

Strategies and Challenges for Urban Green Spaces: A Case Study of Butwal

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Abstract

Urban forms are changing and becoming more ad hoc. Urban green spaces are an important part of public open spaces and services provided by a city and serve as a health-promoting setting for urban dwellers. It is therefore necessary to ensure that public green spaces are easily accessible for all population groups and distributed equitably within the city. The successful protection, creation, and development of green space is one of the key elements required to achieve sustainable urban development. The case of Butwal Sub-Metropolitan City is analyzed in this paper to examine the challenges and strategies involved in safeguarding these essential green areas. A mixed methodological approach was considered for data collection, including interviews, observation, mapping, and analysis using various parameters and collection of required information from documents. The study reveals disparities in the distribution of green space around the city, particularly in highly populated regions, with an emphasis on accessibility, distribution, and the impact of local regulations. This study has made some important observations by carefully examining the urban environment of Butwal. First, it showed that there were differences in how green spaces were distributed throughout the city, with densely crowded wards frequently lacking sufficient access to these vital amenities. Second, it brought to light the difficulties encountered by local governments in the absence of clear typologies, standards, and enabling laws for the design and development of green spaces. The study also highlighted the difficulty in ensuring equal access to nature in urban settings due to the absence of defined legislation and minimum standards for green areas. By addressing the challenges and strategies explored in this case study, stakeholders can work towards creating more sustainable and livable urban environments, ensuring that nature remains an integral part of our urban landscapes, fostering well-being, community cohesion, and environmental resilience.

Keywords

Urban Green Spaces, Urbanization, Strategies, Challenges, Livable cities

1. Introduction

At present 55 percent of the world's population resides in urban regions, and by 2050, that number is projected to rise to 68 percent [1]. This will result in expansion and/or densification of urbanized areas. One issue identified is the lack of urban green space in densified urban areas and the removal of green space when densifying city areas. With an increasing percentage of the population living in urban areas, there is a growing need to ensure that cities are planned and developed in a sustainable and livable manner. Green spaces make important benefits to the city, its citizens, and the ecosystem. However, due to rapid urbanization, these contributions could not be properly reflected in urban space. Living in cities comes with certain drawbacks, including limited access to nature and increased exposure to environmental threats like air and noise pollution. The dilemma of how to become sustainable and provide more areas for public green spaces emerges when cities throughout the world experience a continuous increase in population and built environment.

While each city faces different challenges and restrictions in executing the greening imperative, most physical, and physiological barriers to vegetation development tend to be uniform [2]. Urban environments in the world are increasingly facing the triple effects of pollution, congestion, and environmental degradation. Urban green encourages social

cohesion by acting as a natural gathering place for the community. They also foster a sense of identity and community in urban areas. How successfully Urban Green Spaces mitigate air pollution depends on the amount of vegetation in a region. Urban greenery provides a safe and healthful atmosphere for jogging, running, and strolling as well as an inviting backdrop for social contact, exercise, and leisure activities. To fulfill human needs for relaxation, esthetics, leisure activities, and environmental preservation, green spaces must be organized as ecologically useful spaces that coexist. Effective planning, administration, and preservation of these spaces are essential topics in urban sustainability discussions. They provide a wide range of social, economic, cultural, and psychological benefits to urban residents and tourists, addressing the challenges posed by urbanization and migration. Prioritizing green spaces in urban contexts is vital for improving residents' quality of life and promoting sustainable use of natural resources, emphasizing the need for policymakers to recognize their significance. Understanding how to maximize the distribution and design of green infrastructure might help cities become more resilient to environmental threats.

The lack of comprehensive planning strategies and rules impedes the incorporation of green spaces into the larger urban fabric, resulting in poor distribution, insufficient connectedness, and limited accessibility for city dwellers. Many cities face inequitable allocation of urban green spaces,

which disproportionately affects underprivileged neighborhoods. This uneven distribution not only damages social cohesion and communal well-being, but it also perpetuates environmental inequities within cities.

1.1 Research objectives

The main objective of this thesis is to study the challenges and strategies for green spaces planning. The research objectives for this thesis are:

- To analyze the existing urban green spaces.
- To identify the challenges faced by institutions during the planning process.
- To investigate the strategies adopted by institutions in planning urban green spaces.
- To develop strategies that will help to incorporate green spaces.

2. Literature review

2.1 Urban Green Spaces

The phrase "urban green space" refers to all areas of land that fall within this definition of "green space," whether they are publicly or privately held [3], [4]. While some research used the phrases open green space or green open space, several studies used different terms such open space or green space. Open spaces are areas that contribute to the visual urban landscape and quality of life as a part of the urban space, have public access, and combine urban and green spaces [5], [6]. Urban green space is defined as all urban land covered by vegetation of any kind. This covers vegetation on private and public grounds, irrespective of size and function, and can also include small water bodies such as ponds, lakes or streams ("blue spaces") [7]. Although designated as a discretionary service there is no doubt that green space forms a vital part of local authority service provision, offering a broad and varied range of facilities and opportunities to all its residents and visitors.

Green spaces exist in a great variety of shapes, structures and types within the city or urban fabric. Within a city, there is a hierarchy of green areas ranging from regional to local. In contrast to local level green areas, which have an impact on residents' quality of life, regional level green areas contribute to the ecology, biodiversity, and environment of the entire region. The typology of green spaces considered for this study is public green spaces which provide some kind of engagement.

Table 1: Public green spaces with their optimum size and distance [8]

Type	Size	Distances from homes
Regional Parks	400 ha	3.2 to 8 km
Metropolitan Parks	60 ha	3.2 km
District Parks	20 ha	1.2 km
Local Parks and Open Spaces	2 ha	Distances from homes 400 m
Small Open Spaces	Under 2 ha	Less than 400 m
Pocket Parks	Under 0.4	Less than 400 m
Linear Open Spaces		

2.2 Guiding Principles

Herzele and Wiedemann (2003) present several basic principles and presumptions to guide the construction of an indicator. These principles make an effort to clarify these concepts and demonstrate how they relate to study.

The first principle is citizen based. Green spaces must be viewed in relation to the locations where people live and in a way that represents their perspective because they are meant to support urban populations' quality of life. Secondly, preconditions for use indicate that prior consideration should be given to the use-related prerequisites (proximity, accessibility, surface, safety, etc.). Green places won't draw people in if these conditions are not met. The third principle, variety of qualities indicate numerous characteristics provide a range of urban green related experiences and activities adjacent to residences and places of employment. And the last one, multiple use which means free and frequent use without regard for their original functions [9].

2.3 Indicators for green spaces in urban settings

The indicators developed to examine the physical characteristics of green spaces consider the two key dimensions of quantity and spatial distribution, and they are described in the following sections [10].

Table 2: Indicators of green spaces

Indicators	Name	Scale
Quantity of green space	Public Green Space per inhabitant Green Space per built-up area	Municipal
Spatial distribution and accessibility to green spaces	Proximity to Green Space	Municipal

Indicators associated with the quantity of green space: To calculate the indicator of green space per resident (in m²), the total area of green space is compared to the population of each municipality. The total amount of green space is divided by the built-up area of each municipality to get the land cover per green space of the built-up municipal territory.

Indicators associated with the spatial distribution of and the accessibility to green spaces: In addition to the indicator of the overall area of green space, it is crucial to consider how the green space is distributed within the municipal territory. The two extreme distributions, according to theory, are:

- limiting all green space to a single community and
- distributing green space equally among all communities.

2.4 Strategies for Urban Green Space

A strategy is in general a policy for achieving several specific objectives. In the case of green spaces, strategies are required to address a variety of (ecological) environmental, social, and economic policies and sustainable development objectives.

They must also be able to effectively defend the objectives against other issues of urban development and planning in the political discourse of decision-making and resource allocation. An urban green space strategy addresses both the current state of green spaces (including all issues, conflicts, potentials, and needs) and the collective vision and objectives for the future. It lays out a shared vision for enhanced green spaces that satisfies community requirements and serves as a benchmark for allocating resources and creating action plans. A strategic plan creates policies and initiatives to fix issues and seize opportunities. It offers a logical and trustworthy framework for making decisions that may be applied to various departmental/professional levels and working procedures.

2.5 Challenges for Urban Green Space

The identification of problems and obstacles can be gleaned from three aspects of the problems regarding green spaces: spatial problems, organizational problems and economic – financial problems. These problems are reflected in the planning, managing and maintaining of green spaces. Although there is a lot of information on UGSs' advantages for cities, their creation, administration, and upkeep are still difficult tasks. There is a growing emphasis on the need for more intensive development in urban areas, centered around the idea of the high-density "compact city," which raises questions about how and where to fit green spaces.

2.6 National plans, policies, and strategies

2.6.1 National Urban Development Strategy (NUDS), 2017

The National Urban Development Strategy 2017 offers a forward-thinking and environmentally conscious roadmap for sustainable urban evolution, emphasizing the preservation and promotion of green spaces, low-carbon emissions, and measures to combat urban heat islands. It addresses the challenges of fragmented metropolitan areas and encroachments on public land through comprehensive zoning regulations. However, it lacks standardized definitions for "open spaces" and municipal-level information, which should be improved for effective implementation. The strategy underscores the importance of integrating natural elements within urban areas and recognizes the role of parks and open spaces in enhancing quality of life. It advocates for equitable access to open spaces as a fundamental principle of urban planning, although this issue has historically been neglected in Nepal's urban development discourse and practice.

According to the open Space milestone of National Urban Development Strategy (NUDS), 2017, green space standard of the following is to be initiated:

- 2.5 percent of land as public open green space at ward level (maintained, monitored) in existing urban area.
- 5 percent of land as public open green space at ward level (maintained, monitored) in new urban area.

2.6.2 Environment-friendly Local Governance Framework, 2013

The Environment-Friendly Local Governance Framework in Nepal aims to establish environmental governance and promote sustainable, eco-friendly practices at various levels, from households to districts. Its objectives include fostering responsibility for sustainable development at the grassroots level, promoting coordination between environment and development efforts, and enhancing local ownership of environmental management. The framework provides specific indicators for municipal-level green planning, including the establishment of parks, promotion of greenery, biodiversity conservation efforts, climate change programs, and awareness campaigns on environmental protection.

2.6.3 Land Pooling Reference Manual, 2072

The document, published jointly by MoUD and DUDBC, serves as a guideline for land pooling, emphasizing its importance for efficient land development. It outlines the concept and process of land pooling while acknowledging the need for open spaces and park development within consolidated areas. To strike a balance between development and landowner concerns, it recommends setting aside 5 percent of the land for open spaces, with specific criteria such as a minimum size of 300 sq.m. and a width of at least 12 m. These open spaces are intended to benefit the community, and their preservation and safeguarding by neighborhood members are essential to ensure a safe and sustainable environment for everyday use.

3. Methodology

The research studied the cases (urban green spaces) as it is and answer the research questions through survey, observations, questionnaire, and case studies findings hence follows pragmatic paradigm. The data is collected using both qualitative and quantitative methods. This research has been designed as exploratory as well as solution seeking which started from getting a thorough understanding of the urban green spaces and how urban planning affects the green spaces of a city. Quantitative Data will be collected based on distribution, accessibility, and quantity of urban green spaces. This can be done through surveys, GIS mapping, and data from government agencies and research institutions. Qualitative Data is gathered through interviews, focus group discussions, and observations, key informant interviews. To study urban green spaces and their accessibility to the public, the challenges related to urban planning and practice issues, a conceptual framework was prepared.

4. Study Area

4.1 Butwal Sub-Metropolitan City

The city is one of the tri-cities of the rapidly growing Butwal-Tilottama-Bhairahawa urban agglomeration primarily based on the Siddhartha Highway in West Nepal. It connects western Nepal with the capital Kathmandu through the highway and air links (via Gautam Buddha International

Airport at Siddharthanagar). The city stands beside the bank of Tinau River, and at the northern edge of the Terai plain below the Siwalik Hills. The vision of the Butwal Sub-Metro is Equitable, Dignified, and Capacitated-Livable Butwal and is working accordingly.

The total area of the city is 101.6 km². The population size according to census data 2021 is 194335 and the population density is 1913/km². The municipality has 3.1 percent annual population growth from 2011 to 2021. The total number of households is 50565 during 2021 census.

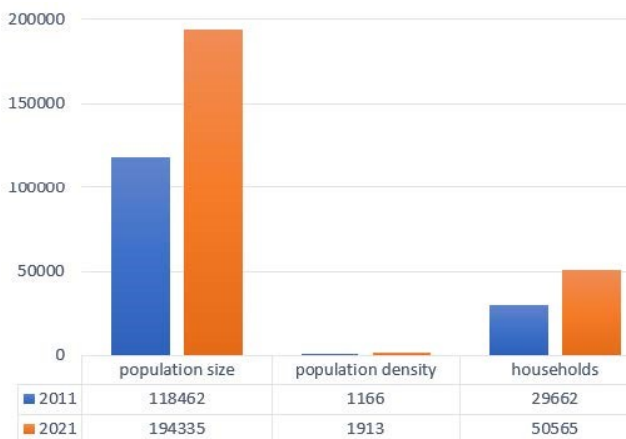


Figure 2: Population data

Ward wise population distribution:

The ward wise population distribution gives a clear vision of population distribution. As we can see in the chart below, ward

11 has the highest population as it lies in a city center where the attraction is comparatively high and ward 18 has the lowest population as it lies on the periphery of the city.

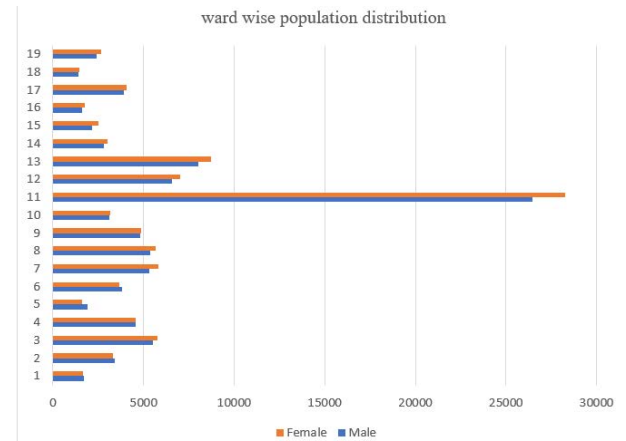


Figure 3: Wardwise population distribution

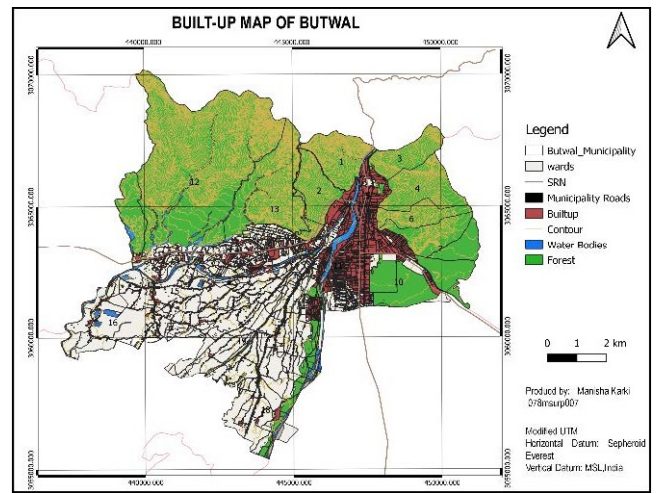


Figure 4: Land-use map of Butwal (Source: Department of Survey)

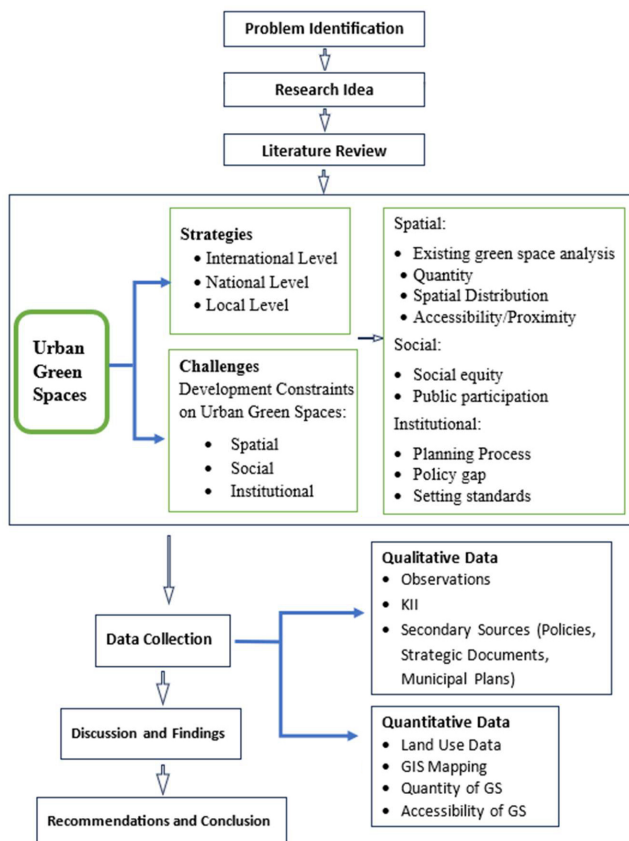


Figure 1: Methodological Flowchart

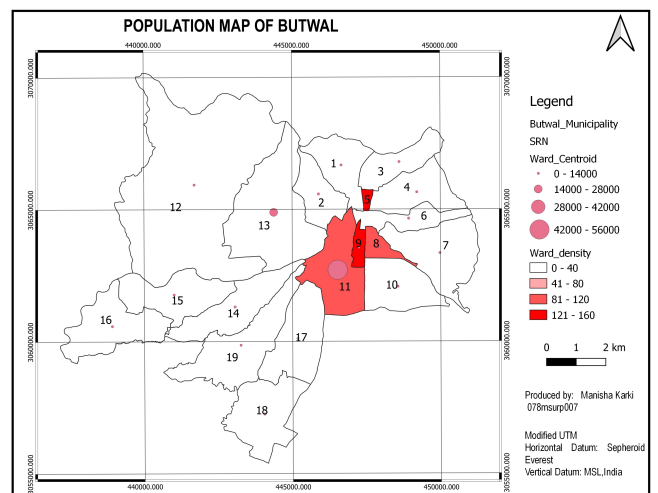


Figure 5: Population Map of Butwal

4.2 Local plans, policies, and strategies

The Integrated Urban Development Plan (IUDP) represents an effective approach for the comprehensive and sustainable development of urban areas, emphasizing cross-sectoral cooperation, a multidisciplinary framework, and participatory involvement. The IUDP places significant emphasis on environmental protection, inclusivity, and good governance, aligning with the municipality's vision of creating an environmentally friendly city while prioritizing plans and programs geared towards urban environment protection and conservation. Some of these programs that focus on increasing green spaces useful to public are:

- A botanical park to be developed within the shivanagar community forest and siddhababa religious forest.
- Introducing sustainable city concepts such as green city, garden city.
- Developing supporting policies for the annual plans of municipality that promote green spaces and encourage public to include green roofs, green walls and urban farming whenever possible.
- The Annual Plans and Policies 2079/080 incorporates includes plans, goals and programs promoting green provision in a city such as:
 - One ward one park
 - One forest one park one pond
- Land deformed in Jyotinagar, laxminagar chure hills to be developed as parks and sports playground after land maintenance.
- A memorial park will be developed in memory of martyrs: B.P. Koirala, Puspallal Shrestha and Surya Prasad Pradhan in Devinagar, ward 11.
- A green trail along the Sukhaura river is to be developed along the ward 3, 4, 6, 7, and 8.
- Promoting tourism in parks and open spaces.

4.3 Existing Green spaces Analysis

Green spaces used by the public for various activities and spaces providing physical and social benefits for the people are included under green spaces. In the map the size and location of green spaces can be seen. Green spaces of varying size and in scattered patterns. Most of the Green spaces are located downhill and are part of the community forest area.

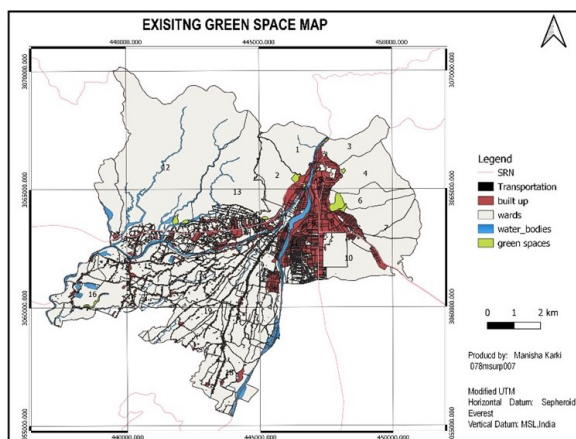


Figure 6: Existing green space map

The analysis of existing spaces is done applying various parameters through GIS mapping and data is collected through municipal profiles and published documents. The existing green spaces will be evaluated in terms of quantity and accessibility. The quantity will be examined based on the distribution and supply of public green spaces as a percentage of all the city area, the m2 of urban green space per inhabitant. Accessibility examines walkability. For the analysis various parameters are shown in Tables 3, 4, and 5.

Table 3: Analysis of existing green spaces

Metrics	Analyzed data	Description
Total area	101.6 km2	Total land area under metropolitan
Total population	194335	Total population according to 2021 census
Built-up area	13308576.96 m2	Tentative area as per GIS
Total green area	596849.1 m2	Tentative area as per GIS

Ward-wise analysis of Green Spaces

Table 4: Green area percentage of each ward

Ward	Total area (m2)	Green Area (m2)	Green Area %
1	3511696.99	11411.8	0.32%
2	2924965.45	78814	2.69%
3	2934926.39	11095.3	0.38%
4	3892471.41	21352.1	0.55%
5	226234.475	809.547	0.36%
6	2323980.63	131540	5.66%
7	5952273.52	159097	2.67%
8	950248.904	2844.08	0.30%
9	619197.092	-	-
10	4233041.04	-	-
11	5127063.44	1408.04	0.03%
12	27224785.1	94092.8	0.35%
13	10296008.4	22079	0.21%
14	4814807.44	-	-
15	4976311.05	-	-
16	5480779.99	58719.1	1.07%
17	5327733.28	3353.31	0.06%
18	5507620.87	-	-
19	6668986.46	-	-

The comprehensive analysis of Butwal's urban and green landscape, population distribution, and accessibility, utilizing GIS mapping and data from the survey department and open street map, highlights significant challenges in providing adequate green spaces within the city. Despite a substantial built-up area, the city's green space allocation is limited, with variations in land usage among different wards. The study reveals that densely populated wards like Ward 9 and Ward 5 have insufficient green space, primarily located in urban areas. The analysis underscores the importance of proximity to green spaces for creating a walkable and livable urban environment, but it also raises concerns about equitable access to nature, particularly for wards with no recorded green areas. The absence of even a small pocket park within the city core disconnects residents from nature, emphasizing the need for a more balanced approach to green space allocation and

urban planning to promote social cohesion and improve overall quality of life.

Table 5: Green space per ward

Ward	Population	Built-up Area (m ²)	Green Area (m ²)	Green space per inhabitant	Green space per built area
1	3377	326949	11411.83	3.38	0.03
2	6760	405554	78813.968	11.66	0.19
3	11268	427959	11095.306	0.98	0.03
4	9115	343518	21352.068	2.34	0.06
5	3493	226088	809.547	0.23	0.00
6	7474	428509	131540.21	17.60	0.31
7	11113	495881	159097.34	14.32	0.32
8	11037	878187	2844.078	0.26	0.00
9	9665	590645	-	-	-
10	6266	685626	-	-	-
11	54699	2750937	1408.043	0.03	0.00
12	13567	1096857	94092.847	6.94	0.09
13	16762	1247355	22078.952	1.32	0.02
14	5804	706024	-	-	-
15	4652	668256	-	-	-
16	3371	388341	58719.054	17.42	0.15
17	7984	710270	3353.309	0.42	0.00
18	2861	383168	-	-	-
19	5067	472016	-	-	-

The graphical representation for the clear visualization for the comparison is shown in Figure 7.

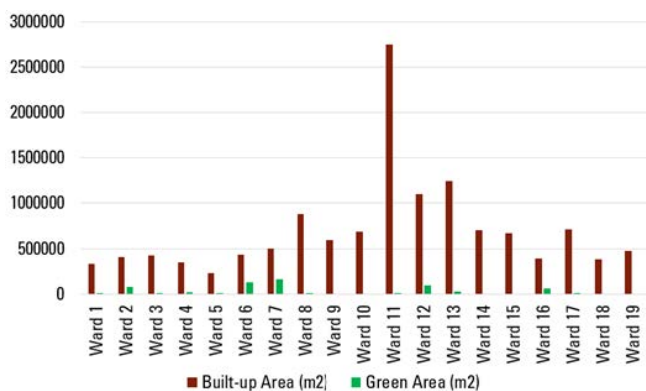


Figure 7: Ward-wise analysis of green spaces

Table 6: Analysis based on indicators of green spaces.

Quantity measures	Percentage of area	0.58%	public green spaces as a percentage of all the city area
	m ² per inhabitant	3.07 m ²	the m ² of urban green space available to per inhabitant of a city
Spatial distribution and Accessibility	Easy access (450m buffer)	2976728.356 m ²	Within 5-10 minutes walking distance
	Medium access (800m buffer)	5710377.660 m ²	Walkable distance
	Built-up Area without walkable access to green spaces	7598199.3 m ²	

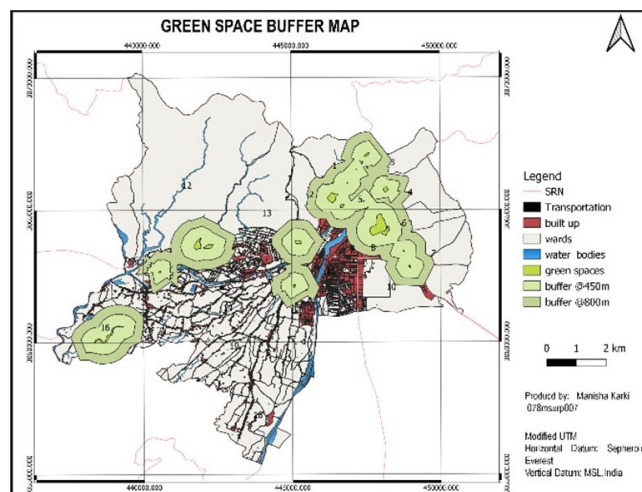


Figure 8: Green space buffer map

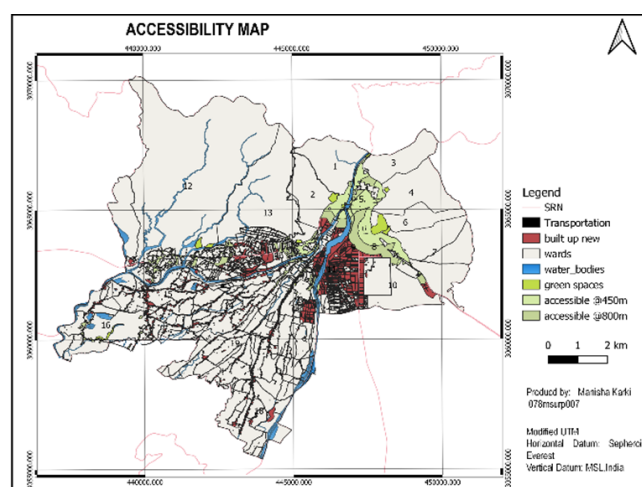


Figure 9: Green space proximity map to built-up

5. Findings and Discussion

The challenge of preserving green spaces in rapidly urbanizing cities is critical due to constant pressure for development and limited available land. Concerning its green spaces, the city has spatial issues. There are few opportunities for recreation and green growth in the core region due to the noticeable lack of open or public places. On the other hand, the peripheral is primarily allocated for residential uses, which leaves little area for green efforts. The small remaining green spaces in the city have been converted to parking lots or are now used for a variety of other purposes, which only serves to exacerbate the problem. It is extremely difficult to guarantee that all city residents have equal access to green spaces given their uneven and scattered distribution throughout the metropolis. To protect these vital areas, it's essential to foster environmental consciousness among communities and promote a sense of shared responsibility. The city has major strategic shortcomings when it comes to managing its green spaces. First, the lack of a standardized typology or classification for green areas makes it challenging to plan and distribute resources effectively. Additionally, the lack of precise guidelines and standards for the provision of green space makes it challenging for the city to create and manage these

crucial areas. It's significant because current regulations do not account for the varied levels of urbanization, the need-based provision of green spaces or the variation of topographical circumstances inside the city. It is crucial to close these policy gaps to make sure that green areas are properly dispersed, planned, and maintained to suit the shifting demands of the city and its inhabitants.

The local government has initiated green projects, such as the "one ward one park" initiative but faces challenges due to land availability and private ownership as mentioned by the key informant during KII. Land use planning is hindered by residential categorization, limiting green development. Alternative solutions include repurposing open spaces used for parking. Land encroachment along river corridors is a significant issue, prompting plans for memorial parks and gardens to protect land and increase green space.

Lack of supporting policies makes planning green spaces difficult. Public participation is encouraged through demand collection and consultation, fostering a sense of belonging among locals. According to the urban infrastructure development officer, in the coming years, population trends are expected to decline, and development has shifted southward, impacting agricultural land and urban environment quality.

Strict laws and regulations supporting green space development are lacking. National and local policies fail to provide clear guidelines for incorporating nature within cities, enforcing minimum standards for green areas. Access to nature in urban environments is crucial for well-being, community cohesion, and urban development. The absence of green spaces can lead to social disparities, health challenges, and urban degradation, emphasizing the importance of nature in cities.

6. Conclusion

In the face of growing urbanization, this study emphasizes the crucial necessity of urban green spaces. Butwal's urban and green landscape analysis finds disparities in green area distribution, with densely populated wards frequently lacking adequate access to these essential resources. Furthermore, local governments have considerable challenges due to the lack of defined typologies, norms, and supporting policies for green space planning and development. The lack of defined legislation and minimum criteria for green spaces makes ensuring fair access to nature within urban surroundings difficult. The difficulties of uneven distribution, poor accessibility, and the lack of clear planning guidelines highlight the need for comprehensive initiatives to protect

and grow these vital resources. With rising urbanization and environmental concerns, cities such as Butwal must emphasize the preservation and extension of natural spaces. As cities expand, officials must acknowledge the importance of green spaces and work toward comprehensive planning and laws that secure their availability for future generations. Finally, as cities continue to expand and grow, understanding the benefits of green areas in improving citizens' well-being, building community cohesiveness, and boosting environmental resilience is critical.

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