sir/Madam,
I am Prabin Shrestha, a student of MSc in Construction Management, and this form is part of my Master's thesis titled **"Optimization of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley".** The optimal sites identified are as follows:

- Rank 1: Kirtipur-9, Near Nepal APF School
- Rank 2: Kirtipur-7, Panga
- Rank 3: Lalitpur-18, Near Nepal Mediciti Hospital
- Rank 4: Madhyapur Thimi-2, Gatthaghar

This interview is conducted to obtain expert feedback regarding feasibility to construct civil servants mid-rise apartment at the identified locations. Your responses will be used solely for academic research.

Interview Questions

- Please provide your opinion about the feasibility of constructing apartments at above identified locations?

• In my personal opinion, Madhyapur Thimi-2, Gathaghar is the appropriate site location for the project. Due to the locational attributes
— equidistance from the government offices,
— transport networks of local transport services from the site to government offices
— Social and Economic infrastructures are also nearby the site..

- Are there any factors that could hinder appropriateness of these site for constructing civil servant's apartment?

- Light, Ventilation and visual disturbance issues should be eddressed for neighbouring conflict.

Name of the Expert: Bishow Ram Prajapati Signature: .....

Designation: SDE / Section Chief Date: 2022/12/30

संयुक्त आवास नियमन
तथा विवाद व्यवस्थापन शाखा

Key Informant Interview

Respected Sir/Madam,
I am Prabin Shrestha, a student of MSc in Construction Management, and this form is part of my Master's thesis titled **"Optimization of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley".** The optimal sites identified are as follows:

- Rank 1: Kirtipur-9, Near Nepal APF School
- Rank 2: Kirtipur-7, Panga
- Rank 3: Lalitpur-18, Near Nepal Mediciti Hospital
- Rank 4: Madhyapur Thimi-2, Gatthaghar

This interview is conducted to obtain expert feedback regarding feasibility to construct civil servants mid-rise apartment at the identified locations. Your responses will be used solely for academic research.

Interview Questions

- Please provide your opinion about the feasibility of constructing apartments at above identified locations?

Apartment culture is futuristic need of kathmandu valley and above locations are allfound suitable. Especially Mediciti hospital because of its proximity & current infrastructures like road, Ringroad etc.

- Are there any factors that could hinder appropriateness of these site for constructing civil servant's apartment?

Traffic volume & travel time from apartment to city center, cost of appartment are major factors that should be considered.

Name of the Expert: Rupak Achayya Signature: .....

Designation: Section Chief DUDBC Date: 2082/12/30

Key Informant Interview

Respected Sir/Madam,
I am Prabin Shrestha, a student of MSc in Construction Management, and this form is part of my Master's thesis titled **"Optimization of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley".** The optimal sites identified are as follows:

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This interview is conducted to obtain expert feedback regarding feasibility to construct civil servants mid-rise apartment at the identified locations. Your responses will be used solely for academic research.

Interview Questions

- Please provide your opinion about the feasibility of constructing apartments at above identified locations?

→ Identified locations seems appropriate for multy-storey housing.
→ The criterion used for the assessment are quite comprehensive.
→

- Are there any factors that could hinder appropriateness of these site for constructing civil servant's apartment?

→ road width > 8m
→ It would be even better if the study verify with the land use plan of municipalities.

Name of the Expert: Ramesh Thapaliya Signature: ...

Designation: Ex Date: 2082.12.30

Key Informant Interview

Respected Sir/Madam,
I am Prabin Shrestha, a student of MSc in Construction Management, and this form is part of my Master's thesis titled **"Optimization of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley".** The optimal sites identified are as follows:

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- Rank 4: Madhyapur Thimi-2, Gatthaghar

This interview is conducted to obtain expert feedback regarding feasibility to construct civil servants mid-rise apartment at the identified locations. Your responses will be used solely for academic research.

Interview Questions

- Please provide your opinion about the feasibility of constructing apartments at above identified locations?

Among above sites, I feel appropriate in Rank 3. Lalitpur - 18 Near Nepal Mediciti Hospital.
Since that location is developed as a high class residential neighbourhood. this site is more feasible.
The Access to the city area is also convinient.

- Are there any factors that could hinder appropriateness of these site for constructing civil servant's apartment?

The main factor need to consider in Land. if Land is available then others are manageable.

Name of the Expert: Roshan Shrestha Signature:

Designation: DDG Date: 2021.12.30

Key Informant Interview

Respected Sir/Madam,
I am Prabin Shrestha, a student of MSc in Construction Management, and this form is part of my Master's thesis titled **"Optimization of Location for Civil Servants' Mid-Rise Apartments in Kathmandu Valley".** The optimal sites identified are as follows:

- Rank 1: Site 2, Kirtipur-9, Near Green Village Education Foundation
- Rank 2: Site 8, Kirtipur-7, Near Bhajangal Chowk
- Rank 3: Site 12, Lalitpur-18, Near Nepal Mediciti Hospital
- Rank 4: Site 58, Madhyapur Thimi-2, Near Gatthaghar Shiva Mandir

This form represents the expert consultation stage as a part of "Validation of Result".

Interview Questions

- Does constructing apartments in the identified sites attract considerable number of civil servants? Please provide feedbacks for each identified sites.

As these locations are with in 7 to 10 km distance from the city core / Singadurbar, considerable number of civil servants will be attracted.

- Are there any factors that could hinder appropriateness of these site for constructing civil servant's apartment?

As major facilities (of higher order Health / educational, etc) are located at city core, smooth traffic flow have to be ensured,

- Please rank the identified sites for constructing apartment for civil servants.

Rank 1: Lalitpur 18 Rank 2: Kirtipur 7 Provide exact google

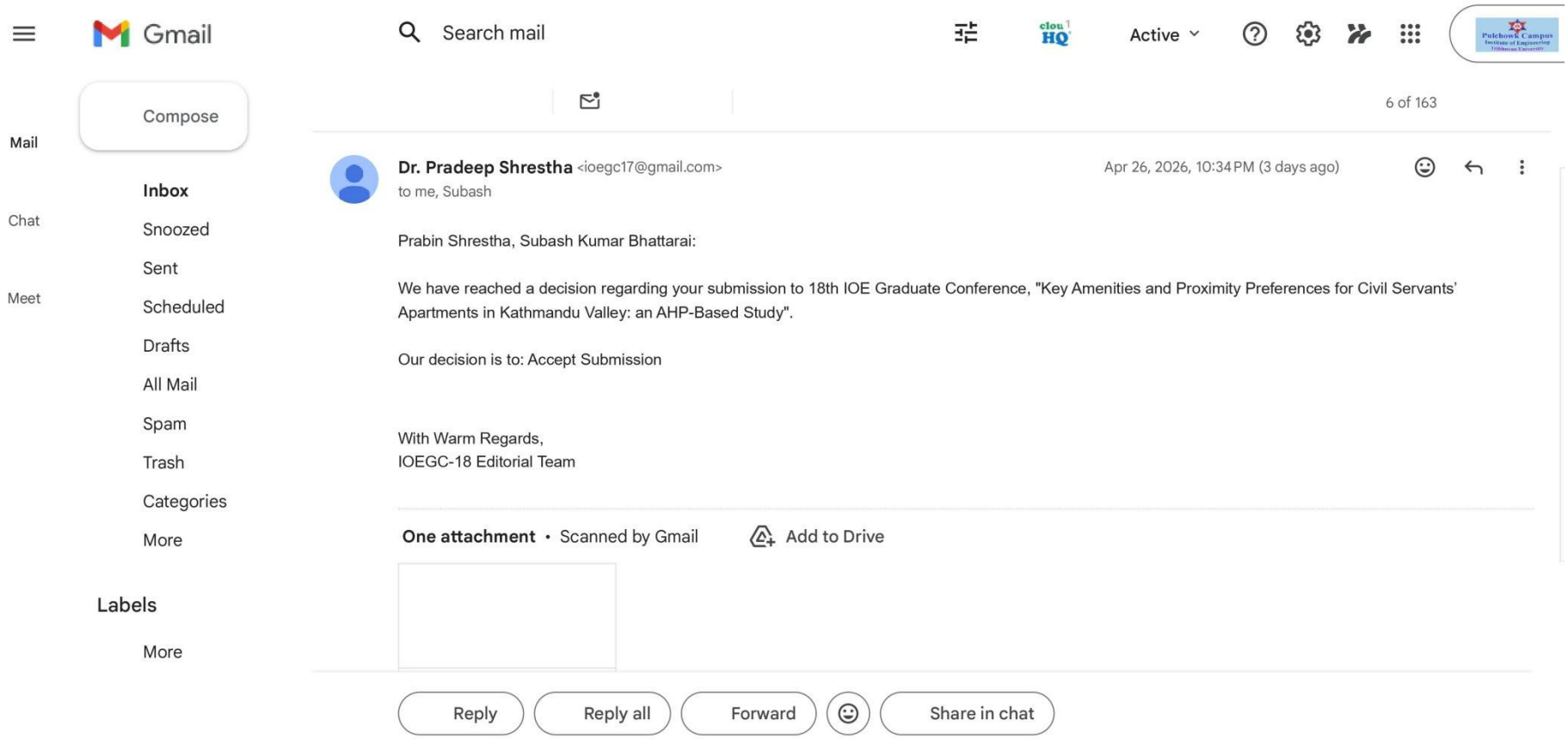
Rank 3: Madhyapur. Rank 4: Kirtipur location for accuracy

Thank you for your valuable time and contribution.
Your responses will be used solely for academic research and will remain confidential.

Name of the Expert: Yeca Raj Adhikari Signature:

Designation: DDG / DUDBC Date: 2082/12/30

APPENDIX 12: Acceptance of Paper in IOE Graduate Conference



APPENDIX 13: Similarity Check Report

iThenticate

Similarity Report ID: oid:3117:584573274

PAPER NAME

Optimal Site Selection for Civil Servants' Medium-Rise Apartments in Kathmandu Valley: An AHP-GIS Multi-Criteria Proximity and Feasibility Ranking Approach

AUTHOR

PRABIN SHRESTHA

WORD COUNT

11578 Words

CHARACTER COUNT

59066 Characters

PAGE COUNT

75 Pages

FILE SIZE

7.3MB

SUBMISSION DATE

Apr 29, 2026 10:30 PM GMT+5:45

REPORT DATE

Apr 29, 2026 10:31 PM GMT+5:45

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