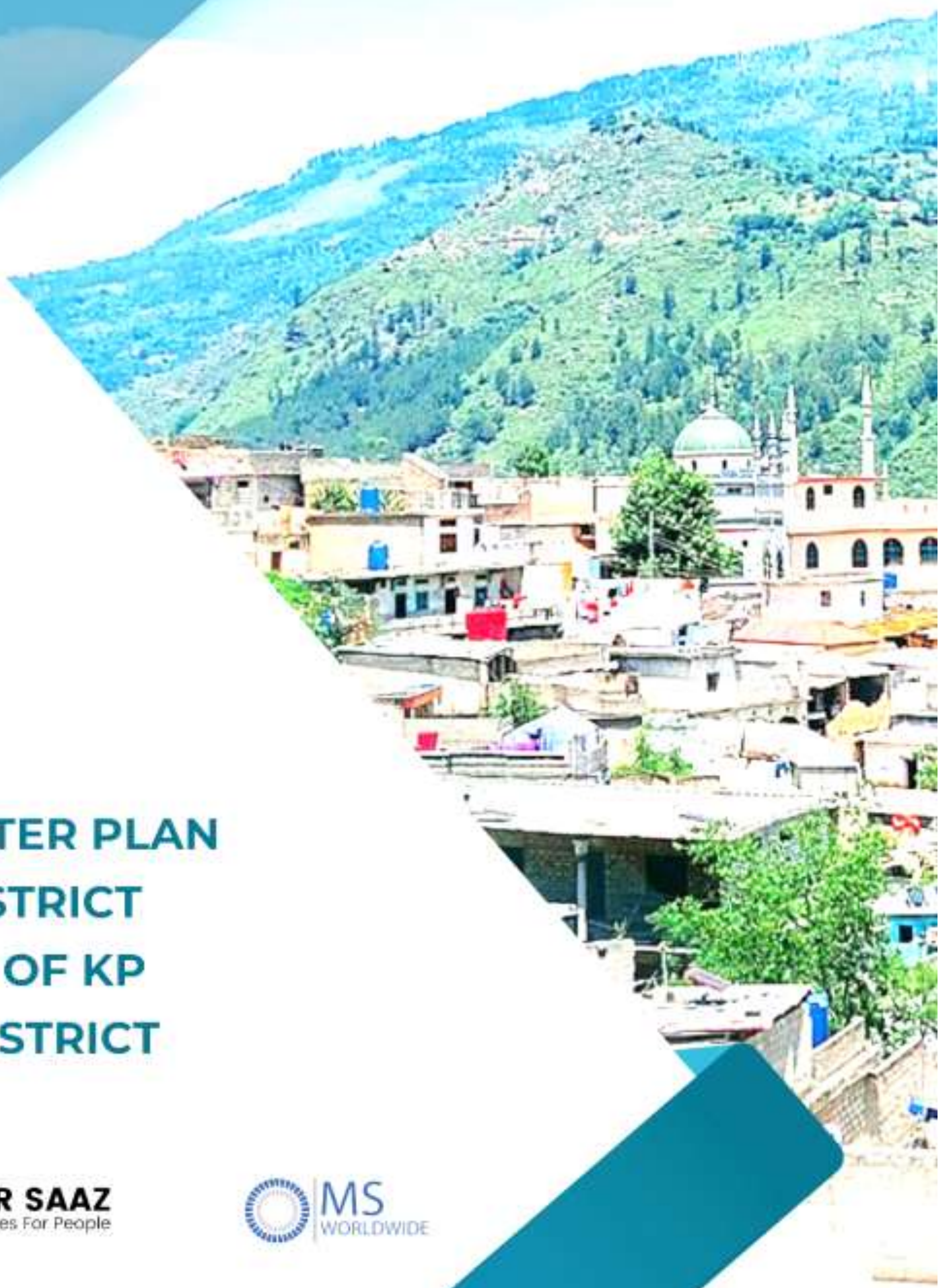
Deliverable 4

DRAFT MASTER PLAN & SCENARIO MAPS – BATTAGRAM CITY

2025–2045



PREPARATION OF MASTER PLAN OF URBAN CENTER (DISTRICT HEADQUARTER CITIES) OF KP INCLUDING MERGED DISTRICT

URBAN POLICY UNIT

SHEHER SAAZ
Creating Places For People

MS WORLDWIDE

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Protect Details:

- Preparation of Master Plans of Urban Centers (District Headquarters) of KPK including Merged Districts
- Master Plan of Battagram City, 2045

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Acknowledgment

The preparation of the Master Plan of Battagram City (2025-2045) has been a collaborative and dedicated effort aimed at guiding the city toward a more structured, sustainable, and resilient urban future. This report reflects the commitment of all stakeholders toward the rational, balanced, and systematic use of land and resources to address Battagram's existing challenges and to guide its future growth in an integrated manner.

We extend our sincere gratitude to the Urban Policy and Planning Unit (UPPU) of the Planning and Development Department, Government of Khyber Pakhtunkhwa for their trust and support in assigning this significant project to our team. Special thanks are due to Mr. Adnan Salim, Project Director of the Master Planning Project, for his insightful guidance and leadership throughout the planning process. His direction and support remained instrumental in shaping the planning process from inception to finalization.

This Master Plan forms part of the broader provincial initiative to promote planned and sustainable urban development across Khyber Pakhtunkhwa. The report addresses key dimensions of urban management including land use, housing, transportation, commerce, industry, infrastructure, water and sanitation, solid waste management, social services, and environmental sustainability, and provides a comprehensive framework for guiding the future development of Battagram City.

We acknowledge the valuable contributions of the officials and technical teams of the Urban Policy Unit, whose input at various stages of conceptualization, data collection, analysis, review, and coordination greatly strengthened the quality of this report. Their professional guidance and sectoral feedback were essential in refining the proposals and ensuring that the Master Plan remained grounded in policy, planning standards, and local realities.

We are also deeply thankful to the District Administration Battagram, Tehsil Municipal Administration / Tehsil Local Government Battagram, and all relevant provincial and district line departments for their cooperation, provision of data, facilitation of field activities, and participation in consultations. We further appreciate the support of local stakeholders, business representatives, community members, and participants of public consultation processes whose local knowledge and practical insights contributed meaningfully to the preparation of this plan.

Special recognition is due to Sheher Saaz Pvt Ltd. JV MS Worldwide for their dedicated efforts in preparing this report. The team's expertise, commitment, and hard work have been critical in ensuring the timely and successful completion of the master plan. Their technical input across planning, engineering, GIS, surveys, urban design, infrastructure, and sectoral analysis has played a central role in the preparation of this comprehensive document.

Finally, we express our gratitude to everyone who contributed to this project, including those who facilitated surveys, shared records and technical information, assisted in coordination, and supported the planning process in various capacities. This Master Plan represents a shared vision for a sustainable, efficient, and prosperous urban future for Battagram City.

Executive Summary

The **Master Plan of Battagram City (2025–2045)** has been prepared as a long-term spatial development framework to guide the orderly growth, management, and transformation of Battagram up to the year 2045. As the district headquarters of Battagram and an important service center within the Hazara region, the city performs a strategic administrative, commercial, and transport role despite its predominantly rural setting. The planning process has therefore sought to establish a realistic and implementable framework for future development while responding to Battagram's topographic constraints, dispersed settlement structure, infrastructure deficiencies, and environmental sensitivities. The study is based on an integrated planning approach involving primary surveys, GIS-based land use mapping, demographic analysis, land suitability assessment, scenario development, and sector-wise planning proposals.

Existing Urban Context and Growth Dynamics

Battagram is not a large plains-based city; it is a mountain-valley urban center whose growth is shaped by terrain, river systems, and corridor-based accessibility. The city has grown gradually but in a dispersed manner, with most development taking place along the N-35 / Karakoram Highway corridor, the main valley floor, and associated settlement clusters. This has produced a terrain-constrained linear-nodal urban form with dispersed hillside expansion, rather than a compact or radial city structure. The main urban concentrations are linked through the central corridor, while secondary settlements such as Argashori, Tamai, Ajmera Proper, Ajmera Bar Paw, Ajmera Kuz Paw, Matta, and Chappagram form supporting nodes in the wider urban structure.

The demographic trend confirms continued growth. Battagram City's population increased from 143,118 in 2017 to 165,055 in 2023. Using geometric, exponential, and arithmetic projection methods, the adopted average planning population reaches 173,148 in 2025, 194,715 in 2030, 218,395 in 2035, 244,472 in 2040, and 273,271 by 2045. This means the city is expected to absorb an additional 100,123 persons over the plan period, placing increasing pressure on housing, mobility, public services, utilities, and developable land

Historic spatial analysis shows that Battagram's urban area expanded from approximately 345 acres in 2015 to 544 acres in 2020, and further to about 727 acres in 2025, indicating strong linear growth along the main corridor. Built-up land cover also increased significantly over the last decade, while vegetation and open land have declined in relative terms.

Existing Land Use Structure

The existing land use pattern confirms that Battagram remains predominantly rural in overall land composition, with limited but growing urban functions. Out of a total study area of 8,462.33 acres, agricultural terraces cover 3,773.86 acres (44.60%), while private and public forests together cover 2,357.90 acres, and rangeland covers 848.06 acres. Residential land occupies 767.05 acres (9.06%), making it the largest built-up urban category. Commercial land occupies only 69.85 acres, while mixed use accounts for 14.01 acres. Industrial land is extremely limited at just 3.01 acres (0.04%). Roads occupy approximately 321.33 acres (3.80%), and recreational land is negligible at 8.57 acres (0.10%)

Comparison with the National Reference Manual (NRM) indicates severe structural imbalances. Residential land is far below the recommended range for a city of Battagram's projected size. Community facilities, recreational spaces, graveyard land, roads, and industrial uses are all substantially underprovided. Only commercial land is close to the lower benchmark, but even there the issue is not simply quantity; it is the weak organization, corridor dependency, and absence of hierarchy. These findings confirm that Battagram is still in a rural-urban transitional stage and requires strong spatial structuring rather than continuation of organic and dispersed growth.

Land Demand and Future Spatial Requirement

The future land demand assessment undertaken for the 2045 planning horizon highlights significant deficiencies across nearly all major urban sectors. Residential land represents the largest future requirement. Commercial, community facilities, recreation, graveyard space, and industrial land all show substantial gaps when compared with projected demand. The assessment also confirms that Battagram possesses a large reserve of agricultural, vacant, and other undeveloped land within the broader study area; however, this land is not uniformly suitable for development due to slope, accessibility, environmental sensitivity, and hazard conditions.

The land demand analysis therefore demonstrates that future development cannot be guided simply by land availability. Growth must instead be directed to the most suitable locations through a managed and phased land use strategy that balances urban development with conservation, hazard reduction, and infrastructure feasibility.

Preferred Development Scenario

Three alternative growth scenarios were developed to test how Battagram could accommodate future residential and commercial growth. Scenario A represented trend / business as usual, based entirely on horizontal expansion. Scenario B proposed managed expansion, with a limited vertical component and stronger structuring of residential and commercial growth. Scenario C proposed a more compact and densified development pattern with greater vertical development and stronger concentration of activity.

Following comparative evaluation, Scenario B was selected as the preferred development direction for Battagram. This scenario is considered the most appropriate because it provides the best balance between land efficiency, implementation feasibility, and compatibility with the city's actual urban form and topographic setting. Battagram is too terrain-constrained to rely on uncontrolled horizontal expansion, but it is also not yet prepared for a highly compact, apartment-led urban model across the whole city. Scenario B therefore introduces a controlled and limited vertical component while retaining plotted housing and outward growth as the dominant but managed form of expansion.

Housing and Residential Development

Battagram's housing profile is defined largely by low-density, self-built, and incremental residential development, with very limited formal housing schemes and a predominantly plot-based housing market. While the current quantitative housing backlog is not very large, the city faces significant future housing demand due to population growth, declining household size, and the need to replace deficient housing stock.

The total projected housing requirement up to 2045 is 18,110 housing units, accommodating a population increase of 102,142 persons. Under the selected housing scenario, 10 percent vertical development and 90 percent horizontal development is proposed. This results in a total residential land requirement of 1,068.04 acres, including 1,045.87 acres for horizontal development and 22.16 acres for vertical development. This is substantially more efficient than the fully horizontal scenario while remaining realistic for Battagram's physical and social context

The proposed residential framework includes a structured combination of Residential Zone 1 (355.532 acres), Residential Zone 2 (257.712 acres), Residential Zone 3 (87.809 acres), Residential Zone 4 (92.536 acres), Model Village (129.515 acres), and Infill Residential (91.695 acres). The residential strategy prioritizes infill and consolidation first, then planned outward expansion into suitable growth areas, while introducing a limited apartment component in accessible locations. The Model Village proposal is a particularly important innovation, intended to demonstrate more organized settlement planning in Battagram's hilly and fragmented context

Commercial Structure and Urban Economy

Battagram's economy is primarily agrarian, informal, and service oriented. The city functions as a local market and service center for surrounding rural settlements rather than as a major regional commercial hub. Existing commercial activity is concentrated in small retail strips, roadside shops, service outlets, and market frontage along the main urban corridor. Formal financial, hospitality, and higher-order commercial uses remain limited.

Using the adopted planning standard of 1 acre of commercial land per 1,000 people, the city's existing commercial area of 87.78 acres is below the current requirement generated by the 2025 planning population. By 2045, the population increase generates an additional commercial requirement of 99.123 acres, confirming the need for a stronger and better organized commercial structure. In response, the Master Plan proposes a structured commercial system comprising Linear Commercial (170.797 acres), Commercial Zone (53.895 acres), Farmers Market (7.318 acres), Mixed Use (10.964 acres). This framework is intended to reduce pressure on the existing bazaar corridor, organize commercial growth into identifiable and serviceable locations, support agriculture-linked marketing, and strengthen Battagram's local economic base

Industrial and Economic Development

Industrial activity in Battagram remains extremely limited at present, with only 3.01 acres of existing industrial land and a very small base of flour mills, stone crushers, block manufacturing, repair workshops, and other micro-enterprises. The city is therefore not an industrial center in the conventional sense. However, it has potential in agro-processing, small-scale storage, rural service industry, and resource-linked economic activity.

To support local value addition and employment generation, the Master Plan proposes an Agro-Industrial Zone of 45.606 acres. This zone is intended for agro-processing, produce handling, cold storage, packaging, agri-input storage, and related rural support activities. Rather than promoting heavy industry, the proposal recognizes Battagram's actual economic structure and seeks to support practical, locally grounded forms of economic development.

Social Infrastructure and Public Facilities

The Master Plan addresses major deficiencies in health, education, civic amenities, public open space, and community services. Existing public facilities are unevenly distributed and insufficient in both scale and accessibility, especially outside the central corridor. The Master Plan therefore proposes a range of new social and institutional designations including Educational Zone (31.867 acres), Health Care Zone (9.533 acres), Civic Amenities Zone (20.445 acres), Community Model School (4.085 acres). These proposals are designed to improve service accessibility, strengthen the city's institutional structure, and enhance its civic and cultural role within the district

Public-space and recreation proposals include Eco-Tourism and Recreational Zone (5.736 acres), Family Park (11.75 acres), Neighbourhood Parks (3.896 acres), River-Front Park (2.218 acres), and Sports Complex (3 acres). These are especially important because Battagram currently has very little organized recreational land and limited public open-space infrastructure.

Agriculture, Environment, and Protected Areas

A central strength of the Battagram Master Plan is that it does not treat all undeveloped land as future urban reserve. Instead, it introduces a strong environmental and agricultural protection framework that reflects the city's mountainous landscape, terrace-farming base, and ecological sensitivity. The plan includes major allocations for Protected Forest (2,291.730 acres), Reserved Agriculture (2417.86 acres), Plantation (843.702 acres), Riparian Zone (316.663 acres), and Green Buffer (18.307 acres). These allocations form the environmental structure of the city and are intended to protect productive land, conserve slopes and vegetation, safeguard streams and riparian systems, and reduce hazard exposure from erosion, landslides, and flooding

This protection framework is particularly important in Battagram because topography is a defining determinant of urban form. The Master Plan therefore emphasizes that long-term sustainability depends not only on accommodating growth, but also on conserving the environmental systems that support local livelihoods, resilience, and urban safety.

Transport, Mobility, and Infrastructure

Battagram's road structure is constrained by narrow corridors, topography, and the concentration of movement along a limited number of routes. The city's transport problems are closely linked with its linear form, roadside commercialization, and insufficient hierarchy of roads and junctions. The Master Plan therefore includes proposals for road widening, new roads, public transport improvement, parking management, and a Transport Terminal (2.1 acres). A Parking Plaza (3.680 acres) is also proposed to address localized congestion and parking pressure within the urban core

These mobility proposals are intended to support a more structured urban form, improve internal circulation, reduce pressure on the central corridor, and strengthen connectivity between the main urban spine and secondary nodes.

Water Supply, Sewerage, Solid Waste, and Environmental Management

The Master Plan places strong emphasis on infrastructure upgrading and environmental services. Battagram currently faces multiple service deficiencies, including uneven water access, limited formal sewerage, weak drainage, and inadequate solid waste management. These deficits are especially significant in a topographically sensitive city where environmental degradation can quickly translate into public health risk, slope instability, and stream pollution.

The Master Plan therefore proposes a phased approach to water supply, sewerage, drainage, stream protection, and solid waste management. A dedicated Landfill Site (9.17 acres) has been proposed, alongside broader improvements in collection, transfer, and disposal systems. The environmental planning framework is closely tied to these infrastructure proposals, ensuring that land use management, hazard mitigation, and service delivery are treated as interrelated rather than separate issues

Proposed Master Plan Structure

The final proposed land use framework for Battagram covers 7,302.21 acres and establishes a comprehensive land use structure for the 2025–2045 planning horizon. Major proposed allocations include Protected Forest (2,291.730 acres), Reserved Agriculture (2417.8 acres), Plantation (843.7 acres), Residential Zones 1–4 totaling 793.589 acres, Model Village (129.515 acres), Infill Residential (91.695 acres), Linear Commercial (170.797 acres), Commercial Zone (53.895 acres), Agro-industrial Zone (45.606 acres), Eco-Tourism and Recreational Zone (5.7 acres), Educational Zone (31.867 acres), Civic Amenities Zone (34 acres), Health Care Zone (9.533 acres), and other supporting civic, environmental, tourism, and transport-related designations

Conclusion

The Master Plan of Battagram City provides a realistic and integrated framework for managing urban growth up to 2045 in a physically constrained, environmentally sensitive, and institutionally evolving urban center. It responds directly to the city's gradual but expanding population base, corridor-led growth pattern, under-provision of social and economic infrastructure, and dependence on agricultural and ecological systems. Rather than imposing an artificial compact-city model, the plan adopts a managed expansion strategy that is consistent with Battagram's terrain, settlement structure, and development capacity.

In essence, the Master Plan seeks to guide Battagram from a largely organic, scattered, and corridor-dependent settlement pattern toward a more organized, serviceable, resilient, and environmentally responsible urban form. It establishes the basis for future zoning, infrastructure investment, institutional coordination, and development control, and provides a coherent framework for transforming Battagram into a better managed, more livable, and economically stronger district headquarters over the next two decades.

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Acronym	Full Form
ADB	Asian Development Bank
AGR	Average Growth Rate
BHU	Basic Health Unit
CBD	Central Business District
CBFC	Common Business Facilitation Center
CDS	Comprehensive Development Strategy
CP	Cordon Point
CPEC	China–Pakistan Economic Corridor
DEM	Digital Elevation Model
DRR	Disaster Risk Reduction
DSS	Decision Support System
ESIA	Environmental and Social Impact Assessment
FGD	Focus Group Discussion
GAIE	Gadoon Amazai Industrial Estate
GDP	Gross Domestic Product
GIS	Geographic Information System
GoKP	Government of Khyber Pakhtunkhwa
HIS	Household Information Survey
HMC	Highway Manual Capacity
JICA	Japan International Cooperation Agency
KP	Khyber Pakhtunkhwa
LOS	Level of Service
LSA	Land Suitability Analysis
LU&BCA	Land Use and Building Control Authority
MCDA	Multi-Criteria Decision Analysis
MCC	Manual Classified Count
MCH	Maternal and Child Health Centre
MLD	Million Litres per Day
NOC	No Objection Certificate

Acronym	Full Form
NC	Neighbourhood Council
NRM	National Reference Manual
O&M	Operation and Maintenance
OD	Origin–Destination
ODK	Open Data Kit
PBS	Pakistan Bureau of Statistics
PCU	Passenger Car Unit
PHH	Persons per Hectare
PPP	Public–Private Partnership
RCC	Reinforced Cement Concrete
RHC	Rural Health Centre
ROW	Right of Way
SDPF	Strategic Development Policy Framework
SME	Small and Medium Enterprise
SWOT	Strengths, Weaknesses, Opportunities and Threats
SWM	Solid Waste Management
TMA	Tehsil Municipal Administration
UN	United Nations
UPU	Urban Policy Unit
VC	Village Council
WATSAN	Water Supply and Sanitation
WHO	World Health Organization

1 CHAPTER: INTRODUCTION

1.1 Project Background

Urbanization is a universal phenomenon and is going on at varying paces in different countries. In Pakistan, the rate of urbanization is one of the fastest in the world. At the moment, Pakistan is almost two thirds rural, but it is projected that the Urban Population will increase to fifty percent by 2030, even earlier. The migration of rural to urban, coupled with the natural increase in population, and the transformation of villages into towns, means that urban living will be the way of the future. The Pakistan economy is transforming with an increasing reliance on urban economic growth. With economic activities in the urban areas producing 78% of the gross domestic product, the aging urban infrastructure is unable to provide basic services that will stimulate this economic growth and create jobs. Improved urban planning and service delivery, combined with large infrastructure investments, will provide blocks for sustainable urban economic growth.

Urbanization is a fundamental prerequisite for development, with a strong correlation between urban growth and national GDP. Urban areas offer lower per-capita service delivery costs, better living conditions, and greater economic opportunities, and are increasingly central to Pakistan's growth framework. As the contribution of agriculture to GDP declines, industrial and service sectors largely urban-based are driving economic activity. In Khyber Pakhtunkhwa (KP), however, the urban sector has been neglected, resulting in unmanaged growth, weak institutions, poor service delivery, and declining quality of life. There is an urgent need to shift policy from "containing urbanization" to "managing urbanization" through integrated, growth-oriented planning, institutional reforms, and coordinated governance.

Urban population growth in KP is being accelerated by multiple push and pull factors, including migration due to conflict, natural disasters, Afghan influx, and the search for better security, education, health, and employment opportunities. This rapid growth has largely occurred without effective master planning, leading to unregulated expansion, infrastructure deficits, and the formation of slums. Urban centers face severe challenges such as overcrowding, traffic congestion, air pollution, inadequate water and sanitation services, and weak solid waste management, with a large proportion of liquid waste discharged untreated into natural water bodies. Transport systems are inefficient and poorly managed, public transport services are substandard, and traffic management remains reactive, particularly in Battagram, where linear growth along major arteries has resulted in persistent congestion and environmental degradation.

Recognizing these challenges, the Government of Khyber Pakhtunkhwa approved the Comprehensive Development Strategy (CDS) 2010–2017, envisioning cities as hubs of trade and economic activity. However, weak institutional capacity, outdated or unimplemented master plans, and lack of a coherent urban policy framework have limited progress. To address these gaps, the government has established the Urban Policy and Planning Unit (UPPU) within the Planning and Development Department. The Unit is mandated to support provincial urban planning and policy formulation, prepare city and land-use plans, coordinate across departments and stakeholders, strengthen institutional capacity, guide regulatory reforms, develop urban economic growth strategies, maintain provincial GIS systems, and promote research and innovation to enable planned, efficient, and sustainable urban development in Khyber Pakhtunkhwa.

1.2 Project Objectives

The broader objectives of the assignment are to:

1. **Ensure equity and social inclusion** in the planning process by adopting participatory and transparent approaches that reflect the needs of all population groups.
2. **Enhance the economic productivity of urban centers** by identifying strategic growth opportunities and improving the enabling environment for economic activities.
3. **Improve the quality of life of urban residents** through better access to municipal services, public spaces, housing, and social amenities.
4. **Promote environmental sustainability** by safeguarding natural assets, strengthening climate resilience, and integrating environmentally responsible practices into urban development.
5. **Equip urban centers with adequate infrastructure and efficient service delivery**, ensuring that municipal systems can respond to the pressures of rapid urbanization.

Collectively, these objectives support the provincial vision of developing prosperous, well-managed, resilient, and future-ready cities across KP. The study also defines essential planning components such as urban growth centers, intensification corridors, high-density development areas, regeneration zones, and long-term built-up boundaries.

Master Plan–Specific Objectives

The specific objectives guiding the preparation of Master Plans for all project cities include:

- Review existing policies, plans, and development schemes to identify gaps and recommend reforms for improved urban development.
- Assess the impact of urbanization, including population growth, reclassification, and boundary expansion, on infrastructure and services and propose strategies to meet future demand.
- Examine regulatory and institutional frameworks and recommend improvements to enhance governance, coordination, and implementation capacity.
- Identify appropriate development forms and densities for various intensification areas, including built form, land-use mix, and high-density zones.
- Develop strategies for affordable housing, livelihoods, and recreational facilities across existing and new urban areas.
- Formulate strategies for urban regeneration and slum upgrading, supporting mixed-use, high-density vertical development in suitable areas.
- Prepare policy frameworks and design guidelines to address local constraints related to densification and efficient land use.

- Assess municipal service adequacy, including stormwater, sewerage, water supply, solid waste, transit, roads, intersections, parking, and public amenities required for future development scenarios.
- Recommend mechanisms linking urban planning with land administration, ensuring land availability and coordinated development.
- Develop criteria for evaluating intensification proposals, addressing compatibility, density, height, access, environmental considerations, transit linkages, pedestrian safety, and traffic impacts.
- Propose inter-institutional coordination strategies for guided and controlled urban development.
- Develop strategies to enhance urban safety and security.
- Recommend approaches for the conservation of heritage, built assets, and natural environments.
- Explore and strengthen urban tourism opportunities as part of future urban economies.
- Identify financial and economic strategies for revenue generation, including land-based financing instruments and improved municipal revenue systems.
- Enhance mobility and transit connectivity to support mixed-use and high-density development while reducing environmental impacts.
- Develop an implementation, monitoring, and review mechanism to ensure that Master Plan proposals remain actionable and effective over time.

1.3 Project Deliverables and Scope

Scope of the Study

The Master Plan Project (MPP) is a province-wide initiative aimed at preparing long-term, data-driven, and implementable Master Plans for all divisional and district headquarters cities of Khyber Pakhtunkhwa, including the urban centers of the Merged Districts (MDs). Given the extensive scale and technical complexity of Master Planning, encompassing land use, infrastructure, governance, environment, mobility, and socio-economic analysis, the project is being delivered in multiple phases.

Phase I of the project involved the preparation of Master Plans for twenty (20) major cities across KP, including seven divisional headquarters, four district headquarters, and nine urban centers of the Merged Districts. Sixteen Master Plans have already been completed and approved by the Land Use and Building Control Council (LU&BCC) and subsequently handed over to the Land Use and Building Control Authority (LUBCA) for implementation. The remaining four Master Plans (Haripur, Kohat, Bannu, DI Khan) are in the final stages and scheduled for completion.

Phase II (current phase) focuses on preparing Master Plans for twelve (12) additional district headquarters cities. This study forms part of that ongoing effort and follows the scope and requirements defined by the Urban Policy Unit (UPU).

The scope covers a wide range of technical tasks, including situational assessment, thematic analysis, stakeholder engagement, spatial planning, infrastructure assessment, scenario development, detailed sectoral action plans, and preparation of regulatory and institutional recommendations. The study also integrates GIS, remote sensing, spatial modelling, public consultation, and sector-specific technical evaluations.

Project Deliverables

The study requires the submission of structured, comprehensive, and progressively detailed deliverables. Each deliverable consists of written documentation supported by analytical summaries, maps, diagrams, spatial datasets, and model outputs.

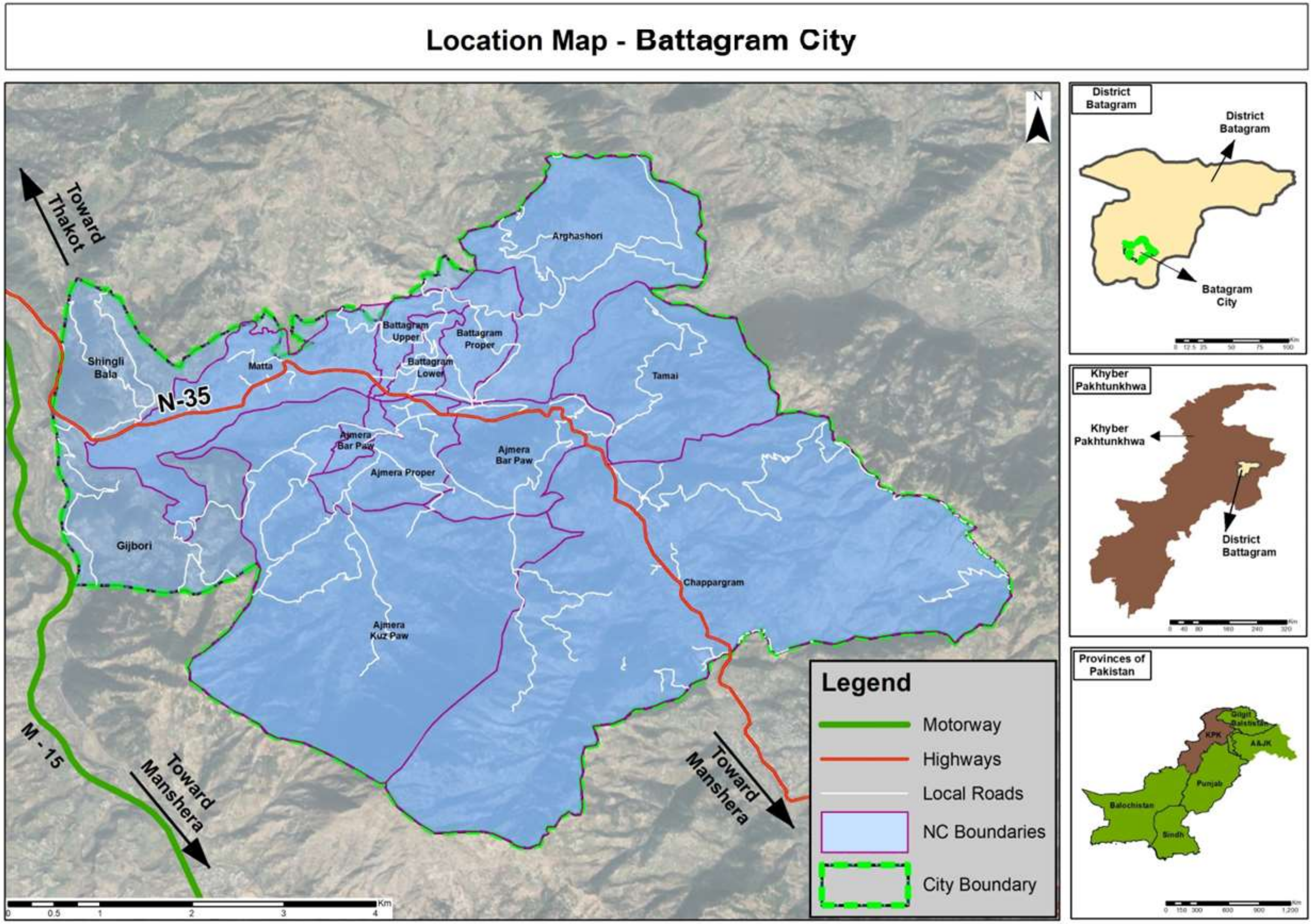
Table 1-1: Project Deliverables and Time Frame

Deliverable No.	Deliverable Title	Description	Time Frame
1	**Deliverable 1: Inception Report**	Submission of detailed methodology, work plan, and list of surveys with questionnaires. Includes presentation to client/local agencies.	**Within 1 month** from start of project
2	**Deliverable 2: Public Consultation & Vision Development Report**	Based on findings from FGDs, Vision Workshop, and participatory exercises including SWOT analysis for vision formulation.	**By end of Month 3**
3	**Deliverable 3: Background Studies / Situational Analysis**	Comprehensive report covering primary & secondary data analysis, existing land use base maps, and sectoral assessments.	**By end of Month 7**
4	**Deliverable 4: Draft Master Plan & Scenario Maps**	Includes public hearing and presentation to client/implementation agencies; revised/alternative plans to be provided if required.	**By end of Month 10**
5	**Deliverable 5: Sector-wise Action Plans**	Draft sector strategies, action plans, preliminary designs and costing; revised versions to be submitted if required.	**By end of Month 14**
6 (Optional)	**Deliverable 6: Web-Based Decision Support System (DSS)**	Development of online web portal for NOC issuance, monitoring, and land-use/building control.	**By Month 15**
7	**Deliverable 7: Final Master Plan**	Submission of final Master Plan, maps, Action Area Plans, preliminary designs & costing, editable GIS/AutoCAD files; presentation to LU&BC Council for approval.	**Within 15 months** of project start

1.4 Study Area Definition & Boundary

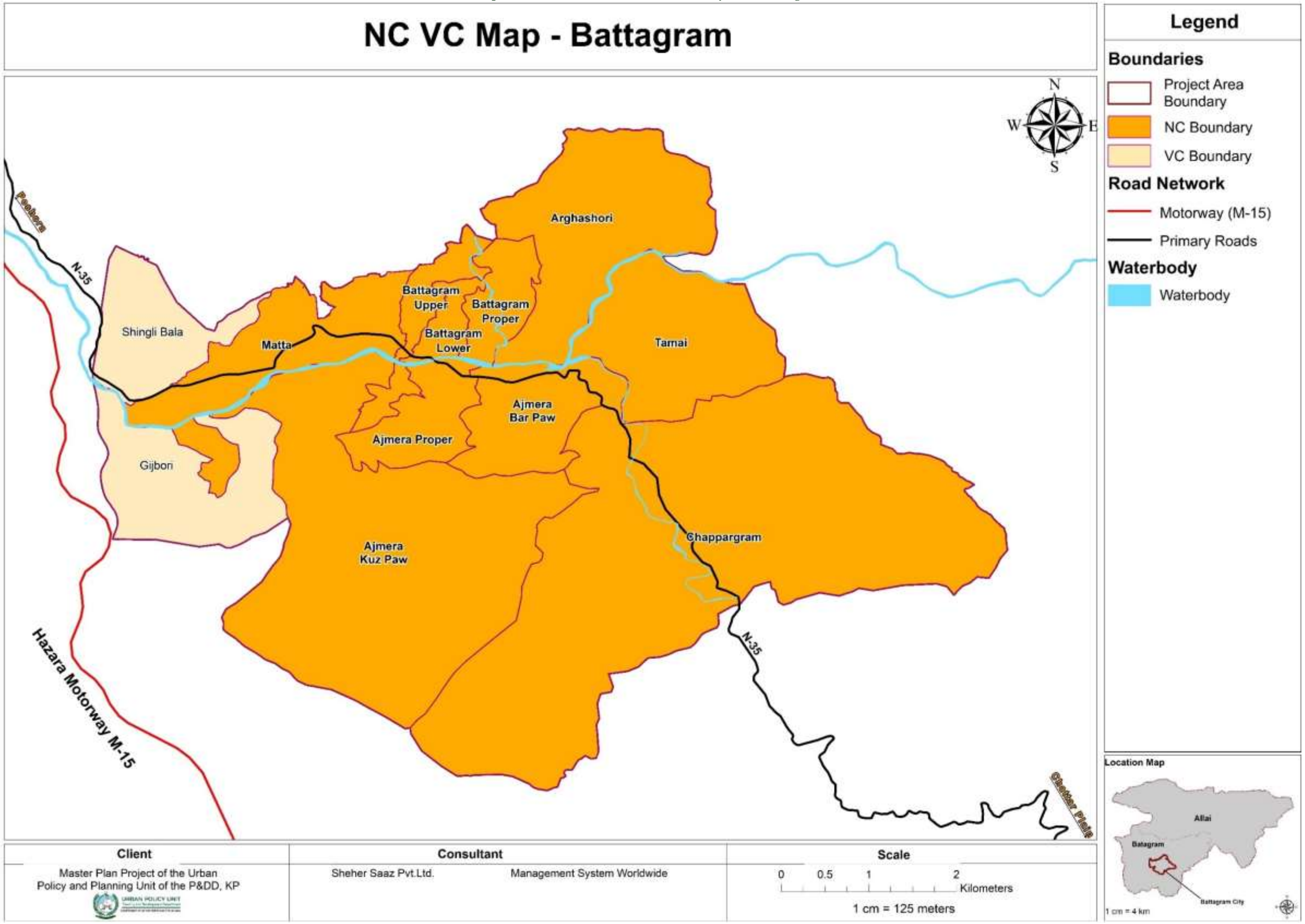
Battagram City is the administrative headquarters of Battagram District, one of the key districts of Khyber Pakhtunkhwa Province, covering an area of approximately 1,301 sq km. The district lies within the Hazara Division, bordered by Torghar to the south, Kohistan to the north, Shangla to the west, and Mansehra to the east. The historic Karakoram Highway, a vital trade and travel route, passes directly through Battagram, connecting it with Gilgit-Baltistan and onwards to China. Battagram district is renowned for its natural beauty, traditional culture, and resilient communities, while its mountainous terrain and fertile valleys make it both scenic and agriculturally rich. The city itself functions as the administrative, commercial, and educational center of the district, with small markets and vibrant local life set against the backdrop of forested hills. Nearby tourist attractions include Allai Valley, famous for its lush green landscapes, waterfalls, and trekking routes, offering visitors a serene escape into nature. With its unique charm and strategic location, Battagram also serves as a gateway to northern tourist destinations, adding to its regional importance.

Map 1: Location Maps of Battagram District



Source: Devised by Consultant

Map 2: Administrative Boundaries - Study Area Battagram



Source: Devised by Consultant

2 CHAPTER: PLANNING APPROACH AND METHODOLOGY

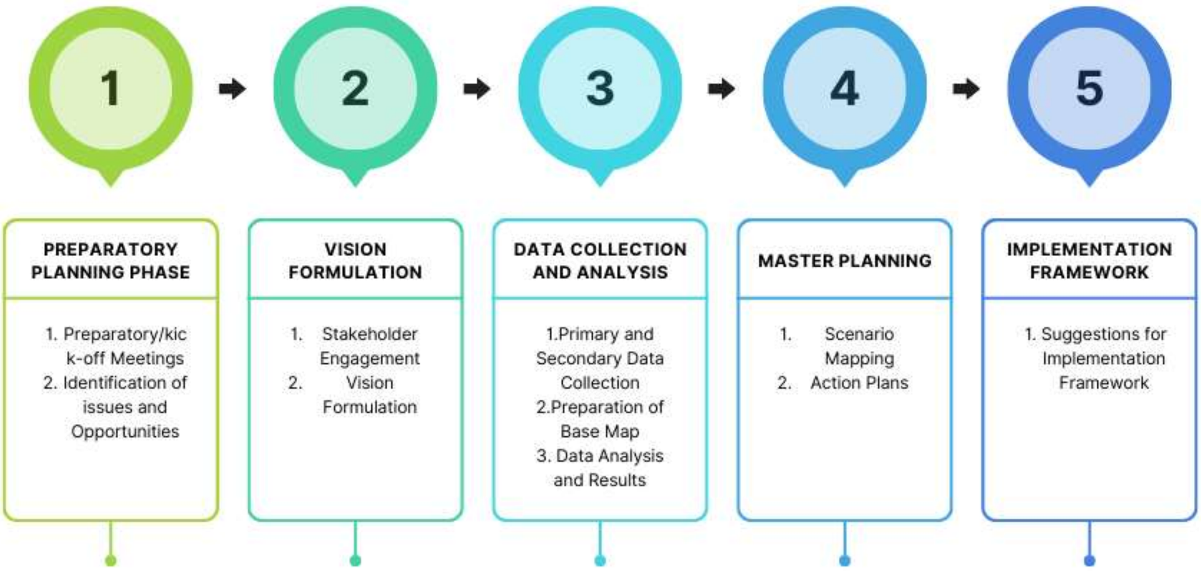
2.1 Planning Process

The preparation of the Battagram City Master Plan has followed a phased, evidence-based, and participatory planning process consistent with the overall project framework for urban centers in Khyber Pakhtunkhwa. The process has been designed to move systematically from initial scoping and baseline assessment toward strategic scenario development, sectoral proposals, implementation planning, and final approval. The sequencing of deliverables under the project reflects this progression, beginning with the inception stage, followed by public consultation and vision development, then background studies and situational analysis, and subsequently the draft master plan, sector-wise action plans, and final master plan submission.

The holistic planning approach defines the overall procedure adopted for creating the Master Plan of Battagram city. It broadly consists of five phases:

1. Preparatory Planning Phase
2. Vision Formulation
3. Data Collection & Analysis
4. Master Planning
5. Action Plans

Figure 1: Master Planning Methodology



For Battagram City, the planning process has been anchored in the understanding that the city is undergoing rapid transformation and requires a coordinated response that combines spatial planning, infrastructure planning, institutional reform, and growth management. The background study established that Battagram is expanding in a corridor-led manner, with rising pressure on agricultural land, road infrastructure, water safety, sanitation systems, and municipal service delivery. These findings have informed the planning process by highlighting the need to guide future growth toward more structured, serviced, and environmentally responsive urban development.

The planning process has therefore been structured around five interlinked stages. The first stage involved project initiation, review of the Terms of Reference, identification of required datasets, and preparation of the methodological framework. The second stage focused on stakeholder engagement and vision formulation, through which local aspirations, issues, and priorities were identified and consolidated into a shared development direction for the city. The third stage comprised the background study and situational analysis, which documented existing conditions across land use, housing, economy, infrastructure, governance, mobility, environment, and public services. The fourth stage, which this report supports, involves the preparation of the draft master plan and strategic scenario development. The final stages translate the preferred spatial strategy into sector-wise action plans, implementation mechanisms, and an integrated final master plan.

This planning process is not limited to physical land allocation alone. It integrates spatial, social, economic, environmental, and institutional dimensions so that the master plan can function as a practical framework for guided urban expansion, service delivery improvement, and long-term city management.

The details of each step are defined in the following sections.

2.2 Preparatory Planning Phase

During the preparatory planning phase, the planning professionals laid the foundation for the planning exercise. Numerous dynamics of the study area were observed, and initial understandings regarding various sectors operating within the city were sketched. Stages covered during the preparatory planning of the master plan are defined below.

Preparatory/Kick off Meetings

For the formulation of the execution strategies of the master plan meetings were held with concerned personnel and planning experts involved in the project. The purpose of these meetings was to thoroughly analyses available options and pathways and choose the best economically and social feasible option for executing the plan.

Identification of Issues and Opportunities

During the kickoff meetings and various brainstorming sessions, we identified the challenges and issues that could potentially create risks and hinder the successful completion of the master planning exercise of the city. Consultant also identified, key opportunities that arose from the project by taking into account several factors that were either directly or indirectly related to the master planning project. Additionally, the consultant looked at the different options available for project execution from a broad perspective at the city level, considering the specific pros and cons associated with each option.

2.3 Vision and Development Direction

The Vision Formulation Workshop was conducted on 29th November 2025 at TMA Hall, Battagram, engaging approximately 80–100 participants representing a diverse range of stakeholders. The workshop was attended by officials from key government departments, representatives from neighbourhood councils, business and trade unions, academia, civil society, and individuals who had participated in earlier FGDs (Phase 1).

The vision statement for Battagram city was developed through an iterative process, drawing upon the outcomes of issue analysis, solution discussions, and group consensus exercises conducted during the Vision Workshop. It reflects a collective aspiration for Battagram's future urban development, integrating the core themes most consistently prioritized by participants. The statement is forward-looking, actionable, and aligned with the principles of sustainable, inclusive, and resilient urban planning, while emphasizing hydel power, good governance, modern infrastructure, and a clean, vibrant environment for all residents.

"A socially and economically vibrant, disaster-resilient Battagram city, powered by hydel energy, with good governance, modern facilities, and a clean, integrated environment for all."

ایک سماجی اور معاشی طور پر فعال، آفات سے محفوظ بٹگرام شہر، ہائیڈل توانائی سے چلنے والا، بہترین حکمرانی، جدید سہولیات، اور صاف، مربوط ماحول سب کے لیے

This vision establishes the broad development direction of the master plan. It reflects the city's need not only for physical expansion but for qualitative improvement in urban systems, including basic services, public infrastructure, governance arrangements, and economic opportunities. The emphasis on cleanliness and reliable utilities directly responds to the service gaps identified in the background study, particularly in relation to sanitation, wastewater, solid waste management, and water quality. The emphasis on quality education, healthcare, and youth opportunity reflects Battagram's role as a district headquarters and service center with a growing and youthful population. Similarly, the focus on modern infrastructure and responsible governance recognizes the need for stronger municipal management, improved transport systems, and better institutional coordination.

In planning terms, the vision translates into a development direction that prioritizes managed urban growth over uncontrolled corridor expansion, protection of productive and environmentally sensitive land, strengthening of the city's service function, improvement of internal mobility and junction performance, and phased infrastructure investment aligned with future land use. Thus, the development direction for Battagram is based on the creation of a more compact, connected, serviced, and resilient urban structure rather than continuation of unregulated outward sprawl.

2.4 Data Collection and Analysis

Data collection formed the foundation of the master planning process. A combination of primary household-level surveys and secondary institutional datasets was used to develop a comprehensive situational understanding of Battagram City.

Primary Data Collection

For Background Studies Analysis, various kind of primary data sets were collected including Household Informant Survey (HIS). The findings of the HIS survey have been incorporated in various chapters of this report as per the relevance of its different sections. The HIS survey covered a 1% sample of total households in Battagram City as given in the ToR which worked to be 549 as given in the table below.[1] The sample size was distributed proportionately to all Neighbourhood Councils (NCs) of Battagram city to make the sample representative of the whole urban population. For this purpose, a stratified sampling technique was used to make sampling more consistent and to ensure the representation of all segments of society including women-headed households, poverty-stricken households, disadvantaged households due to disabilities and other social and economic disparities.

For choosing a sample from each NC of the project area, the proportion allocation method was used.[2] The sample size following the population turned out to be 247 household across the NCs.

HIS Survey Instrument and Execution

A structured questionnaire was developed in consultation with the client (UPU). The survey covered the following thematic areas:

- Household demography
- Education and health status
- Employment, income, and expenditure
- Housing and basic facilities
- Access to services and infrastructure
- Environmental and transport conditions
- Knowledge, Attitude, and Practices (KAP)
- Perceptions of quality of life in Mansehra City

Land Use Survey

The Existing Land Use Survey formed the backbone of the situational analysis. Prior to fieldwork, a GIS-based base map of Battagram City was prepared using satellite imagery and historical maps. The study area was divided into survey sheets for systematic ground verification.

[1] District Wise Census Report of Battagram, 2017, Pakistan Bureau of Statistics.
[2] Let there are N Neighbourhood councils, where data should be collected from the field. Then N=N1+N2+N3+N4……………Nh=∑Ni
A total of ‘n’ sample should be studied for analysis. The size of total sample is:
n=n1+n2+n3+………… nh=∑ni
The sample size of each Neighbourhood Council is:
ni =n*Ni/N
Where: ni=sample selected from each NC, n=Total sample size, Ni=population of each NC and N=Total population of all NCs

Parcel-level surveys were conducted using the ODK mobile application, covering the entire built-up area. For each parcel, land use type, building condition, number of storeys, and other physical attributes were recorded. Surveyors were trained to ensure consistency and accuracy.

All spatial and attribute data were digitized and processed in GIS. The outputs were presented in the form of thematic maps and spatial databases, forming the basis for land use analysis, density assessment, and future planning proposals.

Transportation Surveys

Traffic and transportation surveys were conducted to understand mobility patterns and infrastructure capacity.

Key surveys included:

- ***Manual Classified Counts (MCC)***

Manual Classified Counts are conducted to measure traffic volumes and vehicle composition along key road sections within the study area. Trained enumerators are stationed at selected cordon points to manually record traffic by direction and vehicle type in fixed time intervals of 15 minutes. The data collected are later converted into PCUs and used for capacity assessment, level of service analysis and future traffic projections.

Figure 2: MCC Survey - Battagram City

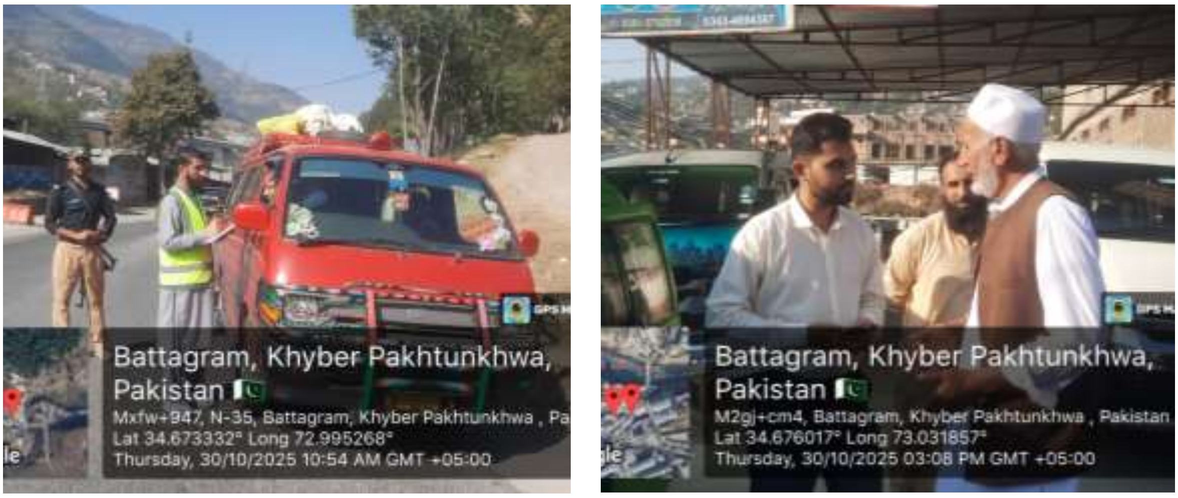
- ***Turning Moment Counts (TMC)***

Turning Movement Counts are undertaken at critical intersections and junctions to understand directional traffic flows and turning patterns. Enumerators observe and record left-turn, through and right-turn movements for each vehicle class on all approaches of the intersection in short time intervals. The survey focuses on peak hours and high-demand periods to capture maximum operational stress, providing essential inputs for intersection capacity analysis, signal design and geometric improvement planning.

- ***Origin Destination Survey (OD)***

The Origin–Destination Survey is designed to identify travel patterns and trip characteristics across the study area. Short roadside interviews are conducted at selected cordon points, entry–exit locations and check posts, where drivers or passengers are asked about their trip origin, destination, purpose, frequency and vehicle occupancy. Surveys are carried out over multiple days to ensure representative coverage, particularly distinguishing between locals and visitors and the results are used to develop OD matrices and desire-line analyses.

Figure 3: OD Survey - Battagram City



- ***Public Transport User Survey***

The Public Transport User Survey assesses usage patterns, service quality and user satisfaction with existing public transport services. Interviews are conducted at transport terminals, HiAce and jeep stands and on-board vehicles to collect data on trip purpose, waiting time, travel duration, fare levels and service reliability. The survey distinguishes between resident and tourist users where relevant and provides insights into demand levels, service gaps and potential improvements to public and tourist transport systems.

- ***Household Information Survey (HIS)***

The Household Information Survey focused specifically on traffic and transport–related characteristics and resident travel behavior within the study area. Face-to-face interviews were conducted using a structured questionnaire to collect information on daily travel patterns, including trip frequency, trip purpose, travel distance and time, mode choice, vehicle ownership and route selection. Respondents were also asked about their dependence on private and public transport, peak-hour travel behavior, access to transport services and key mobility constraints.

Figure 4: HIS Survey - Battagram City

- Parking Survey

The Parking Survey evaluates parking demand, supply and utilization within commercial areas, tourist nodes and activity centers. A combination of parking inventory and occupancy counts is carried out, recording the number of parked vehicles, parking duration, turnover and illegal or informal parking at regular intervals throughout the day. The survey results are used to assess demand–supply imbalances and to inform parking management, regulation and pricing strategies.

- Traffic Mobility Synergy Survey

The Traffic Mobility Synergy Survey adopts an integrated approach to examine the interaction between traffic flow, land use, pedestrian movement, tourism activity and transport operations. The survey combines systematic traffic and pedestrian observations with user perception surveys and stakeholder consultations in high-pressure mobility zones. This methodology helps identify operational conflicts, bottlenecks and behavioral issues, providing an evidence base for integrated mobility management measures, including traffic control, shuttle services and ITS-based interventions.

Environmental Surveys

Environment-related surveys were conducted to assess urban pollution and natural resource conditions.

Key elements included:

- Air quality monitoring
- Water quality assessment
- Noise level measurements

The results are used to identify environmentally sensitive areas, pollution hotspots, and inform sustainability measures in the Master Plan.

Secondary Data Collection

Secondary data was collected from official departments and agencies to complement primary survey findings. The Consultant gathered spatial and non-spatial datasets covering administrative boundaries, land use, infrastructure, socio-economic, environmental, and sectoral information.

Table 2: Key Data Sources and Departments

Sector / Data Type	Responsible Department(s)
Administrative Boundaries	Revenue Department (DC), Auqaf, other relevant departments
Forests & Wildlife	DFO (Forest Department)
Agriculture, Orchards & Livestock	Agriculture Extension Department, CRS (Concerned District)
Transportation	DTO, C&W Department, PKHA
Water Supply, Sanitation & Solid Waste	PHED, TMA, other relevant departments

Housing & Public Amenities	TMA, other relevant departments
Irrigation & Disaster Risk	SDO District Irrigation, NDMA, PDMA
Education	DEO, PSRA, HED, TEVTA, other relevant departments
Health	District Health Officer
Industries	Industries Department
Parks, Recreational & Heritage Sites	TMA, Tourism Department
Energy	PEDO

These secondary datasets were verified, cross-checked, and integrated with primary survey results for spatial analysis, trend identification, and planning projections.

GIS & Remote Sensing Methods

GIS and remote sensing were used as cross-cutting analytical tools to integrate survey data, secondary datasets, and spatial analysis outputs.

a) Historical Urban Growth Analysis

Urban expansion between 2010, 2015 and 2025 was analyzed using Landsat imagery and Google Earth Engine time-series data at five-year intervals. Supervised classification and change detection techniques were applied to identify growth direction, intensity, and development corridors.

b) Housing Trends and Needs Assessment

Housing trends were assessed using census data, HIS findings, and spatial analysis. The assessment focused on household size trends, housing conditions, tenure types, and affordability. Housing backlog indicators were derived by identifying unsuitable housing, affordability gaps, and vulnerable groups. Built-up density and land availability were analyzed using satellite imagery and GIS to support residential zoning decisions.

c) Density Mapping

Population and built-up density maps were prepared for residential, commercial, and public-use areas using classified imagery and population data. These maps supported identification of high- and low-density zones and informed recommendations for infill development, densification, and mixed-use planning.

d) Land Use Base Map Preparation

A detailed land use base map (1:5,000–1:10,000) was prepared using 0.5m resolution satellite imagery, ground survey data, and GIS digitization. Parcel-level shapefiles were developed with unique identifiers and validated through field surveys.

The base map included residential, commercial, industrial, institutional, recreational, open spaces, transport networks, water bodies, and heritage/tourism sites.

2.5 Base Map and Spatial Database

A robust geospatial base was prepared to support the planning process and ensure that subsequent proposals are spatially accurate and implementation-oriented. The BSR notes that a detailed land use base map was prepared using high-resolution satellite imagery, field surveys, and GIS digitization, supported by parcel-level mapping and unique identifiers. It also records that, prior to fieldwork, a GIS-based base map of Battagram City was prepared using satellite imagery and historical maps, and the study area was divided into survey sheets for systematic ground verification. Parcel-level surveys were undertaken using the ODK mobile application, and the resulting spatial and attribute data were processed in GIS to generate thematic maps and spatial databases.

The base map and spatial database include, at minimum, administrative boundaries, existing land use, building footprints, road hierarchy, transport nodes, water bodies, public facilities, institutional land, open spaces, and other key land use categories. GIS and remote sensing were also used for historical urban growth analysis, density mapping, land use classification, and spatial trend assessment. This geospatial framework is essential not only for understanding the current urban structure of Battagram but also for identifying future growth corridors, intensification areas, infrastructure requirements, and environmentally sensitive zones.

For the master plan stage, the base map serves three main functions. First, it provides the reference framework for all future land use proposals and zoning decisions. Second, it supports analytical exercises such as land suitability assessment, density analysis, accessibility mapping, and scenario development. Third, it establishes a spatial database that can later feed into implementation tools, development control systems, and decision-support platforms. Accordingly, the base map is not merely a cartographic output but a planning instrument that underpins the entire master planning exercise.

2.6 Master Planning Framework

The master planning framework for Battagram City has been developed as an integrated framework that links the vision, the baseline analysis, and the future development strategy. It is informed by the broader provincial objectives of sustainable, inclusive, resilient, and well-managed urban development, while also responding to the city-specific conditions identified in the BSR. These include rapid corridor-led growth, inadequate internal road performance, environmental stress, weak municipal services, and increasing pressure on agricultural and vacant land.

The framework is built around several core principles. The first is evidence-based planning, whereby proposals are derived from analysis of existing conditions rather than from abstract assumptions. The second is spatial structuring, which seeks to guide growth toward an organized urban form through identified corridors, nodes, service centers, and planned expansion areas. The third is service-led development, under which future land allocation must remain linked to realistic infrastructure provision and municipal capacity. The fourth is environmental responsibility, requiring the protection of natural drainage, reduction of exposure to hazards, and safeguarding of productive and ecological land. The fifth is institutional feasibility, meaning that planning proposals must be capable of implementation through existing or strengthened governance arrangements.

In practical terms, the master planning framework moves from diagnosis to strategy. The background study identified the city's issues and potentials. The next step is to develop alternative spatial growth options and evaluate them against criteria such as accessibility, service efficiency, land suitability, hazard exposure, economic opportunity, and environmental sustainability. From this process, a preferred development scenario will be selected and translated into a draft master plan that addresses future land use, housing, commerce, industry, mobility, social infrastructure, municipal services, environmental management, and implementation priorities.

Thus, the framework for Battagram is intended to move the city from an unstructured corridor-growth pattern toward a more deliberate urban form that is connected, serviced, compact where appropriate, and strategically expandable where necessary.

2.7 Stakeholder Consultation and Public Hearing Framework

Stakeholder engagement has been treated as an integral part of the planning methodology rather than as a parallel or standalone activity. The project's deliverable structure explicitly includes a Public Consultation and Vision Development Report as an early-stage output and a public hearing at the draft master plan stage before finalization of proposals.

In the case of Battagram City, stakeholder consultation has already informed the planning process through vision development and earlier consultations. The BSR records that the Vision Formulation Workshop engaged a broad range of participants representing public institutions, elected local bodies, business interests, academia, and civil society. This indicates that the planning process has already incorporated both technical and community perspectives in setting priorities for the city.

For the master plan stage, the consultation framework should continue in a structured manner. First, technical consultations with line departments and implementing agencies are required to validate existing datasets, confirm infrastructure constraints, and assess the feasibility of proposals. Second, stakeholder engagement with local communities, traders, educational institutions, transport operators, and other interest groups is necessary to test the acceptability and practical implications of alternative growth options. Third, the draft master plan must be presented through a formal public hearing process, as required under the project framework, so that comments, objections, and recommendations can be received and incorporated where justified.

The public hearing framework is particularly important for Battagram because many of the key issues identified in the BSR, such as corridor sprawl, parking conflicts, environmental degradation, and service deficiencies, affect a wide range of actors and require shared understanding to support implementation. A transparent consultation process will therefore improve legitimacy, reduce resistance, and help build consensus around proposed zoning, infrastructure interventions, and growth management measures.

2.8 Action Plans

Action plans for several sectors, including quality of life, health, education, zoning and management, rural-urban fringe, heritage, zoning and land management, etc., will be prepared, devising policies and guidelines for dealing with the existing problems and covering the future demands of Battagram city.

3 CHAPTER: SPATIAL GROWTH AND URBAN FORM

The urban activity system is shaped by a variety of factors, including social, cultural, and economic activities. Some of these activities are regular and so predictable, whereas others are unpredictable because of people's lifestyles, or change in technology, or particular needs.[3] These activity systems thus define the spatial distribution pattern or land use of a city. Land Use is a broad term that describes the categorization or classification of human activities and natural features on the landscape.[4]

Understanding the Land Use of any area is essential for master planning, land management, determining mobility patterns, and monitoring urbanization. Any change in the land use pattern of a city has greater impacts, both negative and positive. Additionally, it also assists in the formation of the policies and programs required for future growth and clarifies various land use concerns, such as conformable or non-conformable uses.

3.1 Regional and City Context

3.1.1. Historical Background

Battagram is a tribal district in the Hazara Division of Khyber Pakhtunkhwa, Pakistan. Historically, it was part of Yaghistan, an independent territory that remained outside formal British control until 1955.[5]

In 1955, Battagram was merged into Pakistan and became part of the neighboring Mansehra District as a tehsil. Following sustained local efforts led by Mr. Yousaf Khan Swati, a Khan of Trand, Battagram was elevated to district status in July 1993 (Swati, 1995).[6]

The district was historically ruled by Khans of the Swati tribe. In 1190 CE, it was conquered by the Swatis under Sultan Pakhal Gibari Swati, becoming part of the Swat Sultanate. Portions of the area were later controlled by Amir Taimur, leading to the establishment of a local Turkic kingdom known as Pakhli Sarkar. In 1644, the Swatis under Akhun Salak Baba reconquered the area after losing their former capital in Swat.[7]

Battagram is also notable for the Black Mountain Expeditions, during which local Khans, including Khan of Allai Arsala Khan Swati and Malik of Thakot Abdul Qadir Khan Swati, resisted British forces for 35 years. Although the British ultimately succeeded in 1891, the region maintained de facto independence until 1955. The district's history reflects continuous governance by local tribal Khans until the formal Instrument of Accession with Pakistan. [8]

[3] Dr. Jean-Paul Rodrigue. Urban Land Use and Transportation
[4] Significance Of Land Use / Land Cover (LULC) Maps, extracted from (www.satpalda.com/blogs/significance-of-land-use-land-cover-lulc-maps), Accessed on 26th January 2022
[5] Battagram District | Wikipedia
[6] IBID
[7] IBID
[8] IBID

3.1.2. Geographical Setting

Battagram District is located in the Hazara Division of Khyber Pakhtunkhwa Province, Pakistan, positioned at approximately 34°41′N latitude and 73°1′E longitude.[9] Its district headquarters, Battagram town, lies about 75 km from Mansehra city along regional road networks connecting northern and central Khyber Pakhtunkhwa. The district covers an area of roughly 1,301 square kilometres, largely comprised of rugged mountainous terrain typical of the Lesser Himalayan foothills.

The landscape is predominantly mountainous, with elevations in the district extending from around 1,038 m (3,408 ft) above sea level in the valley floors to much higher peaks in surrounding ranges. These mountains form steep slopes and narrow valleys that shape settlement patterns, infrastructure, and land use. Valleys such as Nandhyar, Tijri Deshan, Batamori, Banna, and Rashang provide pockets of more level ground used for agriculture and habitation. Several notable peaks in the district rise significantly above the valley floors, contributing to the region's dramatic relief and diverse micro-climates.

3.2 Topography & Physiography

Battagram District is situated in the northern mountainous region of Khyber Pakhtunkhwa, forming part of the Lower Himalayan foothills. Its landscape is predominantly rugged and undulating, with steep slopes, narrow valleys, and interspersed terraces that support agriculture and settlements. The district's elevation ranges from approximately 1,038 meters (3,408 feet) in valley floors to over 3,000 meters in surrounding peaks, contributing to significant variation in climate, vegetation, and land use across short distances.

The district can be broadly divided into three physiographic zones:

2. Valley Floors and Terraces
These are relatively flat or gently sloping areas along riverbeds, including the Batagram, Nandhyar, and Allai valleys, where settlements, terraced agriculture, and small industries are concentrated. These zones are fertile and serve as the primary areas for crop cultivation and horticulture.

3. Mountain Slopes
Steep, often forested slopes dominate much of the district. These slopes are prone to soil erosion and landslides, especially during monsoon rains. Livestock grazing, terraced farming, and limited forestry activities occur here.

4. High Peaks and Ridges
The highest elevations form rocky ridges and summits, many exceeding 3,000 meters. These areas are largely inaccessible and sparsely populated, serving primarily as sources of streams, snowmelt, and natural habitats for wildlife.

[9] IBID

Feature Type	Description	Elevation Range/Details
Mountains	Dominant ranges including the Lesser Himalayas and Black Mountains with peaks rising sharply from valleys. Notable peak: Sukai Sar (highest in Allai Valley).	Up to 4,000–4,690 meters (peaks over 15,000 feet in some ranges).
Valleys	Notable areas like Allai Valley, Chor Valley, Chattar Valley, Tikri Valley, and Battagram Valley.	1,200–3,000 meters (valley floors; higher meadows up to 4,000m+).
Plains/Tracts	Fertile, cultivated areas: Narrow valley plains and pastures, such as Chattar Plain and alluvial tracts near rivers/streams for terraced agriculture.	Lower elevations, around 500–1,200 meters (e.g., near Thakot ~525m to valley bottoms).
Average Elevation	Varies by sub-region, reflecting mountainous terrain.	Approximately 1,000–2,024 meters (district average; headquarters at ~1,038m).

Source: Grokipedia

3.3 Socio-Cultural Background

Battagram District exhibits socio-cultural characteristics typical of a predominantly rural and traditional region of Khyber Pakhtunkhwa, where demographic structure, literacy patterns, and settlement form play a decisive role in shaping social services demand, economic participation, and urban development dynamics.

3.1.3. Demographic Characteristics

As per the 2023 Population and Housing Census, Battagram District has a total population of 335,984 persons residing in 51,366 households, reflecting a low-density, dispersed settlement pattern[10]. The entire population is classified as rural, highlighting the absence of formally designated urban population concentrations within the district and reinforcing the agrarian and village-based socio-spatial structure.

The district exhibits a relatively balanced gender composition, with a sex ratio of 101.26 males per 100 females, indicating no significant gender imbalance at the population level. However, demographic dependency is high, as 103,719 individuals (30.89%) are below the age of 10, placing substantial pressure on education, health, and social protection systems and signaling continued population momentum in the coming decades.

Literacy levels remain low, standing at 39.09% overall, with pronounced gender disparities. Male literacy is recorded at 54.69%, while female literacy is significantly lower at 23.34%, reflecting persistent socio-cultural constraints, limited access to education for women, and long-standing rural development challenges. This literacy gap has direct implications for workforce participation, household income diversification, and human capital development.

[10] https://en.wikipedia.org/wiki/Battagram_District#Demographics

Religious composition is largely homogeneous, with 799 persons (0.24%) belonging to religious minorities, primarily Christians. Although numerically small, this minority population underscores the need for inclusive planning approaches that ensure equitable access to services and social protection for all residents.

3.1.4. Economy

Battagram District, located in the mountainous terrain of Khyber Pakhtunkhwa Province, Pakistan, has a diverse economy primarily driven by agriculture, livestock, and emerging sectors like tourism, despite challenges posed by its rugged geography and limited infrastructure. The economy supports a largely rural population through subsistence activities, with potential for growth in trade and mining.

5. Agriculture
6. Livestock
7. Fisheries
8. Industry
9. Mining
10. Trade
11. Tourism

3.1.5. Agriculture

Battagram District, located in the mountainous terrain of Khyber Pakhtunkhwa Province, Pakistan, features a predominantly subsistence-based agricultural economy that supports the majority of its rural population, with farming and livestock rearing accounting for approximately 54.6% of economic activities amid limited industrial alternatives[11]. The district's rugged landscape, characterized by steep slopes and fertile valley plains irrigated by natural springs and streams like Nandhyar and Allai Khwars, limits large-scale farming but enables cultivation of key crops such as maize, rice, vegetables, and fruits, often on terraced fields vulnerable to erosion and climate variability[12].

The agriculture is dominated by Maize and Wheat, which occupy the largest land area and provide the bulk of total production, though their average yields remain moderate. In contrast, while Fruits and Vegetables (particularly Kharif Fruits and Rabi Vegetables) utilize significantly less land, they achieve the highest productivity with yields exceeding 8,000 kg/hectare. This indicates a sharp divide between high-volume cereal farming and high-efficiency horticultural crops, with minor crops like Rapeseed showing the lowest overall land use and yield.

Table 3: Production and Yield per Hectar in 2021-22

Category	Area (Hectare)	Production (Tonnes)	Yield per Hectare (Kg)
Wheat	8,087	12,782 1	1,581
Maize	20,913	33,962	1,624

[11] https://kpboit.gov.pk/battagram-district
[12] Earthquake Reconstruction & Rehabilitation Authority Government of Pakistan Provincial Earthquake Reconstruction & Rehabilitation Agency Government of NWFP

Rice	1,657	3,629	2,190
Barley	110	152	1,382
Rapeseed and Mustard	24	13	542
Rabi Vegetables	30	252	8,400
Rabi Fruits	3,801	821	3,801
Kharif Vegetables	93	591	6,355
Kharif Fruits	181	1,545	8,536

Source: Development Statistics of Khyber Pakhtunkhwa 2025

The data reveals a major productivity gap while Maize and Wheat dominate land usage, their yields are significantly lower than those of the horticultural sector. Kharif Fruits and Rabi Vegetables achieve peak efficiency with yields exceeding 8,300 kg/ha nearly five times that of cereals, despite occupying less than 1% of the total area. This indicates that while the region focuses on grain volume, it remains under-diversified in high-efficiency, high-yield crops.

Table 4: Production and Yield per Hectar in 2022-23

Category	Area (Hectare)	Production (Tonnes)	Yield per Hectare (Kg)
Wheat	7,993	12,442	1,557
Maize	19,028	30,885	1,623
Rice	1,633	3,577	2,190
Barley	49	67	1,367
Rapeseed and Mustard	-	-	-
Rabi Vegetables	33	277	8,394
Rabi Fruits	220	1,853	8,423
Kharif Vegetables	98	627	6,398
Kharif Fruits	187	1,602	8,567

Source: Development Statistics of Khyber Pakhtunkhwa 2025

The agricultural production in Battagram District for 2023-24 is dominated by cereals suited to its mountainous terrain. Maize leads with 19,221 hectares cultivated, producing 31,200 tonnes at a yield of 1,623 kg per hectare, while wheat covers 8,370 hectares yielding 13,024 tonnes at 1,556 kg per hectare. Rice shows higher productivity on 1,656 hectares, with 3,628 tonnes at 2,191 kg per hectare, and barley remains minor at 52 hectares. Rapeseed and mustard recorded no cultivation.

Vegetables achieve yields of 6,388–8,364 kg per hectare, and fruits excel with rabi at 8,427 kg and kharif reaching 9,464 kg per hectare.

Rapeseed and Mustard crops are reported in 2021-22 (24 hectares, 13 tonnes) but, there is complete discontinuation of cultivation of Rapeseed and Mustard crop in 2022-2024 which could reflect shifts in farmer preferences, climate unsuitability, or low economic viability.

Table 5: Production and Yield per Hectar in 2023-24

Category	Area (Hectare)	Production (Tonnes)	Yield per Hectare (Kg)
Wheat	8,370	13,024	1,556
Maize	19,221	31,200	1,623
Rice	1,656	3,628	2,191
Barley	52	72	1,385

Rapeseed and Mustard	-	-	-
Rabi Vegetables	33	276	8,364
Rabi Fruits	227	1,913	8,427
Kharif Vegetables	103	658	6,388
Kharif Fruits	192	1,817	9,464

Source: Development Statistics of Khyber Pakhtunkhwa 2025

3.1.6. Livestock

Livestock plays a pivotal role in easing the daily lives of Battagram's predominantly rural population by ensuring food security, generating supplementary income especially for smallholder families who constitute the majority of farms (over 90% under 5 acres)[13] and supplying draft power for cultivating terraced fields and transportation in rugged areas inaccessible by vehicles (Bureau of Statistics, Khyber Pakhtunkhwa, 2025). In this mountainous district, where arable land is limited and fragmented, animals provide essential milk, meat, wool, hides, and manure for fertilizer, supporting household nutrition and local markets while integrating closely with subsistence crop farming.

The scale of livestock production remains significant despite these land constraints, with the district hosting over 7.2 million livestock heads, dominated by poultry, goats, buffaloes, sheep, and cattle.[14] The predominance of small landholdings, as reflected in the table, limits mechanized agriculture and reinforces dependence on livestock as a flexible and low-capital livelihood option. However, livestock rearing also presents challenges linked to this fragmented farmland pattern, including fodder shortages on steep slopes, disease exposure, limited access to veterinary and extension services, and high labor requirements for grazing and animal care burdens often carried by women and youth. While the sector supports household income stability and long-standing rural practices, its productivity remains constrained by weak infrastructure and service delivery, underscoring the need for targeted investments aligned with the district's smallholder-dominated farm structure.

Table 6: Total number of Livestock in Battagram

Category	Number
Cattle	633,418
Buffaloes	976,395
Sheep	723,808
Goats	1,254,546
Poultry	3,067,247
Camel	16,177
Horse	65,399
Asses	66,866
Mules	104,578
Other	295,215
Total	**7,203,649**

Source: Development Statistics of Khyber Pakhtunkhwa 2025

[13] Bureau of Statistics, Khyber Pakhtunkhwa. (2025). Development statistics of Khyber Pakhtunkhwa 2025.
[14] Bureau of Statistics, Khyber Pakhtunkhwa, 2025.

This role is closely tied to the district's fragmented landholding structure, where most farms are small and dispersed. As shown in the farmland distribution table, out of a total of 42,289 farm holdings, nearly 90% fall below 5 acres, with 13,340 farms under 1 acre and 16,210 farms between 1 and 2.5 acres. In a mountainous setting with limited arable land, livestock provides milk, meat, wool, hides, and manure, supporting household nutrition and local markets while complementing subsistence crop farming.

In Battagram, livestock forms an essential part of the rural economy by spreading risk for households with limited land and enabling year-round income. Farmhouses and small landholdings provide households with space for keeping animals, fodder storage, and basic shelter, allowing families to sustain livestock-based livelihoods and generate income. This close integration of farmhouses with agricultural land supports nutrient recycling through the use of manure to maintain soil fertility on terraced farms and strengthens the link between crop production and household consumption, particularly in remote settlements where access to markets remains irregular. The following table presents data on the number of government and private farms in Battagram, categorized by farm size, as reported in the Agriculture Census 2010.

Table 7: Number of Government & Private Farms by Size in Battagram (As Per Agriculture Census 2010)

Sr. No.	Category	Number
1	Under 1 Acre	13,340
2	1.0 to Under 2.5 Acres	16,210
3	2.5 to Under 5 Acres	8,652
4	5.0 to Under 7.5 Acres	2,271
5	7.5 to Under 12.5 Acres	953
6	12.5 to Under 25 Acres	510
7	25.0 to Under 50 Acres	254
8	50.0 to Under 100 Acres	94
9	100.0 to Under 150 Acres	5
10	150 & above	0
Total		**42,289**

Source: Development Statistics of Khyber Pakhtunkhwa 2025

3.1.7. Fisheries

Fisheries in Battagram constitute a small but meaningful component of the district's rural economy and food system. Located in a mountainous region with rivers, streams, and cold-water resources, the district supports inland fisheries that mainly serve local consumption and supplementary income needs. At the regional and national level, Pakistan's fisheries sector contributes to nutrition, employment, and export earnings, with inland fisheries playing an increasingly important role in upland and riverine districts. Within this broader context, Battagram's fisheries reflect localized production patterns shaped by geography, water availability, and small-scale livelihood practices rather than commercial exploitation.

The fisheries sector in Battagram is closely linked to natural water systems, making it sensitive to environmental variability. Recent observations indicate changes in river flows and seasonal water availability, particularly in streams such as the Nandhiyar River[15], which are influenced by shifting rainfall patterns, reduced snow accumulation, and temperature variability. These changes affect aquatic habitats, breeding cycles, and overall fish productivity.

During 2023–24, Battagram recorded a total fish production of 10.600 metric tons, with an estimated market value of PKR 3.650 million. Production is dominated by non-trout species (9.800 MT), while trout production accounts for 0.800 MT, reflecting the limited but present cold-water fish potential in selected streams and controlled environments. In value terms, trout contributes PKR 1.200 million, while non-trout species account for PKR 2.450 million.[16]

Table 8: District wise Fish Production

2023-24						
District	Production in M.Tons			Value in Million Rs		
	Trout	**Non- Trout**	**Total**	**Trout**	**Non- Trout**	**Total**
Battagram	0.800	9.800	10.600	1.200	2.450	3.650

Source: Development Statistics of Khyber Pakhtunkhwa 2025

This production pattern indicates that fisheries in Battagram remain largely small-scale and inland-focused, supporting household consumption and local markets rather than large commercial supply chains. The modest scale of output aligns with the district's rugged terrain, dispersed settlements, and dependence on natural water bodies rather than intensive aquaculture systems.

Despite its limited scale, fisheries play an important role in supporting livelihoods, food diversity, and income supplementation in Battagram. Fish farming and capture fisheries provide an accessible economic activity for rural households, particularly where agricultural land is scarce or fragmented. The presence of both trout and non-trout species suggests potential for gradual improvement through better water management, habitat protection, and low-input aquaculture practices suited to mountainous environments.

With appropriate technical support, awareness, and conservation-oriented planning, fisheries can continue to contribute positively to household nutrition and local economies. Strengthening linkages between environmental management and livelihood development offers an opportunity to sustain fisheries resources while supporting community resilience in the district.

3.1.8. Industry

Industries in Battagram, though limited in scale, play an important role in supporting local livelihoods by providing employment and complementing agricultural and livestock activities. The district's industrial sector primarily comprises small- to medium-scale operations such as flour mills and stone crushers, catering mainly to local demand. As per 2023–24 data, Battagram hosts 5 flour mills and 4 stone crushing plants reflecting the district's modest but essential industrial base.

[15] Impact of climate change: Decrease in water crisis in Nandhiyar River threatens fish industry, land fertility| By Sheraz Ahmad Sherazi
16 Development Statistics of Khyber Pakhtunkhwa 2025

At the national level, Pakistan's industrial sector contributes significantly to employment, economic diversification, and local development. While Battagram's industries are relatively small compared to larger districts, they form a critical component of the district's socio-economic framework, providing opportunities for income generation and local value addition.

Table 9: Nature of Industries in Battagram (2023-24)

Sr. No	District	Nature of Industry	Number of Industry
1	Battagram	Flour Mills	5
2		Stone Crushers/ Crush Plants	4

Source: Development Statistics of Khyber Pakhtunkhwa 2025

Industrial activity in Battagram remains concentrated in small-scale operations that support local needs, such as flour processing and stone crushing for construction. These industries provide employment to local communities and complement agricultural livelihoods by offering inputs or services that facilitate farming and rural infrastructure development. The presence of 9 registered industries highlights the district's modest but vital industrial foundation.

3.1.9. Mining

Mining in Battagram District forms a modest but strategically important component of the local economy, exploiting the district's geological setting within the Lesser Himalayas, which is rich in metamorphic mineral deposits. At the provincial level, Khyber Pakhtunkhwa hosts significant mineral resources that contribute substantially to Pakistan's national output in categories such as marble, granite, and gemstones, with the province accounting for a notable share of the country's non-metallic and metallic mineral production. Nationally, Pakistan's mining sector supports industrial inputs for construction, ceramics, and metallurgy, though it remains underdeveloped relative to potential. In this broader context, Battagram's mining activities primarily small-scale and focused on construction-related minerals such as feldspar, granite, quartz, and soapstone align with regional patterns in mountainous districts, providing raw materials for local crush plants and potential export through nearby trade corridors like the Karakoram Highway and CPEC-linked routes.

Mineral extraction in Battagram's rugged terrain poses environmental risks that affect both ecosystems and mining sustainability. Open-pit quarrying and blasting for granite, feldspar, and quartz contribute to deforestation, soil erosion, and landscape degradation on steep, landslide-prone slopes. Dust from crushing and processing impacts air quality and nearby farmland, while improper waste disposal can contaminate streams and springs. Limited regulatory oversight and weak environmental assessments increase vulnerability to climate-related risks, highlighting the need for sustainable practices to protect mining, agriculture, and tourism in the district.

The current status of mining in Battagram reflects intermittent and variable production across several minerals, as detailed in the official data for 2021–2024. The following table summarizes mineral production quantities (in tonnes) over the three fiscal years, highlighting fluctuations that indicate challenges in consistent extraction, market demand, or operational constraints.

Table 10: Mineral Production in Battagram (2021-2024)

Sr. No.	District	Type of mineral	2021-22	2022-23	2023-24
1	***Mineral Production in Battagram***	Cooper	55	189	26
2		Feldspar	8,127	5,189	1,810
3		Fire Clay	-	158	-
4		Feldspar	384,126	466,929	301,169
5		Granite	-	2,487	2,228
6		Garnet Schist	-	-	2,163
7		Granite	5,216	4,679	7,640
8		Iron Ore	711	1,190	905
9		Quartz	27	1,296	5,416
10		Soap Stone	251	-	-

Source: Development Statistics of Khyber Pakhtunkhwa 2025

The mineral sector in Battagram exhibits a few distinct trends. Production of a major feldspar type has declined significantly, falling from 466,929 tonnes in 2022–23 to 301,169 tonnes in 2023–24. Granite output has remained relatively consistent, averaging between 5,000 and 7,000 tonnes, while quartz extraction is gradually increasing, reaching 5,416 tonnes. Output of minor minerals such as copper, iron ore, and soapstone is low and irregular, with certain categories recording no production in some years.

3.1.10. Trade

Trade in Battagram District remains primarily local and small-scale, centered on essential goods, agricultural produce (such as maize, wheat, fruits, and vegetables), livestock products, and basic services. Key trading hubs include Banna, Thakot, Kuza Banda, Shamlai, and Battagram town, where numerous small shops, hotels, restaurants, and transport services cater to local residents and travelers along major routes like the Karakoram Highway (KKH). The district's strategic proximity to Mansehra and alignment with China-Pakistan Economic Corridor (CPEC) infrastructure particularly the Hazara Motorway and KKH Phase II (Havelian-Thakot section) offers potential for enhanced connectivity, facilitating smoother movement of goods and possibly boosting regional trade in the future.

Small-scale enterprises, supplemented by public sector employment and overseas remittances, continue to support livelihoods, but the sector's growth potential remains tied to improved infrastructure and broader provincial trade dynamics under initiatives like CPEC.

3.1.11. Tourism

Tourism in Battagram District, nestled in the scenic Lesser Himalayas of Khyber Pakhtunkhwa, Pakistan, is an emerging sector that capitalizes on its breathtaking natural landscapes, including lush meadows, towering peaks, cascading waterfalls, and serene valleys, attracting primarily domestic tourists seeking adventure, tranquility, and eco-friendly experiences. Although underdeveloped due to challenges such as limited infrastructure, poor road access in remote areas, vulnerability to landslides and flash floods, and occasional security perceptions, the district offers authentic off-the-beaten-path appeal, with visitor numbers rising post-COVID through social media promotion and improved connectivity via the Karakoram Highway (KKH)[17]. National policies advocate sustainable development through public-private partnerships, ecotourism standards, and community involvement to enhance economic benefits while preserving the environment.

The region offers a range of scenic attractions, including Galai Meadows, known for its lush pastures, camping spots, and wide views. Sukai Sar, the highest peak in Allai Valley, attracts trekkers with its challenging routes and rich natural surroundings. Chor Valley features waterfalls, open meadows, and striking peaks, giving it strong ecotourism potential. Allai Valley is valued for its streams, trout fishing and hiking opportunities. Mundi and Baleeja Meadows provide calm trails, forested camping areas, and a glimpse of local Pashtun village life, while nearby sites such as Kiwai Waterfall and views along Takot Bridge add to the area's charm.

3.1.12.Occupation

In Battagram District, a predominantly rural and mountainous region in Khyber Pakhtunkhwa Province, Pakistan, the economy is primarily agrarian, with the majority of the population engaged in subsistence agriculture and livestock rearing as their main sources of livelihood[18]. Common crops include maize, wheat, rice, vegetables, and fruits, cultivated on limited valley plains irrigated by springs and streams, while livestock (cattle, goats, sheep, buffaloes, and poultry) provides additional income and food security, particularly for small farmers and landless households. [19]

The most common occupation is farming combined with livestock rearing, reflecting the district's rugged topography, lack of large-scale industry, and reliance on natural resources (Khyber Pakhtunkhwa Board of Investment and Trade, n.d.). Many residents supplement income through small-scale businesses (e.g., shops, hotels, transport services like vans), remittances from overseas employment (often in the Middle East), or seasonal labor (Pakistan Almanac, 2022). Formal employment opportunities are limited, with minimal industrial activity (e.g., a few flour mills) and low female participation in the workforce (National Disaster Management Authority, 2021).

3.1.13.Geology & Soil Profile

Battagram district sits on the northwestern margin of the Lesser Himalaya within the broader Hazara–Kashmir syntaxis. A complex tectonic knot where the Himalayan thrust systems (Main Boundary Thrust, Main Mantle Thrust and several local thrusts such as the Battal/Battagram-related thrusts) fold and uplift older metasedimentary and igneous rocks. Field and geophysical

[17] https://beautyofpakistan.com/locations/battagram | Beauty of Pakistan
[18] Khyber Pakhtunkhwa Board of Investment and Trade. (n.d.). Battagram district. https://kpboit.gov.pk/battagram-district/2021
[19] Directorate of Livestock and Dairy Development, Government of Khyber Pakhtunkhwa. (n.d.). Livestock and dairy development. https://livestockext.kp.gov.pk/

studies describe the area as a mosaic of folded metasediments, intrusive bodies (granites) and steeply dipping fault systems, with a thick but tectonically deformed sedimentary wedge beneath the surface.[20] These structural conditions control drainage, slope form and the location of colluvial and alluvial deposits in valley bottoms.

Soils in Battagram are typically shallow, coarse, and stony on the steep mountain slopes, grading to deeper alluvial and colluvial soils in valley floors and river terraces that support most cultivation. The rock mass and surface materials are highly fractured and weathered, so slopes are intrinsically fragile and prone to slope failures. A vulnerability made clear by extensive earthquake-triggered landslides recorded in the region (notably during the 2005 Kashmir earthquake) and by contemporary slope-stability investigations. Local soil surveys and district profiles further note limited moisture retention in upland soils and a predominance of marginal, erosion-prone soils used for subsistence agriculture; where settlements and roads cut steep slopes, the risk of mass movement and erosion increases markedly. For planning and engineering in Battagram this means foundation works, slope protection and drainage are critical design concerns and that land-use planning must explicitly avoid unstable toe and colluvial zones. [21]

3.1.14.Seismology

The Battagram region and broader northern Pakistan lie within one of the most seismically active parts of the world due to the ongoing collision between the Indian Plate and the Eurasian Plate. This continental collision causes continuous deformation along major thrust systems such as the Main Boundary Thrust (MBT) and related faults within the Hazara–Kashmir Syntaxis; a structural zone where the Himalayan orogen bends sharply and concentrates seismic strain. Earthquakes in this zone are typically shallow (within ~10–60 km depth) and can be highly damaging, as energy is rapidly transmitted to the surface along thrust faults and crustal structures. This tectonic regime explains the frequent seismicity recorded around Battagram and surrounding districts. [22]

Historical and modern seismic records show significant earthquake activity near Battagram. For example, the M 5.5 earthquake on February 14, 2004 struck about 20 km east-northeast of Battagram, causing structural damage, casualties, and triggering landslides a common secondary hazard in steep mountainous terrain. The frequency and range of earthquake magnitudes demonstrate persistent seismic hazard, with database compilations indicating over a thousand earthquakes within a 150 km radius since the 1950s, including events reaching up to about M 7 in the broader region. These patterns reflect the long-term seismicity associated with active faults in the Himalayan collision zone and underscore the importance of seismic hazard assessment for planning and engineering in Battagram and northern Pakistan. [23]

[20] Subsurface geological model of sedimentary and metasedimentary wedge from Mansehra to Battal based on gravity data, Hazara area, Pakistan
[21] Battagram District Disaster Risk Management Plan
[22] https://database.earth/earthquakes/pakistan/khyber-pakhtunkhwa/battagram-district
[23] In and Around the Hazara-Kashmir Syntaxis: a Seismotectonic and Seismic Hazard perspective

3.1.15.Hydrology

Battagram District, located in the mountainous terrain of the Hazara Division in Khyber Pakhtunkhwa (KP), Pakistan, features a hydrology dominated by surface water sources influenced by seasonal rainfall, snowmelt, and glacial contributions from the Lesser Himalayas. The district lies in a high-rainfall zone with annual precipitation exceeding 1,000 mm, primarily during the monsoon season (July–September) and winter snowfall in higher elevations[24]. Hydrology is characterized by numerous springs, perennial and seasonal streams (locally called khwars), and limited groundwater utilization due to the rugged topography. Water resources are critical for drinking, irrigation, and small-scale hydropower but are highly vulnerable to climate variability, deforestation, and seasonal droughts[25].

3.1.15.1. Surface Water

Surface water forms the backbone of Battagram District's hydrology, primarily consisting of numerous natural springs and streams that originate from the surrounding mountainous terrain and snowmelt in the Lesser Himalayas. The two major streams are the Nandhyar Khwar which originates in the Hill mountains, flows through the main valleys including fertile plains such as Nindhyar, Tijri Deshan, Batamori, Banna, and Rashang, and ultimately joins the Indus River at Thakot, and the Allai Khwar, which rises in the Chaur Mountains, traverses Allai Tehsil, and converges with the Indus River near Besham or Kund (National Disaster Management Authority.[26]

These surface sources are critical for drinking water supply, where approximately 364 gravity-fed schemes (many reconstructed post-2005 earthquake) rely on open springs and streams, though historical data indicate that only about 20.14% of the population had access to piped water as of 1998, leaving most dependent on unprotected sources vulnerable to monsoon contamination. Irrigation in the district's valley plains is similarly supported by these springs and streams, sustaining subsistence agriculture without large-scale canal systems due to the rugged topography. Surface water quality faces challenges from turbidity during heavy rains, bacteriological contamination in unprotected schemes, and hazards like flash floods and landslides during monsoons[27].

3.1.15.2. Groundwater Conditions

In Battagram District, groundwater serves a secondary but vital role compared to abundant surface sources, constrained by the mountainous geology of fractured rocks and shallow aquifers that recharge mainly through infiltration of rainfall and snowmelt, with springs acting as the primary discharge points[28]. Aquifers are typically shallow and unconfined, located in valley alluvium and fractured bedrock, where recharge efficiency has declined due to widespread deforestation, resulting in reduced spring yields and falling water tables.[29] Utilization is limited, with few deep tube wells; instead, dug wells and natural springs

[24] Integrated Water Resource Management Strategy Government of Khyber Pakhtunkhwa
[25] National Disaster Management Authority. (2021). District profile Battagram.
[26] Pakistan Almanac. (2022). Khyber Pakhtunkhwa - Battagram
[27] National Disaster Management Authority. (2021). District profile Battagram.
[28] Integrated Water Resource Management Strategy Government of Khyber Pakhtunkhwa
[29] Irrigation Department, Government of Khyber Pakhtunkhwa

supplement surface water for domestic consumption and small-scale irrigation. Provincial assessments suggest generally satisfactory groundwater quality in mountainous areas, characterized by low electrical conductivity and total dissolved solids, though risks of contamination from surface runoff persist, and no detailed district-specific mapping exists; Khyber Pakhtunkhwa-wide annual extraction stands at approximately 3.97 million acre-feet, with declining tables more pronounced in overexploited lowland areas than in northern highlands like Battagram. As of December 2025, the prolonged dry winter of 2024–2025 has exacerbated water table decline, with local reports of diminished well yields and concerns over spring drying, undermining historically reliable year-round availability sustained by extended snowmelt periods[30].

3.1.16.Environmental Profile

Battagram District experiences a humid subtropical highland climate, characterized by significant seasonal variations due to its elevation in the Lesser Himalayas. Recent years have shown increasing variability, with the 2024–2025 winter season marked by exceptionally low precipitation and snowfall, confined mostly to high peaks, resulting in drought-like conditions across lower areas. [31]This dry spell has led to reduced stream flows, declining water tables, and risks to agriculture and drinking water supplies, exacerbating concerns over shifting patterns such as wetter monsoons and drier winters linked to broader climate change impacts in Khyber Pakhtunkhwa.

Air quality in Battagram is generally better than in urban lowland areas of Pakistan due to its mountainous, less industrialized setting. However, occasional episodes of reduced quality occur from biomass burning, dust from eroded slopes, and transboundary haze. Real-time monitoring indicates variable conditions, often moderate but reaching levels unhealthy for sensitive groups during dry periods or seasonal burning.[32]

Furthermore, forest cover in Battagram consists primarily of coniferous species in higher elevations, but the district, like much of Khyber Pakhtunkhwa, faces ongoing pressures from land use changes, including agriculture, grazing, and fuelwood collection. Provincial policies highlight vulnerabilities, with the Khyber Pakhtunkhwa Climate Change Policy emphasizing the need for conservation amid rising temperatures and altered precipitation affecting forest

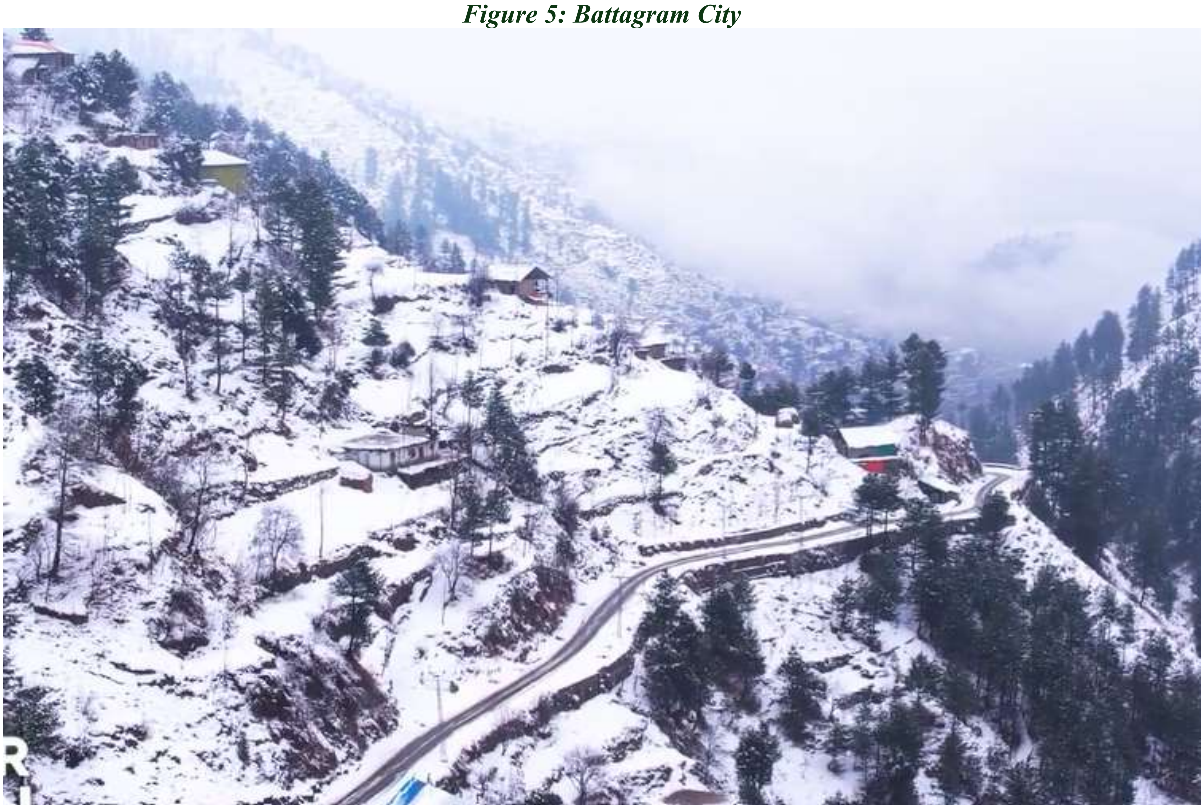
[30] Dry winter creates ‘drought-like’ situation in Battagram| Hamayoun Baber Yousafzai
[31] Khyber Pakhtunkhwa Climate Change Policy 2022
[32] https://www.iqair.com/pakistan/khyber-pakhtunkhwa/battagram

health[33]. No district-specific deforestation rates for 2022–2025 are available, but regional trends indicate persistent challenges in maintaining cover due to climate-induced stresses and human activities.

3.4 Battagram City

Battagram City, the administrative and commercial center of Battagram District, is a small urban settlement within an overwhelmingly rural district. According to the 2017 census, the city had a population of approximately 143118 people, while the district as a whole remained nearly entirely rural, with virtually no officially classified urban population. Over the last two decades, the district's population has grown significantly from around 307,000 in 1998 to over 476,000 in 2017 but this growth has largely occurred in rural settlements rather than in urban areas. Compared to national and provincial trends, where urbanization has steadily increased, Battagram's urban expansion has remained minimal due to its mountainous terrain, agriculture-based economy, and limited urban infrastructure. The city's role as the district headquarters and its location along the Karakoram Highway provide some potential for future urban growth, particularly in commercial and administrative zones. However, the predominance of rural settlements and land use continues to define the district, meaning that land suitability and planning for Battagram must carefully balance the needs of a largely rural population with the modest urban footprint of the city.

Figure 5: Battagram City



3.5 Drivers of Urban Growth

Urban growth in Battagram City is shaped by a mix of administrative functions, economic realities, infrastructure pressures, and rural-urban linkages that reflect the ground realities of a

[33] Khyber Pakhtunkhwa Climate Change Policy 2022

small but strategically located town. As the district headquarters, Battagram draws people from surrounding rural villages for access to government services, education, health facilities, and commerce, functions that are largely absent outside the city's core. Despite being within a predominantly rural district, the concentration of public offices, banks, schools, and hospitals encourages daily and permanent migration into the urban core, creating pockets of densification around these key facilities. The city's location along the Karakoram Highway, part of the national route network connecting northern Pakistan with major markets, is another significant driver; this corridor not only facilitates movement of goods and people but also boosts trade and small business activities along the highway frontage, increasing land demand and commercial development.

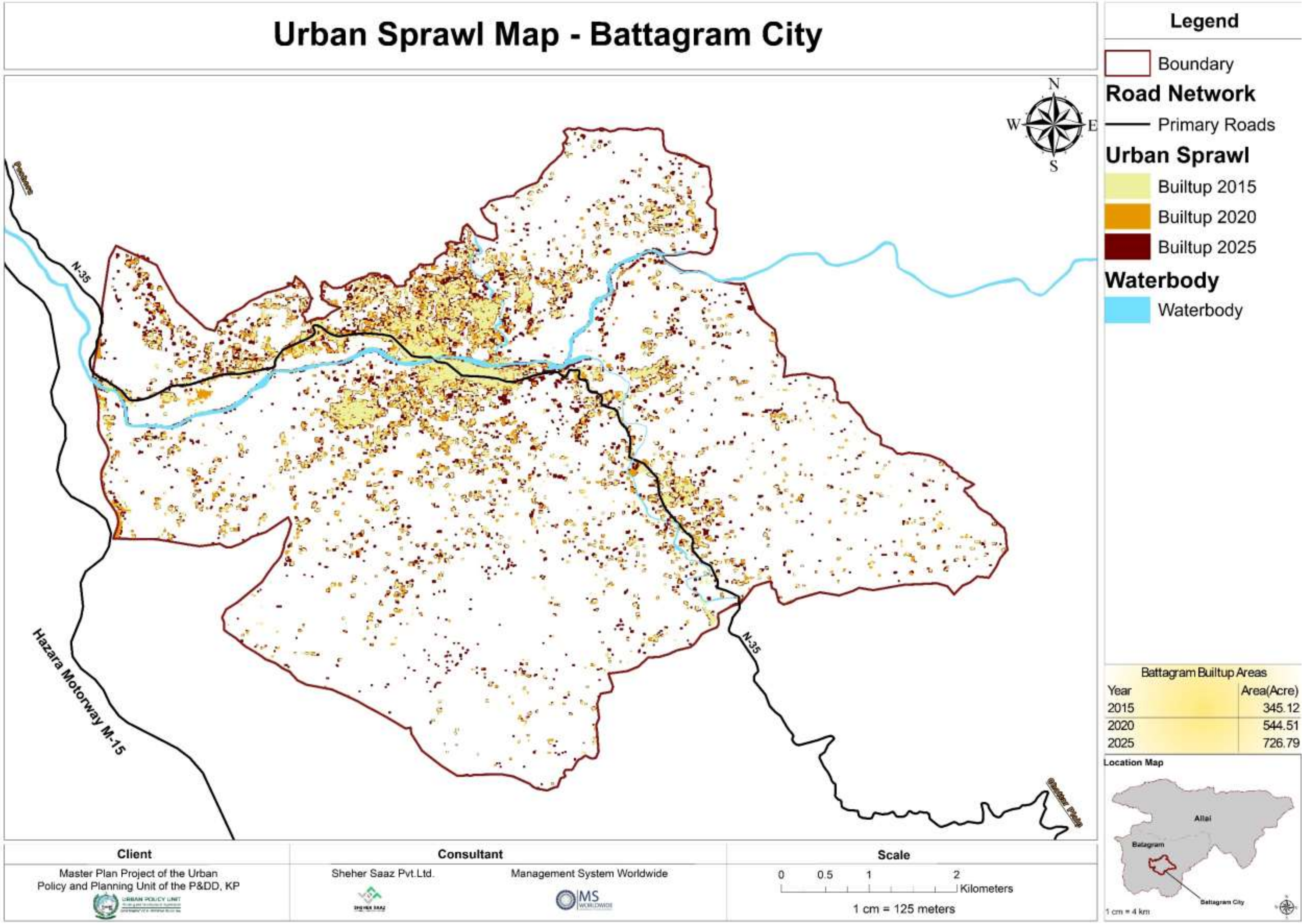
However, this growth is happening amid practical constraints and pressures: the main bazaar's narrow thoroughfare, which serves as both the commercial street and the principal transport artery, regularly experiences traffic congestion and pedestrian conflict, reflecting inadequate urban infrastructure to match growing activity levels. Locals have repeatedly demanded construction of a bypass and widening of roads to relieve chronic congestion caused by heavy vehicles and encroachment, highlighting how transportation bottlenecks influence land use and shape patterns of development within the city.

Additionally, limited link roads, which remain in poor condition in many areas, constrain both internal urban movement and connectivity with rural hinterlands, reinforcing Battagram's role as a central node despite infrastructural challenges. Economic drivers are also grounded in reality: agriculture still dominates the surrounding economy, so urban growth is incremental rather than explosive, fueled more by small trade, services, remittances from migrant workers, and grassroots development projects than by large industrial investment. These factors, combined with ongoing community infrastructure initiatives at the village level, create a pragmatic pattern of urban expansion where growth is tied to service accessibility, transport linkages, and the gradual uplift of living standards rather than rapid industrialization or mass rural-to-urban migration.

3.6 Historical Growth Trends

Battagram City has experienced noticeable spatial expansion over the last decade, with its urban area increasing from approximately 345 acres in 2015 to 544 acres in 2020, and further to 727 acres in 2025. This growth represents a near doubling of the urban footprint over ten years, reflecting both population pressures and economic activities. The urban expansion has been largely linear along the N-35 (Karakoram Highway), which serves as the city's main commercial and transport spine, connecting Battagram with neighboring districts and northern regions. This corridor-based growth has naturally promoted the development of major urban hubs, including Battagram Upper, Battagram Proper, Ajmera Barpaw, and Ajmera Proper, where residential, commercial, and administrative functions have concentrated. Observations on the ground indicate that much of the new development is informal or incremental, with land parcels gradually converted from agricultural or vacant land to residential or mixed-use purposes, often without formal urban planning controls. The sprawl has also been influenced by the topography, with most expansion occurring on relatively flat land adjacent to the highway, while hilly and steep areas remain largely undeveloped. As a result, the urban pattern is characterized by elongated growth along main roads with scattered peripheral clusters, rather than a compact urban core. This historic growth trend underscores the need for structured land use planning, improved road infrastructure, and services in emerging hubs to guide further expansion, prevent uncontrolled sprawl, and ensure accessibility and livability in newly urbanized areas.

Map 3:Historic Growth Trend and Urban Sprawl Analysis



3.7 Land Use and Cover Analysis

The Land Use and Land Cover (LULC) analysis of Battagram City from 2015 to 2025 highlights significant spatial and functional changes in urbanization patterns, vegetation, and land utilization. The analysis shows that the built-up area has grown steadily, expanding from 428.94 acres in 2015 (5.07%) to 685.49 acres in 2025 (8.10%), reflecting the city's gradual urban expansion, particularly along the N-35 corridor and around the major urban hubs of Battagram Upper, Battagram Proper, Ajmera Barpaw, and Ajmera Proper.

The built-up growth is concentrated along primary transportation corridors and administrative centers, where services, markets, and government facilities are concentrated. The rate of expansion from 2015 to 2020 was approximately 115 acres, while from 2020 to 2025 it was 141 acres, indicating an accelerating urbanization trend. Observations from local field surveys suggest that much of this development is informal or semi-planned, with unregulated plot division in newly developed neighborhoods.

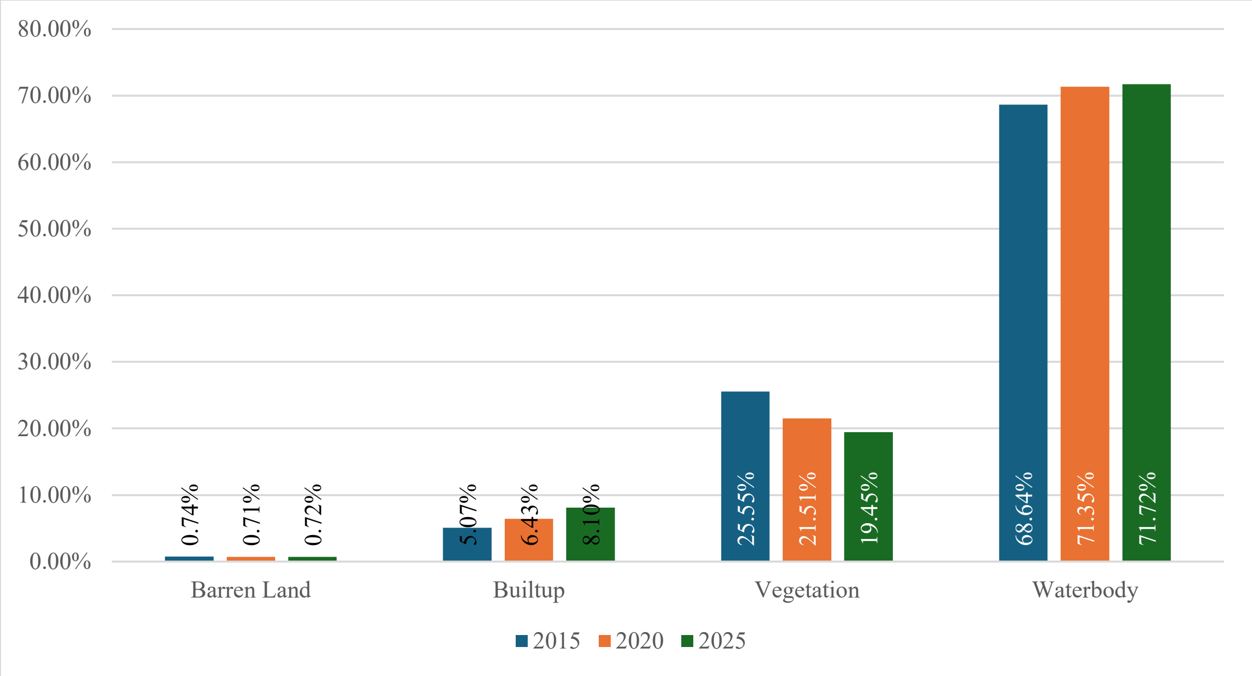
Vegetated areas, which accounted for 25.55% (2161.94 acres) in 2015, have declined to 19.45% (1646.26 acres) by 2025, primarily due to conversion into built-up zones and incremental encroachment on agricultural lands. This reduction not only signals a loss of green cover but also increases vulnerability to soil erosion and localized flooding, given the city's sloped and hilly terrain. Vegetation loss is most noticeable in peri-urban fringes surrounding the main hubs, especially near Ajmera Barpaw and Battagram Upper.

Barren land has remained relatively stable, ranging from 62.78 acres (0.74%) in 2015 to 61.2 acres (0.72%) in 2025. These areas are primarily located on steeper slopes and rocky terrain, which are unsuitable for construction or agriculture. While the absolute area has not changed significantly, barren lands act as natural buffers limiting urban sprawl in rugged terrain zones.

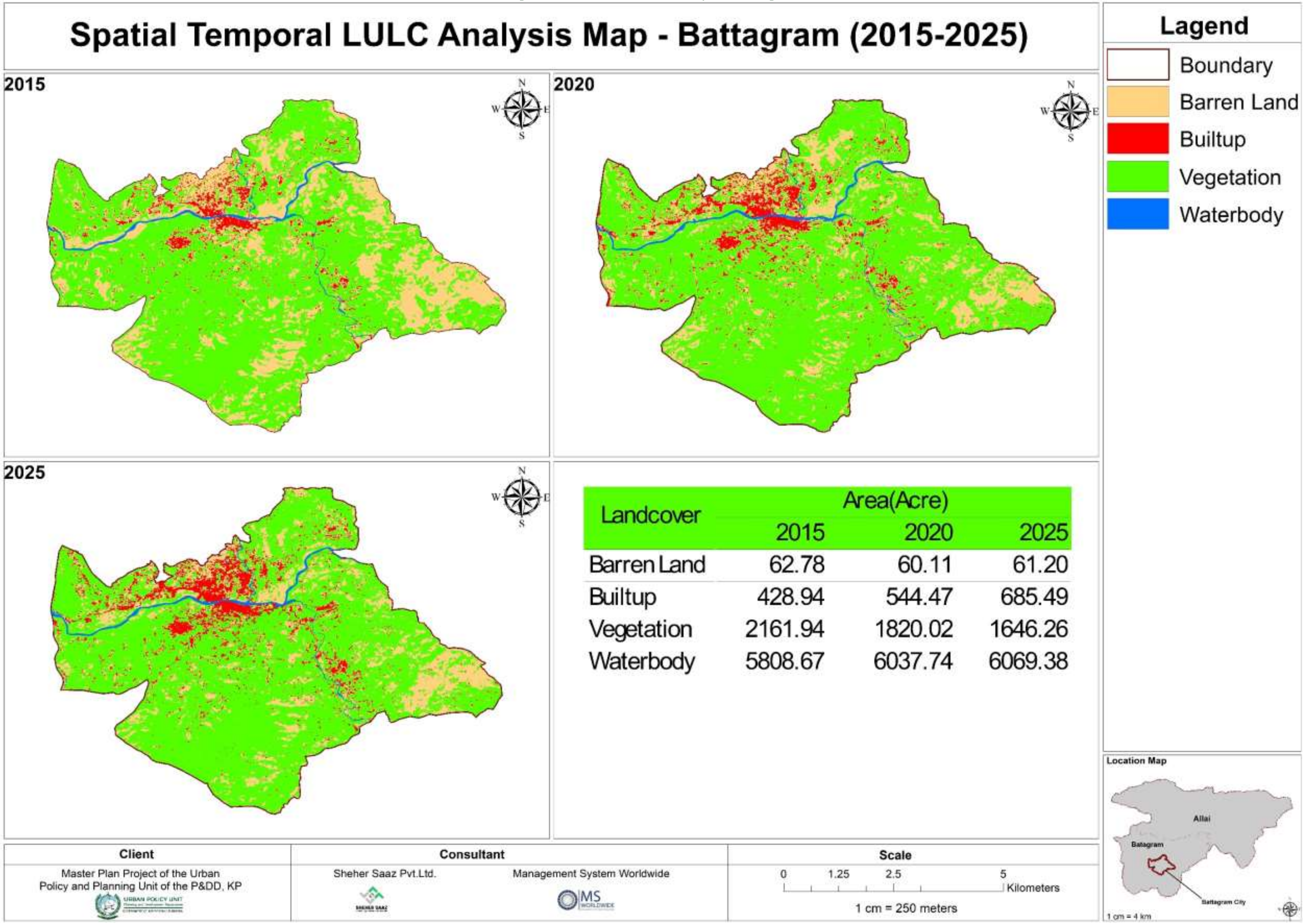
Water bodies, including rivers, streams, and small reservoirs, cover the largest portion of the study area, increasing slightly from 5808.67 acres (68.64%) in 2015 to 6069.38 acres (71.72%) in 2025. The slight increase is attributed to enhancement of drainage channels, minor dam reservoirs, and seasonal pond formation, which reflect both natural hydrological processes and local water management interventions. The proximity of settlements to watercourses along the Kunhar River and other tributaries necessitates careful urban planning to avoid encroachment and flood risk.

Overall, Battagram City exhibits a shift from vegetation-dominated land cover towards urban built-up areas, with water bodies continuing to dominate the landscape due to river networks and reservoirs. Built-up growth has occurred primarily along transport corridors, resulting in elongated urban forms rather than compact growth, while vegetation and open land are progressively decreasing. This trend underlines the importance of integrating green belts, floodplain management, and regulated urban expansion into future land use planning to ensure sustainable urban growth.

Figure 6: Land Use Land Cover Analysis (2015-2025)



Map 4: Land Use Land Cover Analysis – Battagram



Landcover	Area(Acre)		
	2015	2020	2025
Barren Land	62.78	60.11	61.20
Builtup	428.94	544.47	685.49
Vegetation	2161.94	1820.02	1646.26
Waterbody	5808.67	6037.74	6069.38

3.8 Population Growth, Density and Distribution

Population growth is one of the primary determinants of future land demand, infrastructure requirements, service provision, and overall urban expansion in Battagram City. The city has shown a steady upward population trend in recent census periods. Its population increased from 143,118 in 2017 to 165,055 in 2023, reflecting a recent average annual growth rate of 2.55 percent. This growth, though lower than that of larger secondary cities, is significant in the context of Battagram because the city is developing within a terrain-constrained mountain-valley setting where the supply of suitable urban land is limited and spatial expansion is strongly influenced by slope, access, and environmental conditions.

This growth trend has direct planning implications. An increasing population will generate additional demand for housing, commercial land, transport infrastructure, education, health facilities, utilities, and municipal services. In Battagram, this challenge is more pronounced because future growth cannot be absorbed uniformly across the planning area. A large share of the land is under agriculture, forest, rangeland, terraces, water channels, and environmentally sensitive slopes, while built-up development is concentrated mainly along the valley floor and transport corridors. It is therefore necessary to estimate future population carefully so that land-use proposals, sectoral requirements, development controls, and phasing strategies can be based on a realistic planning population.

The study area of Battagram City covers approximately 8,462.33 acres, or about 34.24 square kilometres. Based on the 2023 population of 165,055, the existing gross population density works out to approximately 4,820 persons per square kilometre, or about 19.5 persons per acre. This gross density is considerably higher than many larger lowland cities because Battagram's effective urban land is compressed within a much smaller and topographically restricted valley system. However, even this gross figure does not fully explain the actual settlement pattern, because population distribution within Battagram is highly uneven. The built-up corridor, central bazaar belt, and accessible settlement clusters carry much higher effective densities, while large parts of the study area remain under agriculture, forest, open slopes, and protected landscape. This indicates that Battagram's future planning challenge is not only one of total population increase, but also of where that population can be accommodated safely, efficiently, and in a manner consistent with the city's terrain, environmental structure, and service capacity.

3.1.17. Population Projection

Population projection for Battagram City has been carried out using three standard methods: Geometric, Exponential, and Arithmetic. Each method reflects a different growth assumption. Since no single method can fully capture future urban growth on its own, the average of all three methods has been adopted as the planning projection for the Master Plan. This provides a balanced estimate between conservative and high-growth outcomes.

The base data used for projection are:

- Population 2017: 143,118
- Population 2023: 165,055
- Growth Rate (2017–2023): 2.55%

For projection calculations, the recent intercensal growth trend has been used in the individual methods, while the final adopted planning population is based on the average of the three projections.

A. Geometric Method

The geometric method assumes that population grows at a constant %age rate, and that each year's increase is added to the previous year's population. In other words, growth is compounded over time.

Formula

$$P_n = P_0(1 + r)^t$$

Where:

- P_n= projected population after $t$years
- P_0= base year population
- r= annual growth rate
- t= number of years from the base year

For Battagram:

- $P_0 = 165{,}055$
- $r = 2.55\% = 0.0255$

Example: Projection for 2025

P2025=165,055×(1+0.0255)2

$$P_{2025} = 165{,}055 \times (1.0255)^2$$
$$P_{2025} \approx 173{,}580$$

Table 11: Geometric Population Projection – Battagram City

City Name	Population 2017	Growth Rate (2017–2023)	Population 2023	Population 2025	Population 2030	Population 2035	Population 2040	Population 2045
Battagram City	143,118	2.55%	165,055	173,580	196,869	223,284	253,242	287,219

B. Exponential Method

The exponential method is similar to the geometric method, but it assumes that population grows continuously rather than at discrete intervals. This method generally produces slightly higher values than the geometric method.

Formula

$$P_n = P_0 e^{rt}$$

Where:

- P_n= projected population after $t$years
- P_0= base year population
- r= annual growth rate
- t= number of years from the base year
- e= 2.71828

For Battagram:

- $P_0 = 165{,}055$
- $r = 2.55\% = 0.0255$

Example: Projection for 2025

$$P_{2025} = 165{,}055 \times e^{(0.0255 \times 2)}$$
$$P_{2025} = 165{,}055 \times e^{0.051}$$
$$P_{2025} \approx 173{,}691$$

Table 12: Exponential Population Projection – Battagram City

City Name	Population 2017	Growth Rate (2017–2023)	Population 2023	Population 2025	Population 2030	Population 2035	Population 2040	Population 2045
Battagram City	143,118	2.55%	165,055	173,691	197,311	224,142	254,622	289,246

C. Arithmetic Method

The arithmetic method assumes that population increases by a fixed number every year, rather than by a fixed %age. It is the most conservative method and is generally used where growth is steady but not strongly compounding.

Formula

$$P_n = P_0 + (K \times t)$$

Where:

- P_n= projected population after $t$years
- P_0= base year population
- K= annual average population increase
- t= number of years from the base year

First, annual increase $K$is calculated as:

$$K = \frac{P_{2023} - P_{2017}}{2023 - 2017}$$
$$K = \frac{165{,}055 - 143{,}118}{6}$$
$$K = \frac{21{,}937}{6} = 3{,}656.17$$

Example: Projection for 2025

$$P_{2025} = 165{,}055 + (3{,}656.17 \times 2)$$
$$P_{2025} = 165{,}055 + 7{,}312.34$$
$$P_{2025} \approx 172{,}367$$

Table 13: Arithmetic Population Projection – Battagram City

City Name	Growth Rate (2017–2023)	Population 2023	Population 2025	Population 2030	Population 2035	Population 2040	Population 2045
Battagram City	2.55%	165,055	172,173	189,966	207,760	225,554	243,348

D. Average Projection

Since the three methods produce different future values, the average of all three has been calculated and adopted as the planning projection. This is considered the most appropriate approach for Battagram because it balances:

- the higher growth tendency shown by geometric and exponential methods, and
- the lower, more conservative estimate shown by the arithmetic method.

Formula

$$P_{avg} = \frac{P_g + P_e + P_a}{3}$$

Where:

- P_g= geometric projection
- P_e= exponential projection
- P_a= arithmetic projection

Example: Average for 2025

$$P_{avg} = \frac{173{,}580 + 173{,}691 + 172{,}173}{3}$$
$$P_{avg} = \frac{519{,}444}{3}$$
$$P_{avg} = 173{,}148$$

Table 14: Average Population Projection – Battagram City

City Name	Population 2023	Population 2025	Population 2030	Population 2035	Population 2040	Population 2045
Battagram City	165,055	173,148	194,715	218,395	244,472	273,271

The adopted average projection indicates that Battagram City is expected to grow from 165,055 persons in 2023 to 273,271 persons by 2045. This reflects a substantial increase in population over the plan period and has direct implications for land requirement, housing, transport, infrastructure, municipal services, and social sector planning. The average projection is therefore used as the base planning population for all subsequent sectoral proposals in the Master Plan.

3.1.18.Density Analysis

3.1.18.1. Population Density

Population density is defined as the number of people residing per unit of area. In a general sense, it indicates how many people would live within one unit area if the population were evenly distributed across the land. In reality, however, population is never distributed uniformly. Urban areas tend to have higher concentrations of people because housing, employment, services, and transport access are clustered there, while peripheral agricultural, forested, and hilly areas remain sparsely settled. Density therefore varies not only from city to city, but also between different local units within the same planning area.

Standards of Population Density

Since every city has a different physical setting, settlement pattern, and land-use structure, no single density threshold is universally applicable. For reference, the KP Urban Policy 2022–2030 classifies residential density broadly into low, medium, and high categories, linking them with accessibility to transit and mixed-use areas. Under that framework, low-density residential areas are generally associated with 100 to 200 persons per hectare (PPH), medium-density areas with 201 to 300 PPH, and high-density areas with 301 to 400 PPH.

Table 15: Density Criteria Taken from KP Urban Policy

Density Zone	Distance from Transit	Average Population Density
Mixed Use with High-Density Residential (CBD)	< 400 meters	301-400 PPH
Mixed Use with Medium Density Residential	400 – 800 meters	201-300 PPH
Low-Density Residential	> 800 meters	100 to 200 PPH

Source: KP Urban Policy, 2022 to 2030

For Battagram City, however, these thresholds have been slightly amended to reflect local conditions more accurately. Battagram is not a large compact city; it is a terrain-constrained, corridor-based urban center with a large proportion of land under agriculture, terraces, forest, open slopes, and low-intensity settlement. If the KP Urban Policy thresholds were applied directly, almost the entire city would fall below the formal low-density threshold, which would not provide a meaningful basis for local analysis. Therefore, for the purpose of this Master Plan, density has been reclassified as follows:

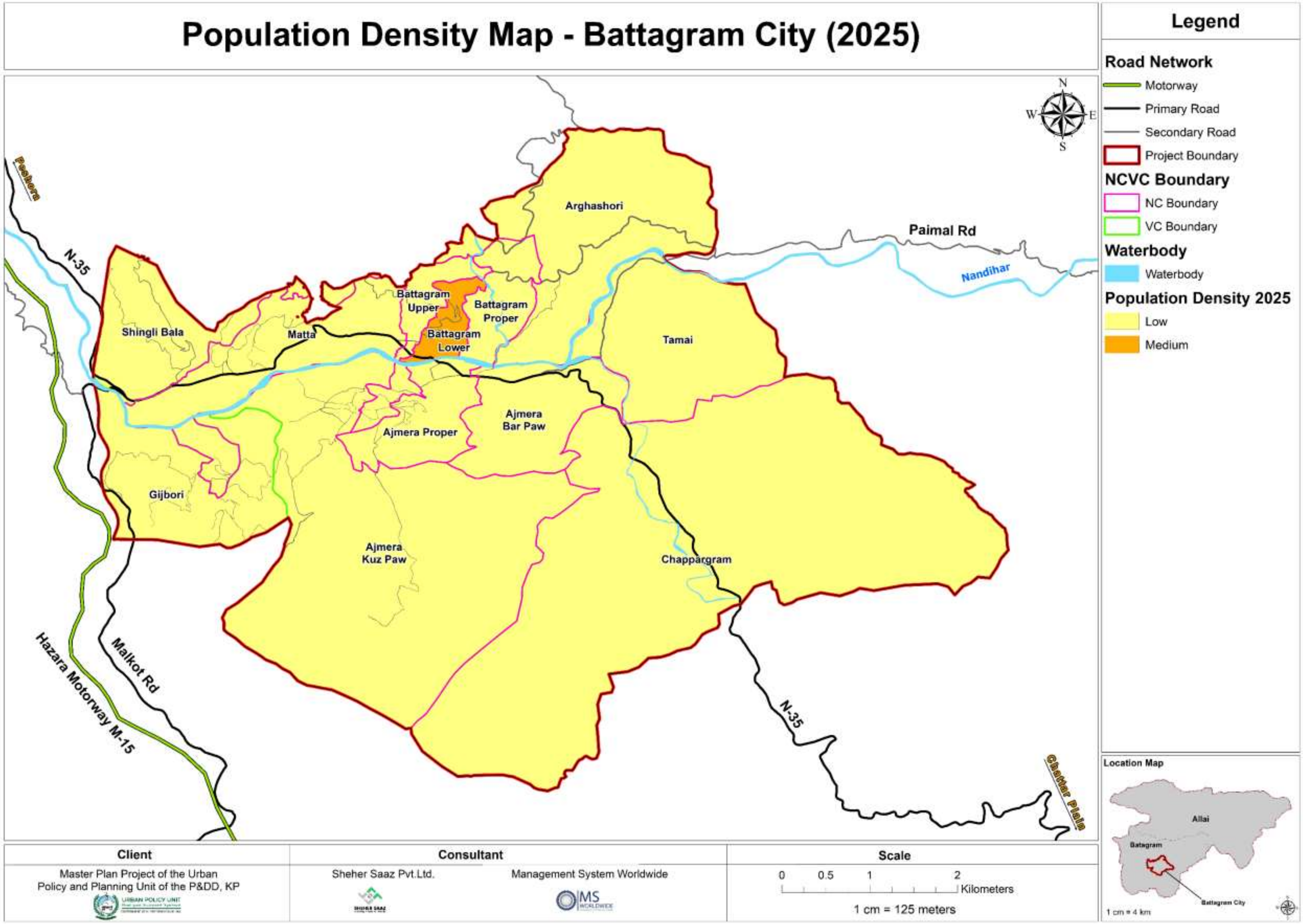
- **Less than 100 PPH = Low Density**
- **100 to 200 PPH = Medium Density**
- **Above 200 PPH = High Density**

This amended density scale is more suitable for Battagram because it distinguishes between the sparse peripheral NC/VCs, the moderately urbanized central settlements, and the most compact parts of the city core.

The 2025 density pattern shows that Battagram is overwhelmingly a low-density city at the NC/VC level. Most of the planning area, including the larger peripheral units such as Shingli Bala, Matta, Argashori, Tamai, Ajmera Proper, Ajmera Bar Paw, Ajmera Kuz Paw, Chappagram, and Gijbori, remains in the low-density category. This reflects the city's dispersed settlement structure, the large extent of agricultural and open land, and the physical constraint imposed by mountains, terraces, and stream corridors. These areas contain settlements, but their gross density remains low because population is spread across relatively large land areas.

A different pattern appears in the central Battagram corridor, where urban concentration is stronger. In 2025, Battagram Proper and Battagram Lower fall in the medium-density category, while Battagram Upper remains relatively compact but still less intense than the core. This confirms that the city's highest concentration of population is already occurring in the central bazaar and service belt along the main valley corridor. In planning terms, this part of the city already functions as the principal urban core and carries the strongest pressure for mixed use, service concentration, and circulation management.

Map 5: Current Population Density 2025



3.1.18.2. Projected Density

The projected density pattern for 2045 shows that population concentration will increase across the planning area, but the increase will remain highly uneven. Most NC/VCs are still expected to remain within the low-density category, which confirms that Battagram will continue to retain a predominantly low-density urban character over the plan period. This is consistent with the city's physical structure, since large parts of the planning area are still unsuitable for compact settlement due to slope, agricultural use, environmental sensitivity, and limited road accessibility.

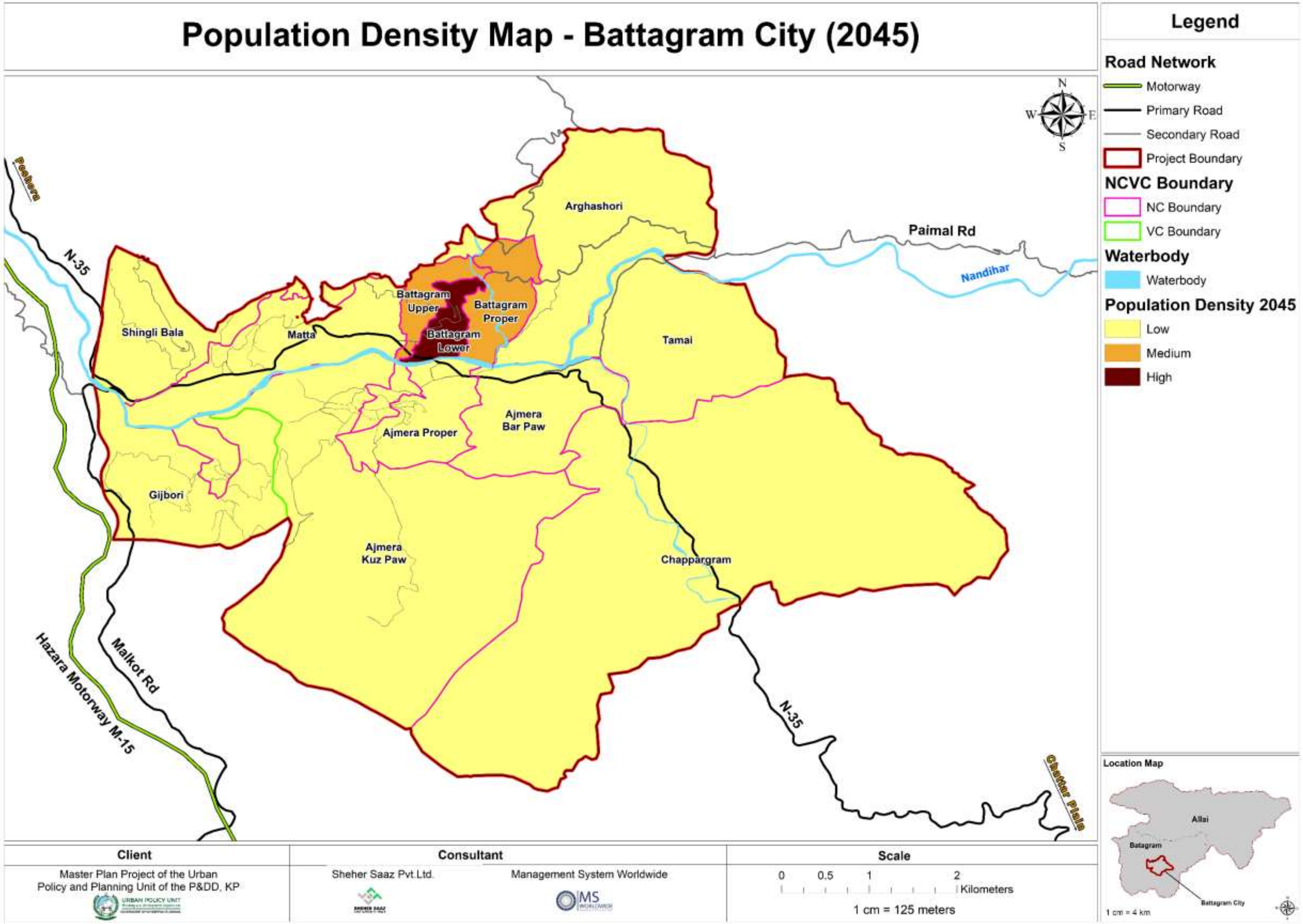
The most significant intensification is projected in the central urban corridor. By 2045, Battagram Lower moves into the high-density category, making it the most compact and intensely urbanized local unit in the city. Battagram Proper and Battagram Upper shift more clearly into the medium-density range, while a small adjoining central pocket also shows medium-density consolidation. This indicates that future urban concentration in Battagram will remain strongly focused on the existing core rather than being distributed evenly across the wider planning area.

This projected pattern confirms that the principal urban core of Battagram will continue to absorb a greater share of population growth than the outer units. The core area is therefore likely to face stronger pressure for land subdivision, higher built-up intensity, mixed-use expansion, parking demand, and infrastructure upgrading. The change from medium to high density in Battagram Lower is particularly important, as it suggests that this area will become the most compact part of the city and will require more careful planning control, circulation management, and service strengthening.

Outside the central core, the wider NC/VCs remain predominantly low density even in 2045. This does not mean they will remain unchanged; rather, it indicates that their population increase will continue to occur in a dispersed and relatively low-intensity form, shaped by topography and accessibility. These areas are more suitable for controlled outward growth, lower-density residential expansion, agriculture-linked settlement, and environmentally responsive development rather than compact urban intensification.

The density analysis demonstrates that Battagram does not exhibit a citywide uniform densification pattern. Instead, it shows a selective concentration structure, in which the central urban corridor intensifies over time while the outer NC/VCs remain predominantly low density. This pattern is entirely consistent with Battagram's terrain-constrained linear-nodal urban form. The city's future development will therefore not be shaped by a single density model. Low-density peripheral units can continue to accommodate growth through planned and infrastructure-supported expansion, while the medium- and high-density central units will need to absorb a greater share of consolidation and controlled intensification.

Map 6: Projected Population Density 2045



3.6.1. Land Use Density of Residential and Commercial Area

A. Methodology

Kernel density estimation (KDE) generates continuous density surfaces that reveal the spatial concentration of residential and commercial parcels across Battagram City, transforming discrete point or polygon data into smooth, interpretable maps of urban intensity.

B. Technical Parameters

The analysis employs precise parameters tailored to urban planning scales:

- Population Field: Counts individual parcels (features) within the search radius, ensuring density reflects actual land parcel distribution.
- Search Radius (Bandwidth): 400 meters, equivalent to a 5-minute walking distance, a standard metric for assessing neighborhood accessibility and local clustering in urban studies.
- Output Cell Size: 100 meters (0.01 km²), providing high-resolution detail to capture fine-scale variations while remaining computationally efficient.
- Area Units: Parcels per square kilometer (parcels/km²), enabling direct comparison with national and international density benchmarks.
- Kernel Function: Quadratic (ArcGIS Spatial Analyst default), which assigns smoothly declining weights to features based on distance from each cell center—nearby parcels contribute most, while those at the radius edge add minimally.

C. Calculation Process

For every 100-meter output cell, the KDE tool evaluates all parcels within the 400-meter radius, applies the quadratic kernel to weight their influence inversely by distance, and computes a density value in parcels/km². This produces a raster surface where high values highlight dense urban cores and commercial nodes, medium values indicate typical neighborhoods, and low values mark sparse peripheries or transitions to rural land.

D. Application Benefits

This methodology excels at visualizing neighborhood-scale patterns, such as ribbon development along Battagram's roads or infill within the urban core, informing master plan decisions on zoning, infrastructure, and densification targets with quantifiable evidence of spatial trends.

1. Residential Land Use Density

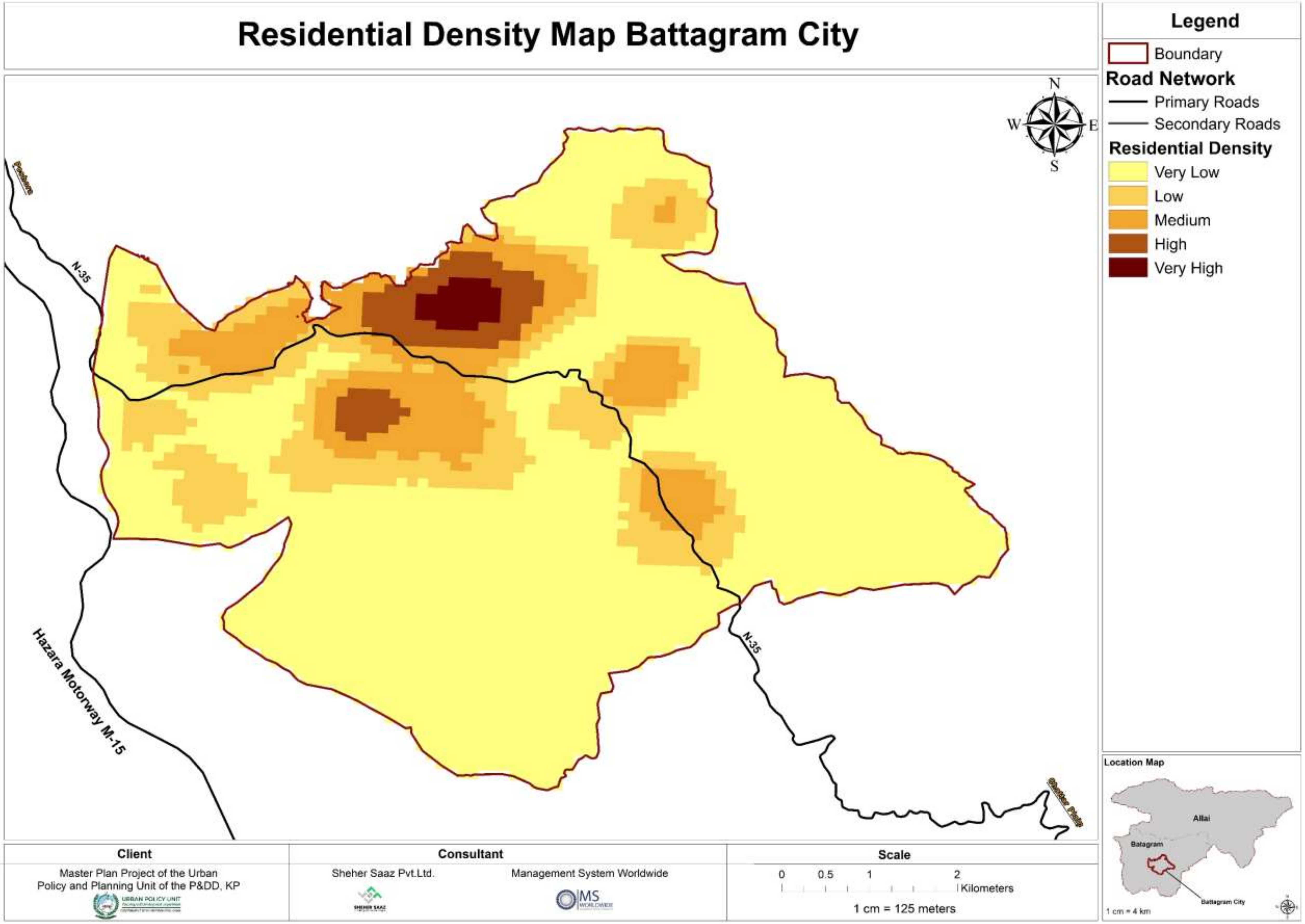
The residential density classification divides urban areas into five progressive bands based on parcels per km², providing a clear framework for assessing housing intensity from rural edges to crowded cores. Very low density (0–300 parcels per km²) marks sparse, transitional zones like rural-suburban fringes with large lots and minimal services, while low density (300–1,000 parcels per km²) describes low-rise suburban layouts with detached homes and open yards. Medium density (1,000–2,500 parcels per km²) represents standard urban neighborhoods with row houses or small lots and walkable street networks, progressing to high density (2,500–

4,500 parcels per km²) in compact inner-city areas featuring multi-storey buildings and denser infrastructure demands. Very high density (4,500+ parcels per km²) indicates congested mixed-use zones with high-rise apartments, intense traffic, and elevated needs for public amenities.

Table 3-16: Residential Land Use Density Standards

Class	Parcels per km²	Description
Very low density	0–300 parcels per km²	Sparse residential/rural–suburban transition
Low density	300–1,000 parcels per km²	Low-density suburban residential
Medium density	1,000–2,500 parcels per km²	Typical urban residential
High density	2,500–4,500 parcels per km²	Dense urban core
Very high density	4,500+ parcels per km²	Congested/mixed-use areas

Map 7: Residential Land Use Density Map



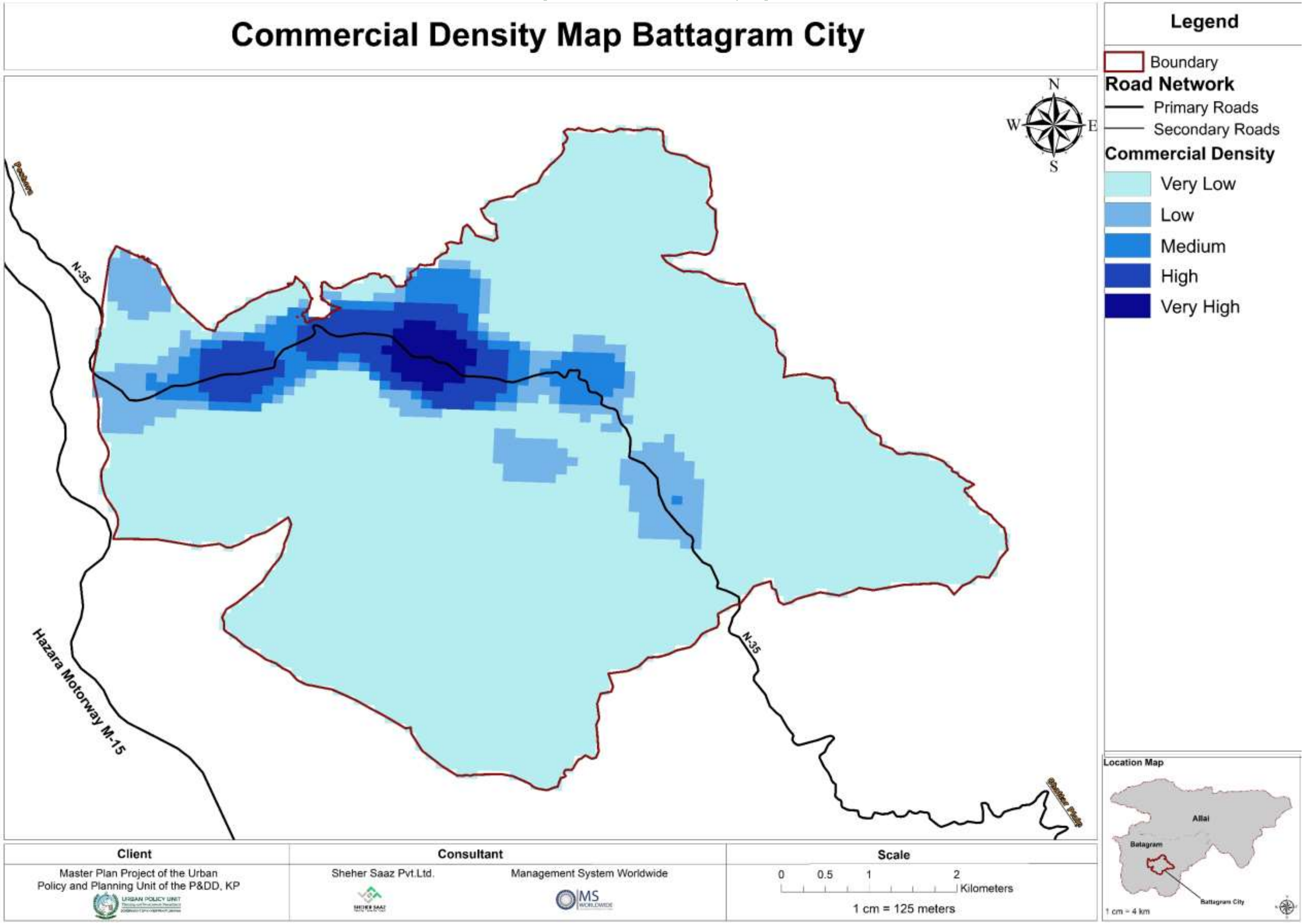
2. Commercial Land Use Density

The commercial density table similarly categorizes business activity into five levels to map retail and service concentrations. Very low density (0–100 parcels per km²) shows isolated shops in residential outskirts, whereas low density (100–300 parcels per km²) captures neighborhood clusters serving daily needs along local roads. Medium density (300–750 parcels per km²) defines broader commercial strips or market districts with varied shops, rising to high density (750–1,500 parcels per km²) in focused trading hubs with heavy footfall. Very high density (1,500+ parcels per km²) signifies central business districts dominated by continuous storefronts, offices above, and peak economic vibrancy. These standardized bands enable planners to identify growth patterns, zoning gaps, and infrastructure priorities across Battagram's varied urban fabric.

Table 3-17: Commercial Land Use Density Standards

Class	Parcels per km²	Description
Very low density	0–100 parcels per km²	Scattered commercial
Low density	100–300 parcels per km²	Neighborhood commercial
Medium density	300–750 parcels per km²	General commercial districts
High density	750–1,500 parcels per km²	Concentrated commercial zones
Very high density	1,500+ parcels per km²	Central business district

Map 8: Commercial Land Use Density Map



3.9 Spatial Structure and Urban Form

The spatial urban form of a city refers to the developed layout pattern in relation to the arrangement of land uses, movement corridors, activity nodes, terrain constraints, and growth directions. Assessment of spatial urban form helps identify the existing structure of urban development and provides a basis for understanding how the city is likely to expand in future.

Battagram City is best interpreted as a terrain-constrained linear-nodal urban form with dispersed hillside expansion. Unlike cities that evolve around a broad compact core, Battagram has developed within a narrow valley setting where topography, the river corridor, and the regional road network strongly influence the distribution of urban activity. The city's principal built-up concentration lies along the central valley corridor, where residential, commercial, mixed-use, transport, and service functions are clustered in a relatively continuous belt. Beyond this main spine, development extends into smaller settlement clusters and scattered hillside pockets, producing a fragmented urban pattern rather than a compact or concentric form.

The strongest structuring element in Battagram is the east-west valley corridor, where the main built-up core has formed through the linkage of Matta, Battagram Lower, Battagram Proper, and Battagram Upper. This central belt functions as the city's principal urban spine. At the same time, secondary settlement concentrations are visible around Argashori, Tamai, Ajmera Proper, Ajmera Bar Paw, Ajmera Kuz Paw, and Chappagram, giving the city a nodal character beyond the central corridor. Recent urban growth has therefore not taken place as compact infill alone; it has proceeded through a combination of corridor-led consolidation, peripheral settlement growth, and dispersed expansion into developable terraces and slopes.

3.1.19.Structure of the Core City

The central part of Battagram functions as the city's primary commercial, administrative, and service nucleus. This core is not organized as a broad compact urban center; rather, it is stretched along the valley floor and road corridor, with the highest concentration of urban functions occurring around Battagram Lower, Battagram Proper, and Battagram Upper. This area contains the greatest continuity of built-up land, the strongest mix of commercial and civic functions, and the most direct integration with the regional movement network.

From a morphological perspective, the core is characterized by:

- elongated built-up concentration along the main corridor
- mixed commercial, transport, and service activity
- relatively finer urban grain than peripheral settlements
- concentration of public and administrative functions
- strong dependence on the main road spine for accessibility and movement

This nucleus remains the dominant anchor of the city. However, because it is narrow and corridor-bound rather than compact, it is more vulnerable to congestion, frontage pressure, and linear overload than a wider urban core. The city center therefore performs an important organizing function, but it does not generate a fully radial urban pattern.

3.1.20.Linear Corridor Structure

The linear corridor model provides the strongest explanation of Battagram's present urban form. Development is concentrated along the valley floor and the principal road corridor, with urban activity extending in a ribbon-like manner through the central belt rather than expanding evenly in all directions. This structure is largely a response to terrain, because flatter and more accessible land is concentrated within the main valley, while surrounding slopes and ridges restrict continuous expansion.

The most important corridor is the central east-west urban spine, which links the western and eastern parts of the city through the main built-up belt. This corridor supports the largest concentration of commercial activity, residential development, public services, and transport functions. It is the city's dominant structural axis and the main carrier of both local and regional movement. Its importance is reinforced by the fact that multiple local roads and settlement links ultimately connect back to this same spine.

The linear character of Battagram is therefore more pronounced than in cities such as Swabi. Here, the corridor is not simply one of several outward growth arms; it is the principal organizing structure of the whole city. This gives Battagram a distinctly elongated urban form in which development intensity declines away from the central belt.

Structural characteristics of the corridor form include:

- concentration of built-up land along the main valley route
- strong frontage-based development pressure
- clustering of commerce and services on accessible roadside land
- gradual thinning of urban continuity away from the central spine
- dependence of secondary settlements on the same corridor for connection to the city core

Advantages of the corridor structure in Battagram include its alignment with natural terrain and existing accessibility patterns, its ability to concentrate development on serviceable land, and its support for relatively efficient linear movement. However, the same structure also creates clear risks. Ribbon expansion can intensify if not controlled, traffic and commercial congestion can accumulate along the main corridor, and the city can become increasingly elongated and inefficient if future growth continues without nodal structuring.

3.1.21.Nodal Settlement Structure

Although Battagram is dominantly linear, it is not a single continuous strip city. It also contains a secondary nodal settlement structure. A number of local settlements have developed as distinct built-up clusters connected to, but spatially separate from, the central corridor. These nodes are shaped by local topography, tributary access routes, settlement history, and the availability of relatively developable land pockets.

The most important secondary nodes include Argashori, Tamai, Ajmera Proper, Ajmera Bar Paw, Ajmera Kuz Paw, Matta, and Chappagram. These do not rival the central city in functional importance, but they do represent meaningful concentrations of housing, local services, and future urbanization potential. They are especially important in understanding Battagram because the city is not growing as one continuous urban mass. Instead, the urban structure is made up of a main corridor core supported by multiple connected settlement nodes.

The strategic significance of these nodes lies in their potential to accommodate:

- localized residential growth
- neighborhood-level commerce and services
- public facilities and community functions
- transport support and local accessibility improvements
- decentralized service delivery beyond the core corridor

Battagram therefore cannot be described as purely monocentric. It remains strongly centered on the main urban spine, but it also exhibits a distributed nodal logic that should be recognized in planning.

3.1.22.Dispersed Hillside Expansion and Fragmentation

A major secondary characteristic of Battagram's urban form is dispersed hillside expansion. Beyond the valley corridor and the main settlement clusters, development is scattered across terraces, slopes, and smaller pockets of accessible land. This pattern reflects the city's mountainous context, where settlement often occurs incrementally on land that becomes available near local access roads or village extensions rather than through formally planned expansion.

This has produced:

- fragmented peripheral built-up patches
- discontinuous residential growth on slopes and terraces
- leapfrog development away from the main corridor
- separation of settlement clusters by agricultural land, streams, and topographic barriers
- increasing difficulty in achieving compact serviceable urban continuity

In practical terms, Battagram is not expanding as a consolidated urban block. Some parts of the city are intensifying along the main corridor, while others are spreading outward in a dispersed and fragmented manner. This mixed condition is typical of mountain towns where settlement geography is strongly constrained by terrain. The challenge for planning is that dispersed growth raises the cost of roads, drainage, water supply, sewerage, waste collection, and public service provision. It also contributes to inefficient land consumption and weakens the coherence of the urban structure.

3.1.23.Role of Terrain and River System in Urban Form

Topography is a defining element of Battagram's urban morphology. The city's form is not simply the result of market-led growth or road orientation; it is fundamentally shaped by the valley floor, slope gradients, river alignment, and the limited availability of developable land. In Battagram, terrain is not a background condition. It is a primary structural force.

The central valley has naturally attracted the highest concentration of urban development because it offers better access, gentler slopes, and greater continuity of movement. By contrast, surrounding slopes and ridges have restricted compact outward expansion, resulting in broken growth, isolated clusters, and hillside settlement pockets. Water courses further segment the landscape and reinforce the corridor-nodal pattern. As a result, Battagram does not possess the physical basis for a broad concentric urban form.

This terrain-conditioned structure has several planning implications. It limits the possibility of uniform urban spread, increases the importance of corridor management, makes nodal strengthening more relevant than large-area expansion, and requires stronger environmental and hazard-sensitive controls in hillside areas.

3.1.24.Best-Fit Urban Form Model for Battagram

Based on the city's elongated core, dominant valley corridor, secondary settlement clusters, and dispersed hillside growth, Battagram is best classified as a:

Terrain-Constrained Linear-Nodal Urban Form with Dispersed Hillside Expansion

This means:

- the city has a corridor-based central urban spine rather than a broad compact core
- principal development is aligned with the valley floor and main road corridor
- secondary settlements form distinct nodes connected to the central belt
- peripheral growth is fragmented and scattered across slopes and terraces
- terrain and hydrology are major determinants of urban structure and future expansion potential

This classification is more accurate than describing Battagram as radial, compact, or purely linear in a simple ribbon sense. The city is structurally linear at the primary level, but nodal and dispersed at the secondary level.

3.1.25.Conclusion

Battagram City is a small but spatially complex urban center whose form has been shaped primarily by terrain, accessibility, and corridor-based development. The city's main urban structure follows the central valley spine, where the highest concentration of built-up land, commerce, transport activity, and public services has developed in an elongated east-west belt. Beyond this spine, the city extends into a set of connected but relatively distinct settlement nodes, while dispersed hillside growth continues to occur in fragmented patches on terraces and slopes.

The planning task is therefore not to impose an artificial compact or radial model on Battagram. Instead, the Master Plan should respond to the city's actual structural tendencies by strengthening the main valley corridor, organizing growth into identifiable nodes, reducing unplanned ribbon expansion, managing hillside sprawl, and protecting environmentally sensitive and agriculturally productive land. A corridor-and-node-based planning response, adapted to mountainous terrain, is therefore the most appropriate framework for guiding Battagram's future urban growth.

4 CHAPTER: COMPARATIVE ANALYSIS OF EXISTING LAND USE

4.1 Existing Land Use Pattern

The existing land use of Battagram City clearly shows that the area is still predominantly rural in character, with urban activities developing in an unplanned and scattered manner. Almost half of the total area is under agricultural terraces, which directly reflects the city's dependence on farming for livelihoods. Most households cultivate wheat, maize, vegetables, and fruits, but the income generated from agriculture remains very low, which explains why residents are gradually shifting towards small businesses, daily wage work, and informal services. This shift is visible on the ground where agricultural land near roads and settlements is slowly being converted into housing and roadside commercial uses without any formal planning approval.

Forests and rangelands together occupy a large portion of the city area and form a natural boundary for urban expansion. These areas are not vacant land but are actively used for grazing, fuelwood, and environmental protection. Construction in these areas is difficult due to steep slopes and instability, yet small pockets of informal development are emerging, increasing the risk of erosion and landslides. The city's physical growth is therefore naturally constrained, but in the absence of clear land use controls, development is occurring wherever access is available rather than where land is suitable.

Residential land use is entirely unplanned and concentrated along tertiary roads and valley floors. Housing growth is driven by population increase and the need to stay close to work opportunities, markets, and transport routes. This has resulted in linear and dispersed settlements with poor access to services, limited open space, and increasing pressure on agricultural land. There is no clear separation between residential, commercial, and mixed uses, and many homes also function as shops or workspaces.

Commercial activity occupies a very small area and is mostly limited to retail shops, small restaurants, and service outlets along main roads. This reflects Battagram's role as a local service center rather than a regional economic hub. Industrial land use is almost absent, which matches the high level of informal employment and limited job options identified in the primary survey. As a result, a large share of the working population depends on agriculture, daily wage labor, or low-scale businesses, while others seek employment outside the district or abroad.

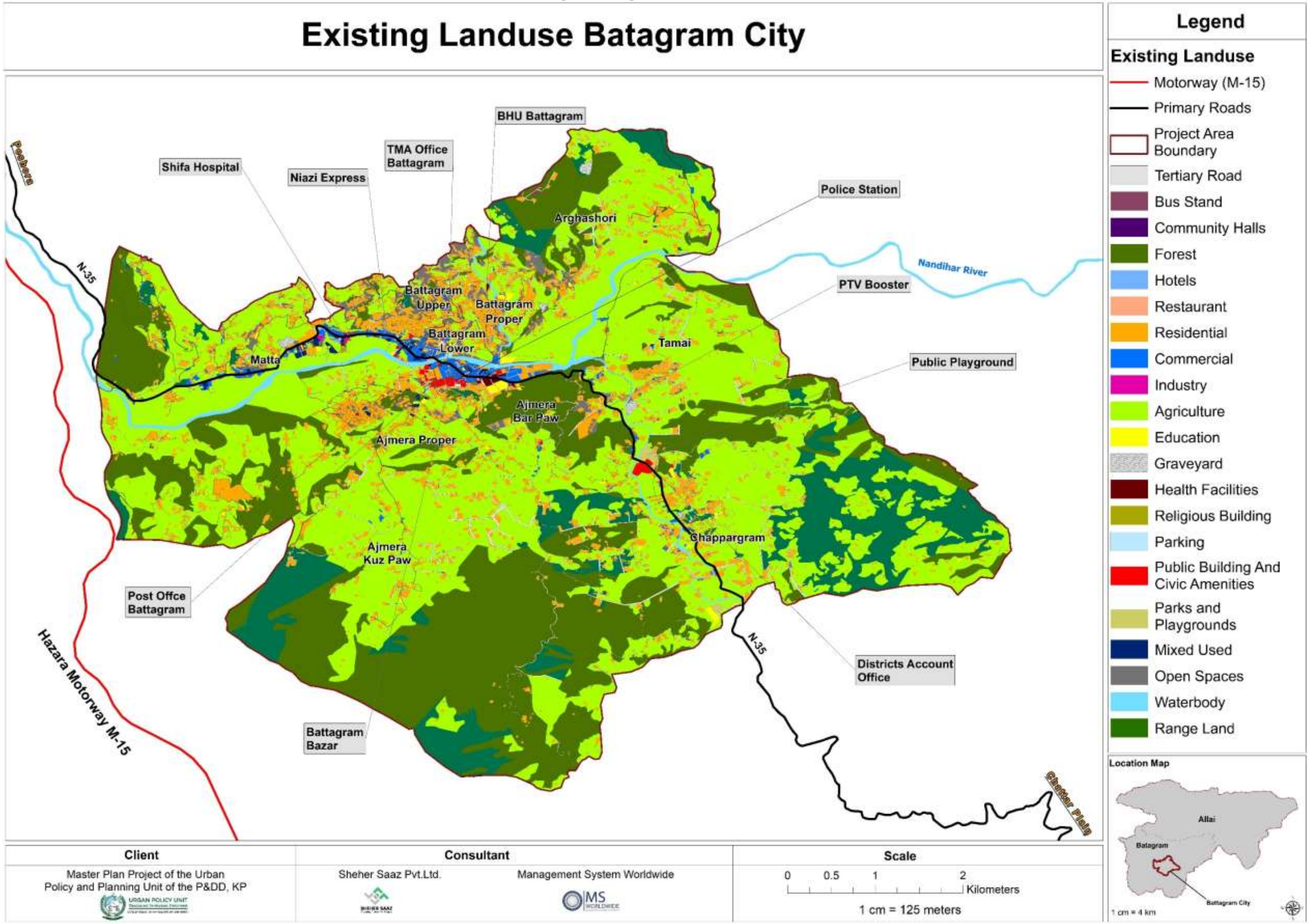
Social infrastructure such as schools, health facilities, parks, and public buildings occupies a minimal share of land and is unevenly distributed. Public open spaces and recreational areas are particularly limited, which affects overall living conditions. Road infrastructure is dominated by narrow tertiary roads, indicating organic growth rather than planned connectivity. Limited primary and secondary roads restrict mobility, concentrating development along a few corridors, and reduce access to services for peripheral settlements.

Tourism-related land use is negligible despite the natural landscape and scenic value of the area. The lack of designated tourism infrastructure shows that economic potential linked to tourism remains largely untapped. Overall, the existing land use pattern reflects low-density, informal growth shaped by livelihood needs, terrain constraints, and limited institutional control. Without structured planning, continued conversion of agricultural and environmentally sensitive land into unplanned settlements will further weaken the city's economic base and increase long-term development risks.

Table 18: Existing Land Use Classification – Battagram City

Major Land Use Category	Sub-Category	Area (Acres)	Percentage (%)
Agriculture	Agricultural Terrace	3773.86	44.60%
Residential	Unplanned	767.05	9.06%
Commercial	Restaurant	0.20	0.00%
	Bank	1.10	0.01%
	Petrol Pump	1.53	0.02%
	Retail	67.03	0.79%
Education	Govt School	17.91	0.21%
	Private School	2.44	0.03%
	Training Institute	1.17	0.01%
	University	2.64	0.03%
Graveyard	Graveyard	13.96	0.16%
Protected Areas	Private Forest	1783.40	21.07%
	Public Forest	574.50	6.79%
Health Facilities	Hospital	2.81	0.03%
	Private Health	3.73	0.04%
Industry	Industry	3.01	0.04%
Mixed Used	Mixed Use	14.01	0.17%
Open Spaces	Vacant	123.60	1.46%
Transportation	Bus Stand	1.79	0.02%
	Parking	2.54	0.03%
	Primary Road	25.09	0.30%
	Secondary Road	44.21	0.52%
	Tertiary Road	247.70	2.93%
Parks and Playgrounds	Park & Playground	8.57	0.10%
Public Building & Civic Amenities	Administrative Building	17.24	0.20%
Range Land	Range Land	848.06	10.02%
Religious Building	Madrassa	2.22	0.03%
	Masjid	9.53	0.11%
Tourism Infrastructure	Hotel	3.87	0.05%
	Tourism Point	0.06	0.00%
Waterbody	Waterbody	97.50	1.15%
Total Area		**8462.33**	**100.00%**

Map 9: Existing Land Use Distribution



4.2 Comparison with Standards

The allocation of land for future uses is also the most complex and sensitive part of the master planning process. At the city scale, there are no universally accepted quantitative standards that can be applied mechanically to determine how much land should be allocated to each sector, because Battagram has its own unique geography, resource base, economic structure, and demographic profile. This means that even if another city shares a similar size, climate, or population, its land needs will still differ from those of Battagram, so copying ratios from elsewhere would risk under- or over-provision of key functions. The level of densification or intensification that planners decide for different neighbourhoods will further influence how much additional land is required for housing, commerce, industry, green spaces, and infrastructure in the future.

In this context, the National Reference Manual (NRM) serves as an indicative guide rather than a rigid rulebook, offering benchmark ranges for sectoral allocations that can be adapted to Battagram's conditions. Using Battagram's existing land-use pattern derived from recent surveys and GIS analysis, a comparison table similar to the one prepared for larger cities can be developed, showing how the current shares of residential, commercial, community facilities, green and recreational areas, graveyards, vacant and reserved land, roads, and industry relate to the NRM ranges for a city in the relevant population category.

Table 19: Existing Land Use Comparison with NRM Standards

Sr. No.	Land Use	Area (Acre)	Land Use Percentages	NRM Standards for city of 100,000-499,000 people
1	Residential	767.05	9.06%	26-48%
2	Commercial including mixed use	83.86	0.99%	1-2%
3	Community Facilities (Health, Education, Mixed Use, Religious, Public etc)	63.62	0.75%	2-10%
4	Recreational	8.24	0.10%	1-7%
5	Graveyard	13.96	0.17%	0.5-4%
6	Vacant/ Other/Reserved (agriculture, orchard etc)	7103.43	83.94%	3-45%
7	Roads	321.3364	3.80%	12-29%
8	Industry	3.01	0.04%	2-15%

The comparison between existing land use distribution and National Reference Manual (NRM) standards for cities with populations between 100,000–499,000 reveals significant structural imbalances in Battagram City's spatial development pattern. The current land use composition reflects a predominantly rural–peri-urban morphology rather than a compact urban form, with extremely high proportions of vacant and agricultural land, underdeveloped transport infrastructure, and critically low allocation for community, recreational, and industrial functions. These imbalances indicate that the city is still in a transitional phase of urbanization and lacks the spatial diversity required for sustainable urban growth.

Residential land accounts for only 9.08%, which is substantially below the NRM recommended range of 26–48%, indicating limited planned housing expansion within the municipal boundary. This suggests that much of the population may reside in dispersed rural settlements, informal clusters, or mixed agricultural areas rather than formally planned residential neighborhoods. Commercial land use, at 1%, falls within the acceptable NRM range of 1–2%, indicating a relatively balanced but minimal commercial footprint that reflects the city's small urban economy. However, community facilities including education, health, and religious uses—occupy only 0.75%, far below the 2–10% benchmark, highlighting a severe deficit in social infrastructure allocation and land reservation for public services.

Recreational spaces represent just 0.10%, significantly lower than the required 1–7%, demonstrating a critical absence of formal parks, playgrounds, and public open spaces. Similarly, graveyards account for 0.17%, below the standard 0.5–4%, which may create long-term pressures on burial space as the population grows. Road infrastructure occupies only 3.82%, dramatically below the NRM requirement of 12–29%, indicating inadequate street hierarchy, connectivity, and right-of-way provision, factors that directly constrain mobility, emergency access, and future urban expansion.

The most striking imbalance lies in the Vacant/Other/Reserved category, which constitutes 83.94% of total land area, vastly exceeding the recommended 3–45% range. This indicates that the municipal boundary encompasses large tracts of agricultural land, orchards, and undeveloped terrain, reinforcing the observation that Battagram's administrative limits extend beyond its functional urban footprint. Industrial land use is nearly absent at 0.04%, compared to the NRM standard of 2–15%, reflecting an almost nonexistent industrial base. This lack of industrial zoning restricts employment generation, economic diversification, and local revenue potential.

4.3 Future Land Requirements

Land demand estimation is a critical step to determine the land required for different land uses, such as residential, commercial, industrial, and institutional. Various sociological and economic factors, existing land use regulations, and regional physical characteristics influence future land requirements. For integrated development, the proposals for 2045 are based on assessments of land use demand. The stages of Land use demand calculation can be broken down into the following three stages:

Figure 7: Stages for land Demand Calculation

Source: Devised by Consultant

Assessment for future built-up areas is done using NRM standards. The process typically involves several stages, beginning with preparing a base map of the study area and identifying various land uses for classification. Next, the existing land uses are compared to the national standards in the NRM to determine any discrepancies. These comparisons identify gaps between the current land uses and the required estimates. Through this approach, estimating the demand for land and developing strategies for the optimal use of available land resources is possible. The process helps to ensure that land is used efficiently, sustainably, and by national standards, promoting economic growth and human well-being.

A detailed Land use survey was carried out, and the land use categories have been developed using the National Reference Manual. The primary land uses include agriculture, vacant commercial and residential buildings, as well as various institutional structures such as healthcare and education facilities, mixed-use developments, and religious buildings.

4.4 Actual Need of the City/Land Demand

The analysis has been carried out by considering the overall study area, including all vacant, agricultural, orchard, and reserved lands located within the urban limits and surrounding settlement areas. By incorporating the entire study area into the assessment, a comprehensive understanding of both existing land resources and future development potential has been achieved. This approach provides an opportunity to identify suitable locations for residential, commercial, industrial, institutional, and recreational development while ensuring that future growth is aligned with infrastructure provision, environmental sustainability, and long-term urban expansion objectives.

The table presents a comprehensive assessment of future land demand estimation for Battagram City based on various land-use categories defined under the National Reference Manual (NRM) and the KP Urban Policy framework. The analysis follows the NRM standards applicable to cities within the population range of 100,000–499,000 and provides the basis for future land-use planning and urban development interventions up to the year 2045.

Table 20: Land Demand Calculation - Battagram City

Sr. No.	Land Use	Area (Acre)	Area Required 2025 (Acre)	GAP 2025 (Acre)	Future Requirement 2045 (Acre)	GAP+Future Requirement 2045 (Acre)	Existing Land Use Percentages	Proposed Land Use Percentages	Existing & Proposed Land Use Percentages	NRM Standards for city of 100,000-499,000 people
1	Residential (Scenario-1) 100% Horizontal	767.05	798.05	31	1086	1117	9.06%	13.34%	0.22	26-48%
	Residential (Scenario-1) 20% Vertcial & 80% Horizontal					883		10.55%	0.20	
	Residential (Scenario-1) 30% Vertcial & 70% Horizontal					776		9.27%	0.18	
2	Commercial including mixed use	87.78	173.53	85.75	98.91	184.66	0.99%	2.21%	0.03	1-2%
3	Community Facilities (Health, Education, Religious, Public etc)	67.4	100.83	247.33	183.11	430.44	0.75%	5.14%	0.06	2-10%
4	Recreational	8.57	86.76	78.19	49.45	127.64	0.10%	1.52%	0.02	1-7%
5	Graveyard	13.96	103.25	89.29	58.85	148.14	0.17%	1.77%	0.02	0.5-4%
6	Vacant/ Other/Reserved (agriculture, orchard etc)	7103.43	-	-	-	-	83.94%	-	-	3-45%
7	Roads	321.33	-	-	-	-	3.80%	-	-	12-29%
8	Industry	3.01	216.91	213.9	123.64	337.54	0.04%	4.03%	0.04	2-15%

Source: Developed by Consultant

The land demand assessment for Battagram City has been prepared based on the projected urban requirements for the year 2045 using the National Reference Manual (NRM) standards applicable to cities within the population range of 100,000–499,000. The analysis compares the existing land-use structure with future land requirements and identifies the gaps that need to be addressed through planned urban expansion and spatial restructuring. The assessment reveals significant deficiencies in several key urban land-use categories, highlighting the need for balanced and sustainable urban growth in Battagram City.

Residential land constitutes the largest component of future land demand. Under NRM standards, 26–48% of urban land should be allocated for residential use. The existing residential area in Battagram City is 767.05 acres, accounting for approximately 9.06% of the total study area. The projected residential requirement for 2025 is estimated at 798.05 acres, creating an immediate gap of 31 acres. By 2045, the future residential requirement is estimated at 1,086 acres under a fully horizontal growth scenario, resulting in a cumulative requirement of 1,117 acres. Alternative growth scenarios based on vertical development indicate that with 20% vertical and 80% horizontal growth, the residential requirement can be reduced to 883 acres, while a 30% vertical and 70% horizontal development scenario further reduce the requirement to 776 acres. These findings highlight the importance of promoting compact and vertical urban development to reduce pressure on agricultural and vacant land while accommodating future population growth efficiently.

Commercial land, including mixed-use areas, currently occupies 87.78 acres or approximately 0.99% of the study area. According to NRM standards, commercial land should range between 1–2% of urban land. The projected requirement for 2025 is 173.53 acres, indicating a shortfall of 85.75 acres. By 2045, the future requirement is estimated at 98.91 acres, resulting in a cumulative demand of 184.66 acres. The proposed land-use allocation increases the commercial share to approximately 2.21%, which falls within the prescribed NRM range. This indicates the need for additional commercial centers, mixed-use corridors, and organized business districts to support economic growth and improve service accessibility.

Community facilities including health, education, religious, public, and other institutional uses currently cover 67.4 acres, representing only 0.75% of the study area. The projected requirement for 2025 is 100.83 acres; however, the overall deficit identified through the analysis is 247.33 acres. By 2045, future demand is estimated at 183.11 acres, resulting in a cumulative requirement of 430.44 acres. The proposed land-use share for community facilities is approximately 5.14%, which lies within the NRM standard range of 2–10%. The findings indicate a substantial shortage of social infrastructure and emphasize the need for new schools, colleges, healthcare facilities, civic institutions, and community services to support future urban development.

Recreational land is among the most critically deficient categories in Battagram City. Existing recreational space covers only 8.57 acres, accounting for 0.10% of the study area. The projected requirement for 2025 is 86.76 acres, creating a gap of 78.19 acres. By 2045, the future requirement reaches 49.45 acres, resulting in a cumulative demand of 127.64 acres. The proposed recreational allocation increases the share to approximately 1.52%, which falls within the NRM range of 1–7%. The severe shortage of parks, playgrounds, public open spaces, and green infrastructure highlights the need for strong policy intervention to improve urban livability, environmental quality, and public health.

Graveyard land currently occupies 13.96 acres or approximately 0.17% of the study area. The projected requirement for 2025 is 103.25 acres, indicating a deficit of 89.29 acres. By 2045, the future requirement is estimated at 58.85 acres, resulting in a cumulative demand of 148.14 acres. The proposed land-use allocation increases graveyard land to approximately 1.77% of the study area, which remains within the NRM standard range of 0.5–4%. The analysis highlights the need for proactive reservation of additional burial spaces and protection of existing graveyards from encroachment and incompatible development.

Industrial land is significantly underdeveloped in Battagram City. Existing industrial land covers only 3.01 acres, representing 0.04% of the study area. According to NRM standards, industrial land should comprise 2–15% of urban land. The projected industrial requirement for 2025 is 216.91 acres, resulting in a substantial deficit of 213.9 acres. By 2045, the future requirement is estimated at 123.64 acres, creating a cumulative demand of 337.54 acres. The proposed industrial allocation increases the share to approximately 4.03%, which falls within the NRM standard range. This demonstrates the urgent need for planned industrial zones, small-scale industrial estates, and employment-generating economic activities to strengthen the local economy and diversify urban functions.

Road infrastructure currently occupies 321.33 acres or approximately 3.80% of the study area. Although no specific quantitative future requirement has been calculated in the table, the existing road network remains significantly below the NRM standard range of 12–29%. This indicates inadequate transport infrastructure and highlights the need for expansion and upgrading of the road hierarchy, including arterial roads, collector streets, and local access networks, to support future urban growth and improve mobility within the city.

Vacant, agricultural, orchard, and other reserved land dominates the existing land-use structure, covering 7,103.43 acres or approximately 83.94% of the total study area. While no quantitative deficit has been identified for this category, it represents the primary land reserve for future urban expansion. The large proportion of undeveloped land provides significant opportunities for planned growth; however, without proper zoning regulations and development control mechanisms, these areas remain vulnerable to unplanned sprawl, haphazard land conversion, and inefficient urban expansion.

Overall, the land demand analysis for Battagram City demonstrates a substantial mismatch between existing land-use distribution and future urban requirements, particularly in the residential, industrial, community facilities, recreational, and commercial sectors. The findings emphasize the need for comprehensive spatial planning, infrastructure investment, densification strategies, and strict land-use management to guide Battagram City toward balanced, sustainable, and functionally efficient urban development.

5 CHAPTER: LAND SUITABILITY AND MULTI-CRITERIA ANALYSIS

5.1 Suitability Mapping

Due to distinct urban features and issues, the assessment of appropriate land use for the future development of the city becomes a difficult task. This issue is further exasperated by multi-faceted aspects of the planning and a variety of competing interests and solutions. To address this issue, GIS-based modelling is carried out by involving different stakeholders and experts. One of the benefits of employing GIS-based land suitability modelling is the capacity of GIS to construct alternative urban development scenarios. The underlying idea of GIS suitability analysis is that each feature of the area has inherent characteristics that are either appropriate or unsuitable for the proposed land uses.

The suitability of the land uses is assessed through a methodical, multi-factor investigation of the problem's various facets. The decision-based modelling has been carried out by giving weightage to the different socio-environment and other related aspects of land use. Weights are assigned to each input based on its relevance or degree of influence. Each input's weight is relative and must sum up to 100% to ensure that all considerations are included in the decision-making process.

5.2 Multi-Criteria Decision Analysis (MCDA)

Multi-criteria decision-making is one approach used to facilitate the consideration of multiple criteria by decision-makers. MCDA is used to logically evaluate and compare multiple, often conflicting, criteria in order to make the best possible decision. Especially useful when you have a wide range of stakeholders with conflicting interests, values and goals.

Though the multi-criteria analysis can be carried out in multiple ways, the consultant has pooled two criterion types into one i.e., land suitability classes and conditional suitability.

The general equation for multi-criteria analysis is as under:

$$\textit{Multi Criteria Analysis} = w \times C \times r$$

Where;
w = specified weightage to the class.
C = Criteria or Factors involved in criteria. &
r = restrictions or constraints involved in the criteria.

Multi-criteria analysis can be performed using a variety of techniques, It can be performed using the raster calculator method or it can be used using the weighted overlay method. In either case, the basic essence remains the same. The core of multi-criteria analysis revolves around the equation stated above.

Land suitability is the aptness of a given type of land for a defined use i.e., residential, or commercial. The suitability can consider land in its existing condition or after improvements. The process of land suitability classification is the appraisal and grouping of specific areas of land in terms of their suitability for defined uses. Multi-criteria analysis has been used to determine suitable land uses for existing land parcels.

The consultant has pooled two criterion types into one i.e., land suitability classes and conditional suitability.

Land suitability classes reflect degrees of suitability. The classes are numbered consecutively in sequence of decreasing degrees of suitability within the Order. The opted criterion provides following three suitability classes:

Figure 8: Classes of the LSA

Highly Suitable:

- Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.

Moderately Suitable:

- Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on Class S1 land.

Least Suitable:

- Land having limitations which in aggregate are severe for sustained application of a given land use and will so reduce productivity or benefits will not be suitable.

Source: Developed by Consultant, 2026

5.3 Constraint Mapping

Important components of constraint maps are identification of areas that will not be considered for residential development. This type of Boolean map composed of ones and zeros. The pixels with a value of 0 represent places that cannot be utilized stating them as constraints. On the other hand, the pixels with a value of one represent areas with no restrictions and can be utilized for residential development as they meet the suitability requirement. (Constraint mapping is the method to identify suitable and non-suitable land for the development. The non-suitable land is extracted from the analysis)

5.4 Factor mapping

(In case of urban development plans such as master plan or land use plan, different proposals for different land uses are developed based on certain factors. These factors are applied in the GIS to generate final outcome.

5.5 Multi-Criteria Land Use Suitability Analysis (LSA)

All criteria in this framework follow a consistent scoring convention. Each factor is classified into suitability classes ranging from 'Highly Suitable' to 'Unsuitable,' with intermediate categories including 'Suitable,' 'Moderately Suitable,' 'Marginal,' and 'Low/Conditional.' These qualitative classes map to a numerical score between 0 and 100, enabling weighted arithmetic aggregation into a final composite index. Weights are assigned to each criterion in proportion to its relative significance for the intended land use type.

3.1.26. Accessibility to Road Network

Road accessibility is the single most heavily weighted criterion in the framework, reflecting the fundamental role that connectivity plays in the viability of any developed land use. Sites that are in close proximity to primary or secondary road infrastructure benefit from reduced logistics costs, improved emergency access, and greater economic connectivity. Conversely, locations beyond practical road-reach thresholds are considered low-suitability or unsuitable for most development types.

The criterion differentiates between two road hierarchy levels primary roads (including highways and arterial routes) and secondary roads with separate distance thresholds applied to each, as shown in Table below.

Table 21: Suitability Classification — Road Accessibility

Road Type	Distance Range	Suitability
Primary Road (Highway / Arterial)	0–1 km	**Highly Suitable**
	1–3 km	**Suitable**
	3–5 km	**Moderately Suitable**
	>5 km	**Low / Unsuitable**
Secondary Road	0–500 m	**Highly Suitable**
	500 m – 1 km	**Suitable**
	1–2 km	**Moderate Suitable**
	>2 km	**Low Suitable**

Source: Developed by Consultant, 2026

For primary roads, land within 1 km is classified as Highly Suitable, with suitability declining progressively beyond 5 km. Secondary roads follow a tighter threshold, with high suitability limited to parcels within 500 metres. This reflects the lower traffic capacity and reduced functional reach of secondary road infrastructure.

3.1.27.Slope and Topography

Topographic slope is a critical physical constraint for any form of land development. Gentle slopes facilitate construction, reduce earthworks costs, and mitigate erosion risks. As slope gradient increases, the cost and complexity of development rise substantially, and the risk of structural instability and surface runoff increases accordingly.

The suitability classification for slope was based on percentage gradient. Land with slopes below 5% was considered Highly Suitable for development, whereas land with gradients exceeding 25% was classified as Unsuitable due to engineering constraints and environmental sensitivity.

Table 22: Suitability Classification — Slope and Topography

Slope (%)	Suitability
0–5%	**Highly Suitable**
5–10%	**Suitable**
10–15%	**Moderately Suitable**
15–25%	**Marginal**
>25%	**Unsuitable**

Source: Developed by Consultant, 2026

3.1.28.Land Type and Current Land Use

The existing land use and cover type of a site directly influences the feasibility, cost, and regulatory permissibility of land conversion. Barren and vacant land represents the least encumbered option for development, while protected agricultural land is subject to legal restrictions and carries significant ecological and food-security value.

The suitability classification for different land type categories was based on existing land use conditions rather than potential land value. This criterion should therefore be interpreted alongside applicable zoning regulations and land acquisition requirements during the planning and development assessment process.

Table 23: Suitability Classification — Land Type and Land Use

Land Type	Suitability
Barren / Vacant Land	**Highly Suitable**
Scrub Land	**Suitable**
Agricultural (Non-Irrigated)	**Moderately Suitable**
Irrigated Agricultural Land	**Low (restricted)**
Protected / Cultivated Fertile Land	**Unsuitable**

Source: Developed by Consultant, 2026

3.1.29.Proximity to Existing Settlements

The distance of a development site from existing populated settlements is a key determinant of future occupancy appeal, infrastructure sharing potential, and integration with existing social fabric. Sites located close to established settlements can leverage existing community services, retail networks, and social infrastructure. More remote sites carry higher costs for service provision and may face lower initial demand.

The suitability classification for proximity to settlements identified sites within 2 km of existing built-up areas as the most suitable for development. In contrast, sites located more than 10 km from any settlement were considered to have low suitability, particularly for residential and mixed-use development typologies.

Table 24: Suitability Classification — Proximity to Settlements

Distance from Settlement	Suitability
0–2 km	**Highly Suitable**
2–5 km	**Suitable**
5–10 km	**Moderate**
>10 km	**Low**

Source: Developed by Consultant, 2026

3.1.30.Proximity to Water Bodies

Unlike the preceding criteria, proximity to water bodies operates as an inverted suitability function: land that is too close to rivers, canals, lakes, or other water features is classified as unsuitable due to flood risk exposure and the requirements of riparian buffer zones under environmental legislation. This criterion therefore functions as both a risk constraint and a regulatory compliance check.

Land located within 100 metres of a water body was classified as Unsuitable, as these areas generally fall within mandatory exclusion or buffer zones. Suitability improves with increasing distance from water bodies, with areas beyond 500 metres considered Suitable where flood and riparian constraints are typically minimal or no longer applicable.

Table 25: Suitability Classification — Proximity to Water Bodies

Distance from Water Body	Suitability
0–100 m	**Unsuitable (buffer zone/flood risk)**
100–300 m	**Low**
300–500 m	**Moderate**
>500 m	**Suitable**

Source: Developed by Consultant, 2026

3.1.31.Geological and Soil Conditions

The bearing capacity and stability of subsurface soil and rock formations fundamentally determine the engineering feasibility of construction and the long-term structural safety of built assets. Stable alluvial or compacted soils present minimal geotechnical risk and support cost-effective foundation design. In contrast, expansive clays, loose sands, seismically active fault zones, and landslide-prone terrain impose significant engineering challenges and can render development economically unviable or legally prohibited.

Table below classifies geological and soil conditions according to their associated geotechnical risk, from stable alluvial soils at the highest suitability to floodplain and landslide-prone terrain, which are deemed Unsuitable for structural development.

Table 26: Suitability Classification — Geological and Soil Conditions

Geological / Soil Condition	Suitability
Stable Soil (Alluvial, Compacted)	Highly Suitable
Moderately Stable Soil	Suitable
Expansive Clay / Loose Sand	Moderate
High Seismic Fault Zone / Unstable Geology	Low
Landslide-Prone / Floodplain	Unsuitable

Source: Developed by Consultant, 2026

3.1.32. Proximity to Public Amenities

Access to public amenities including educational institutions, healthcare facilities, and commercial services is a primary driver of residential appeal and social sustainability. Developments well-served by nearby amenities command greater market value, support higher occupancy rates, and reduce the burden on residents to travel for essential services.

The suitability thresholds were based on standard planning principles that identify 2 km as the walkable catchment boundary for essential community services. Sites located more than 10 km from the nearest amenities were classified as having low suitability, particularly for residential land use development.

Table 27: Suitability Classification — Proximity to Public Amenities

Distance from Public Amenities	Suitability
0–2 km	Highly Suitable
2–5 km	Suitable
5–10 km	Moderate
>10 km	Low

Source: Developed by Consultant, 2026

3.1.33. Proximity to Major Infrastructure

The availability of trunk infrastructure including water supply networks, sewerage systems, electricity grids, gas pipelines, and telecommunications backbone is a decisive factor in determining both the technical viability and economic cost of development. Sites located within the serviceable range of existing infrastructure can connect with modest extension works; those situated beyond these thresholds require disproportionately expensive new infrastructure investment.

The threshold distances and corresponding suitability classifications were established for five categories of major infrastructure. Proximity to water supply and sewerage networks was considered the most critical for immediate operational requirements; therefore, these services were assessed using stricter thresholds for the Highly Suitable classification.

Table 28: Suitability Classification — Proximity to Major Infrastructure

Infrastructure Type	Threshold Distance	Suitability
Water Supply Network	< 1 km	**Highly Suitable**
Sewerage Network	1–2 km	**Highly Suitable**
Electricity Grid / Substation	< 2 km	**Suitable**
Telecom Backbone	< 2 km	**Suitable**

Source: Developed by Consultant, 2026

3.1.34.Environmental and Hazard Constraints

Environmental and natural hazard constraints constitute a gatekeeping criterion in any land suitability assessment. Regardless of the performance of a site on other criteria, the presence of significant hazard conditions such as location within a floodplain, active seismic fault zone, or legally designated protected area will typically render a site Unsuitable for development under applicable planning regulations and risk management standards.

The sites were classified based on the type and severity of environmental or hazard exposure. Sites with no identified hazard conditions received the highest suitability rating. Sites affected by moderate risks, such as proximity to noise corridors or minor pollution sources, were classified as Conditional, indicating that development may proceed if appropriate mitigation measures are implemented.

Table 29: Suitability Classification — Environmental and Hazard Constraints

Environmental / Hazard Condition	Suitability
No Hazard Zone	**Highly Suitable**
Low Environmental Sensitivity	**Suitable**
Moderate Risk (Noise, Pollution)	**Conditional**
Floodplain / Seismic Fault / Protected Area	**Unsuitable**

Source: Developed by Consultant, 2026

5.6 Composite Suitability Scoring

3.1.35.Scoring Methodology

Upon completion of the individual criterion assessments, a composite suitability score is calculated for each candidate land parcel by summing the weighted scores across all nine criteria. Each criterion is scored on a 0–100 scale, multiplied by its assigned weight (expressed as a decimal fraction), and aggregated to produce a final composite index also on a 0–100 scale.

The composite score reflects the overall development suitability of a site, accounting for the relative importance of each criterion as determined by the weighting scheme. Sites with high composite scores across multiple criteria are ranked above those which score well on only a subset of factors.

3.1.36.Composite Score Classification Bands

The composite scores were interpreted using a five-tier classification system. Sites scoring 80 and above were identified as highly suitable and considered priority locations for development allocation, as they performed well across most suitability criteria. In contrast, sites scoring below 20 were regarded as unsuitable for development due to the concentration of existing constraints under current conditions.

Table 30: Composite Suitability Score Classification

Composite Score Range	Classification
80–100	**Highly Suitable**
60–80	**Suitable**
40–60	**Moderately Suitable**
20–40	**Marginal**
< 20	**Unsuitable**

Source: Developed by Consultant, 2026

5.7 Recommended Criterion Weightings

The weighting assigned to each criterion reflects its relative importance in determining overall land development suitability. These weightings were developed in accordance with planning best practices and may be adjusted to suit specific project objectives, such as industrial or residential development, or urban and peri-urban planning contexts.

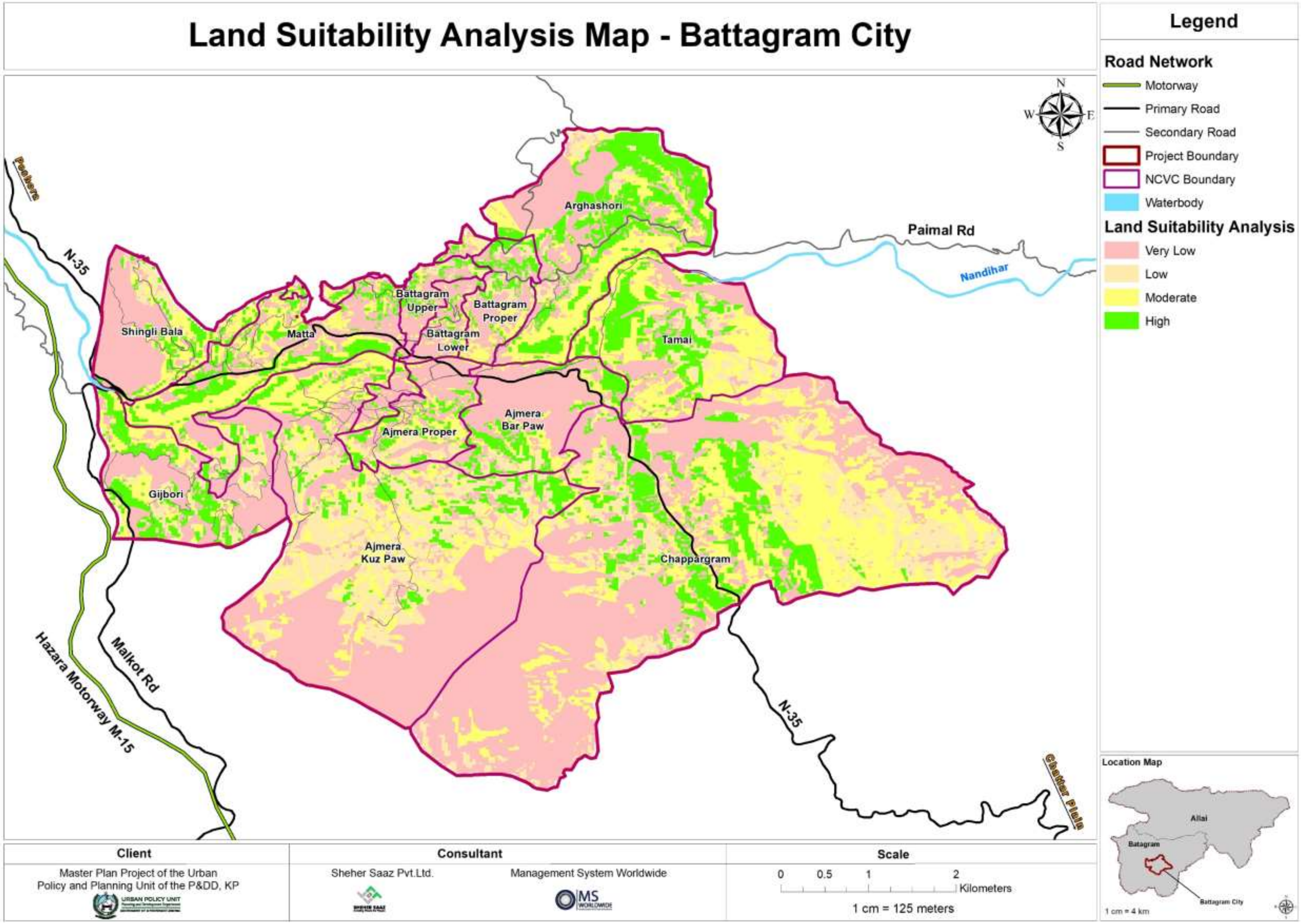
The recommended weighting structure allocates the highest emphasis to road accessibility (20%), followed by slope/topography and infrastructure access (15% each), highlighting the importance of physical connectivity and service provision in supporting viable development. The remaining criteria were each assigned a weighting of 10%, reflecting their comparable role as supporting or constraining factors within the overall suitability assessment framework.

Table 31:Recommended Criterion Weighting Distribution

Sr.	Criteria	Weighting (%)
1	Road Accessibility	20%
2	Slope / Topography	15%
3	Infrastructure Access	15%
4	Land Type / Land Use	10%
5	Proximity to Settlements	10%
6	Soil / Geology Conditions	10%
7	Environmental Constraints	10%

8	Public Amenities Proximity	10%
9	Water Bodies Proximity	10%
	Total	100%

Map 10: Land Suitability Analysis Results



6 CHAPTER 6: SCENARIO DEVELOPMENT AND SELECTION

6.1 Introduction

Scenario development is a critical stage in the preparation of the Master Plan because it allows alternative patterns of future urban growth to be tested before the final spatial strategy is selected. In a physically constrained and topographically sensitive urban center such as Battagram, future development cannot be guided through land demand estimation alone. It is equally necessary to determine how residential, commercial, and economic growth should be spatially accommodated, and what form of urban development is most compatible with the city's terrain, infrastructure capacity, settlement structure, and long-term planning objectives.

Battagram differs from larger plains-based urban centers in that its growth is heavily shaped by valley geography, slope conditions, watercourses, and a limited supply of buildable land. The city has developed as a linear-nodal settlement structure, with the main urban concentration located along the valley corridor and adjoining settlement clusters extending into accessible terraces and lower slopes. Recent growth has remained largely low-rise, plot-based, and expansion-led. Commercial activity is also concentrated primarily along accessible road corridors and local market strips. Under these conditions, uncontrolled outward growth would increase land consumption, intensify service delivery costs, place pressure on fragile terrain, and reinforce scattered urbanization.

The purpose of this chapter is therefore to develop and assess alternative development scenarios for Battagram City over the plan period. These scenarios are based on varying combinations of horizontal expansion, moderate vertical growth, corridor-based development, nodal concentration, and commercial structuring. The scenarios are primarily tested against residential and commercial land requirements, since these are the major drivers of urban land demand. However, they are also evaluated in relation to terrain suitability, infrastructure efficiency, implementation practicality, land-use compatibility, and long-term urban sustainability.

For Battagram City, three growth scenarios have been developed:

- **Scenario A – Trend / Business as Usual**
- **Scenario B – Managed Expansion**
- **Scenario C – Densification / Compact Development**

These scenarios are designed to reflect a progression from purely horizontal low-density expansion toward more land-efficient and regulated forms of urban growth. The final selected scenario will be based on its compatibility with Battagram's actual urban form, housing market, development capacity, and planning needs.

6.2 Scenario Design and Construction

The scenarios have been constructed using different combinations of horizontal development and vertical development. In this context:

- **horizontal development** refers to accommodation of future growth through expansion onto new land;

- **vertical development** refers to absorption of future demand through densification, infill, redevelopment, apartment housing, and multi-storey commercial development in appropriate locations.

This scenario approach is particularly relevant for Battagram because the city remains predominantly low-rise and horizontally expanding, yet the supply of conveniently developable land is limited by terrain. A fully horizontal growth model would consume large amounts of valuable land and encourage dispersed settlement extension, while an overly compact model would not align well with present housing preferences, market realities, or infrastructure conditions. The scenario design therefore aims to test realistic alternatives between these two extremes.

For residential development, the scenarios have been structured not only in terms of horizontal and vertical shares, but also in terms of plot composition, housing typology, and achievable density. This is necessary to assess how future housing demand in Battagram may be accommodated under different development models ranging from low-density expansion to more compact and managed settlement growth.

Table 32: Residential Growth Scenarios – Battagram City

Scenario	Horizontal Development Pattern	Vertical Development Pattern	Proposed Density
Scenario I – 100% Horizontal Development	Residential growth is accommodated entirely through plotted housing. Development consists of 3, 5, 7, and 10 Marla plots, as well as 1 Kanal plots, predominantly in single-storey units. Approximately 45% of the gross residential sector area is reserved for allied uses including roads, open spaces, local facilities, and utilities. This produces a relatively low-density urban form.	Not applicable	**70 PPA**
Scenario II – 10% Vertical and 90% Horizontal Development	Residential growth is accommodated primarily through plotted housing using 3, 5, 7, 10 Marla, and 1 Kanal plots, with the horizontal component remaining largely low-rise in character. About 40% of the gross sector area is reserved for allied uses including roads, community	A limited share of future demand is absorbed through 1-bed, 2-bed, and 3-bed apartment units, generally in G+4 storey buildings, located in selected accessible sectors and suitable nodal areas.	**100 PPA**

	facilities, open spaces, and utilities. This scenario introduces moderate land-use efficiency while retaining the prevailing residential character of Battagram.		
Scenario III – Densification / 30% Vertical and 70% Horizontal Development	Horizontal housing is limited to 3, 5, 7, and 10 Marla plots only, with no 1 Kanal plots permitted in order to achieve a more compact urban form. About 50% of the gross sector area is reserved for allied uses. This scenario promotes smaller plot sizes and stronger compactness.	A larger share of future demand is accommodated through 1-bed, 2-bed, and 3-bed apartment units in G+3 storey buildings, resulting in stronger densification and lower per-unit land consumption.	**120 PPA**

Source: Developed by Consultant

The density variation across the three scenarios reflects progressively increasing land-use efficiency. Scenario I represents the lowest-density and most land-consumptive option. Scenario II introduces only a limited vertical share and therefore remains close to the prevailing development character of Battagram while improving land efficiency moderately. Scenario III produces the strongest reduction in land demand, but it also requires a higher level of regulatory control, more infrastructure capacity, and greater market acceptance of compact housing forms.

The same conceptual logic has also been applied to commercial development. In commercial terms, however, the scenarios differ not only in land-use intensity but also in the spatial structure they produce. Under the lower-density scenario, commercial growth continues in dispersed roadside form. Under the intermediate scenario, commercial development is structured through corridors and growth zones. Under the more compact scenario, commercial activity is concentrated in dedicated commercial zones and defined centers.

Table 33: Commercial Growth Scenarios – Battagram City

Scenario	Horizontal Development Pattern	Vertical Development Pattern	Commercial Development Character
Scenario I – Business as Usual	Future commercial growth is accommodated through continuation of existing roadside shops, linear ribbon commercialization, plot-based retail strips, and dispersed market activities along the existing urban	Not applicable	Low-intensity, dispersed commercial growth with weak hierarchy and strong ribbon tendency

	road system. Commercial uses continue to spread incrementally without major restructuring of the hierarchy.		
Scenario II – Commercial Corridors and Growth Zones	Commercial growth is accommodated primarily through controlled horizontal corridor development along the main urban spine and selected growth zones in accessible nodal locations. Horizontal growth remains dominant, but it is structured and directed rather than dispersed.	A limited portion of future demand is absorbed through upper-floor commercial use, mixed-use buildings, retail-over-service development, and selected multi-storey commercial blocks at suitable nodes and corridor intersections.	Moderate-intensity corridor and growth-zone commercial development with improved hierarchy and better land-use efficiency
Scenario III – Compact Development through Dedicated Commercial Zones	Horizontal commercial expansion is reduced and concentrated mainly in defined commercial zones, structured market areas, and selected mixed-use centers, rather than continuous linear frontage. Commercial land is organized into planned concentrations instead of dispersed strips.	A substantial portion of future demand is absorbed through multi-storey commercial and mixed-use buildings, including market complexes, commercial plazas, office-retail blocks, and vertically integrated business centers in strategic locations.	High-intensity, concentrated commercial development with stronger hierarchy, market clustering, and greater land efficiency

For Battagram, the commercial scenarios are especially important because the city's present economic structure is highly corridor-influenced. Without planning control, future commercial activity is likely to continue extending linearly along major roads and settlement edges, producing traffic friction, weak functional hierarchy, and inefficient frontage-based sprawl. The commercial scenario design therefore tests whether the city should continue with dispersed road-led growth, shift toward controlled corridor and nodal structuring, or move toward more compact commercial concentration.

For residential land requirement, the comparative outcomes of the three Battagram scenarios are as follows:

Table 34: Total Residential Area Requirement – Battagram City

Scenario	Area Requirement for Horizontal Development (Acres)	Area Requirement for Vertical Development (Acres)	Total Area Requirement (Acres)
Scenario I – 100% Horizontal Development	1550.98	-	1550.98
Scenario II – 10% Vertical and 90% Horizontal Development	1045.87	22.16	1068.04
Scenario III – 30% Vertical and 70% Horizontal Development	781.01	85.13	866.13

These figures show that the shift from Scenario I to Scenario II generates a meaningful reduction in land demand without requiring a major transformation of Battagram's residential structure. The shift from Scenario II to Scenario III reduces land demand further, but does so at the cost of introducing a substantially more compact and regulated urban form that may be difficult to implement across the city as a whole in the current planning horizon.

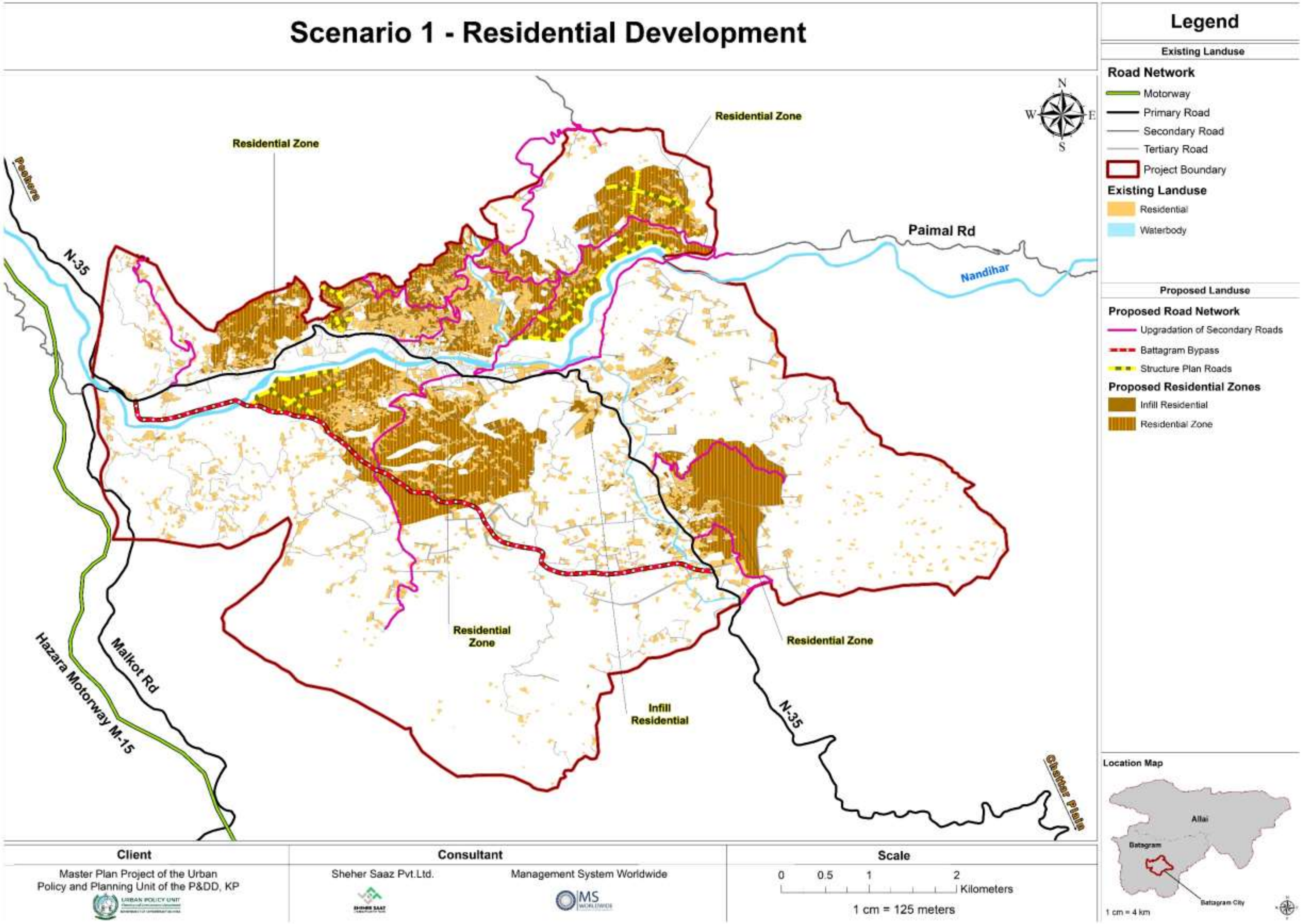
3.1.37. Scenario A – Trend / Business as Usual

Scenario A represents the continuation of the existing urban growth pattern without any substantial intervention in density, land efficiency, or structural control. Under this scenario, future residential growth is accommodated entirely through horizontal expansion in the form of plotted housing. The development pattern remains dominated by 3, 5, 7, and 10 Marla plots, along with 1 Kanal plots, primarily as single-storey residential units. Around 45 % of the gross residential area is assumed for allied uses such as roads, open spaces, community facilities, and local utilities, resulting in an overall low-density development pattern of approximately 70 persons per acre.

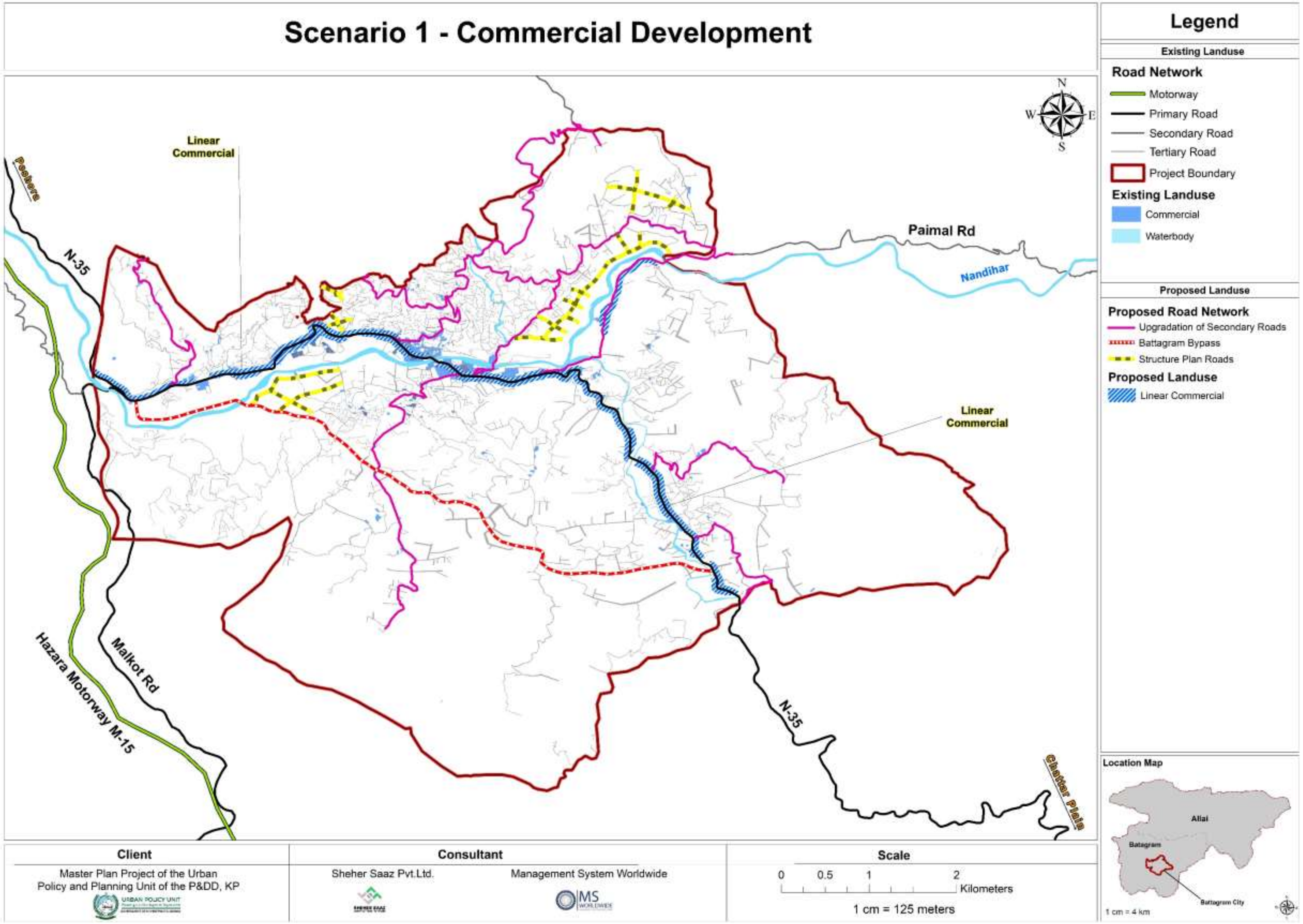
Under this scenario, Battagram would continue to grow through outward expansion into accessible valley-edge land, terraces, and settlement extensions adjoining the existing built-up clusters. This is the most socially familiar and market-driven scenario because it reflects the city's current development behavior, where housing is predominantly low-rise, family-based, and plot-oriented. However, it is also the most land-consumptive option. The total residential land requirement under Scenario A is estimated at 1,550.98 acres, which is the highest among all three scenarios.

In practical terms, Scenario A would place the greatest pressure on land resources and infrastructure. In a terrain-constrained city like Battagram, unrestricted horizontal growth would not simply consume more land; it would also intensify scattered development, increase service delivery costs, and reduce the efficiency of road, drainage, water supply, and sewerage networks. It would further encourage fragmentation between built-up pockets and increase pressure on slope-sensitive and agriculturally productive land. From a commercial perspective, if this same pattern is extended into trade and business activity, the city would remain dependent on roadside ribbon commercialization and dispersed low-order market growth without meaningful hierarchy or concentration.

Although Scenario A is useful as a reference scenario, it is not a preferred planning option. It represents the likely outcome in the absence of effective planning control, but it does not provide a sustainable framework for long-term urban development in Battagram. Its major strengths lie only in its familiarity and ease of passive implementation, while its weaknesses are pronounced in terms of land efficiency, infrastructure performance, and spatial coherence.



Map 11: Residential Development Map - Scenario I



Map 12: Commercial Development Map - Scenario I

3.1.38.Scenario B – Managed Expansion

Scenario B represents a more balanced and managed growth alternative, combining 90 % horizontal development and 10 % vertical development. It is based on the recognition that Battagram's existing urban structure and housing market still require plotted outward growth, but that future development cannot be accommodated through purely horizontal spread without creating severe pressure on land and infrastructure. This scenario therefore introduces a modest degree of vertical housing while retaining the city's prevailing low-rise residential character.

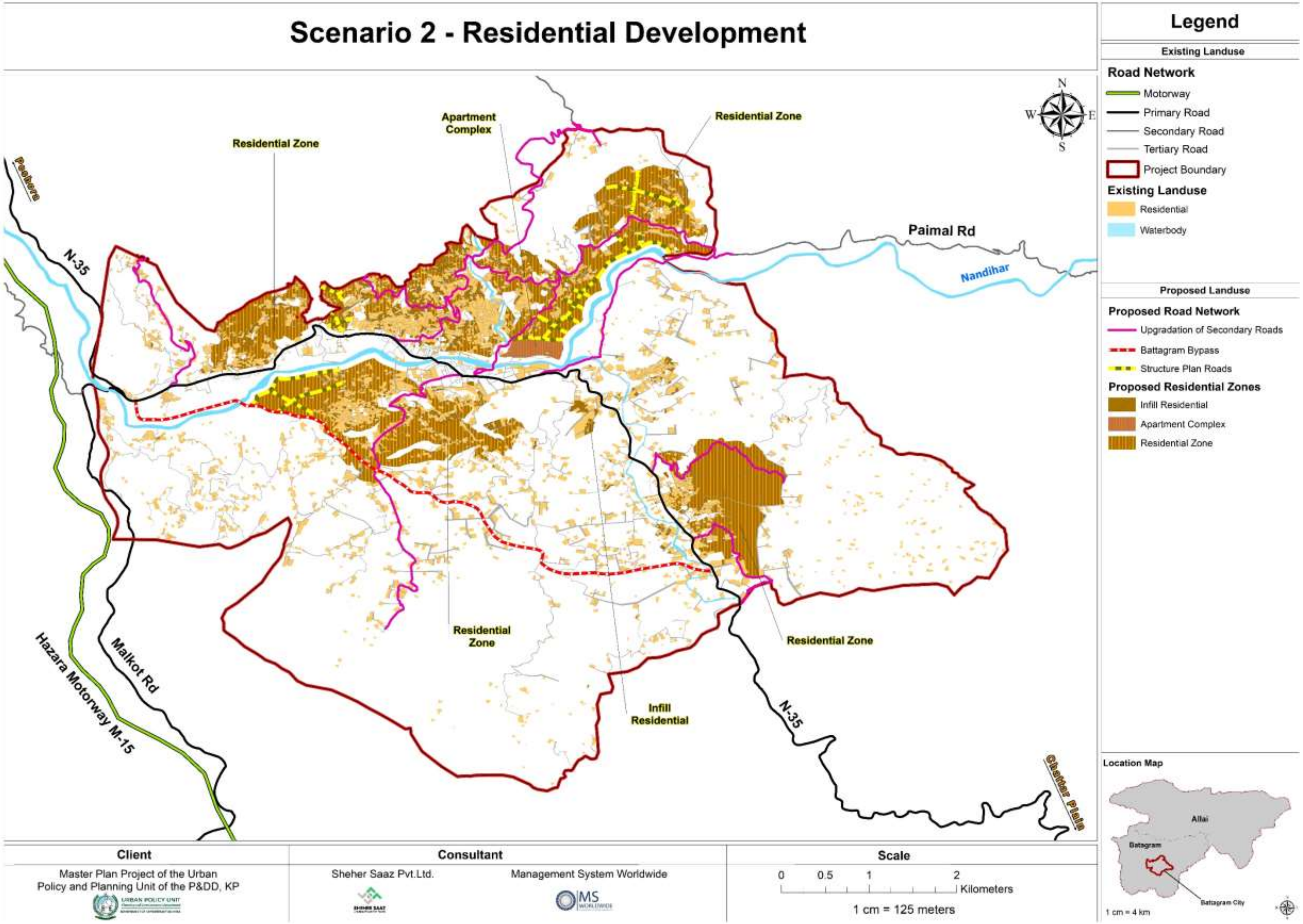
Under this scenario, residential growth is still accommodated primarily through plotted housing using 3, 5, 7, 10 Marla, and 1 Kanal plots, but the gross residential land is organized with approximately 50 % allocation for allied uses such as roads, open spaces, local services, and utilities. In addition, a limited share of future residential demand is absorbed through 1-bed, 2-bed, and 3-bed apartment units in G+4 storey buildings, located only in suitable and accessible sectors. The resulting proposed density under this scenario is 80 persons per acre.

Scenario B requires a total residential land area of 1068.04 acres, comprising 1045.87 acres through horizontal development and 22.16 acres through vertical development equivalent. This means the scenario achieves a meaningful reduction in land requirement compared to Scenario A, while avoiding the abrupt transition to a strongly compact urban model. It therefore offers a practical middle path between sprawl and intensive densification.

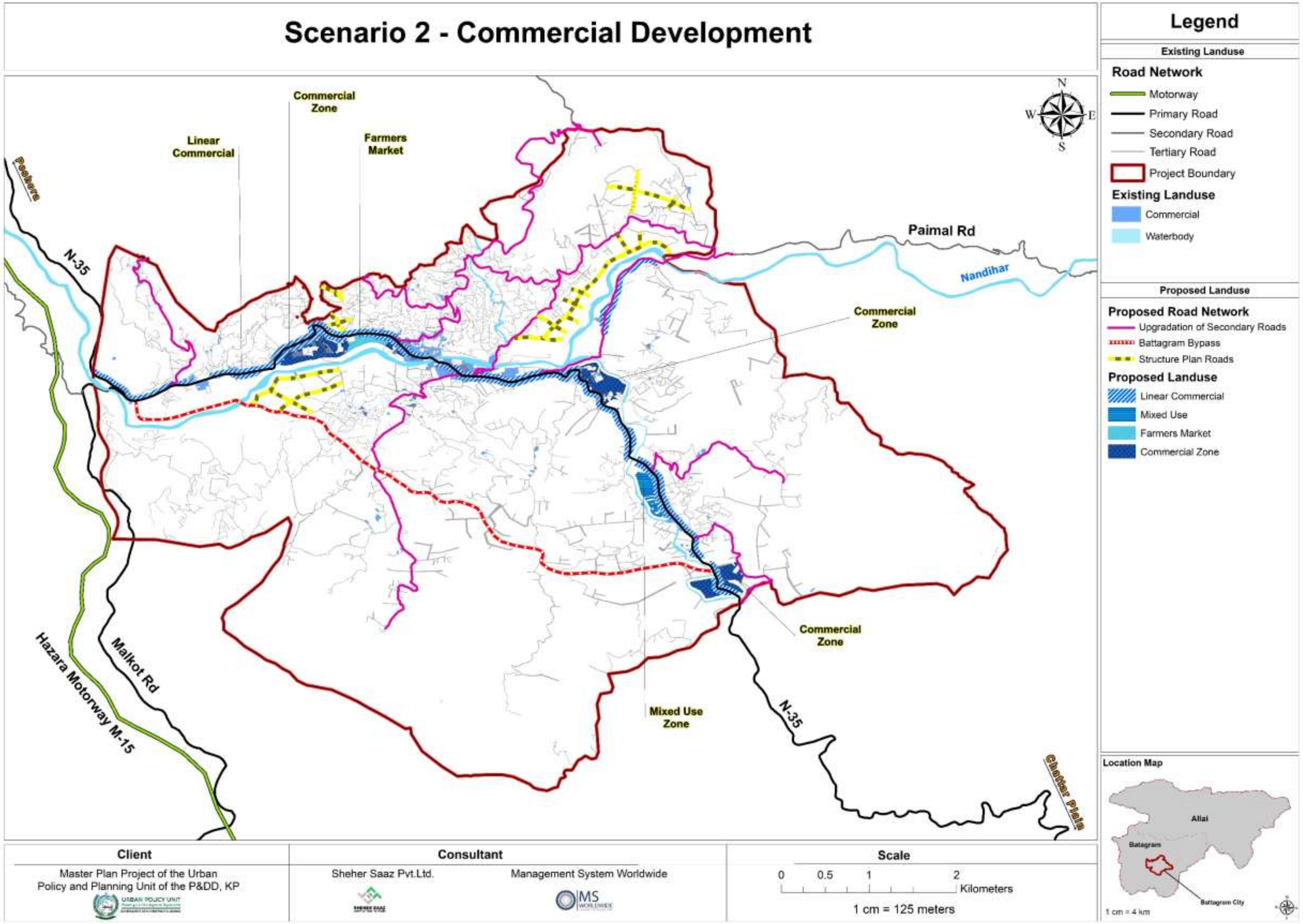
In Battagram's context, this scenario is particularly important because it aligns with the city's actual linear-nodal structure. It allows future growth to continue in a realistic way through planned extension of existing settlements, infill of accessible built-up areas, and moderate strengthening of the urban spine and connected nodes. At the same time, it prevents the city from relying exclusively on land-intensive horizontal expansion. The introduction of a small vertical component also helps the city begin a gradual transition toward better land-use efficiency without demanding a full shift in housing market behavior.

Under scenario-II, future commercial activity is not left to continue in an entirely dispersed ribbon form. Instead, it is structured through commercial corridors and growth zones. This means that the main urban spine and selected accessible nodal locations become the principal areas for future trade and service expansion. Commercial development remains largely horizontal, but it is guided and organized rather than left to spread incrementally along every road edge. A limited degree of vertical commercial growth may also be introduced through upper-floor mixed-use development and small multi-storey commercial blocks in suitable locations.

The strength of Scenario B lies in its balance. It is more land-efficient than Scenario A, but much more realistic than a stronger densification model. It also supports a more coherent commercial structure by introducing the concept of corridors and growth zones rather than depending solely on unregulated frontage commercialization. For Battagram, this scenario represents a practical and transitional development model: one that remains compatible with the city's present residential and commercial character, while improving efficiency and planning control.



Map 13: Residential Development Map - Scenario II



Map 14: Commercial Development Map - Scenario II

3.1.39.Scenario C – Densification / Compact Development

Scenario C represents the most compact and land-efficient alternative. It assumes that future residential development is accommodated through a combination of 70 % horizontal development and 30 % vertical development, resulting in a significantly reduced land requirement compared to the other two scenarios. This model is based on the principle that future growth should rely more heavily on densification, smaller plots, apartment housing, and stronger concentration of activity into defined areas rather than widespread outward expansion.

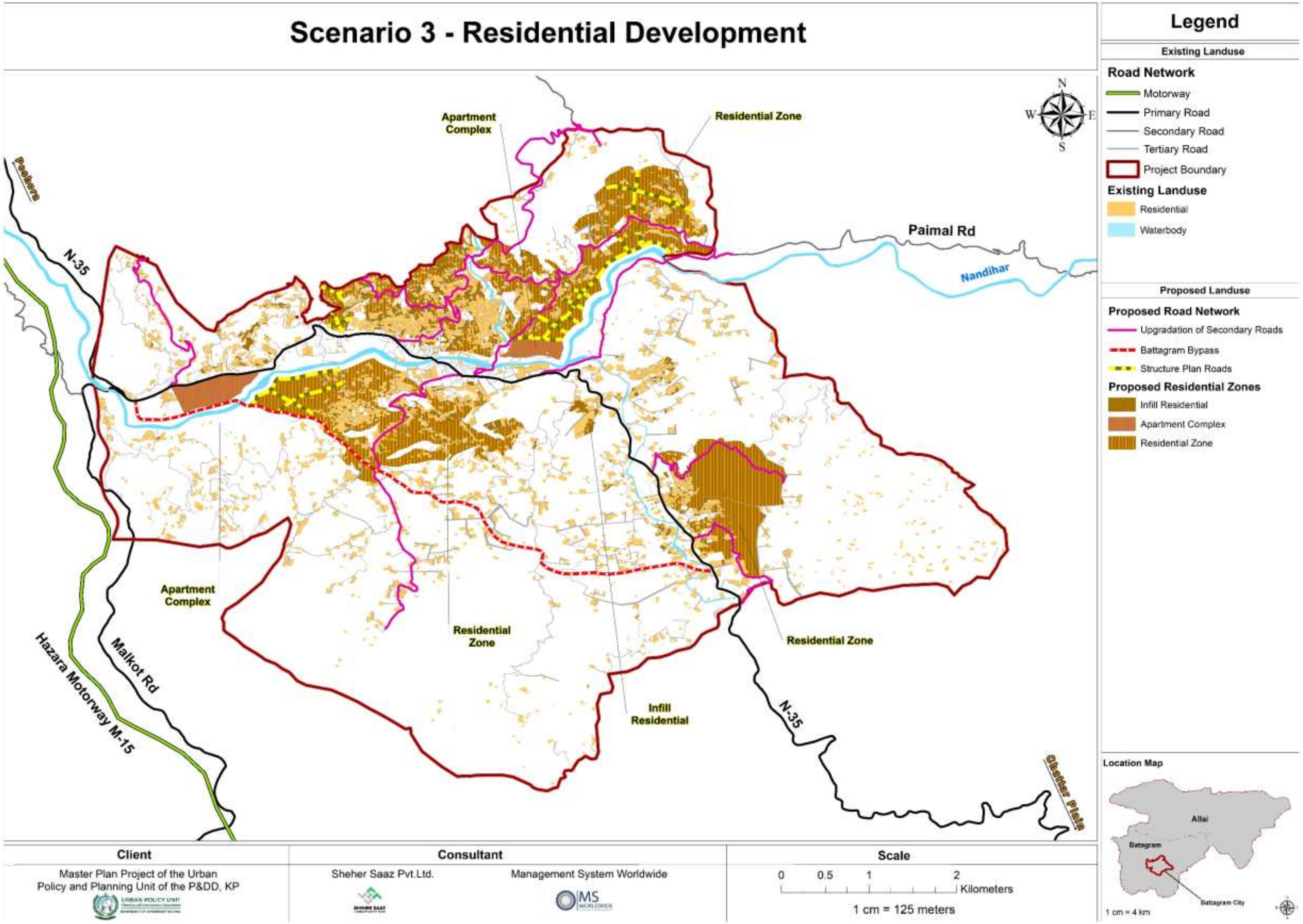
Under this scenario, horizontal housing is restricted to 3, 5, 7, and 10 Marla plots only, with no 1 Kanal plots permitted. As in Scenario B, around 50 % of the gross residential area is assumed for allied uses. A larger share of future housing demand is accommodated through 1-bed, 2-bed, and 3-bed apartments in G+3 storey buildings. This results in a significantly higher density of 120 persons per acre.

The total residential land requirement under Scenario C is estimated at 866.13 acres, comprising 781.01 acres through horizontal development and 85.13 acres through vertical development equivalent. This makes it the most efficient option in terms of reducing land consumption. In a city where terrain and buildable land are both major constraints, such a reduction is attractive from a purely spatial and environmental standpoint.

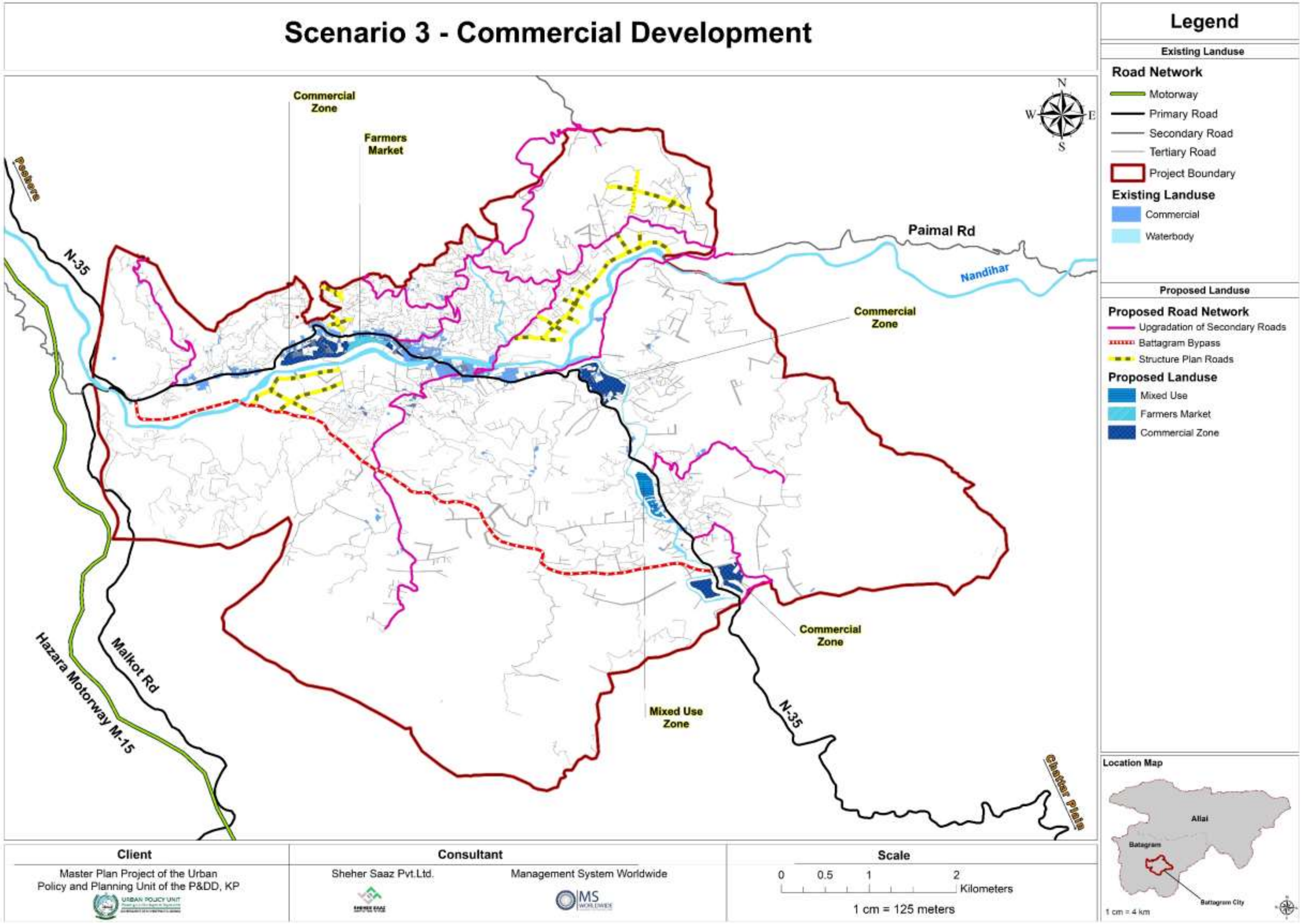
From a commercial perspective, Scenario C follows the same principle as in Swabi by shifting future commercial development away from dispersed strips and toward a more compact structure based on dedicated commercial zones. This produces a stronger functional hierarchy and allows higher-order commercial activities to be concentrated rather than diluted along extended road frontage. In spatial terms, it would create a more organized market pattern and reduce random roadside commercialization.

However, despite its advantages in land efficiency, Scenario C is also the most demanding in terms of implementation. It requires a much stronger building control regime, better infrastructure capacity, more organized parking and access management, and greater acceptance of apartment-based living. In Battagram, where the present housing market remains overwhelmingly plot-based and low-rise, and where urban services and regulatory capacity remain limited, a citywide shift toward 30 % vertical development may not be immediately realistic.

Scenario C is therefore a strong strategic option in theoretical planning terms, particularly for improving land efficiency and encouraging more concentrated commercial structuring. However, it is less suitable as the dominant citywide growth model for present-day Battagram. Its major value lies in demonstrating the upper limit of compactness that the city could potentially adopt in selected sectors over time, rather than as the main development logic for the entire urban area.



Map 15: Residential Development Map - Scenario III



Map 16: Commercial Development Map - Scenario III

6.3 Scenario Evaluation

The three scenarios were evaluated against the principal planning criteria relevant to Battagram's urban conditions. These include compatibility with the existing urban form, land efficiency, infrastructure efficiency, terrain suitability, implementation feasibility, housing market realism, commercial structure, and long-term sustainability. Since Battagram is a terrain-constrained city with a linear-nodal structure, the evaluation places particular emphasis on whether a scenario can work with the city's actual morphology rather than imposing an abstract development model.

Scenario A performs relatively well only in terms of familiarity and passive market feasibility. It reflects the prevailing pattern of development and would therefore be easy to occur naturally. However, from a planning perspective, it is the weakest scenario because it requires the highest land consumption, encourages scattered expansion, and places the greatest pressure on infrastructure and accessible land. It also does little to improve the structure of commercial development, which would remain weakly organized and increasingly ribbon-based.

Scenario B performs best overall because it introduces moderate land-use efficiency while remaining compatible with Battagram's existing urban character. It works with the city's linear-nodal form, allows continued plotted housing where necessary, and introduces only a limited vertical component that is socially and institutionally more realistic. It also improves the commercial growth model by directing future trade and service activity into corridors and growth zones rather than allowing entirely dispersed roadside spread.

Scenario C performs best in terms of land efficiency and concentration of activity. It would reduce residential land demand the most and would create the strongest commercial hierarchy through dedicated zones. However, it is also the most difficult to implement in Battagram's current context because it depends on a stronger shift toward compact living, denser building forms, and more intensive infrastructure management. While it is strategically valuable, it is less realistic as the main citywide development model over the present plan period.

Table 35: Comparative Evaluation of Scenarios – Battagram City

Evaluation Criteria	Scenario A – BAU / 100% Horizontal Development	Scenario B – Managed Expansion	Scenario C – Densification / Compact Development
Compatibility with present urban form	High	Very High	Moderate
Land efficiency	Low	Moderate	High
Infrastructure efficiency	Low	High	Moderate to High
Terrain suitability	Low to Moderate	High	Moderate
Protection of developable and agricultural land	Low	Moderate	High
Suitability for residential growth	Moderate	High	Moderate
Suitability for commercial growth	Weak	Moderate	High

Feasibility of implementation	High in passive terms	High	Moderate to Low
Requirement for strong regulation	Low	Moderate	High
Risk of ribbon / dispersed sprawl	Very High	Moderate	Low
Overall planning suitability	Low	High	Moderate to High

The comparative assessment shows that Scenario A is the easiest to occur under existing market conditions, but it is also the weakest from a planning perspective because it consumes the most land, reinforces dispersed expansion, and places the highest pressure on infrastructure and terrain-sensitive areas. Scenario B performs best overall because it aligns with Battagram's existing linear-nodal urban form, improves land efficiency without requiring a major structural shift in the housing market, and remains practical in implementation terms. Scenario C performs best in terms of land efficiency and commercial concentration, but it requires a stronger transition toward compact and regulated development than Battagram is presently prepared to accommodate on a citywide basis. For this reason, Scenario B is considered the most appropriate primary development framework, with selected compact-growth elements from Scenario C to be incorporated for commercial structuring and strategic urban functions.

6.4 Scenario Selection and Refinement

Based on the comparative evaluation of the alternative growth models, the preferred development direction for Battagram City is **Scenario B – 10% Vertical and 90% Horizontal Development**. This scenario is selected because it provides the most appropriate balance between land efficiency, implementation realism, and compatibility with Battagram's physical setting.

The selection is primarily guided by the city's terrain conditions and prevailing pattern of urban growth. Battagram is a hilly and terrain-constrained urban center where buildable land is limited, settlement expansion is shaped by valleys and accessible slopes, and large-scale compact growth cannot be assumed as a practical citywide model. At the same time, continuation of fully horizontal development would consume excessive land and further spread urbanization into fragmented and difficult terrain. Scenario B responds to this condition by retaining horizontal growth as the dominant mode of development, while introducing a limited and realistic degree of vertical expansion.

The introduction of a **10 % vertical component** is intended as a controlled planning intervention rather than a structural transformation of the city's housing model. The purpose is to begin shifting future growth away from entirely land-consumptive expansion and toward a more efficient use of serviced and accessible urban land. In Battagram, this approach is more suitable than a purely horizontal scenario because it reduces overall land requirement from **1,550.98 acres** under Scenario A to **1,271.66 acres** under Scenario B, while still remaining close to the city's existing low-rise residential character. At the same time, it is more realistic than Scenario C, which requires a substantially stronger shift toward compact development and greater dependence on apartment-based housing.

Scenario B therefore represents a measured and context-responsive planning choice. It acknowledges that Battagram will continue to grow primarily through plotted housing and outward expansion, but it also establishes that future growth should not remain entirely horizontal. Limited vertical development in selected suitable locations can help absorb part of future housing demand, reduce pressure on accessible land, and improve land-use efficiency without imposing unrealistic density levels across the city.

From a planning perspective, the selection of Scenario B does not imply unrestricted outward growth. Rather, it means that horizontal expansion will remain the primary mode of development, but should be guided in a managed manner, while vertical development is introduced gradually where topography, access, and infrastructure conditions permit. This makes Scenario B the most suitable framework for Battagram's future growth.

The refinement of the selected scenario is therefore based on the following principles:

- horizontal expansion remains the main development form because of prevailing housing patterns and terrain-adjusted settlement behavior;
- vertical growth is introduced in a limited and strategic way to improve land efficiency;
- development should be guided toward suitable and serviceable areas rather than dispersed randomly across slopes;
- and the city's future structure should remain responsive to its hilly terrain and constrained buildable geography.

Accordingly, the final selected development approach for Battagram may be described as a **predominantly horizontal growth strategy with limited vertical expansion**, adopted specifically to improve land-use efficiency within the context of a hilly and terrain-constrained city.

3.1.40. Consultation, Review, and Refinement Process

The identification of Scenario B as the preferred scenario represents the consultant's expert recommendation based on spatial analysis, land-use evaluation, infrastructure considerations, and development feasibility. However, the scenario selection process does not end with technical recommendation alone.

The alternative scenarios, together with the consultant's preferred option, will be presented to the client, relevant government departments, and key stakeholders as part of the consultation and review process. This will allow discussion of:

- implementation practicality,
- sectoral priorities,
- institutional preferences,
- land-use implications,
- and stakeholder concerns regarding future urban growth

Following this consultation, the preferred scenario may be further refined in terms of phasing, land-use distribution, density assumptions, and corridor-node emphasis. Such refinement is a normal part of the master planning process and strengthens the legitimacy and Implementability of the final spatial strategy.

Nevertheless, from a technical planning standpoint, the consultant considers Scenario B to be the most appropriate base scenario for Battagrams City, and any stakeholder-led modification should be treated as refinement of this recommended framework rather than as replacement by a less suitable alternative.

3.1.41. Final Selected Development Approach

The final selected development approach for Battagram may therefore be described as:

a managed urban growth strategy based primarily on 90 % horizontal development with a limited 10 % vertical expansion component.

This approach responds directly to Battagram's physical and urban conditions. The city is located in a hilly setting where buildable land is constrained by slopes, valleys, and fragmented developable pockets. Under such conditions, a wholly horizontal development model would place unnecessary pressure on accessible land and would continue to stretch urban growth into inefficient and difficult terrain. At the same time, a strongly compact scenario based on high vertical absorption is not yet suitable as the dominant citywide model. The selected approach therefore introduces vertical expansion in a limited and practical manner, with the aim of improving land-use efficiency without forcing an unrealistic transformation of the city's housing structure.

In operational terms, this means that:

- the **residential sector** follows **Scenario B** as the principal model, based on **90 % horizontal and 10 % vertical development**;
- the **commercial sector** follows the same development structure adopted for Swabi, combining controlled corridor-based growth with more organized commercial concentration in selected locations;
- and the overall urban growth pattern remains expansion-led, but with a clear planning intention to reduce excessive land consumption and to introduce moderate densification where feasible.

6.5 Development Phasing Logic

The selected development scenario for Battagram requires a phased implementation framework so that urban growth takes place in a structured, serviceable, and terrain-responsive manner. Since the preferred strategy is based on Scenario B – Managed Expansion, with selected Scenario C elements for commercial structuring, the phasing logic must translate this hybrid growth model into a practical sequence of development.

The purpose of phasing is not simply to divide the plan period into time segments. Rather, it is to ensure that future land development follows a rational sequence in which existing urban areas are strengthened first, outward growth is directed second, and higher-order commercial structuring is introduced in a controlled sequence. This is especially important in Battagram, where growth pressure is concentrated in limited accessible areas while topography and infrastructure remain major constraints.

Accordingly, the phasing strategy for Battagram is based on the following planning principle:

consolidate first, expand selectively second, intensify moderately, and structure strategic commercial functions in parallel with infrastructure provision.

3.1.42.Phase I – Consolidation, Infill, and Urban Strengthening

The first phase focuses on the existing built-up structure of Battagram, especially the core urban belt and adjoining residential and mixed-use areas. Before large-scale outward growth is encouraged, the city must first improve the performance and efficiency of areas that already exist.

The main objective of this phase is to strengthen the current urban structure through:

- infill development on vacant and underutilized land,
- regularization and improvement of existing residential sectors,
- upgrading of roads, drainage, sewerage, and utility systems,
- improvement of the central commercial areas,
- and selective redevelopment of strategically located plots.

In residential terms, this phase corresponds to the limited vertical and horizontal balancing proposed in the selected scenario. Existing built-up areas should absorb part of future demand through planned infill, redevelopment of serviced plots, and selective medium-density housing in suitable locations.

In commercial terms, Phase I should also focus on strengthening the existing urban market core and improving internal circulation, parking, and service functions. This phase is important because it establishes the base urban structure from which later expansion can proceed. Without consolidation of the present city, outward growth would simply reproduce existing inefficiencies at a larger scale.

3.1.43.Phase II – Planned Expansion into Suitable Growth Areas

Once the existing urban structure has been strengthened, the second phase should focus on planned outward growth into the city's most suitable and accessible development areas. This phase corresponds directly to the selected Scenario B framework and represents the main period of structured urban expansion.

The purpose of this phase is not to allow unrestricted spread, but to organize expansion into:

- planned residential sectors,
- controlled extensions of existing settlement clusters,

- neighborhood-scale facilities,
- and selected commercial growth areas.

For residential development, Phase II should accommodate the main share of future horizontal growth under the selected scenario. This includes plotted housing sectors, moderate densification in appropriate locations, and introduction of apartment housing in suitable accessible sites where services and road access can support somewhat higher density.

For commercial development, this phase should introduce the corridor-and-growth-zone logic of Scenario B. Future trade and service activity should be directed into the main urban spine and selected nodal growth areas, rather than being allowed to spread unregulated across all road edges.

3.1.44. Phase III – Commercial Structuring and Nodal Strengthening

The third phase introduces the more selective and strategic elements of Scenario C, particularly for commercial land use. By this stage, the city's core and major growth areas should already be spatially defined, and the next planning priority becomes strengthening commercial nodes, market hierarchy, and economic concentration.

This phase should focus on:

- development of designated commercial growth zones,
- strengthening of selected local market and service nodes,
- consolidation of mixed-use activity in suitable centers,
- and reduction of dependence on dispersed roadside commercialization.

The purpose of this phase is to prevent Battagram's economic structure from remaining too scattered and frontage-based. Instead, the city should begin to develop a more coherent commercial hierarchy capable of supporting both local and wider urban functions.

3.1.45. Phase IV – Controlled Long-Term Extension and Land Protection

The fourth phase represents the longer-term extension stage of the Master Plan. It is intended to accommodate demand arising after the city has already undergone consolidation, structured expansion, and commercial strengthening. This is not an open-ended outward growth phase; it is a controlled extension phase governed by land suitability, infrastructure logic, and environmental protection.

By this stage, the key objective is to ensure that any additional outward growth does not undermine the long-term structure of the city. Development should only be permitted where:

- trunk infrastructure can be extended efficiently,
- slope and terrain conditions are acceptable,
- environmentally sensitive and hazard-prone areas remain protected,

- and future growth can be integrated into the planned settlement structure.

This phase is particularly important in Battagram because the city's terrain constraints mean that not all available land is equally suitable for development. Long-term extension must therefore remain selective, guided, and service-led.

- **Infrastructure-Led Implementation Principle**

Across all phases, the fundamental implementation principle of the Master Plan is that urban growth should be led by **infrastructure and structure**, not by road frontage alone. In small and intermediate towns, development often follows accessible roads regardless of whether utilities, drainage, open space, and public services are available. In Battagram, such a pattern would quickly intensify terrain-related inefficiencies and scattered settlement growth.

Accordingly, each phase of development should be linked with:

- road hierarchy improvement,
- water supply extension,
- drainage and sewerage provision,
- slope-sensitive planning control,
- public facilities,
- community open spaces,
- and development control enforcement.

In practical terms, land should not be released for development unless it can be connected to the city's service framework and integrated into the planned urban structure.

7 CHAPTER : RESIDENTIAL AND HOUSING PROPOSALS

7.1 Existing Housing Context

The housing context of Battagram City is shaped by its role as a district headquarters located within a hilly and terrain-constrained setting, where residential growth has taken place largely through incremental, owner-built, and unplanned expansion rather than through formally approved housing schemes. Unlike larger urban centers where planned residential sectors and organized housing societies guide outward growth, Battagram's housing structure remains predominantly low-rise, plot-based, and family-led in character. As a result, the city's residential fabric is numerically extensive but spatially irregular, with housing clusters concentrated along valley floors, road corridors, and gentler slopes, while steeper terrain and environmentally sensitive land continue to constrain continuous urban expansion.

At present, residential development in Battagram is overwhelmingly unplanned. Existing residential land occupies approximately 767.05 acres, accounting for about 9.06 % of the total mapped city area, and no formally planned or officially recognized housing schemes have been identified within the existing urban footprint. Housing growth has therefore occurred mainly through individual plot subdivision, family-based land sharing, and informal construction without a structured layout system or strong development control. This has produced compact but irregular housing clusters, narrow access patterns, uneven infrastructure coverage, and limited provision of organized neighbourhood facilities. In practical terms, the city's housing issue is not simply one of unit supply, but of residential form, infrastructure adequacy, and the spatial quality of settlement growth.

3.1.46.Residential Structure and Growth Pattern

Battagram's residential pattern reflects the broader urban form of the city, which is linear-nodal and strongly influenced by terrain. Housing development has concentrated primarily in accessible built-up pockets along the main valley corridor and connected settlement clusters, while additional residential spread has occurred through gradual extension into adjoining terraces and lower-slope areas. This has produced three broad residential tendencies within the city: relatively compact housing concentrations in the established urban core, linear roadside settlement growth along the main access corridors, and scattered peripheral residential expansion in outer developable pockets. Because much of this growth has taken place incrementally and without formal layout planning, residential areas often exhibit irregular block shapes, weak internal street hierarchy, and limited space for future upgrading.

3.1.47.Housing Stock and Demographic Change

Recent housing trends in Battagram show that household growth is rising faster than population growth, which is an important planning signal. Between **2017 and 2023**, the city's population increased from **143,118 to 165,055**, while household units rose from **20,872 to 25,730**. During the same period, average household size declined from **6.78 to 6.40 persons per household**. This means that future housing demand in Battagram is being driven not only by population increase, but also by gradual household subdivision and the formation of smaller household units. In planning terms, this creates continuing pressure for additional housing even where overall population growth remains moderate.

Table 36: Intercensal Population Increase 2017-2023

Sr. #	Description	2023	2017
1	Population	165,055	143,118
2	Intercensal Increase in Population (%)	2.40%	
3	Household Units (HU)	25,730	20,872
4	Intercensal Increase in HUs (%)	3.54%	
5	Household Size (HS)	6.40	6.78
6	Intercensal Increase in HS (%)	−0.96%	

Source: PBS Census 2023 and 2017

3.1.48.Construction Character and Built Form

The construction character of housing in Battagram reflects a gradual shift toward more durable materials, although substantial variation remains across the housing stock. Primary survey data indicate that roof construction is dominated by linter (cement iron), used by 52 % of households, followed by tin roof construction (25 %) and T-iron / girdar systems (15 %), while wooden roofs account for 8 %. In wall construction, cement blocks dominate with 56 %, followed by stone and mud (23 %), stone and cement (14 %), and red bricks (6 %). This indicates that while the city's housing stock is increasingly moving toward more permanent and durable construction, a significant portion of houses still depends on traditional or semi-permanent materials, particularly in lower-income or older residential areas.

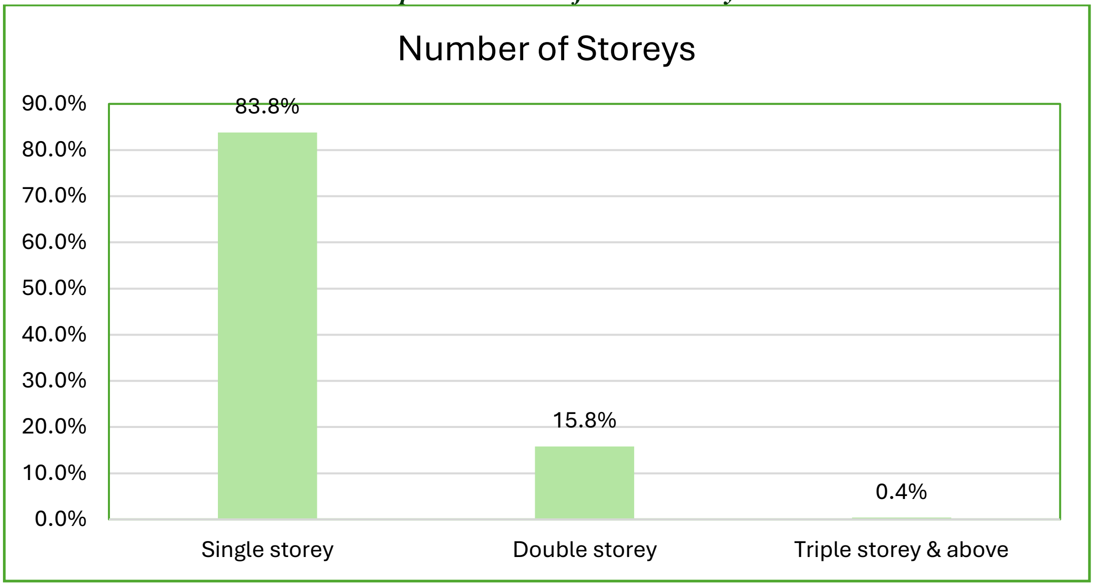
Table 37: Construction Material used in Battagram

S. No	Construction Material	%age (%)
	Construction Material of Roof	
1	Tin roof	6%
2	Wood	9%
3	T-iron and Girdar	24%
4	Linter (Cement Iron)	61%
5	Total	100%
	Construction Material of Walls	
1	Stone and mud	4%
2	Stone and cement	13%
3	Cement Block	22%
4	Red bricks	59%
5	Mud bricks/block	2%

Source: Primary Data collected by the consultant

In terms of building height, Battagram remains overwhelmingly low-rise. About 83.8 % of surveyed houses are single-storey, while 15.8 % are double-storey and only 0.4 % are three storeys or above. This clearly confirms that Battagram continues to function as a predominantly horizontal residential city with very limited vertical development. This low-rise character is particularly relevant for the Master Plan because it shows that any future introduction of apartment-based or medium-density housing must be moderate and selective rather than citywide and transformative.

Graph 1: Number of House Storey

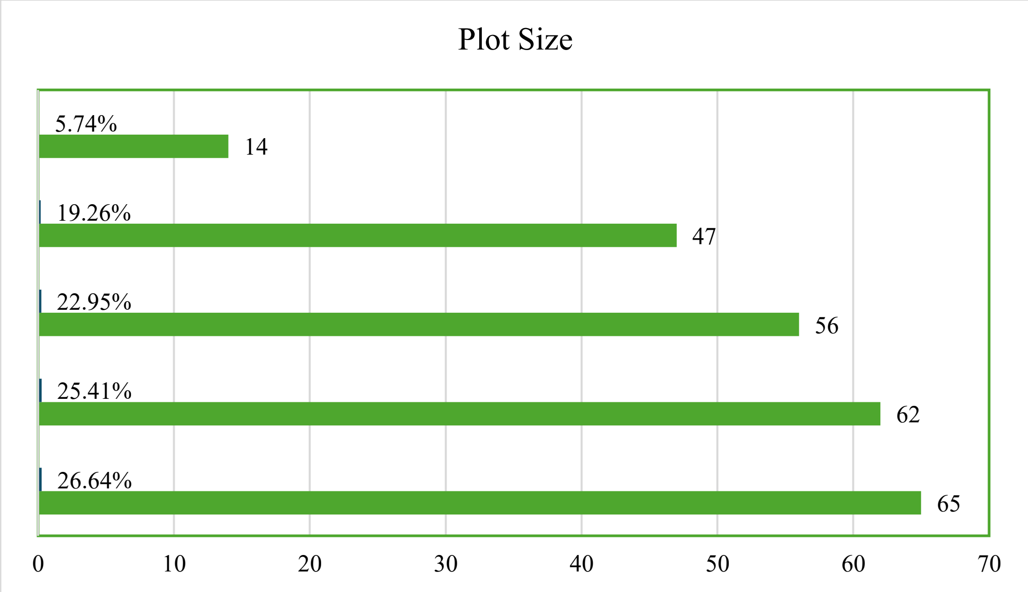


Source: Primary Data collected from field survey

3.1.49.Plot Pattern, Occupancy, and Housing Adequacy

The existing residential plot structure of Battagram is dominated by small- and medium-sized plots. Survey findings show that 26.64 % of housing units are built on plots of less than 3 Marla, 25.41 % on 3–5 Marla plots, and 22.95 % on 6–10 Marla plots. Only a relatively small share falls into larger residential plot categories. This indicates that the city's housing market is strongly aligned with low- and lower-middle-income residential conditions, where affordability and efficient land use are the dominant determinants of plot size. The limited presence of larger plots also suggests that wide-plot suburban residential development is not the defining character of Battagram's housing market.

Figure 9: Plot Sizes in Battagram



Source: Primary Data collected from field survey

The National Reference Manual (NRM) of Pakistan has divided recommended plot sizes between high to low-income groups. According to NRM, recommended plot sizes for high-income groups are approximately between 12 Marla to 20 Marla. Whereas the plot sizes recommended for the low-income groups are between 4 Marla to 3 Marla. The following table depicts recommended plot sizes from low to high income by NRM:

Table 38: NRM Standards of Plot Sizes by Income Groups

S. No.	Income Groups	Plot Categories	Plot Size (Sq. m)	Plot Size (Marla)	Adjusted Plot Sizes (Marla)
1	High	A	500	19.76	20
		B	312	12.34	12
2	Middle	C	250	9.88	10
		D	160	6.32	6
3	Low	E	105	4.16	5
		F	72	2.84	< 3

Source: National Reference Manual of Planning and Infrastructure Standards, Government of Pakistan

The association between standards mentioned in the NRM and primary analysis depicted that a total of 25% of the housing units belonged to the high-income group. While 52.05% of the housing units in the primary survey belonged to the low-income group. The table depicting the association between plot sizes in primary analysis with the NRM standard for the income group is as follows:

Table 39: Association between Primary Data and NRM Standards of Plot Sizes by Income Groups – Battagram

S. No.	Plot Size	Income Groups	%ages in Primary Data (%)
1	> 16 Marla	High	5.74%
	11-15 Marla		19.26%
2	6-10 Marla	Middle	22.95%
3	3-5 Marla	Low	25.41%
	< 3 Marla		26.64%

Source: Devised by Consultant based on Primary Data associated with NRM Standards, Government of Pakistan.

3.1.50.Ownership Pattern and Housing Market Character

The housing market of Battagram is strongly dominated by owner-occupied housing. Survey data show that 76.2 % of households live in owner-occupied dwellings, while 12.1 % reside in rented housing and 11.7 % occupy housing on a subsidized or rent-free basis. This indicates that Battagram's housing structure is socially embedded and family-based, with relatively limited dependence on a formal rental market. The residential development process is therefore shaped more by private household ownership, family land subdivision, and self-financed incremental construction than by formal developer-led schemes or institutional housing provision. From a planning perspective, this means that future housing delivery in Battagram will continue to depend heavily on regulated self-built expansion rather than on large formal housing schemes alone.

3.1.51.Housing Schemes and Planned Residential Development

Battagram does not currently have a well-established network of formal or large-scale planned housing societies. No official data or records were obtained from the Tehsil Municipal Administration or district planning authorities regarding approved housing schemes, and no recognized formally registered planned residential schemes could be confirmed for the city. This absence of formal housing schemes reinforces the conclusion that most housing in Battagram remains informal, incremental, and individually developed.

At the same time, there are signs of emerging private-sector real estate interest in the broader Battagram area. The report notes the example of Pearl Villas, a private villa-type residential initiative associated with the Karakoram Highway corridor. Although this does not represent a citywide housing solution, it is significant because it indicates the early emergence of more formalized residential development interest in the district. However, the dominant reality remains that Battagram's residential supply is still governed by plot-based, incremental, and largely unregulated development rather than by planned housing communities.

3.1.52.Informality, Infrastructure, and Housing Pressure

The existing housing context of Battagram cannot be understood separately from its infrastructure and land constraints. A significant share of residential growth has taken place in an unplanned manner, with weak road connectivity, partial access to services, and limited integration with drainage and sewerage systems. Survey findings indicate that only 55.4 % of housing units are linked by roads, while 44.6 % are not connected to road infrastructure in an adequate manner. This reflects the dual challenge of Battagram's housing structure: the core and established areas are often compact and congested, while peripheral and slope-edge areas remain fragmented and difficult to service.

In addition, the city contains informal and unplanned residential clusters, especially along expansion edges and peri-urban corridors, including areas influenced by the N-35 and extensions toward Ajmera and adjoining settlements. These areas generally lack the full range of public infrastructure expected in planned urban neighborhoods and depend on private or ad hoc arrangements for water, sanitation, and waste disposal. Although no formal slum inventory exists, the report makes it clear that the absence of official designation should not be interpreted as absence of need. Rather, it reflects limited institutional capacity for identifying and managing urban informality in a smaller hill city.

7.2 Housing Need and Demand

Housing need and demand in Battagram City has been assessed through existing housing stock, population growth, household size, backlog, replacement demand, and projected future population. The purpose of this assessment is to determine both the current housing shortfall and the scale of additional housing required up to 2045.

3.1.53. Existing Housing Backlog

The current backlog assessment shows that Battagram does not face a very large numerical shortage in absolute terms, but the housing requirement increases once replacement demand is added. In 2017, the city had a population of 143,118 and an average household size of 6.78, which generated a requirement of 21,109 housing units against an existing stock of 20,872 units. This resulted in a backlog of 237 units. By 2023, the population increased to 165,055 and household size declined to 6.40, raising the required number of housing units to 25,790. With an existing stock of 25,730 units, the numerical backlog stood at only 60 units. However, after including replacement demand of 656 units, the total housing requirement in 2023 rises to 716 units. This indicates that the current housing issue is not limited to shortage alone; replacement of structurally weak or obsolete stock is also an important component of demand.

Table 40: Current Housing Backlog – Battagram City

Year	Population	Household Size	Required Housing Units	Existing Housing Units	Backlog	Replacement Demand	Total Requirement
2017	143,118	6.78	21,109	20,872	237	—	237
2023	165,055	6.40	25,790	25,730	60	656	716

3.1.54. Future Housing Demand

Future housing demand has been estimated up to 2045 using projected population, proposed household size, backlog adjustment, and replacement demand. The projections show a steady rise in requirement across all planning intervals. By 2025, the total additional housing requirement is estimated at 1,469 units. This increases to 3,800 units by 2030, 4,199 units by 2035, 4,899 units by 2040, and 5,752 units by 2045. The cumulative housing demand over the full plan period reaches 20,118 units. A major reason for this increase is the continued decline in average household size, from 6.27 in 2025 to 5.01 in 2045, which means that more housing units are required even when population growth remains moderate. The projected increase in population between successive phases also remains substantial, ranging from 8,093 persons in the first interval to 28,799 persons in the final interval, which further adds to the total demand.

Table 41: Future Housing Demand Estimation – Battagram City

Year	Population	Proposed Household Size	Increase in Population	Existing Housing Units	Housing Backlog	Future Requirement	Total Requirement	Cumulative Demand
2025	173,148	6.27	8,093	26,088	178.99	1,290	1,469	1,469
2030	194,715	5.96	21,567	27,557	178.99	3,621	3,800	5,269
2035	218,395	5.64	23,680	31,357	—	4,199	4,199	9,467
2040	244,472	5.32	26,077	35,555	—	4,899	4,899	14,366
2045	273,271	5.01	28,799	40,454	—	5,752	5,752	20,118

The projections shows that housing demand in Battagram will rise continuously throughout the plan period. The main drivers are population increase, declining household size, and replacement of part of the existing stock. This means that future housing policy cannot rely only on present stock sufficiency. It must provide for new units, replacement of deficient units, and phased land allocation for additional residential development up to 2045.

7.3 Housing Supply and Infill Potential

At present, a precise assessment of formal housing supply in Battagram City is constrained by the absence of official records on approved housing schemes from the concerned local authorities. No verified data have been received regarding planned residential schemes, their boundaries, plot inventory, development status, or occupancy levels. On this basis, the current assessment of housing supply relies on field observations and spatial review rather than confirmed administrative records. The available evidence indicates that Battagram does not currently possess a significant planned housing scheme structure and that most of its housing supply continues to come from incremental, owner-led, and unplanned residential development.

The housing supply structure of Battagram is therefore fundamentally different from larger or more formally expanding cities. Residential growth is being accommodated mainly through plot subdivision, family-based construction, and gradual settlement extension within and around existing built-up clusters. This means that future supply is not being generated through organized housing estates, but through dispersed and small-scale additions to the existing urban fabric. While this pattern has enabled housing stock to grow over time, it has also limited the city's ability to produce residential land in a structured, serviceable, and infrastructure-efficient manner.

Infill potential within the existing municipal area is also limited. Based on the consultant's spatial assessment, less than 100 acres of vacant or underutilized parcels have been identified as potential infill residential land within the existing urban area. This is a relatively small amount when compared with the projected housing demand up to 2045. The limited scale of infill land is due to the city's existing settlement pattern and physical setting. Battagram remains predominantly agricultural and terrain-constrained, with built-up areas already concentrated in accessible pockets while large portions of the surrounding land are either under cultivation, environmentally sensitive, or unsuitable for compact urbanization because of slope and topographic constraints.

The housing supply context of Battagram therefore rests on two important conclusions. First, the city does not presently have a strong formal housing scheme base that can absorb future demand through planned private or public sector development. Second, although some infill potential exists within the urban area, it is not sufficient on its own to accommodate long-term housing needs. Future residential planning must therefore combine limited infill utilization with carefully directed outward expansion in suitable and serviceable areas. This makes the role of planned residential zoning and phased expansion particularly important in Battagram, where housing supply cannot be left to continue through scattered and unstructured growth alone.

7.4 Housing Scenarios

Future housing demand in Battagram has been assessed through alternative residential development scenarios in order to determine how projected households up to 2045 may be accommodated under different land-use and density conditions. The scenario exercise is necessary because Battagram is not a flat, freely expanding city. Its future residential growth must respond to a constrained physical setting, a predominantly low-rise housing structure, and a strong dependence on plotted housing. The purpose of scenario testing is therefore to compare how much land would be required if the city continues with a fully horizontal pattern, and how much land can be saved if a limited degree of vertical residential development is introduced.

The scenario design is based on both quantitative and qualitative factors. The quantitative basis includes projected population, housing backlog, future housing requirement, average household size, existing plot-size distribution, and prevailing storey pattern. The qualitative basis includes the hilly terrain of Battagram, the city's green and agricultural setting, the existing dominance of single-storey housing, and the limited but necessary scope for introducing apartment housing in selected locations. Because of these factors, the scenarios do not assume high levels of vertical development. Instead, only 10 % and 30 % vertical development options have been tested. This reflects the fact that Battagram is not suitable for a strong compact-city model across its full urban area, but it can absorb some part of future housing demand through moderate densification.

Table 42: Residential Growth Scenarios – Battagram City

Scenario	Horizontal Development Pattern	Vertical Development Pattern	Proposed Density
Scenario I – 100% Horizontal Development	3, 5, 7, 10 Marla and 1 Kanal plots in single-storey units. About 45% area reserved for allied uses.	Not applicable	**70 PPA**
Scenario II – 10% Vertical and 90% Horizontal Development	3, 5, 7, 10 Marla and 1 Kanal plots in single-storey units. About 40% area reserved for allied uses.	1-bed, 2-bed and 3-bed apartments in **G+4** storey buildings.	**100 PPA**
Scenario III – 30% Vertical and 70% Horizontal Development	3, 5, 7 and 10 Marla plots only, with no 1 Kanal plots. About 50% area reserved for allied uses.	1-bed, 2-bed and 3-bed apartments in **G+3** storey buildings.	**120 PPA**

3.1.55.Basis of Scenario Formulation

The scenario range has been kept deliberately moderate. Battagram's housing stock is overwhelmingly horizontal, and the city's settlement pattern is controlled by terrain, terrace availability, road access, and slope stability. Under such conditions, very high vertical shares would not be consistent with the present urban structure. The 10 % vertical option has been introduced as a limited transition model, where most future demand continues through plotted housing but a small portion is absorbed through apartments. The 30 % vertical option represents the upper level of densification considered suitable for testing under Battagram's conditions. It is intended as an efficiency scenario, not as an assumption that the city will fully convert to compact apartment-led housing.

This means that the housing scenarios for Battagram are not abstract numerical alternatives. They reflect the city's actual development context: a hilly, green, and predominantly low-rise urban center where future growth must remain largely horizontal, but where some controlled vertical expansion can reduce land demand.

3.1.56.Scenario I – 100% Horizontal Development (Business as Usual)

Scenario I represents business-as-usual residential growth. Under this model, all future housing demand is accommodated through outward horizontal expansion in the form of single-storey plotted housing. The plot mix includes 3, 5, 7, and 10 Marla plots, along with 1 Kanal plots, and 45 % of the gross area is reserved for allied uses such as roads, open spaces, local facilities, and utilities.

Using projected population growth from 173,148 in 2025 to 273,271 in 2045, an increase of 100,123 persons, and an average household size of 5.64, the future requirement up to 2045 is calculated at 17,752 housing units. After adding the carry-forward backlog of 358 units, the total housing requirement becomes 18,110 units, equivalent to accommodation for 102,142 persons. Under a fully horizontal pattern, this translates into a residential land requirement of 1,550.98 acres.

The plot allocation under this scenario is distributed as follows: 10 % in 3 Marla units, 25 % in 5 Marla units, 20 % in 7 Marla units, 25 % in 10 Marla units, and 20 % in 1 Kanal units. This produces an overall residential density of approximately 66 persons per acre. The scenario provides the greatest flexibility for plot-based family housing, but it also requires the largest amount of land and would extend development further into agricultural and slope-sensitive areas if applied at full scale.

3.1.57. Scenario II – 10% Vertical and 90% Horizontal Development

Scenario II introduces a limited degree of vertical development while retaining horizontal growth as the dominant residential form. Under this scenario, 90 % of future housing demand is accommodated through plotted housing and 10 % through apartment units. The plotted housing component still includes 3, 5, 7, 10 Marla, and 1 Kanal plots, while apartment supply is introduced through 1-bed, 2-bed, and 3-bed units in G+4 storey buildings. Allied uses are assumed at 40 % of the gross residential area.

The same overall housing requirement of 18,110 units is distributed differently under this model. The horizontal portion remains dominant, but the inclusion of even a small vertical component reduces total land demand substantially. The total residential area requirement under this scenario is 1,068.04 acres, comprising 1,045.87 acres for horizontal development and 22.16 acres for vertical development equivalent.

The housing mix under Scenario II is more compact than Scenario I. Horizontal plots are allocated as 20 % in 3 Marla units, 25% in 5 Marla units, 25% in 7 Marla units, 10 % in 10 Marla units, and 10 % in 1 Kanal units. The apartment component includes 2% 1-bedroom units, 3 % 2-bedroom units, and 5% 3-bedroom units. This raises the overall residential density to approximately 96 persons per acre, or rounded in planning terms to 100 persons per acre.

Scenario II is significant because it achieves a reduction of about 483 acres compared with the fully horizontal model, while still preserving the city's prevailing low-rise and plot-based character. It therefore represents a transitional housing model in which vertical development is introduced selectively rather than extensively.

3.1.58. Scenario III – 30% Vertical and 70% Horizontal Development

Scenario III represents the densification option. Under this model, 70 % of future housing demand is accommodated through horizontal plotted housing and 30 % through apartment-based residential development. In order to increase land efficiency, the horizontal component is limited to 3, 5, 7, and 10 Marla plots only, with no 1 Kanal plots permitted. Apartments are provided in 1-bed, 2-bed, and 3-bed units in G+3 storey buildings. Allied uses are assumed at 50 % of the gross residential area.

Under this scenario, the total land requirement falls to 866.13 acres, including 781.01 acres for horizontal development and 85.13 acres for vertical development equivalent. This is the most land-efficient of the three scenarios. The housing mix is distributed as 15 % in 3 Marla units, 15 % in 5 Marla units, 20 % in 7 Marla units, 20 % in 10 Marla units, and 30 % in apartments, made up of 5% 1-bedroom, 15 % 2-bedroom, and 10 % 3-bedroom units. The overall residential density under this model rises to 120 persons per acre.

Although this scenario produces the greatest land saving, it also requires the strongest change in Battagram's existing housing pattern. It assumes a much larger apartment share and a much lower reliance on large plots. In a city where most housing remains single-storey and family-plot based; this scenario is more useful as a comparative efficiency model than as the likely dominant pattern of actual growth.

Table 43: Total Residential Area Requirement – Battagram City

Scenario	Area Requirement for Horizontal Development (Acres)	Area Requirement for Vertical Development (Acres)	Total Area Requirement (Acres)
Scenario I – 100% Horizontal Development	1550.98	–	1550.98
Scenario II – 10% Vertical and 90% Horizontal Development	1045.87	22.16	1068.04
Scenario III – 30% Vertical and 70% Horizontal Development	781.01	85.13	866.13

The comparison of area requirements shows the effect of introducing vertical expansion in a terrain-constrained city. Scenario I consumes the highest amount of land because all growth is accommodated horizontally. Scenario II reduces land demand substantially while keeping the city predominantly plot-based. Scenario III reduces land requirement further, but at the cost of a much stronger shift toward compact living and greater dependence on apartment housing.

The scenario results therefore establish the planning choice clearly. Battagram cannot continue indefinitely through fully horizontal growth because of land consumption and topographic limitations. At the same time, the city's existing housing character does not support a strongly vertical residential model at full scale. The scenario exercise therefore shows why a limited and controlled vertical component is appropriate for the city.

Detailed scenario calculation tables are attached in the Annexures.

7.5 Selected Housing Scenario

The preferred housing scenario for Battagram City is Scenario II – 10% Vertical Development and 90% Horizontal Development. This scenario has been selected because it provides the most suitable balance between future housing demand, existing residential character, land consumption, and the physical constraints of the city. Battagram remains predominantly a low-rise, plot-based urban center where detached family housing continues to be the dominant form. At the same time, the city is located in a hilly and environmentally sensitive setting where unrestricted outward housing expansion would consume excessive land and further extend development into difficult terrain. Scenario II addresses this condition by retaining plotted housing as the principal mode of growth while introducing a limited vertical component to reduce overall land demand.

The main basis for selecting this scenario is that it matches Battagram's existing housing structure while still improving land-use efficiency. A fully horizontal model would require 1,550.98 acres of residential land and would continue the city's dependence on land-intensive expansion. By contrast, Scenario II reduces the total residential land requirement to 1,068.04 acres, generating a saving of about 483 acres. This reduction is achieved without requiring a major departure from the city's present settlement pattern. Scenario III reduces land requirement even further, but it depends on a much stronger shift toward apartment housing and denser urban form than Battagram can reasonably absorb at the city scale during the plan period.

Under the selected scenario, the projected population increases from 173,148 in 2025 to 273,271 in 2045, resulting in an incremental population of 100,123 persons. Using an average household size of 5.64, the future housing requirement up to 2045 is calculated at 17,752 housing units. After adding a backlog carry-forward of 358 units, the total requirement becomes 18,110 housing units. These units are intended to accommodate a total projected additional population of 102,142 persons. Within this requirement, 90 % of development is proposed in the form of plotted housing and 10 % through apartment-based vertical development.

The selected scenario is not intended to convert Battagram into a compact apartment city. The purpose of the vertical component is limited and specific: to introduce a controlled level of densification in suitable locations so that future growth is not accommodated entirely through outward expansion. This is particularly important in Battagram because the city's developable land is constrained by slopes, ridgelines, watercourses, and agricultural pockets. The selected scenario therefore acts as a controlled transition model, allowing the city to remain predominantly horizontal while beginning to use land more efficiently.

3.1.59.Proposed Housing Mix under the Selected Scenario

The selected housing scenario combines plotted residential development with a limited apartment-based component. The horizontal component includes 3 Marla, 5 Marla, 7 Marla, 10 Marla, and 1 Kanal housing units, while the vertical component is proposed in the form of 1-bedroom, 2-bedroom, and 3-bedroom apartments in G+4 buildings. This combination allows housing supply to respond to different household types while retaining a realistic development pattern for Battagram.

Table 44: Plot and Apartment Mix for Selected Housing Scenario – Battagram City

Housing Type	Share in Total Development

Horizontal Development – 90%	
3 Marla House	20%
5 Marla House	25%
7 Marla House	25%
10 Marla House	10%
1 Kanal House	10%
Subtotal Horizontal	**90%**
Vertical Development – 10%	
1-Bedroom Apartment	2%
2-Bedroom Apartment	3%
3-Bedroom Apartment	5%
Subtotal Vertical	**10%**
Total	**100%**

This housing composition reflects the existing residential character of Battagram. The larger shares of 5 Marla and 7 Marla units correspond to the city's established pattern of small- and medium-plot family housing. The continued presence of 10 Marla and 1 Kanal plots allows for accommodation of larger household types, while the apartment component remains limited and targeted. In area terms, the horizontal housing component requires 1,045.87 acres, while the vertical component requires 22.16 acres, resulting in a total residential land requirement of 1,068.04 acres. The overall residential density under the selected scenario is approximately 96 persons per acre, which may be taken as about 100 persons per acre for planning purposes.

3.1.60. Phase-wise Development of the Selected Scenario

To support orderly implementation, the selected housing scenario has been divided into four phases. This phasing enables future housing demand to be accommodated in manageable increments and linked with road provision, infrastructure extension, public services, and land release. It also allows the apartment component to be introduced gradually rather than concentrated in a single period.

Table 45: Phase-wise Area Requirement under Selected Housing Scenario – Battagram City

Phase	Duration	Horizontal Development (Acres) – 90%	Vertical Development (Acres) – 10%	Total Area Required (Acres)
Phase I	2025–2030	231.17	4.90	236.07
Phase II	2030–2035	252.81	5.36	258.16
Phase III	2035–2040	267.01	5.66	272.67
Phase IV	2040–2045	294.88	6.25	301.13
Total	**2025–2045**	**1045.87**	**22.16**	**1068.04**

The phase-wise distribution shows a gradual increase in land requirement over time, with the largest residential area demand occurring in the later phases. This reflects continuing population growth and the gradual reduction in household size over the plan period. The figures also show that the vertical component remains limited in every phase, which is consistent with the selected development approach. The role of apartment housing is therefore supplementary rather than dominant. It is intended to absorb a small share of future households in suitable urban locations, while most of the city's housing demand continues to be accommodated through plotted horizontal development.

The selected scenario therefore provides Battagram with a residential growth model that is both measurable and land-efficient. It reduces land demand significantly compared to the fully horizontal model, introduces controlled vertical growth, and remains consistent with the city's existing housing structure and terrain constraints.

Detailed calculation tables for the selected housing scenario and its phase-wise distribution are attached in the Annexures.

Phase I – 2025 to 2030

Phase I accommodates the first increment of future housing demand between 2025 and 2030. During this period, the projected population increases from 173,148 to 194,715, resulting in an increase of 21,567 persons. With an average household size of 5.64, the future housing requirement for this phase is 3,824 units. After adding the carried-forward backlog of 179 units, the total housing requirement for the phase becomes 4,003 units, corresponding to a total population accommodation of 22,577 persons.

Under the selected housing scenario, the total residential land required during Phase I is 236.07 acres, of which 231.17 acres are allocated for horizontal development and 4.90 acres for vertical development. This phase should focus primarily on residential expansion in immediately serviceable areas, use of vacant and underutilized land near the existing urban core, and the initial introduction of apartment housing in limited suitable locations. The phase is intended to establish the first structured increment of planned residential growth while keeping development close to existing infrastructure and road access.

Table 46: Phase I: Future Housing Requirement

Projected Population for 2025	**173,148 People**
Projected Population for 2030	194,715 People
Increase in Population	21,567 People
Household Size from 2025 till 2030	5.64
Future Requirements Housing Units for 2030	3824 Units
Backlog carry forward	179 Units
Total Requirement till 2030	4,003 Units
Total Population to be accommodation till 2045	22,577 People

This phase is intended to focus primarily on:

- infill development within already urbanized sectors,
- planned residential extension in immediately serviceable locations,
- and introduction of apartment housing in selected areas with adequate access and infrastructure support.

The residential density achieved in this phase is approximately 96 persons per acre, reflecting a moderate but manageable increase over the current pattern.

Phase II – 2030 to 2035

Phase II accommodates the next increment of growth between 2030 and 2035. The projected population rises from 194,715 to 218,395, resulting in an increase of 23,680 persons. At the same household size of 5.64, the future housing requirement is 4,199 units. With the addition of the carry-forward backlog of 179 units, the total housing requirement for the phase becomes 4,378 units, serving a projected population accommodation of 24,690 persons.

Table 47: Phase II: Future Housing Requirement

Projected Population for 2030	194,715 People
Projected Population for 2035	218,395 People
Increase in Population	23,680 People
Household Size from 2030 till 2035	5.64
Future Requirements Housing Units for 2035	4199 Units
Backlog carry forward	179Units
Total Requirement till 2035	4,378 Units
Total Population to be accommodation till 2035	24,690 People

The total residential land required during this phase is 258.16 acres, including 252.81 acres for horizontal development and 5.36 acres for vertical development. Compared with Phase I, this phase represents a modest increase in area demand. Residential growth during this period will extend the initial planned sectors and increase the need for neighbourhood-level facilities, internal roads, and basic utility expansion. The vertical component remains limited, indicating that plotted housing still dominates the city's growth pattern.

This phase will likely involve:

- continued expansion into planned residential sectors,
- strengthening of neighbourhood-level facilities,
- and broader acceptance of moderate-density residential typologies.

Phase III – 2035 to 2040

Phase III represents a larger increment of urban growth. Between 2035 and 2040, the projected population increases from 218,395 to 244,472, producing an increase of 26,077 persons. With the same average household size of 5.64, the future housing requirement is 4,624 units. No backlog is carried forward into this phase, so the total housing requirement remains 4,624 units, equivalent to accommodation for 26,077 persons.

Table 48: Phase III: Future Housing Requirement

Projected Population for 2035	**218,395 People**
Projected Population for 2040	244,472 People
Increase in Population	26,077 People
Household Size from 2035 till 2040	5.64
Future Requirements Housing Units for 2040	4624 Units
Total Population to be accommodation till 2040	26,077 People

The total residential land required during Phase III is 272.67 acres, of which 267.01 acres are allocated for horizontal development and 5.66 acres for vertical development. By this stage, the role of planned residential expansion becomes more significant because the city must absorb a larger population increment without dispersing development into unsuitable terrain. This phase therefore requires stronger coordination between residential zoning, road extension, drainage, and public service provision. The apartment component remains small but continues to contribute to improved land-use efficiency.

Phase IV – 2040 to 2045

Phase IV is the largest housing phase of the plan period. During this interval, the projected population rises from **244,472** to **273,271**, generating an increase of **28,799 persons**. With an average household size of **5.64**, the future housing requirement is **5,106 units**. Since no backlog is carried forward, the total requirement for this phase is also **5,106 units**, accommodating **28,799 persons**.

Table 49: Phase IV: Future Housing Requirement

Projected Population for 2040	244,472
Projected Population for 2045	273,271
Increase in Population	28,799
Household Size from 2040 till 2045	5.64
Future Requirements Housing Units for 2045	5,106 Units
Total Population to be accommodation till 2045	28,799 People

The total residential land requirement during Phase IV is **301.13 acres**, including **294.88 acres** for horizontal development and **6.25 acres** for vertical development. This phase represents the highest area demand within the plan period and confirms that housing growth in Battagram will continue to intensify over time. The increasing land requirement in the later phases indicates that residential land must be identified and reserved in advance, particularly in the most suitable and accessible sectors of the city. Without such advance planning, later growth would likely shift toward fragmented and inefficient expansion.

3.1.61. Allied Uses within Residential Areas

The total residential area requirement under the selected scenario includes not only land for housing units, but also land for allied uses necessary to support sustainable residential development. These include:

- local roads and internal circulation,
- neighbourhood-level commercial uses,

- parks and open spaces,
- utility space,
- and basic community facilities.

Residential Area Required
- 1068 Acres

Housing
- 60%
- Area Required (Acres) 768

Allied Uses
- 50%
- Overall Area Required (Acres) 305

Details of Allied Uses
- Health 4% 30.52 acres
- Education 4% 30.52 Acres
- Commercial 2% 15.26 Acres
- Civic Amenities 3% 22.89 Acres
- Parks and Playground 10% 76.29 Acres
- Roads 17% 129.69 Acres

Figure 10: Details of Allied Uses
Source: Devised by Consultant

In the selected scenario, 40% additional area has been provided for allied uses in the residential sector calculations. This is intended to ensure that future residential development does not repeat the pattern of narrow-access, under-serviced, and poorly structured neighbourhood growth that characterizes parts of the existing city. The allocation of allied uses will be refined in accordance with the residential zoning and sector planning framework of the Master Plan.

7.6 Proposed Residential Structure

The proposed residential structure of Battagram City has been developed in accordance with the selected housing scenario, projected housing demands up to 2045, existing settlement pattern, and the physical constraints imposed by terrain. Since Battagram is a hilly city with a predominantly linear-nodal form, the residential proposal does not rely on uniform outward spread. Instead, it distributes future housing growth across a set of planned residential zones, limited infill areas, and a designated model village so that expansion takes place in accessible and relatively serviceable pockets rather than through scattered slope encroachment.

The proposed residential structure combines consolidation of the existing built-up area with controlled outward extension. It is intended to accommodate the city's future housing requirement through a hierarchy of zones that reflect location, accessibility, and development intensity. The proposal includes four residential zones, one model village, and one infill residential category. Together, these components form the spatial framework for future housing growth in Battagram.

Table 50: Proposed Residential Land Use – Battagram City

Proposed Zone	Area (Acres)
Residential Zone 1	355.53
Residential Zone 2	257.71
Residential Zone 3	87.81
Residential Zone 4	92.54
Model Village	129.51
Infill Residential	91.69
Apartment Complex	25.40
Total Area	***1040.19***

The largest allocation is made to Residential Zone 1, covering 355.53 acres. This zone is located in the more accessible northern and north-eastern urban sectors, where the existing settlement structure is already relatively continuous and where future growth can be linked more efficiently with roads and services. Residential Zone 1 is intended to function as the principal planned urban housing zone of Battagram. It is suitable for the main share of structured residential growth because it lies close to the existing urban core and can support a relatively higher degree of consolidation compared to more peripheral areas.

Residential Zone 2, covering 257.71 acres, is proposed mainly in the southern and south-central sectors where development can occur as controlled outward extension from the existing built-up area. This zone is intended for general residential expansion and plotted housing development in locations that are contiguous with present settlements but outside the most congested urban core. It forms an important part of the city's future housing supply because it provides room for horizontal expansion while remaining within the planned residential framework.

Residential Zone 3, with an area of 87.81 acres, is located toward the western side of the city and is relatively smaller in extent. This zone reflects the limited but necessary provision of planned residential land in accessible outer pockets. Its smaller size indicates that the western side has more restricted scope for major housing growth and should therefore remain a limited residential expansion zone rather than a major urban growth sector.

Residential Zone 4, covering 92.54 acres, is proposed in the south-eastern sector. This zone accommodates residential growth in another peripheral but connected direction of expansion. It supports the objective of distributing housing demand without over-concentrating all future growth in one part of the city. At the same time, its limited size indicates that expansion in this direction must remain selective and terrain-responsive.

A distinct component of the proposed residential structure is the Model Village, with an area of 129.51 acres, proposed in the Chappargram side of the city. This area is intended to function as a planned residential growth node rather than as an unregulated peripheral extension. The model village concept is particularly relevant in Battagram because it allows one part of future housing growth to be developed in a more organized form with proper internal layout, access, and neighbourhood-level facilities. Its inclusion within the residential structure indicates that part of the future demand can be absorbed through a planned settlement unit rather than only through conventional plotted expansion.

Figure 11: Model Village 3d view- Option 1
Source: Developed by Consultant

Figure 12: Model Village 3d view- Option 2
Source: Developed by Consultant

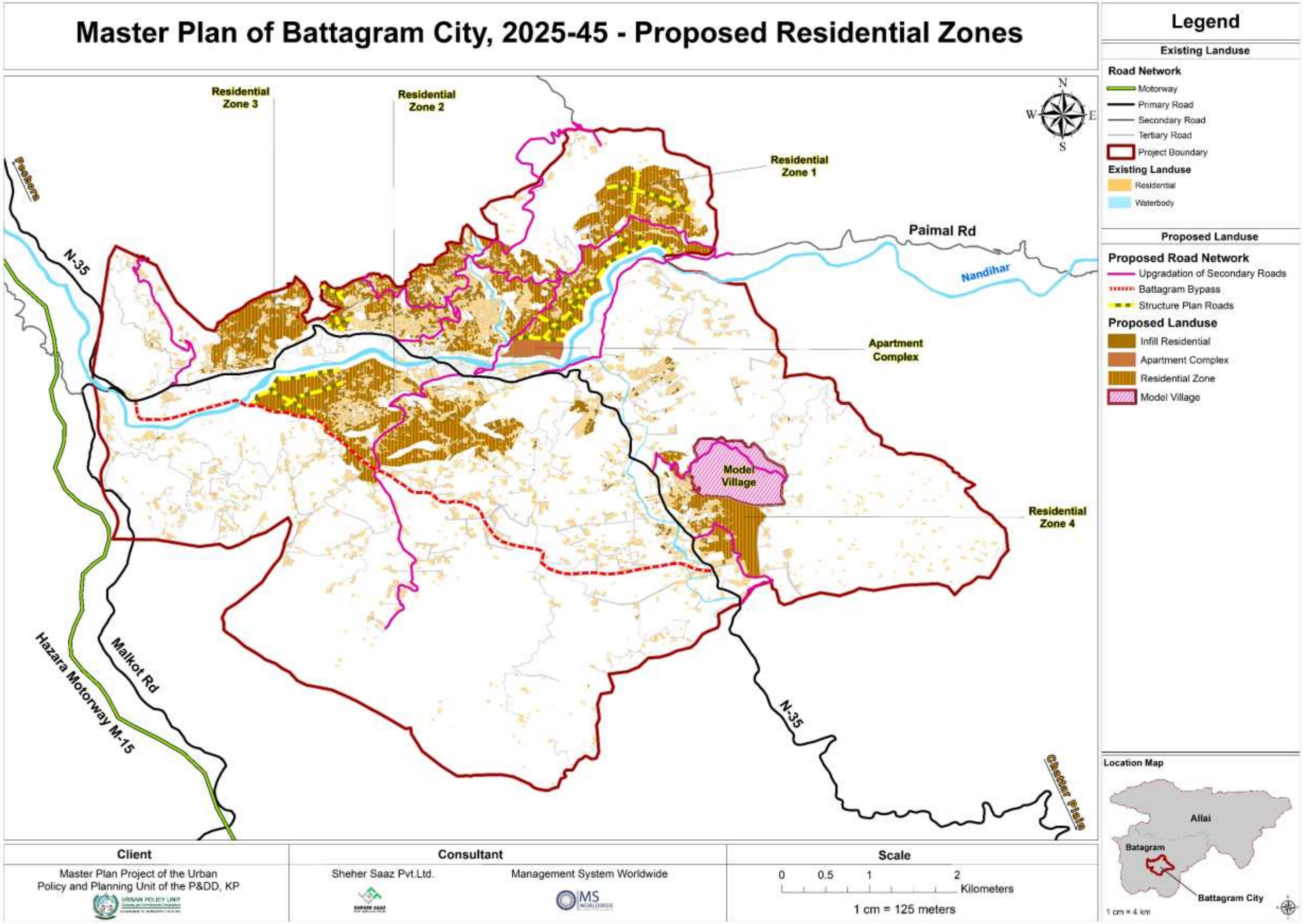
The proposal also identifies 91.69 acres as Infill Residential. These areas fall within or immediately around the existing built-up structure and are intended for consolidation of the present urban fabric. Infill residential development is important in Battagram because it reduces the pressure for unnecessary outward spread and allows part of the housing requirement to be met through better use of already urbanized land. Although the amount of infill land is relatively limited, it remains an important component of the residential structure because it supports compacting of fragmented settlement pockets and improves land-use efficiency.

7.7 Zoning Regulations for Residential Use

Table 51: Permitted, Permissible Land Uses of Residential Area

Land Use Zone	Permitted Land Uses	Permissible on Appeal Land Uses
Low-Density Residential Zone	Detached and semi-detached dwellings; mosques; primary and secondary schools; clinics and dispensaries; social and cultural institutions; neighbourhood parks and playgrounds; local recreational uses; utility installations of local character; neighbourhood-level retail shops and	Commercial offices and service shops of local character; small guest houses; community halls; taxi/rickshaw stands; petrol pumps and gas filling stations on approved roads only; private educational institutions; poultry

	convenience stores; offices of professionals with adequate parking; home-based occupations of non-nuisance nature; nurseries and non-commercial kitchen gardening	keeping for non-commercial purposes
Medium-Density Residential Zone	All uses permitted in low-density residential zone; compact detached and semi-detached dwellings; row housing and town houses; low-rise apartments/flats where specifically zoned; local shopping areas; clinics, maternity homes, and small healthcare units; educational institutions; parks, playgrounds, and community open spaces; public utilities and buildings	All uses permissible on appeal in low-density residential zone; restaurants of neighbourhood character; small hotels/guest houses; hospitals; fuel stations on designated roads; mixed-use buildings on approved corridors; parking plazas of local scale
High-Density Residential Zone	All uses permitted in medium-density residential zone; multi-family dwellings including apartments and condominiums; mixed residential buildings; public utilities and public buildings; structured parking; recreational uses; neighbourhood and sector-level commercial uses as specifically zoned; taxi and rickshaw stand; transit-support uses	All uses permissible on appeal in medium-density zone; larger mixed-use developments; hotels; hospitals; commercial offices; higher-order retail and service facilities subject to traffic, parking, and environmental clearance
Apartment Complex Zone	Apartment buildings; condominium housing; gated or planned residential complexes; internal community facilities; mosques; nurseries and day-care; parks and internal open spaces; community centers; parking areas and utilities; neighbourhood retail of local character integrated within the complex	Private schools, clinics, fitness and recreation facilities, convenience commercial, restaurants/cafes of local scale, guest houses, and management/maintenance offices, subject to approved layout and parking provision



Map 17: Proposed Residential zones - Battagram City

8 CHAPTER: COMMERCE AND TRADE INDUSTRY AND URBAN ECONOMY

8.1 Background

Battagram City functions primarily as an administrative, service, and market center for its surrounding rural hinterland rather than as a self-sustaining urban economic hub. The city's economy is closely tied to the wider district economy, which remains dominated by agriculture, daily wage labour, small retail trade, transport services, and informal employment. In this structure, Battagram serves as the main point of exchange, service delivery, public administration, and local-level commerce for the settlements connected to it through the Karakoram Highway and adjoining rural roads.

The employment profile reflects this economic base clearly. Primary survey findings indicate that agriculture, daily wage labour, private jobs, and small business together form the core of local livelihoods. Agriculture remains a major source of income and subsistence, while daily wage labour and small-scale services provide additional support to household economies. District labour force data further confirms this pattern. Agriculture accounts for 48.6 percent of employment, services for 33.0 percent, and industry for 18.4 percent. However, most industrial activity is not organized manufacturing; rather, it is associated with construction, quarrying, stone crushing, and other small-scale activities. Formal employment is limited to only 11.6 percent, while 88.4 percent of workers operate within the informal economy. This makes Battagram's urban economy largely household-based, low-productivity, and weakly formalized.

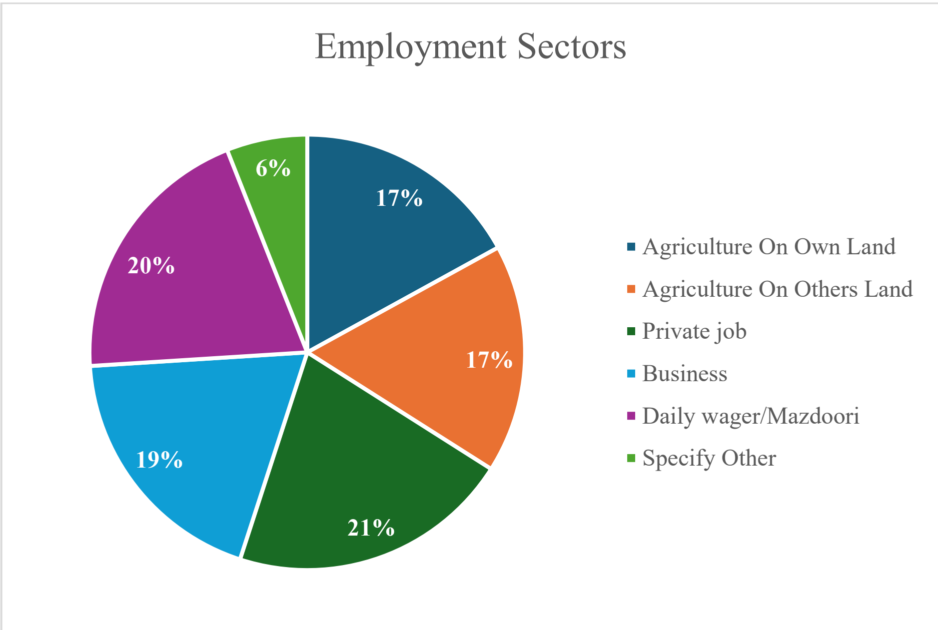


Figure 13: Employment Sectors

The city's commercial activity therefore performs a critical support function. Battagram does not operate as a higher-order trade center, but it plays an essential role in meeting daily consumption needs, facilitating small-scale exchange, and supporting transport-linked services for the surrounding population. Its economic role is reinforced by road connectivity and by its position along a regional movement corridor, but constrained by narrow market structure, weak infrastructure, low purchasing power, and absence of organized commercial and industrial districts. From a planning perspective, this means that the city's future economic development should focus on strengthening commerce, market infrastructure, services, and local value addition rather than assuming a conventional industrial growth model.

8.2 Commerce and Trade

Existing commerce and trade in Battagram City is small in scale, linear in structure, and strongly dependent on the road network. Commercial activity is concentrated mainly along the Karakoram Highway corridor and the principal internal streets that connect the core bazaar with adjacent residential and village catchments. This has produced a roadside and frontage-based commercial form in which shops, services, and mixed-use buildings cluster along accessible streets rather than within planned commercial centers. The existing commercial system is therefore functional, but spatially unstructured.

Commercial land use occupies a limited share of the total city area. Based on the existing land-use assessment, commercial uses cover about 69.85 acres, while mixed-use land occupies 14.01 acres, bringing the broader commerce-related footprint to approximately 83.86 acres. Retail is the dominant component of this structure, accounting for 67.03 acres, and forms the main economic base of the city's trade system. These retail activities consist largely of small, family-operated shops selling groceries, clothing, hardware, mobile accessories, household goods, and agricultural inputs. Restaurants, petrol pumps, and banks occupy only minor areas, indicating the limited scale of higher-order commercial and service functions.

Table 52: Commercial Land Use Classification - Battagram

Major Land Use Category	*Sub-Category*	*Area (Acres)*	*Percentage (%)*
Commercial	Restaurant	0.20	0.00%
	Bank	1.10	0.01%
	Petrol Pump	1.53	0.02%
	Retail	67.03	0.79%
Total Commercial		***69.85***	***0.83%***
Mixed Used	Mixed Use	14.01	0.17%

The existing commercial pattern is heavily informal. A significant part of the bazaar economy operates through semi-formal or unregulated roadside shops, small service outlets, street activity, and mixed residential-commercial plots. Ground-floor retail within residential structures is common, especially along main approach roads and bazaar streets. This organic mixing supports livelihoods and reduces travel needs, but it also creates problems of congestion, weak frontage control, absence of parking, and frequent conflict between pedestrians, vehicles, and loading activity. Commercial growth has therefore occurred through incremental occupation of road edges rather than through planned market zoning.

Battagram also lacks a structured wholesale market, specialized trade district, or formally planned town-center commercial complex. Agricultural produce, especially wheat, maize, vegetables, and fruits, is traded mostly through informal channels, local roadside exchange, or onward movement to larger markets outside the city. This limits the city's role in value addition and keeps its trade system at the level of local service provision rather than regional market leadership. Financial and hospitality functions remain limited as well, which indicates that commerce in Battagram is still based mainly on routine local demand and highway-related passing activity.

8.3 Economic Challenges

Battagram City faces structural economic challenges rooted in its rural character, environmental vulnerability, and weak infrastructure base. The local economy is narrow, dominated by low-productivity agriculture, informal services, and daily wage labor, offering limited opportunities for stable or skilled employment. This pushes a significant share of the working-age population, particularly youth, to seek work outside the district.

Infrastructure constraints remain a major barrier to economic stability. Poor road conditions, frequent landslides, and flood-related disruptions along internal routes and highway connections regularly interrupt trade, transport, and access to markets. For small traders and transport workers, even short road closures translate into immediate income losses that cannot be recovered.

Limited access to reliable water supply, drainage, and solid waste management affects market functioning and public health. During monsoon periods, flooding and waterlogging damage shops, disrupt roadside businesses, and discourage commercial activity. These recurring shocks increase operating risks and discourage reinvestment by small entrepreneurs.

Battagram’s economy is also highly seasonal and shock-prone. Agricultural income depends on rainfall patterns, while transport and roadside commerce fluctuate with road conditions and security. With minimal insurance coverage, savings, or formal support systems, households remain vulnerable to single-event losses such as crop failure, vehicle damage, or illness.

Low literacy levels, 43.5% overall with a sharp gender gap, further constrain diversification into higher-value services or skilled work. The lack of vocational training, business development support, and local employment opportunities reinforces a cycle of out-migration, remittance dependence, and slow local economic growth.

Overall, Battagram’s economic challenges are less about unemployment and more about underemployment, informality, vulnerability, and lack of resilience, requiring planning responses that prioritize connectivity, basic infrastructure, and livelihood stabilization rather than conventional urban economic models.

8.4 Future Requirement

The future requirement for commercial land in Battagram City has been assessed using the planning standard of 1 acre per 1,000 persons. This standard provides a simple basis for comparing existing commercial land with present and future population demand and for identifying the scale of additional land that should be reserved for commerce and trade functions over the plan period.

Based on the projected 2025 population of 173,148, the current commercial land requirement comes to 173.148 acres. Against this, the existing commercial area is only 87.78 acres, resulting in a current shortfall of 85.368 acres. This shows that even at the start of the planning period, Battagram already has less commercial land than required for its present population. The city is therefore functioning with a constrained commercial base, which explains the concentration of trade along roads, mixed-use spillover, weak market organization, and pressure on the existing bazaar structure.

By 2045, the projected population of Battagram City is 272,271, which means the total commercial land requirement rises to 272.271 acres. The increase in population between 2025 and 2045 is 99,123 persons, generating an additional future commercial requirement of 99.123 acres. This additional demand is over and above the existing shortfall. In planning terms, this means that Battagram must not only address its present commercial deficiency but also reserve sufficient land for future expansion of retail, services, markets, and trade-support functions.

Overall, the commercial land assessment confirms that Battagram requires a significant increase in planned commercial space during the Master Plan period. The future requirement should not be met only through continued roadside ribbon growth. Instead, it should be accommodated through a structured commercial framework including linear commercial areas, designated commercial zones, mixed-use areas, farmer-oriented market functions, and trade and service zones.

Table 53: Commercial Land Requirement – Battagram City

Existing Commercial Area (acres)	Population 2025	current Requirement (Acres)	Current Gap (Acres)	Population 2045	Increase in population (Acres)	Future Requirement (Acres)
87.78	173148	173.148	85.368	272271	99123	99.123
Standard NRM: 1 acre per 1000 people						

8.5 Proposed Commercial Zones

The proposed commercial structure for Battagram has been organized to match the city's actual movement pattern, settlement form, and economic base. Battagram does not require a single large commercial expansion area. Its trade structure is better supported through a combination of corridor-based commerce, concentrated commercial nodes, a dedicated farmers market, mixed-use urban activity, and a trade-and-service area for space-intensive functions. This zoning structure is intended to strengthen the existing bazaar economy, improve roadside commercial order, support agricultural exchange, and distribute future commercial activity more efficiently across the urban area.

Table 54: Proposed Commercial Zones – Battagram City

Proposed Zone	Area (Acres)
Linear Commercial	170.80
Commercial Zone	53.89
Farmers Market	7.318
Mixed Use	10.96
Agro-industrial Zone	45.61

The largest allocation is proposed as Linear Commercial, covering 170.80 acres. This is appropriate for Battagram because the city's commercial activity is already strongly aligned with the main valley corridor and the principal approach roads. The proposed linear commercial areas are therefore concentrated along the main urban movement spine passing through the central built-up belt and extending along the principal road segments where retail, frontage-based activity, and daily service functions can be sustained. These corridors are intended for shops, pharmacies, eateries, local business premises, repair services, and other small- to medium-scale commercial uses that depend on visibility and direct access. The purpose is not to allow continuous uncontrolled ribbon growth, but to formalize selected commercial frontages where such activity is most suitable.

The proposed Commercial Zone, with an area of 53.89 acres, is intended to function as the main concentrated commercial category outside the narrow bazaar pattern. It has been positioned in key urban nodes rather than dispersed in small fragments. This allows the city to accommodate more structured business activity in accessible locations where higher-order trade, grouped retail, offices, and service establishments can develop with better internal organization. The commercial zone is particularly important for Battagram because the present bazaar system is already under pressure and cannot continue absorbing all future commercial demand in an unstructured manner.

A dedicated Farmers Market of 7.32 acres has been proposed in a location that can serve both the urban center and the surrounding agricultural catchment. This is a strategic addition to the commercial system because Battagram's wider economy remains closely tied to agriculture, vegetables, fruits, and local produce exchange. At present, much of this activity occurs informally. The proposed farmers market provides a defined space for produce sale, periodic rural trade, small-scale wholesale exchange, and direct producer-to-market linkage. Its role is not only commercial, but also economic, since it helps connect the agrarian hinterland more directly with the city.

The proposed Mixed-Use zone, covering 10.96 acres, has been identified in a more urbanized part of the city where residential and commercial activities can continue to coexist in a regulated form. In Battagram, mixed-use activity already exists informally in parts of the central area and along active streets. The proposed mixed-use zone is intended to formalize this condition in selected locations by allowing ground-floor commercial uses with upper-floor residential, office, or service functions. This is suitable in areas where a fully commercial designation is not necessary but where urban activity is strong enough to support a more intensive land-use mix.

Taken together, the proposed commercial zones create a differentiated economic framework for the city. The linear commercial areas support daily roadside trade and service activity along the main urban spine. The commercial zones provide more concentrated business locations at important nodes. The farmers market supports agricultural exchange. The mixed-use zone formalizes compact urban activity where residential and commercial functions already overlap. The trade and service zone accommodates larger and more traffic-generating commercial uses in a more suitable setting. This combination is more appropriate for Battagram than a single bazaar-based model and provides a clearer basis for future commercial growth, traffic management, and market organization.

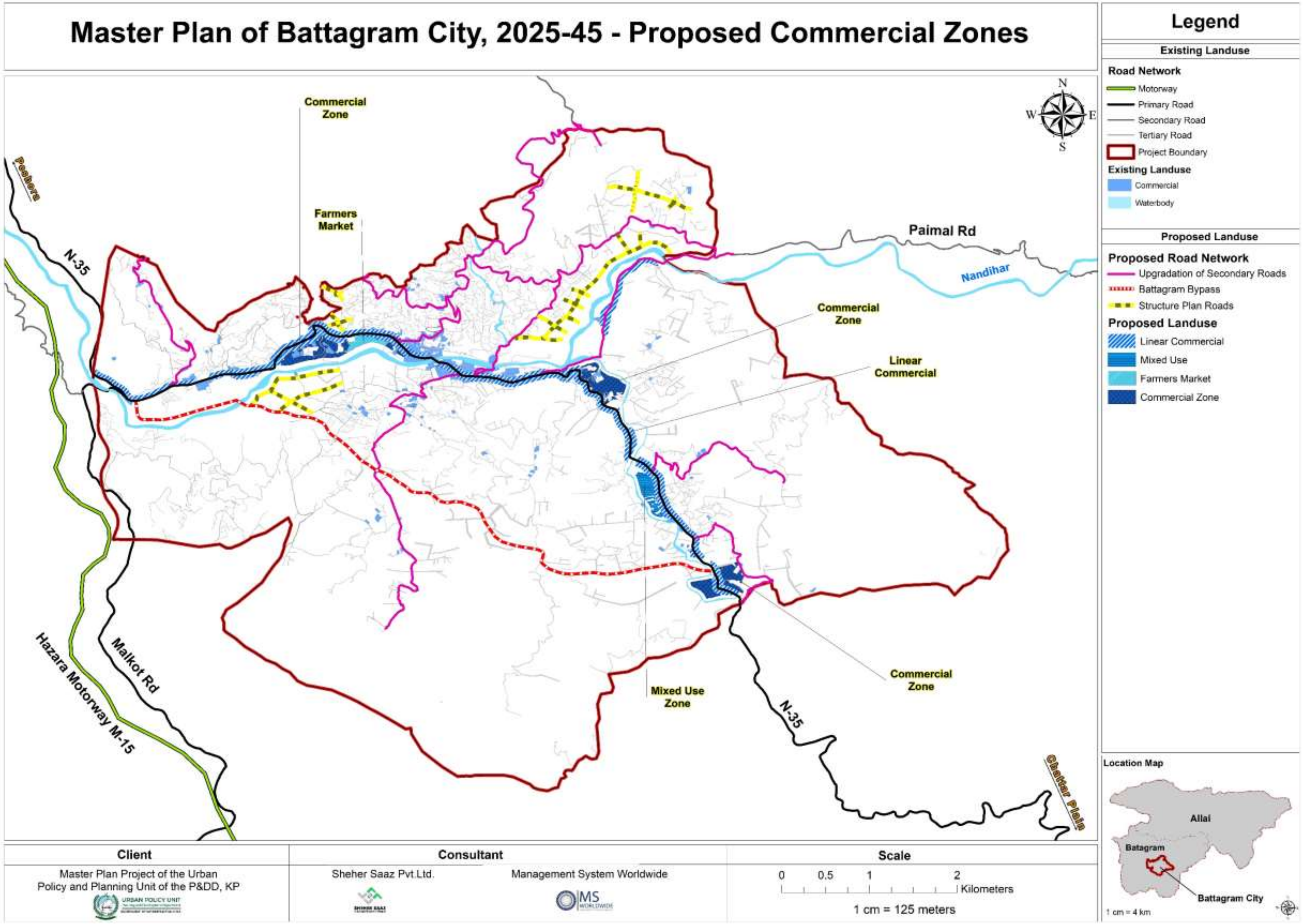
8.6 Zoning Regulations for Commercial Areas

The commercial zoning regulations for Battagram have been developed to support the city's emerging market structure, improve commercial order, and reduce land-use conflict between bazaar activity, roadside commerce, transport-linked services, and adjacent residential areas. Since Battagram's trade structure is relatively small, linear, and service-oriented, the zoning framework allows a range of commercial uses but differentiates between those that may be permitted outright and those that should be allowed only on appeal, subject to traffic, environmental, and compatibility review.

Table 55: Zoning Regulations for Proposed Commercial Zones

Land Use Zone	Permitted Land Uses	Permitted on Appeal Land Uses
Commercial Zone	Retail shops and markets; shopping plazas; wholesale and semi-wholesale trade; business and professional offices; banks and financial institutions; restaurants, cafés, and hotels; public and private service establishments; clinics and diagnostic centers; pharmacies; courier and logistics offices; public utilities and buildings; approved parking areas; community and recreational uses compatible with commercial activity	Petrol pumps and gas filling stations; hospitals; marriage halls and event venues; bus terminals; cinemas and indoor entertainment uses; warehousing and storage subject to site suitability; service workshops of non-nuisance character
Linear Commercial Zone	Roadside retail shops; convenience stores; restaurants and tea stalls; pharmacies; banks and ATMs; service shops; mobile, electronics, and repair outlets; professional offices; small business premises; public utilities; approved parking and loading spaces	Petrol pumps; hotels and guest houses; clinics; workshops of local service character; transport booking offices; small warehouses subject to traffic review
Mixed Use Zone	Residential above commercial use; ground-floor retail; offices; restaurants; clinics; educational and training centers; small community facilities; neighborhood shopping; professional services; public utilities; parking areas	Hotels and hostels; larger office buildings; marriage halls; private institutional uses; commercial plazas; hospitals subject to access and parking adequacy
Farmers Market Zone	Fruit and vegetable market; grain and produce sale; livestock-related sale yards of limited scale; agri-input shops; seed, fertilizer, and farm supply stores; produce storage; auction sheds; loading and unloading areas; public convenience	Cold storage; agro-processing of non-polluting type; warehousing; transport depots; seasonal wholesale market functions; service sheds related to market operation

	facilities; open market spaces; parking for pickups and small goods vehicles	



Map 18: Proposed Commercial Zones

9 CHAPTER: INDUSTRY AND URBAN ECONOMY

9.1 Industry and Economic Activity Areas

Battagram City is not an industrial city in the conventional sense. Its urban economy is primarily based on administration, local commerce, transport-linked services, agriculture-related exchange, and small-scale informal enterprise. Within the wider district, economic activity remains strongly rural and resource-based, with livelihoods dependent on agriculture, livestock, daily wage labor, roadside trade, and small service businesses. In this context, Battagram City functions mainly as a service and market center for its hinterland rather than as a manufacturing hub.

The city's economic structure shows only a limited industrial base, but it does possess specific sectors that justify planned economic zoning. These include small construction-material units, repair and workshop activity, local processing functions, transport support services, and resource-linked activity associated with agriculture and minerals. At the district level, Battagram also has economic potential in agro-processing, livestock-related processing, mineral extraction, and downstream stone or material-based activity. Although these sectors have not yet developed into a formal industrial system, they provide a basis for future economic diversification if land, infrastructure, and regulatory support are provided.

Battagram's industrial and economic role must therefore be understood in relation to its physical and regional context. The district does not contain a formal industrial estate, and the city itself has a very small industrial footprint. However, the city occupies an important position on the Karakoram Highway corridor and serves as a node for movement, exchange, and local service delivery. This gives it some capacity to support small industrial and service-economic uses, particularly those linked to construction materials, storage, logistics, agro-processing, and mineral-related trade. In addition, the presence of the Allai Khwar Hydropower Project as a major district-level infrastructure asset provides a supportive background for future economic activity, even though it does not directly function as an urban industrial use within the city.

From a planning perspective, the main issue in Battagram is not industrial shortage in absolute land terms, but the absence of an organized framework for economic activity. Existing industrial and workshop use are scattered, informal, and weakly structured. Future planning should therefore focus on creating a small but functional economic land-use system that can support local employment, value addition, and service-sector growth without introducing incompatible heavy industry into the urban area.

3.1.62. Existing Industrial / Workshop / Warehousing Pattern

Existing industrial activity within Battagram City is extremely limited. Based on the current land-use assessment, industrial land covers only about 3.01 acres, which is approximately 0.036 percent of the total surveyed area. This confirms that the city does not presently contain a significant industrial base and that formal industrial land use is almost absent from the urban structure.

The small amount of existing industrial activity that does exist is not organized into a planned industrial district. Instead, it takes the form of scattered and low-intensity enterprises such as block factories, building material storage, repair workshops, small mechanical units, and service-oriented business activity linked to transport and construction. These uses are generally owner-operated, locally serving, and informal or semi-formal in nature. They are not large production units and do not function as a major urban employment base in the way a formal industrial estate would.

At the district level, the industrial base remains similarly modest. Official development statistics indicate the presence of only a few basic processing units such as flour mills and an ice factory, which support food processing and local supply functions but do not represent a larger manufacturing economy. The broader district economy instead points toward resource-linked and agriculture-linked sectors as the most likely basis for future industrial development. Agriculture and livestock create potential for agro-processing, dairy-related activity, food storage, and local value addition, while mineral occurrences such as granite, feldspar, and granitic schist indicate some potential for stone and mineral-based processing.

The mining and extraction sector is one of the few structured economic activities in the district, although it remains outside the core urban footprint of Battagram City. Secondary data identifies 14 registered mining leases and prospecting licenses in Battagram District, largely related to granite, feldspar, and granitic schist. These operations are distributed across rural and peri-urban locations such as Kotwal, Bilandkot, Jambera, Bakrwali, Shamlai, Rajdhari, Karborai, Bandigo, Narai Borai, Tarlai, and Nelishang. While these activities contribute to local employment, haulage, and material supply, they are not yet connected to a formal urban industrial structure. Most raw material leaves the district without substantial local processing, which limits local value addition.

The existing industrial pattern of Battagram therefore has four main characteristics. First, the industrial land footprint within the city is extremely small. Second, most activity is informal, scattered, and service-oriented rather than production-intensive. Third, the strongest economic potential lies in agro-linked and mineral-linked sectors rather than in conventional manufacturing. Fourth, there is no formal industrial zone or estate within the city to consolidate such uses in a planned manner.

9.2 Proposed Industrial / Economic Zones

The Master Plan for Battagram proposes a focused and limited industrial-economic structure rather than a broad industrial land strategy. This approach is consistent with the city's actual economic role, physical setting, and existing industrial base. Battagram does not presently require a conventional general industrial estate. Its economic development potential lies more specifically in **agro-linked processing, storage, rural support services, and local value-added activity** rather than in heavy manufacturing or large-scale factory development. For this reason, the proposed industrial framework is based on a single **Agro-Industrial Zone**.

Table 56: Proposed Industrial Land Use – Battagram City

Proposed Land Use	Area (Acres)
Agro-Industrial Zone	45.6

The proposed **Agro-Industrial Zone**, covering **45.6 acres**, has been located in the south-western part of the city in a peripheral and road-accessible position. This location is appropriate because it provides separation from the denser residential and commercial core while remaining connected to the main transport network. Such a location is suitable for activities that require operational space, loading and unloading, storage, and movement of goods, but should not be mixed directly with the central bazaar or neighborhood residential areas.

The proposed zone is intended for **agro-processing, produce handling, packaging, cold storage, grain and flour processing, dairy-related activity, agri-input storage, and allied rural support functions**. Battagram's wider economy remains linked to agriculture, livestock, and small-scale rural production, and the city serves as a service node for this hinterland. The proposed agro-industrial area therefore supports the local economy by creating space for value-added processing and storage functions that are currently either absent or scattered in unplanned form.

This proposal also responds to the fact that Battagram's current industrial pattern is too limited and fragmented to support economic diversification. Existing industrial activity within the city is negligible in land terms and consists mainly of micro-scale workshops, block factories, and small service units. At the same time, the district has potential in agriculture-linked and resource-linked sectors, but very little of that activity is presently organized within a planned urban economic zone. The proposed agro-industrial area is therefore intended to serve as a first structured economic platform rather than as a large industrial district.

3.1.63.Freight, Logistics and Wholesale Functions

Battagram's urban economy is closely linked with movement, roadside services, and supply functions rather than with conventional industrial production. Because the city lies along an important regional movement corridor and serves a dispersed rural hinterland, freight, logistics, and wholesale activity already form an important part of its functional economy. These activities include loading and unloading of agricultural produce, movement of construction materials, small storage functions, roadside transport services, workshop support activity, and supply handling for local markets and surrounding settlements.

The Master Plan therefore treats freight and logistics functions as an integral part of the proposed agro-industrial and urban economic structure. In Battagram, these uses should not continue to spread in an unregulated manner along the central bazaar streets or within mixed residential areas. Instead, storage, produce handling, service yards, and small wholesale-support functions should be directed toward the proposed Agro-Industrial Zone, where road access, operational space, and separation from dense urban activity can be better managed. This is especially important in Battagram because the existing road structure is narrow and terrain-constrained, and even modest freight activity can create congestion and safety issues if it remains mixed with retail and passenger traffic.

The appropriate freight and logistics functions for Battagram include produce aggregation, grain and flour handling, cold storage, agri-input distribution, storage sheds, loading platforms, small warehousing, transport support facilities, and rural goods handling services. These uses should remain limited in scale and linked to the district's agrarian economy rather than to large regional freight operations. The purpose of the proposed economic structure is therefore to improve organization and local value addition, not to create a heavy logistics terminal. A controlled approach is more suitable for Battagram's scale and physical setting.

3.1.64.Zoning Regulations for Industrial Land Use

The zoning regulations for industrial land use in Battagram should reflect the city's actual economic profile. Since Battagram is not a heavy industrial center and the proposed industrial land is limited to an **Agro-Industrial Zone**, the regulations should favor agro-processing, storage, rural support functions, light service-industry activity, and non-polluting economic uses. Hazardous, noxious, or large-scale industrial activities should not be permitted within the urban structure.

Table 57: Zoning Regulations for Industrial Land Use – Battagram City

Land Use Zone	Permitted Land Uses	Permitted on Appeal Land Uses	Prohibited Uses
Agro-Industrial Zone	Agro-processing; fruit and vegetable grading, packing and storage; flour and grain processing; dairy and livestock product processing; seed processing; agri-input storage; cold storage; packaging; produce handling sheds; farm machinery service and repair; small warehouses; loading and unloading areas; public utilities; parking and service yards	Wholesale agri-markets; transport depots; veterinary service centers; agri-machinery sales; service-commercial offices; small mineral or stone-processing units of non-polluting type; supporting training and extension facilities; fuel stations, subject to site planning, road access, buffering, and environmental safeguards	Heavy industry; steel mills; chemical plants; fertilizer plants; cement plants; explosives or fireworks manufacturing; oil refining; hazardous waste handling or disposal; tanneries; large slaughterhouses; smelting and foundry operations; polluting mineral processing; brick kilns; asphalt plants; thermal power plants; industries generating excessive smoke, toxic emissions, vibration, noise, or effluent; any use involving flammable, explosive, corrosive, radioactive, or otherwise hazardous materials in quantities incompatible with nearby urban uses

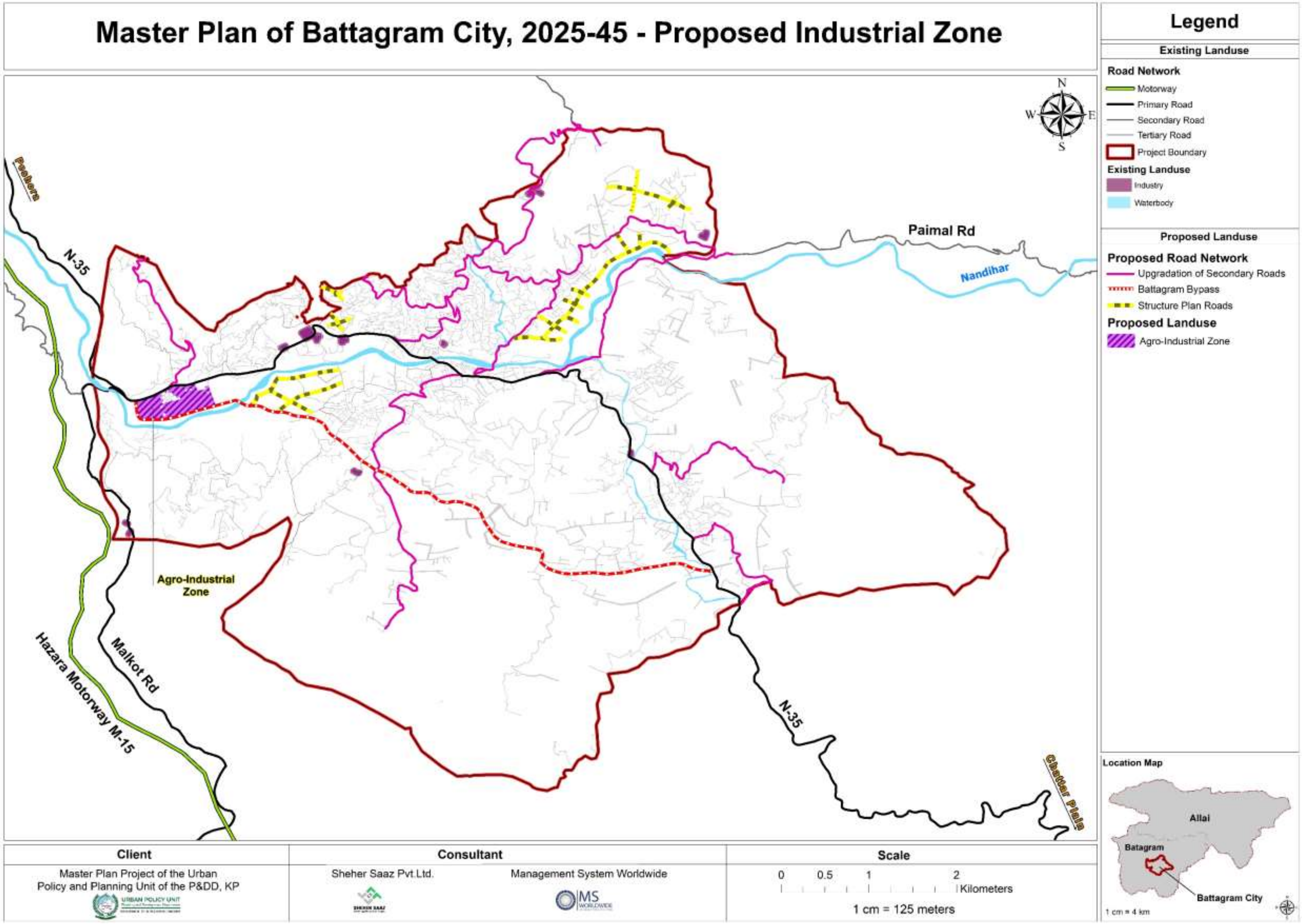
All prohibited uses shall not be allowed within the Agro-Industrial Zone under any circumstances. In addition, any use likely to generate hazardous emissions, excessive heavy traffic, environmental pollution, major noise nuisance, or serious incompatibility with nearby residential, commercial, agricultural, or environmentally sensitive land shall be treated as prohibited unless specifically cleared under provincial environmental and planning laws.

9.3 Tourism Economy Proposals

Battagram's tourism economy is not based on a large urban destination but on its role as a transit, service, and support center along the Karakoram Highway and routes leading toward scenic and upland areas. The city is used by travelers, transport operators, and short-stay visitors moving toward upper mountain regions and surrounding valleys. As a result, tourism-related activity in Battagram is expressed mainly through hotels, roadside restaurants, fuel stations, local retail, repair services, and stopover facilities rather than through a specialized tourism district.

The tourism economy proposal for Battagram should therefore focus on strengthening the city as a gateway and visitor-support center rather than attempting to develop it as a stand-alone destination of large tourism intensity. This means improving the quality of short-stay facilities, supporting food and hospitality services in appropriate commercial areas, organizing roadside visitor services more effectively, and integrating tourism-support functions into the broader commercial structure of the city. Selected areas along the main movement corridor and within the central service belt are appropriate for tourism-oriented uses such as family restaurants, guest houses, local craft outlets, scenic stop points, and visitor assistance functions.

Battagram also has potential to benefit from cultural and local-identity tourism, especially where public projects such as the proposed art gallery, craft-related activities, and cultural facilities can strengthen the city's visitor profile. In addition, improved roadside management, safer pull-off points, better signage, organized commercial frontage, and cleaner public spaces would make the city more attractive to passing travelers and support local income generation. Tourism-support uses in Battagram should therefore be promoted as part of an integrated urban economy strategy based on transit services, cultural identity, and local hospitality rather than on resort-style tourism development.



Map 19: Proposed Industrial Zones

10 CHAPTER: SOCIAL INFRASTRUCTURE

10.1 Health Facilities

Historically, the healthcare system in Pakistan evolved from the British colonial administrative framework, which established a structured public health service primarily focused on preventive and curative care. Following independence, this system expanded to include both public and private sector participation, providing healthcare services at primary, secondary, and tertiary levels. Over time, the healthcare delivery mechanism has adapted to demographic growth, urbanization, and changing disease patterns.

A tier-based healthcare system operates across the country, particularly in the public sector, ensuring progressive levels of care and referral. Primary healthcare facilities such as Basic Health Units (BHUs), Rural Health Centers (RHCs), Government Rural Dispensaries (GRDs), Mother and Child Health (MCH) centers, and tuberculosis (TB) centers serve as the first point of contact, especially for preventive care and basic treatment. Secondary healthcare services are delivered through Tehsil Headquarters (THQ) and District Headquarters (DHQ) hospitals, while tertiary healthcare is provided through teaching and specialized hospitals, largely concentrated in major urban centers.

A major institutional shift occurred following the 18th Constitutional Amendment in 2010, which devolved legislative and executive authority for the health sector from the federal government to the provincial governments. This transition strengthened provincial autonomy in planning, financing, and managing healthcare services, while maintaining a mixed public–private healthcare model. Despite increasing private sector involvement, public sector institutions remain the backbone of preventive healthcare provision, particularly for low-income and vulnerable populations.

3.1.65.Existing Facilities and Situational Analysis

The health infrastructure in Battagram reflects a mixed service delivery model, combining limited public-sector facilities with a growing number of private hospitals, clinics, and diagnostic centers. Based on the compiled land use inventory and secondary data, the district's formal public health system remains relatively small, consisting mainly of the District Headquarters (DHQ) Hospital Battagram, DHQ Emergency facility, and one Basic Health Unit (BHU) located at Arghashori Colony. No Community Dispensaries (CDs) or Maternal and Child Health (MCH) centers were identified within the study area, indicating significant gaps in primary healthcare and specialized maternal services at the neighborhood level.

The private health sector has expanded considerably to compensate for the limited public healthcare capacity. A total of 22 private hospitals/clinics and 1 diagnostic laboratory are identified, including facilities such as Rizwan General & Surgical Hospital, Rabia Hospital, Haris General Hospital, Faizan Medical Complex, Azaan General Hospital, Rabeea Surgical Hospital, Zain Surgical Hospital, Zeeshan Hospital, Al Raheem Surgical Hospital, Gul Khan Hospital, and Shifa Hospital. In addition, several medical stores and diagnostic centers, such as IDC Lab & Diagnostic Centre Battagram and Niazi Medical Store, contribute to basic healthcare access but do not fully substitute for comprehensive clinical services.

The dominance of private healthcare indicates a reliance on market-based service provision, which can improve accessibility but may also increase cost burdens on residents, particularly for low-income households. The absence of adequate government-run primary and preventive healthcare facilities places additional pressure on the DHQ Hospital, which serves as the main referral and emergency center for the district and surrounding rural areas.

Spatially, most health facilities are concentrated within the urban core and along major road corridors, leaving peripheral settlements and expanding residential areas with limited access to immediate healthcare services. This imbalance results in longer travel times for routine care and increases dependence on informal healthcare providers in remote areas.

Table 58: Existing Health Facilities in Battagram

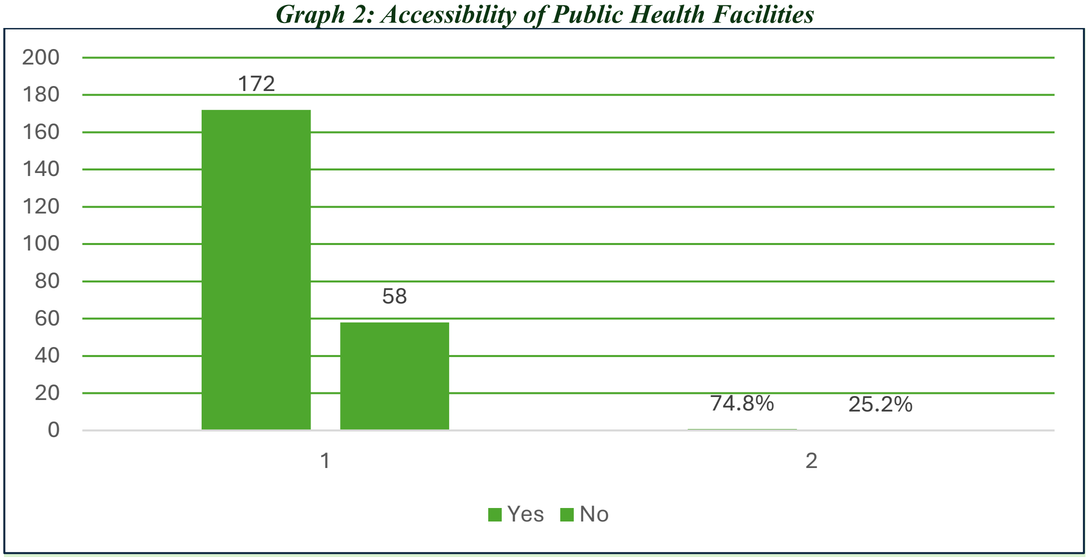
Type	CD	BHU	MCH	Hospital/DHQ	Lab
Government		1	0	1	-
Private				22	1

Source: Devised by the Consultant

In terms of spatial distribution, health facilities occupy a relatively small proportion of the urban area. Government hospitals cover approximately 2.81 acres (0.038%), while private healthcare uses account for approximately 3.73 acres (0.04%) of the total study area. The limited land allocation highlights spatial constraints and indicates that healthcare infrastructure has not expanded proportionately with population growth or service demand.

During the primary field survey in Battagram, the survey revealed that 74.8% of respondents reported having access to public health facilities, while 25.2% indicated that such access is limited or unavailable. This suggests that although a majority of residents can reach healthcare services, a significant portion of the population still faces barriers, likely due to factors such as distance, transportation challenges, or the limited availability of facilities. Addressing these gaps is essential to ensure equitable healthcare access and to improve health outcomes for all segments of the community, especially for vulnerable groups who may experience additional mobility or financial constraints.

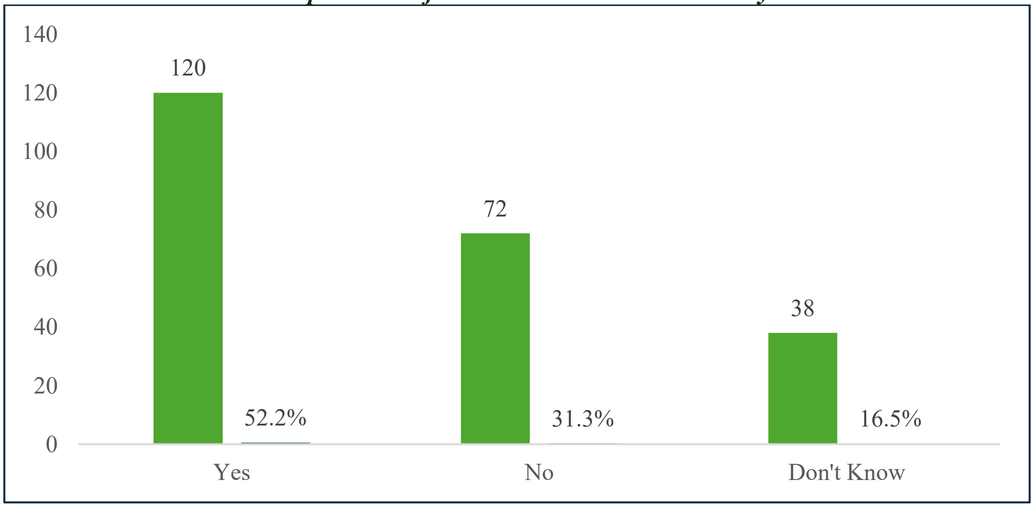
Graph 2: Accessibility of Public Health Facilities



Source: Primary Data collected from field survey

The primary survey in Battagram revealed that just over half of the respondents (52.2%) expressed satisfaction, indicating a generally positive perception among the majority. Meanwhile, 31.3% of respondents reported dissatisfaction, and 16.5% were uncertain or did not know, highlighting that a significant portion of the population either faces challenges or is unsure about the services or conditions being evaluated. These findings suggest that while satisfaction is slightly above average, there is still room for improvement to address concerns and enhance confidence among all community members.

Graph 3: Satisfaction with the Health Facility



Source: Primary Data collected from field survey

The primary survey in Battagram revealed that a large majority of respondents (81.2%) reported the availability of maternity services, indicating that most residents have access to essential maternal healthcare. However, 18.8% of respondents indicated that such services were not available, highlighting gaps in coverage that could affect maternal and child health outcomes. Ensuring consistent access to maternity care across all areas remains important to improve health services and support safe pregnancies and deliveries.

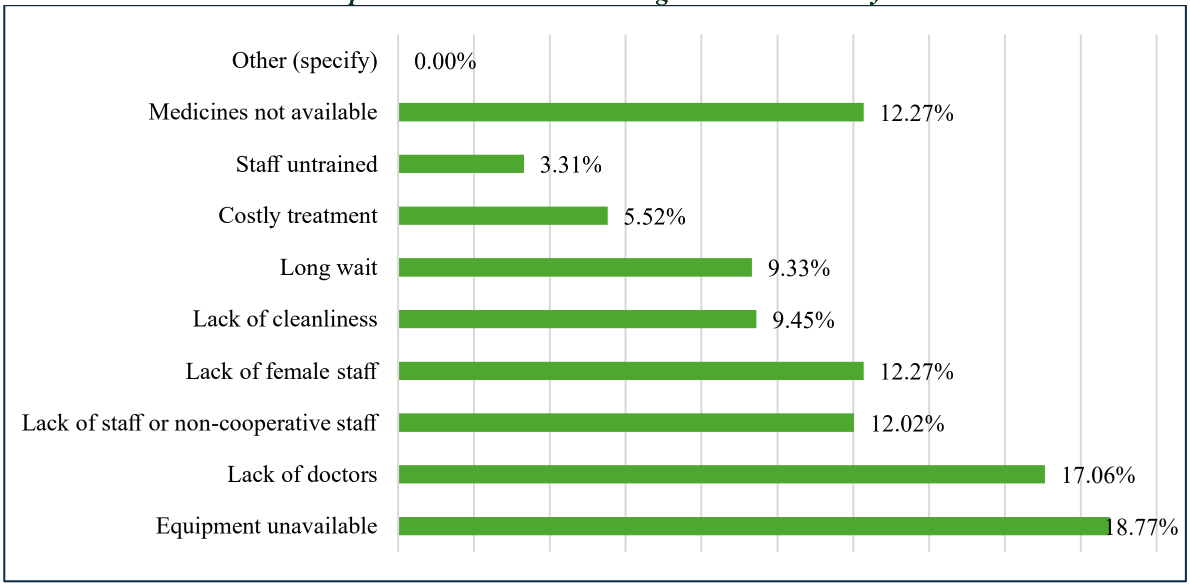
Table 59: Availability of Maternity Services

Availability of Maternity Services		
Yes	186	81.2%
No	43	18.8%
Total	229	100%

Source: Primary Data collected from field survey

In Battagram, several challenges affect access to health facilities. The most common issues include unavailability of equipment (18.8%) and a lack of doctors (17.1%), indicating critical gaps in service provision. Other significant problems are lack of female staff (12.3%), unavailability of medicines (12.3%), and insufficient or non-cooperative staff (12.0%), highlighting operational and staffing limitations. Additional concerns include poor cleanliness (9.5%), long waiting times (9.3%), and costly treatment (5.5%), while untrained staff (3.3%) was less frequently reported. These findings emphasize the need for improvements in staffing, equipment, medicine availability, and facility management to enhance healthcare access and quality.

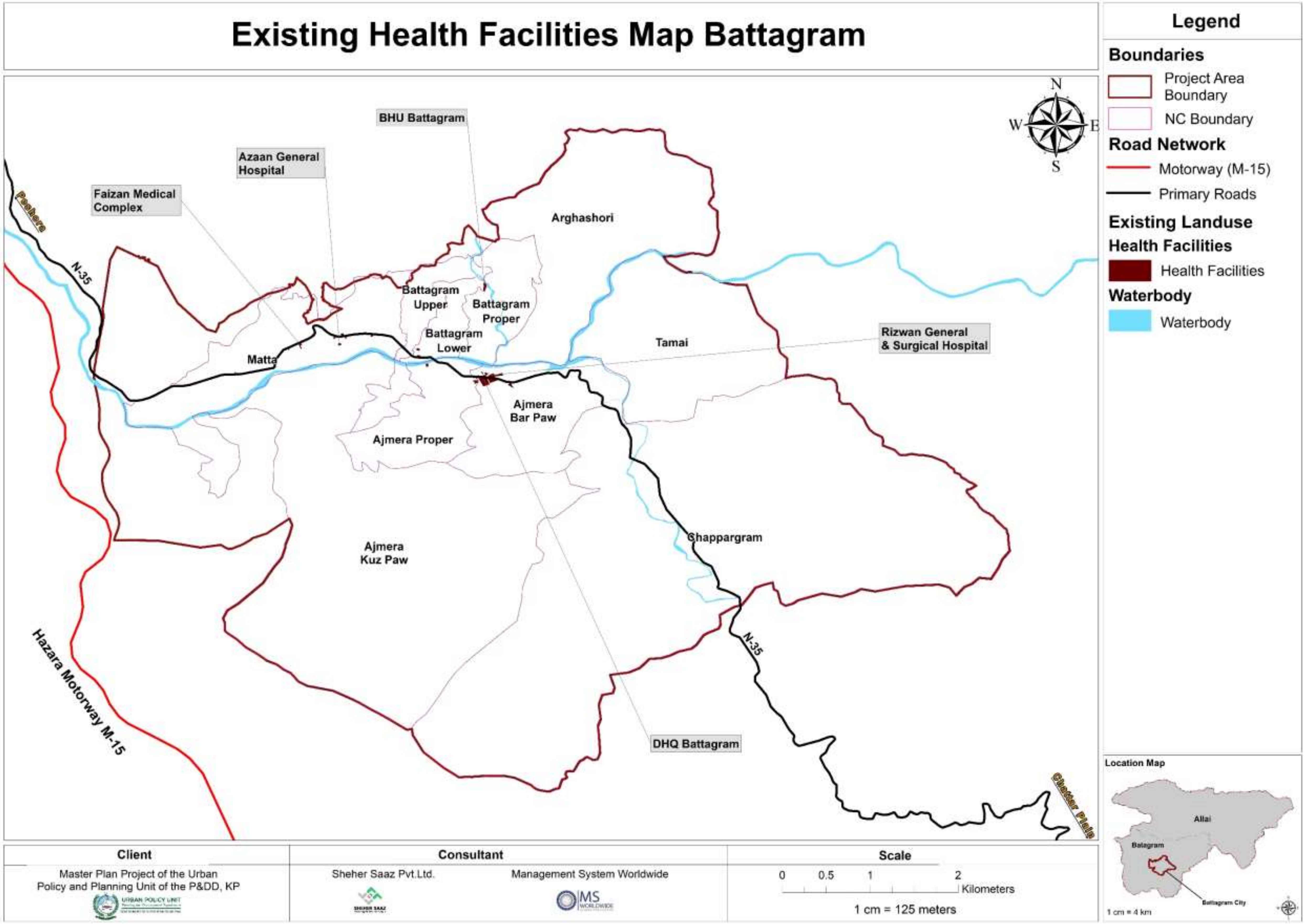
Graph 4: Problems while visiting the Health Facility



Source: Primary Data collected from field survey

Overall, Battagram's healthcare system reflects a primary-care dominated structure, with strong reliance on government facilities and limited private-sector participation. While basic healthcare access is available, the absence of specialized diagnostic facilities, tertiary hospitals, and diversified private healthcare investment creates pressure on existing services and increases dependency on regional urban centres for advanced medical treatment.

Map 20: Existing Healthcare Facilities – Battagram



3.1.66.National and International Standards

i. National Standards

3.1.66.1. National reference manual (NRM)

Health facility standards in Pakistan are based on population thresholds to ensure equitable and efficient healthcare service delivery across all regions. A Basic Health Unit (BHU) is recommended for every 10,000 people, functioning as the primary level of care for outpatient treatment, maternal and child health services, and preventive care. For more comprehensive services, a Rural Health Centre (RHC) is required for every 73,000 people, offering minor surgical procedures, inpatient care, and diagnostic support.

While dispensaries do not follow a defined population standard, they are typically established in remote or underserved areas to provide basic outpatient care. At the secondary level, one District Headquarters Hospital (DHQ) is required per district. At the same time, a Tehsil Headquarters Hospital (THQ) is established in each tehsil to serve as a referral point for BHUs and RHCs, delivering specialized care. General Hospitals are located in major urban areas, offering tertiary-level care and a broad range of specialist services. These standards serve as a guideline for identifying service delivery gaps and planning new health infrastructure to meet the needs of both rural and urban populations.

Table 60: Requirement for New Health Institute in the District

Type of Health Facility	Standard
Basic Health Unit (BHU)	1 BHU for 10,000 people
Rural Health Centre (RHC)	1 for 73,000 people
Dispensary	1 for 15,000
District Headquarters Hospital (DHQ)	1 per district
Tehsil Headquarters Hospital (THQ)	1 per tehsil (1 hospital for 0.5 to 1 million people)
General Hospital	In Large Cities
Hospital Beds	3 for 1000 people

Source: National Reference Manual of Planning and Infrastructure Standards (NRM)

3.1.66.2. Khyber Pakhtunkhwa Health Facility Planning Framework

As per the Kp policies, the establishment of a Basic Health Unit (BHU) is planned to serve a catchment population of 15,000–20,000 in urban areas and 10,000–15,000 in rural areas, within a 7–10 km service radius. Each BHU requires 10.75 kanals of land, along with basic infrastructure including road access, electricity, and water supply. The facility should be located 7–10 km away from another BHU or higher-level health facility, and the availability of basic educational facilities in the area is considered supportive.

For up-gradation of a BHU to a Rural Health Center (RHC), the proposed catchment population increases to 45,000–60,000, with a wider service area of 25–35 km. The up-gradation requires 10.75 kanals of additional adjacent land, a minimum OPD load of 50–60 patients per day, and access via a metallic road, along with reliable electricity and water supply. The presence of at least one college or higher secondary school and a post office is desirable, while the upgraded RHC should be located 25–35 km from the nearest RHC or Civil Hospital to ensure balanced healthcare coverage.

Table 61: Proposed Criteria for Establishment of BHU and Up-gradation to RHC[34]

Sr. No.	Criteria	BHU Establishment Standards	BHU Up-gradation to RHC Standards
1	Catchment Population	Urban: 15,000 – 20,000 Rural: 10,000 – 15,000	45,000 – 60,000
2	Catchment Area	7 – 10 km radius	25 – 35 km radius
3	Land Availability	10.75 Kanals	10.75 Kanals (adjacent to existing BHU)
4	Road Access	Road access required	Metallic road required
5	Electricity & Water	Required	Required
6	OPD Load	Not applicable	Minimum 50–60 patients/day per BHU
7	Distance from Nearest Health Facility	7 – 10 km from another BHU or higher-level facility	25 – 35 km from nearest RHC or Civil Hospital

The proposal has been prepared using National Reference Manual (NRM) standards, given that a detailed assessment of existing health facilities was not feasible at this stage. It is therefore recommended that a comprehensive evaluation of current BHUs including population coverage, service demand, land availability, and infrastructure be undertaken. Based on this evaluation, BHU up-gradation to RHCs should follow the outlined criteria, ensuring that facilities meet the required population thresholds, service radius, OPD load, and access to utilities, thereby supporting effective and balanced healthcare service delivery.

- **Primary Healthcare Facilities in Khyber Pakhtunkhwa**

Healthcare services in Khyber Pakhtunkhwa are delivered through a tiered system of facilities to ensure comprehensive coverage and accessibility. **Basic Health Units (BHUs) and dispensaries** serve as the first point of contact, primarily catering to populations of 15,000–20,000, offering essential primary healthcare including maternal and child care, immunization, and common ailment management. **24/7 BHUs and MCH centres** provide round-the-clock services, including delivery care, for a larger catchment of 30,000–40,000 people. **Rural**

[34] Source: Secondary Data collected from Education Department

Health Centres (RHCs) serve 40,000–60,000 or more, offering a broader range of services including emergency care, minor surgical procedures, inpatient care, and support to linked BHUs. At the higher level, **first level hospitals** provide specialist consultations, diagnostic services, and hospital admissions on referral from primary care, ensuring continuity and equity of healthcare delivery. This tiered system is structured to maintain service accessibility, operational efficiency, and effective referral linkages across the province.

Table 62: Healthcare Facility Types and Services – Khyber Pakhtunkhwa[35]

Facility Type	Population Served / Catchment	Operating Hours	Key Services & Functions	
Basic Health Unit (BHU) / Civil Dispensary / General Practitioner Clinic	~15,000–20,000 (per Union Council/Ward)	8 hours / 6 days a week	Maternal & child care (static & outreach) Immunization- Family planning- Management of diarrhoea, pneumonia, common ailments Control of communicable diseases Health education- Management & logistic support to LHWs & community-based providers	Dispensaries are older type facilities mainly in urban areas; BHUs are primarily rural; first formal point of contact for primary healthcare
24/7 BHU / MCH Centre / Medical Centre	30,000–40,000	24/7	Expanded primary healthcare services- Round-the-clock delivery services- Maternal & child health- Requires adequate infrastructure, human resources, equipment & supplies	Upgradation of BHUs for 24/7 delivery care is being implemented in Khyber Pakhtunkhwa; MCH centres and private clinics also provide 24/7 services
Rural Health Centre (RHC) / Health Centre / Nursing Home	40,000–60,000 or more	24/7	Comprehensive primary healthcare Basic inpatient care (20 beds)- BEmONC services Emergency management (injuries, accidents) Selected minor surgical procedures (stitching, abscess drainage, circumcision) First aid & referral services	Typically links 5–8 BHUs for referral; private sector equivalents exist in urban areas; ambulance services under Rescue 1122

[35] Essential Package of Health Services with localized evidence/ UHC Benefit Package of Khyber Pakhtunkhwa, Health Department, Khyber Pakhtunkhwa, 2022

Facility Type	Population Served / Catchment	Operating Hours	Key Services & Functions	
			Clinical, logistical, managerial support to linked BHUs, LHWs, MCH Centres, Dispensaries- Laboratory & X-ray services- Medico-legal, basic surgical, dental, ambulance services	
First Level Hospital	Intermediate care on referral from primary care	24/7	Specialist consultation- Hospital admissions- Technical, therapeutic, diagnostic services- Basic specialist services per standardized categories (A–D)	Previously known as DHQ/THQ hospitals; standardized since 2002 to ensure 1 bed per 2,500 population; infrastructure & equipment upgradation conducted through ADP

Source: National Reference Manual of Planning and Infrastructure Standards (NRM)

3.1.66.3. Comparative Analysis of NRM and KP Health Department Standards

The National Reference Manual (NRM) and the population-based standards of the Khyber Pakhtunkhwa Health Department differ primarily in their approach to healthcare planning and service provision. NRM standards are more conservative and planning-oriented, as they apply lower population thresholds per facility, resulting in higher facility and capacity requirements. In contrast, KP Health Department standards are designed around minimum service delivery needs, allowing higher population thresholds per facility and therefore indicating lower numerical requirements.

For primary healthcare facilities such as Basic Health Units, NRM prescribes one BHU per 10,000 population, while the KP Health Department allows one BHU per 17,500 population. This makes NRM more sensitive to population growth and spatial accessibility, whereas KP standards focus on maintaining essential service coverage. In the case of Rural Health Centres and Maternal and Child Health facilities, both standards broadly align, although KP Health Department standards typically adopt slightly lower population thresholds, emphasizing service delivery efficiency rather than long-term capacity expansion.

Dispensaries show minor variation between the two frameworks, with NRM generally recommending a higher number of facilities due to stricter population ratios, while KP standards permit fewer units without compromising basic outpatient coverage. At the hospital level, NRM defines clear population thresholds for major hospitals, whereas KP Health

Department standards rely more on administrative and functional considerations rather than fixed population criteria.

A significant distinction is observed in hospital bed standards, where NRM recommends a substantially higher bed-to-population ratio, reflecting future demand, service intensity, and emergency preparedness. KP Health Department standards, on the other hand, prescribe lower bed ratios that represent minimum operational requirements. Overall, NRM standards are more suitable for long-term spatial planning and infrastructure forecasting, while KP Health Department standards are more appropriate for assessing immediate service adequacy and operational planning.

Table 63: Comparison of NRM and Khyber Pakhtunkhwa Health Department Standard

Health Facility Type	NRM Population Standard	Khyber Pakhtunkhwa Health Department Standard
Basic Health Unit (BHU)	1 BHU per 10,000 population	1 BHU per 17,500 population
Rural Health Centre (RHC)	1 RHC per 73,000 population	1 RHC per 50,000 population
Maternal & Child Health (MCH) Facility	1 MCH per 73,000 population	1 MCH per 50,000 population
Dispensary	1 Dispensary per 15,000 population	1 Dispensary per 17,500 population
DHQ / Public Hospital	1 Hospital per 0.5 – 1.0 million population	No fixed population-based standard
Hospital Beds	3 beds per 1,000 population	1 bed per 2,500 population

Source: National Reference Manual of Planning and Infrastructure Standards (NRM) and Khyber Pakhtunkhwa Health Department Standard

ii. International Standards

Health facility planning is a core component of health system design. International best practices rooted in the WHO Alma-Ata Declaration (1978), the Astana Declaration (2018), and the Sustainable Development Goals (SDG 3) provide a tiered, population-based approach to health infrastructure. The fundamental principle is that every person, regardless of geography or income, should have timely access to the appropriate level of care.

WHO's Universal Standard: 2-Hour Travel Time[36]

The World Health Organization (WHO) sets a 2-hour travel time as the universal benchmark for access to quality healthcare services. This underpins Universal Health Coverage (UHC) goals. At the primary care level, the standard tightens further, WHO recommends primary healthcare within a 5 km radius (~30-minute walk) for rural populations.

[36] World Bank, World Development Indicators: Hospital Beds per 1,000 People. https://data.worldbank.org/indicator/SH.MED.BEDS.ZS

3.1.66.4. Facility Types, Population Norms & Accessibility

Comparison with WHO and India IPHS 2022[37] standards indicates that District Battagram faces significant gaps in healthcare coverage and accessibility. International norms require higher facility density at the primary level (1 per 3,000–5,000 population) and defined travel thresholds (≤5 km), whereas planned BHU provision in the district remains comparatively lower.

At the secondary level, the absence of RHCs deviates from global standards that mandate PHC/RHC coverage within 8–10 km, while similar gaps exist for THQ-level facilities serving larger population clusters. Additionally, hospital bed provision in Battagram remains substantially below international benchmarks, limiting inpatient and specialized care capacity.

Table 64: International Examples of Health facilities based on population

Facility Level	WHO / Global Norm	India IPHS 2022 (Plains)[38]	India IPHS 2022 (Hilly/Tribal)	Min Beds	Accessibility Standard
Sub-Centre / Dispensary / BHU	1 per 5,000 pop. (plain) 1 per 3,000 pop. (remote)	1 per 5,000 (plain)	1 per 3,000 (hill/tribal)	0–2 (OPD only)	≤ 5 km / 30 min walk
Primary Health Centre (PHC) / RHC	1 per 10,000–30,000	1 per 30,000 (plain)	1 per 20,000 (hill)	4–10 beds	≤ 8–10 km / ≤ 1 hr
Community Health Centre / THQ Hospital	1 per 80,000–1,20,000	1 per 1,00,000–1,20,000	1 per 80,000	30 beds (min)	≤ 30 km / ≤ 2 hrs
District Hospital (DHQ)	1 per 2,50,000–5,00,000	1 per district (approx. 5–15 lakh)	1 per district	100–500 beds	≤ 50 km / ≤ 2–3 hrs
General / Sub-Divisional Hospital	1 per 5–10 lakh	1 per sub-district	1 per sub-district	50–200 beds	≤ 50–80 km
Teaching / Tertiary Hospital	1 per 2.5–5 million	State / Regional level	State level	500–1000+ beds	≤ 100–200 km

3.1.66.5. Hospital Beds & Health Resources

A comparison with OECD and high-income country benchmarks highlights significant disparities in healthcare capacity and resource allocation. The OECD average stands at 4.2 beds per 1,000 population, with 3.9 doctors and 9.2 nurses per 1,000, serving as a baseline for well-

[37] Government of India, Ministry of Health & Family Welfare, Indian Public Health Standards (IPHS) 2022, Volume I: Sub-District and District Hospital. New Delhi, April 2022. Available: https://iphs.mohfw.gov.in/

[38] Government of India, MOHFW, IPHS 2022, Volume II: Community Health Centre. https://nhm.gov.in/images/pdf/guidelines/iphs/iphs-revised-guidlines-2022/02-CHC_IPHS_Guidelines-2022.pdf

functioning health systems. Countries such as Japan and South Korea demonstrate high bed densities (12.4–12.5 per 1,000), reflecting strong inpatient capacity, while European systems like Germany and Switzerland emphasize balanced care models with high physician and nursing availability alongside robust primary care access[39].

In contrast, systems like the United Kingdom and Canada operate with lower bed densities (2.5 per 1,000) but compensate through strong primary care gatekeeping and universal coverage. Health expenditure also varies significantly, ranging from approx. 9% to 16.9% of GDP, indicating that higher investment generally correlates with better service coverage and accessibility.

Relative to these benchmarks, District Battagram's projected standards even under NRM (3 beds per 1,000) only approach the lower spectrum of developed systems, while current conditions remain far below international averages. Additionally, the absence of adequate primary care networks and human resource benchmarks (doctors and nurses per population) further widens the gap. Overall, the comparison highlights the need to strengthen both infrastructure capacity and workforce availability to move toward internationally aligned healthcare provision.

Table 65: International Hospital Beds & Health Resources Standards

Country	Beds/1,000 pop.	Doctors/1,000	Nurses/1,000	Health Spend
Japan	12.5	2.6	12.2	10.6% of GDP
Germany	7.8	4.5	14.0	12.7% of GDP
South Korea	12.4	2.8	8.8	9.7% of GDP
Switzerland	4.4	4.4	17.0	11.7% of GDP
France	5.7	3.2	12.4	12.1% of GDP
Australia	3.8	4.1	12.7	10.0% of GDP
United Kingdom	2.5	3.0	8.7	10.2% of GDP
Canada	2.5	2.8	10.1	12.8% of GDP
United States	2.8	3.7	10.5	16.9% of GDP
OECD Average	4.2	3.9	9.2	9.3% of GDP

Source: WHO, OECD Health at a Glance 2025[40], India IPHS 2022,[41] NHS England, European Observatory on Health System [42]

3.1.67. Accessibility of Health Facilities

To assess the spatial accessibility of existing health facilities in Battagram City, standardized service catchments were applied using GIS-based buffer analysis. Two access thresholds were adopted: a 1 km walking buffer and a 5 km driving buffer, representing reasonable and

[39] Jones RP (2024). A New Approach for Understanding International Hospital Bed Numbers. International Journal of Environmental Research and Public Health, 21(8), 1035. DOI: 10.3390/ijerph21081035
[40] OECD, Health at a Glance 2025 (November 2025). https://www.oecd.org/en/publications/2025/11/health-at-a-glance-2025_a894f72e.html
[41] IPHS India, Part A1: Guidelines for Sub-Centres. https://healthfacilityguidelines.com/india-v1.2/part_a1_sub_centres.pdf
[42] WHO Global Health Observatory, Hospital Beds per 10,000 Population Indicator Registry. https://www.who.int/data/gho/indicator-metadata-registry/imr-details/97

commonly accepted distances for accessing primary and secondary healthcare services in urban contexts.

A 1 km walking distance, equivalent to approximately 10–15 minutes on foot, was considered an appropriate threshold for basic healthcare access. This threshold is particularly relevant for vulnerable population groups, including children, elderly persons, women, and patients with limited mobility, for whom longer walking distances may pose physical and time-related constraints. Given Battagram's mixed topography, compact urban form, and localized street networks, walking-based accessibility remains a critical indicator of equitable service provision.

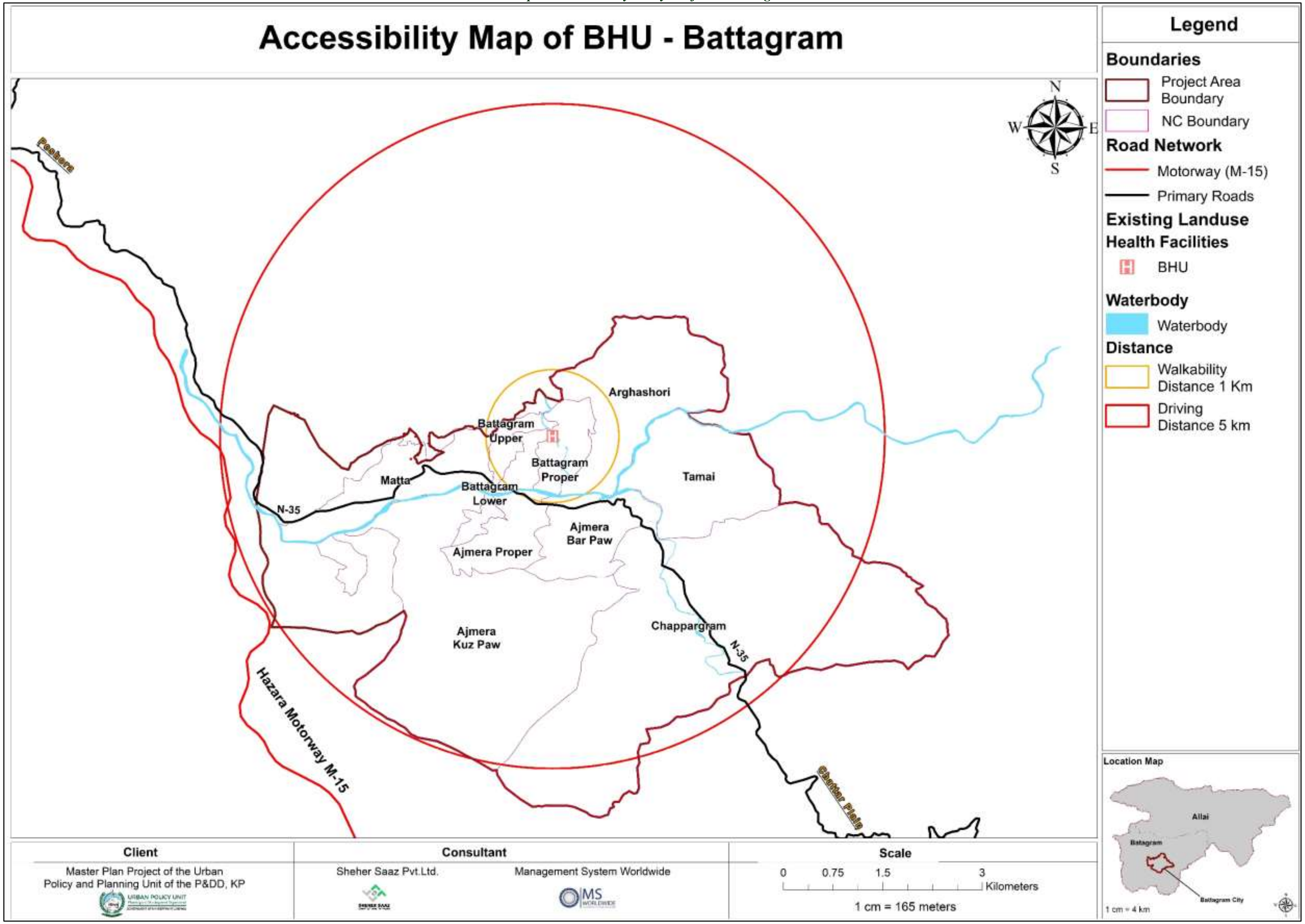
A 5 km driving catchment was applied to reflect motorized access to healthcare facilities. This distance typically corresponds to a short vehicle trip for routine outpatient visits and is widely used in accessibility assessments to represent acceptable travel time, cost, and convenience when private or public transport is available. Driving-based accessibility therefore captures city-wide service coverage beyond immediate neighborhood-level access.

Accessibility of Basic Health Units (BHUs)

The accessibility assessment for primary healthcare services in Battagram indicates that pedestrian-level accessibility is limited but strategically concentrated within the core urban neighborhoods. The existing Basic Health Unit (BHU) provides walking-distance coverage (1 km radius) primarily to Battagram Proper, Upper Battagram, and Lower Battagram Neighborhood Councils, reflecting localized pockets of adequate pedestrian access within the central urban settlement. However, this walking catchment remains confined to the immediate built-up area, leaving peripheral settlements and newly expanding residential zones beyond a comfortable walking distance to primary healthcare facilities.

When analyzed under a 5 km motorized accessibility buffer, the existing BHU network demonstrates full coverage of the Battagram urban study area, indicating that residents can generally reach BHU-level healthcare services through vehicular transport. While this suggests that motorized accessibility is relatively adequate at the city scale, the disparity between walking and driving accessibility highlights a critical planning concern. Communities without private vehicles or reliable public transport—particularly low-income households, women, children, and elderly residents—face reduced physical access to essential primary healthcare services.

Map 21: Accessibility Analysis of BHU Battagram



3.1.68. Existing Gap Analysis

The gap analysis for healthcare infrastructure in Battagram shows a substantial deficiency in existing medical facilities when compared with both the National Reference Manual (NRM) standards and the standards prescribed by the Khyber Pakhtunkhwa (KP) Health Department. The assessment highlights that the current healthcare system is insufficient to cater to both the existing and projected future population, thereby necessitating significant investment in healthcare infrastructure expansion over the planning period up to 2045.

According to the ***NRM standards***, Battagram presently has only one Basic Health Unit (BHU), while no Rural Health Centers (RHCs), Maternal and Child Health (MCH) centers, dispensaries, or adequate hospital bed facilities exist in proportion to the current population demand. For the projected population of 173,148 in 2025, the district requires 17 BHUs, resulting in an immediate gap of 16 BHUs. Similarly, the existing population requires 2 RHCs and 2 MCH centers, both of which are entirely absent, creating a full-service gap. The requirement for dispensaries stands at 12 facilities, indicating a gap of 12 dispensaries due to the absence of such facilities. Hospital bed demand is estimated at 519 beds in 2025, whereas the existing provision is negligible, resulting in a deficit of 519 beds.

By 2045, with the population projected to increase to 273,271 persons, healthcare demand is expected to intensify further. Under NRM standards, the future incremental requirement generated by population growth between 2025 and 2045 includes an additional 10 BHUs, 1 RHC, 1 MCH center, 7 dispensaries, and 300 hospital beds. Consequently, the total requirement by 2045, including both the current gap and future demand, will reach 26 BHUs, 4 RHCs, 4 MCH centers, 18 dispensaries, and 820 hospital beds. These figures demonstrate the magnitude of healthcare infrastructure expansion needed to achieve compliance with national planning standards.

The analysis based on ***KP Health Department*** standards also indicates considerable service deficiencies, although the overall requirements are comparatively lower due to broader population thresholds for facility provision. Under the KP standards, the current population in 2025 requires 10 BHUs, resulting in a gap of 9 BHUs against the existing single facility. Similarly, 3 RHCs and 3 MCH centers are required, yet none currently exist, creating complete service deficits in both categories. The requirement for dispensaries is estimated at 10 facilities, producing a gap of 10 dispensaries. Hospital bed demand stands at 202 beds in 2025, all of which represent unmet need.

For the projected 2045 population, the additional healthcare demand under KP standards includes 10 more BHUs, 3 RHCs, 3 MCH centers, 10 dispensaries, and 205 hospital beds. Accordingly, the cumulative requirement by 2045 will increase to 18 BHUs, 7 RHCs, 7 MCH centers, 19 dispensaries, and 407 hospital beds. Although these projections are lower than those calculated under NRM standards, they still indicate a severe shortfall in healthcare infrastructure and service accessibility within Battagram.

Table 66: Gap Analysis and Future Requirement as per NRM Standards

Facility Type	Existing facilities	Pop 2025	Pop 2045	Increase in Population 2045-2025	NRM Standards				
					Existing Requirement 2025	*Gap*	*Future Requirement 2045*	*Total Requirement (Gap+Future)*	*Population Based Standards*
BHU	1	173148	273,271	100,123	17	16	10	26	10,000
RHC	0				2	2	1	4	73,000
MCH	0				2	2	1	4	73,000
Dispensary	0				12	12	7	18	15,000
Beds					519	519	300	820	3 for 1000 people

Source: National Reference Manual of Planning and Infrastructure Standards (NRM)

Table 67: Gap Analysis and Future Requirement as per Kp Standards

Facility Type	Existing facilities	Pop 2025	Pop 2045	Increase in Population 2045-2025	Health Department Standards, KP				
					Existing Requirement 2025	*Gap*	*Future Requirement 2045*	*Total Requirement (Gap+Future)*	*KP Health Standards*
BHU	1	173148	273,271	100,123	10	9	10	18	17,500
RHC	0				3	3	3	7	50,000
MCH	0				3	3	3	7	50,000
Dispensary	0				10	10	10	19	17,500
Beds					202	202	205	407	1 per 2,500

Source: Khyber Pakhtunkhwa Health Department Standard

3.1.69. Future Requirement (2025-2045)

The future projected healthcare demand for Battagram has been assessed using two benchmark frameworks: the National Reference Manual (NRM) of Planning and Infrastructure Standards and the standards prescribed by the Khyber Pakhtunkhwa (KP) Health Department. The analysis indicates a substantial increase in healthcare infrastructure requirements in response to the projected population growth from 173,148 persons in 2025 to 273,271 persons by 2045.

3.1.69.1. National Reference Manual (NRM) Standards

According to the NRM standards, healthcare provision is based on one Basic Health Unit (BHU) for every 10,000 population, one MCH/RHC facility for every 73,000 population, one dispensary for every 15,000 population, and three hospital beds per 1,000 persons. Under these standards, the requirement for BHUs is projected to increase from 17 units in 2025 to 27 units by 2045, while MCH/RHC facilities will rise from 2 to 4 units during the same period. Similarly, dispensary requirements are expected to increase from 12 to 18 facilities, whereas bed requirements will expand significantly from 519 beds in 2025 to 820 beds in 2045.

Overall, the cumulative requirement calculated under NRM standards amounts to 110 BHUs, 15 MCH/RHC facilities, 74 dispensaries, and 3,312 hospital beds over the planning horizon. These projections reflect the need for a substantial expansion of healthcare infrastructure to maintain adequate service coverage in line with national planning benchmarks.

3.1.69.2. KP Health Department Standards

Under the KP Health Department standards, the facility thresholds are comparatively different, with one BHU and one dispensary required for every 17,500 population, one RHC/MCH facility for every 50,000 population, and one hospital bed for every 2,500 persons. Based on these standards, the demand for BHUs in Battagram is projected to increase from 10 units in 2025 to 16 units by 2045.

MCH/RHC facilities are expected to rise from 3 to 5 units, while dispensary requirements will similarly increase from 10 to 16 facilities. Bed requirements under the KP standards are comparatively lower, increasing from 208 beds in 2025 to 328 beds by 2045. Cumulatively, the projected requirement under KP standards is estimated at 63 BHUs, 22 MCH/RHC facilities, 63 dispensaries, and 1,325 hospital beds during the planning period.

Table 68: Future Requirement (Year-wise) as per NRM Standards

Year	Population	Increase in Population	Basic Health Unit (BHU)	MCH/RCH	Dispensary	Beds
2025	173,148	-	17	2	12	519
2030	194,715	21,567	19	3	13	584
2035	218,395	23,680	22	3	15	655
2040	244,472	26,077	24	3	16	733
2045	273,271	28,799	27	4	18	820
Total			110	15	74	3312

Source: National Reference Manual of Planning and Infrastructure Standards (NRM)

Table 69: Future Requirement (Year-wise) as per KP Health department

Year	Population	Increase in Population	Basic Health Unit (BHU)	MCH/RCH	Dispensary	Beds
2025	173,148	-	10	3	10	208
2030	194,715	21,567	11	4	11	234
2035	218,395	23,680	12	4	12	262
2040	244,472	26,077	14	5	14	293
2045	273,271	28,799	16	5	16	328
Total			63	22	63	1325

Source: Khyber Pakhtunkhwa Health Department Standard

3.1.70. Proposed Healthcare Zones

The health sector in Battagram requires significant spatial expansion to meet the increasing healthcare demands of the growing population and to improve access to quality medical services across the district. At present, the total area under existing health facilities in 2025 is approximately 6.485 acres, which is insufficient to cater to future population growth and rising healthcare needs. In response, an additional 9.533 acres has been proposed for the expansion and development of healthcare infrastructure. Consequently, the total area allocated for health facilities is projected to reach 16.018 acres by 2045.

The proposed expansion aims to strengthen the overall healthcare system through the provision of improved hospitals, basic health units, rural health centers, emergency services, maternal and child healthcare facilities, and allied medical infrastructure. This increase in area allocation will also support better service coverage in underserved and peripheral areas, reduce pressure on existing facilities, and enhance healthcare accessibility for local communities.

Furthermore, the proposed healthcare development strategy focuses on ensuring equitable distribution of medical facilities, improving disaster and emergency response capacity, and accommodating future demographic growth. The expansion of health infrastructure will play a critical role in improving public health standards, reducing travel time to medical services, and promoting sustainable social development within Battagram District by 2045.

Table 70: Proposed Health Zones/Facilities

Area of Existing Health Facilities 2025 (Acres)	Proposed Area (acres)	Total Area till 2045 (acres)
6.485	9.533	16.018

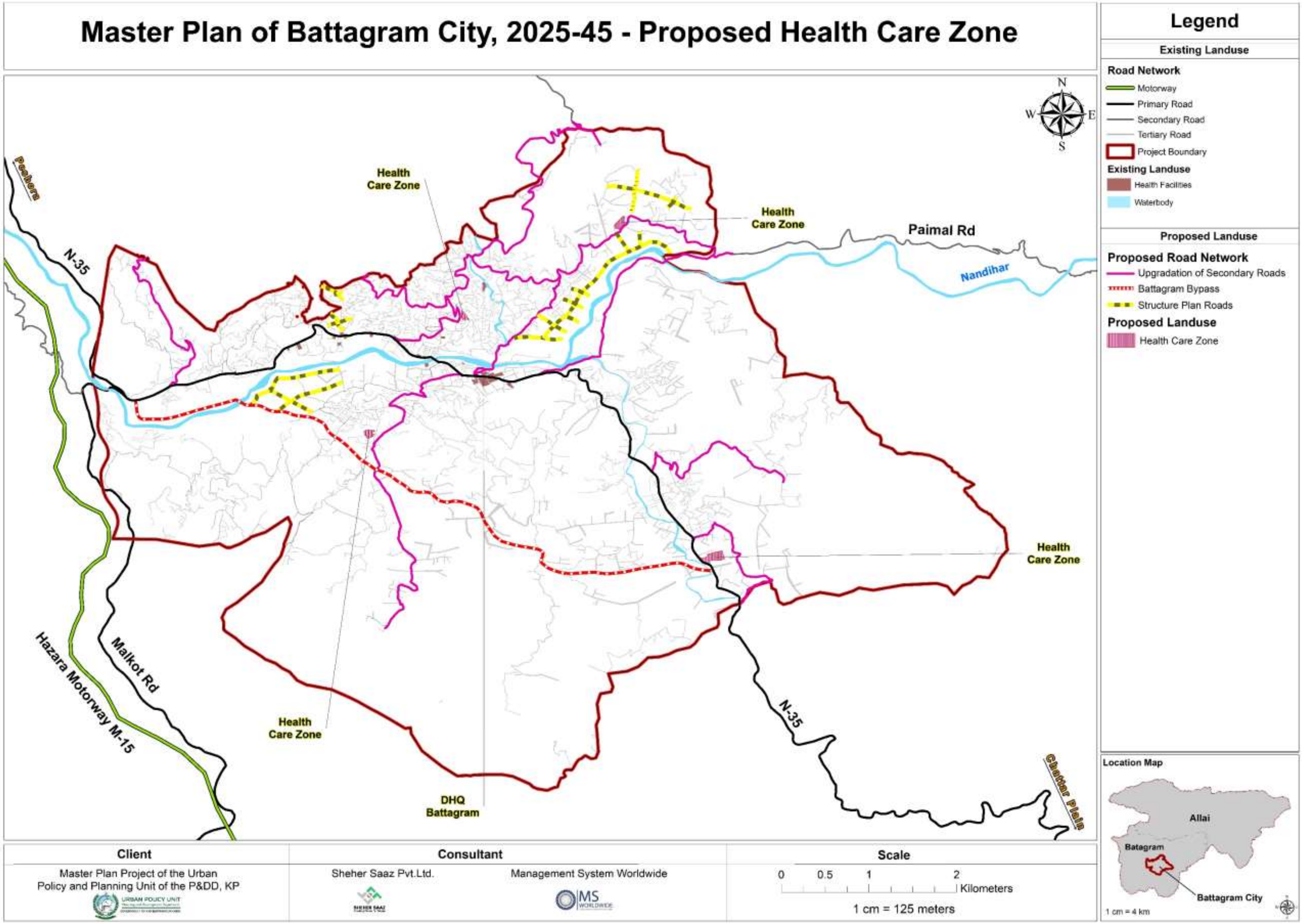
3.1.71. Zoning Regulations for Health Facilities

Table 71: Zoning Regulations for Health Facilities

Permitted Land Uses	Permitted on Appeal
• **Hospitals** • **Burn Units** • **Basic Health Units** • **Teaching Hospital** • **Medical Research Centers** • **Staff Residencies** • **Community facilities** • **Parking lots** • **Urban Forest** • **Religious Place** • **Veterinary Hospital** • **Clinical Laboratory** • **Day care center or Pre schools** • **Support facilities (bus stops, parking lots, civil dispensaries and small green open spaces)**	• Playlands & Amusement Parks • Hostels • Hotels & Restaurants • Banks • Gymnasiums & Clubs • Cinema • Petrol Pumps • Banks

Source: Developed by Consultant

Map 22: Proposed Health Facilities/Zone



10.2 Education Facilities

Education in Pakistan continues to face structural challenges including unequal access, limited funding, and disparities between rural and urban populations. Literacy levels remain modest, while rural and mountainous regions encounter additional barriers due to terrain, poverty, and limited infrastructure. Khyber Pakhtunkhwa reflects national trends but has implemented targeted measures to improve enrolment and accessibility, particularly for girls and remote communities.

Battagram District is predominantly rural and mountainous, resulting in uneven educational distribution between valley settlements and remote upland areas. Battagram City acts as the main educational hub where most public and private institutions are concentrated. Government schools provide foundational education, while private institutions supplement gaps in quality, infrastructure, and specialized programs. Despite a growing institutional presence, higher education and professional training opportunities remain limited, requiring students to travel outside the district for advanced studies.

3.1.72.Existing Facilities in Battagram

Education provision in Battagram City reflects the broader structural challenges faced across Pakistan, particularly in mountainous and semi-urban districts where access, infrastructure, and institutional diversity remain uneven. As the district's primary urban center, Battagram City functions as the main educational hub, concentrating most public and private institutions within its municipal boundaries. Government schools provide the foundation for basic education and ensure geographic coverage at the primary level, while private institutions supplement perceived gaps in quality, infrastructure, and specialized learning environments. Despite gradual expansion in educational services, literacy outcomes and equitable access remain constrained by socio-economic factors, terrain limitations, and limited public investment in higher and technical education.

At the primary level, the strong presence of government schools supports widespread foundational access, complemented by a growing number of private institutions responding to parental demand for improved learning standards. However, a significant institutional decline is observed at the middle and secondary levels, creating a narrowing educational pipeline that contributes to dropout risks and pressure on existing facilities. Gender disparities remain evident, particularly in peri-urban and transitional neighborhoods where cultural and mobility barriers restrict continued enrolment beyond primary grades. Although Battagram City hosts several government colleges, the absence of formally recognized universities underscores a critical gap in tertiary education, forcing students to relocate to regional centers such as Abbottabad or Mansehra for advanced academic opportunities.

Technical and vocational education is present through a limited number of private training institutes offering courses in health sciences, IT, and technical disciplines. While these institutes represent an emerging shift toward skills-based learning and employability, their scale and program diversity remain limited, and the absence of public-sector technical training further constrains inclusive workforce development. Overall, the education sector demonstrates relatively strong foundational access but reveals structural gaps at secondary, tertiary, and vocational levels, indicating the need for strategic expansion, improved institutional balance, and diversified skill development opportunities to support long-term socio-economic growth in Battagram City.

Table 72: Existing Educational Facilities in Battagram

Ownership	Primary	Middle	High	College	Training Inst.	University
Government	28	4	7	3	-	-
Private Institutions	12				5	1

Source: Devised by the Consultant

3.1.72.1. Education Attainment

In Battagram QH, the 2023 Population and Housing Census reports a relatively low overall literacy rate of 39.4%, with 60.6% of the population illiterate, reflecting long-standing educational challenges in the district. Male literacy stands at 53.3% (46.7% illiterate), which is substantially higher than female literacy at 25.5% (74.5% illiterate), highlighting a pronounced gender gap that is characteristic of rural and semi-urban areas of Khyber Pakhtunkhwa. No literacy data is reported for the transgender population in the census, indicating limitations in enumeration and disclosure.

Findings from the 2025 Primary Survey conducted in Battagram QH indicate an improvement in overall literacy, rising to 50.0%, with illiteracy correspondingly reduced to 50.0%. The survey results show male literacy at 30.2% and female literacy at 19.8%, with illiteracy levels at 26.4% for males and 23.6% for females, reflecting the sample-based nature of the survey and differences in respondent composition compared to the census. While the survey suggests progress in overall literacy levels, gender disparities remain evident, with women continuing to lag behind men in educational attainment. As with the census, no transgender respondents were recorded in the survey.

Overall, the comparison between Census 2023 and Survey 2025 suggests gradual improvement in literacy in Battagram QH, particularly at the aggregate level, while also underscoring persistent gender-based inequalities. Variations between census and survey results are likely influenced by differences in methodology, sample size, age structure, and local participation patterns. The findings emphasize the need for targeted interventions focused on female education, adult literacy, and inclusive data collection to achieve more equitable educational outcomes in the district.

Table 73: Education Attainment according to gender

Battagram QH	Census of 2023		Survey 2025	
	Literate %	Illiterate %	Literate %	Illiterate %
Total	39.4	60.6	50.0	50.0
Male	53.3	46.7	30.2	26.4
Female	25.5	74.5	19.8	23.6

Source: Primary Data collected from field survey

The educational attainment of Battagram QH shows that the majority of the educated population remains concentrated at the lower and middle levels of education, with clear gender disparities across all categories. A substantial number of individuals have attained primary education but remain below matric level, comprising 13,381 males and 7,073 females, indicating early dropouts after basic schooling, particularly among females. The gap widens at the matric but below degree and other intermediate levels, where 8,056 males are recorded compared to only 2,056 females, reflecting reduced female participation as education levels increase. Attainment of degree-level education and above remains limited overall, with 2,885 males and only 678 females, highlighting significant constraints in access to higher education, especially for women. No educational attainment is reported for the transgender population, pointing to continued underrepresentation and data limitations.

Battagram	Educational Attainment								
	Primary But Below Matric			Matric But Below Degree & Others			Degree & Above		
	Male	Female	Trans	Male	Female	Trans	Male	Female	Trans
Battagram QH	13,381	7,073	0	8,056	2,056	-	2,885	678	0

Source: PBS Census 2023

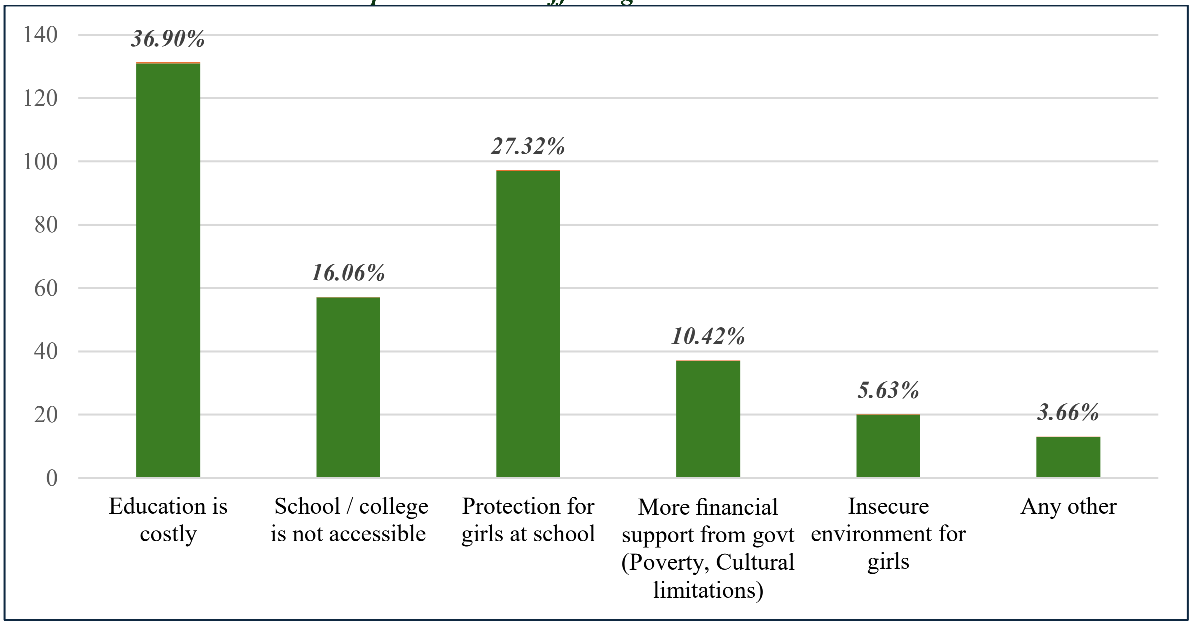
3.1.72.2. Household Education

Literacy levels in Battagram also show that there is an existing gap in genders and continuous education. Out of the male population, 31.3 percent of the people are literate, 35.2 percent illiterate, and a significant 33.5 percent are undergoing education which means that the literacy level may improve in the future. The female literacy is less at 30.1, 46.2 are illiterate with only 23.6 currently engaged, which shows that there are huge obstacles to female education and involvement. On the whole, the actual enrollment of males gives the opportunity to grow literacy, but the level of female enrollment is low, and illiteracy is high, which proves the necessity to make specific efforts to grant women and girls more opportunities to get an education and keep it in the region.

Literacy					
Sr. No.	**Literacy**	**Male**		**Female**	
1	Literate	317	31.3%	208	30.1%
2	Illiterate	357	35.2%	319	46.2%
3	Currently Enrolled	339	33.5%	163	23.6%
4	Total	1013	100.0%	690	100.0%

Source: Primary Data collected from field survey

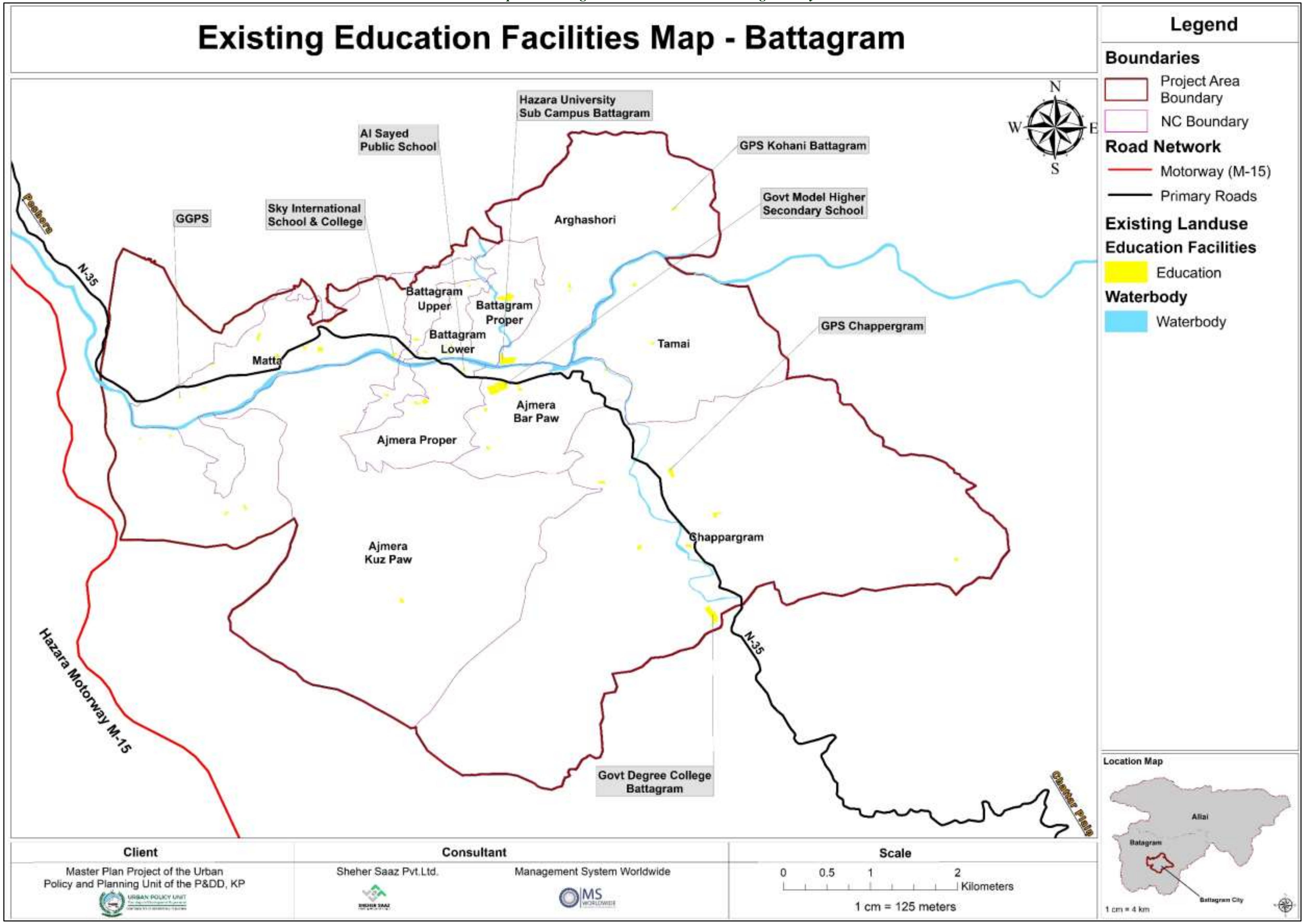
Graph 5: Barriers Affecting Access to Education



Source: Primary Data collected from field survey

Spatially, the education facilities cover total area of 24.16 acres (0.29%), as shown in the map below.

Map 23: Existing Educational Facilities - Battagram City



3.1.73.National and International Education Policies and Planning Standards

3.1.73.1. National Standards

10.2.1.1.1 National Reference Manual (NRM)

According to the NRM standards, a primary school is required for a population of 7500. A middle school is required for a population of 17000, and a high school is required for a population of 74000. For a college, a population of 170,000-400,000 is required.

Standards for Allocation of New Education Facilities

According to the National Reference Manual for Planning and Infrastructure Standards, primary schools should be strategically positioned within existing or well-planned residential areas to ensure effective service to the community. Ideally, these schools should be within walking distance of homes but located away from busy roads to ensure safety. Secondary schools should be easily reachable by both vehicle and foot and should also be situated away from high-traffic roads to maintain security.

Both primary and secondary schools are considered essential residential amenities, and their locations should be carefully planned during the development of new housing schemes and areas. Colleges, universities, and other higher education institutions, which offer undergraduate and graduate programs, are best located in the Town Center to facilitate accessibility and integration into the community. The table below shows the location guidelines for establishing a new education institute.

Table 74: Location Guidelines for New Educational Institutes

Sr. No.	Educational Institution Type	Location Guidelines
1	Primary School	• Near existing and planned housing schemes • Located within walking distance from home • Commonly situated centrally within residential areas and away from busy roads • Catchment area for urban schools: 0.5-1 km • Catchment area for rural schools: up to 2.2 km
2	Secondary School	• Must have easy and good vehicular access and safe walking routes • Located away from schools of the opposite gender • Situated far from the main busy roads with fast and heavy traffic • Positioned on roads with favorable linkages to their catchment area • Catchment area for urban schools: 1.25-2 km • Catchment area for rural schools 5-10km

Sr. No.	Educational Institution Type	Location Guidelines
3	Intermediate College	• Catchment area for urban school - boys: 2.75-4 km • Catchment area for rural school - boys: 10-15 km • Catchment area for urban school - girls: 3.25-5 km
4	Degree College	Large City
5	University	Metropolitan City Area

Source: National Reference Manual of Planning and Infrastructure Standards (NRM)

10.2.1.1.2 Khyber Pakhtunkhwa Education Facility Planning Framework

The planning, establishment, and upgradation of education facilities in Khyber Pakhtunkhwa are governed by provincial education policies, with specific provisions for backward and hilly areas. These policies define quantitative enrolment thresholds, population triggers, distance criteria, land requirements, and minimum infrastructure standards, ensuring equitable access to education while avoiding duplication of facilities.

Table 75: Education Planning Framework - KP Specific

Facility Type	Trigger / Eligibility Criteria	Distance / Catchment Criteria	Land Requirement	Key Infrastructure Requirements
Primary School (New)	Catchment population ≥ 800, ensuring minimum 80 students	No primary school within 1.5 km (waived if nearest school is overcrowded)	Urban: 1–2 Kanal Rural: 2 Kanal	6 classrooms, admin block, lavatories, water supply, electricity/solar, boundary wall (8 ft), play area
Primary School (Additional)	Village population > 5,000, existing school overcrowded and no expansion space	Distance condition waived	Same as above	Same as above
Secondary School (Grade VI–XII) *(Backward & Hilly Areas)*	Feeder enrolment: • Class V: ≥50 boys / 40 girls • Class VIII: ≥25 boys / 20 girls • Class X: ≥100 boys / 80 girls	No secondary school within 5 km (waived if overcrowded); feeder schools within 2.5 km	Urban: 4 Kanal Rural: 8 Kanal	Academic blocks, labs, admin spaces; vertical construction (≤50% covered area)

Facility Type	Trigger / Eligibility Criteria	Distance / Catchment Criteria	Land Requirement	Key Infrastructure Requirements
	• Minimum total: 175 boys / 140 girls			
Middle to High School Upgradation *(Backward & Hilly Areas)*	Class VIII enrolment: • Proposed school: ≥10 boys / 8 girls • Feeder schools: ≥15 boys / 12 girls • Minimum Class IX intake: 25 boys / 20 girls	No high school within 3 km (waived if overcrowded); feeder schools within 2 km	9,000 sq ft available for expansion	3 classrooms, library, IT & science labs, exam hall, staff rooms
High to Higher Secondary Upgradation *(Backward & Hilly Areas)*	• Class X enrolment (including feeder schools): ≥100 boys / 80 girls	No HSSC / college within 10 km (girls: 5 km); waived in urban areas	10,000 sq ft additional area	4 classrooms, Physics/Biology/Chemistry/IT labs; vertical construction

General Planning and Design Provisions

All education facilities must comply with general provisions relating to safety, accessibility, learning environment, and disaster resilience. These include solar power provision, emergency exits, accessibility for physically challenged students, ICT and multimedia facilities, boundary walls, play areas, and site selection based on school mapping and EMIS data. Furniture, fixtures, and equipment are to be provided in accordance with notified standards.

3.1.73.2. International Policies and Planning Frameworks

Internationally, education planning is increasingly based on evidence-driven, catchment-oriented frameworks rather than fixed "1 school per population" ratios. Countries such as Australia, the United States, New Zealand, and Qatar employ official policies and guidelines to ensure that new schools and expansions are aligned with projected enrolment, demographic trends, and community needs.

In Australia, the NSW Education Facilities Standards and Guidelines (EFSG) and Queensland's School Site Selection Guidelines determine school size and land requirements based on enrolment forecasts, with primary schools typically accommodating up to 1,000 students on 1.5–2 hectares and secondary schools up to 2,000 students on 2.5–4 hectares. The United States combines federal environmental siting guidelines (EPA) with state-level enrolment and land formulas, ensuring schools are sited safely with sufficient land area (e.g., primary schools 5–8 acres, secondary schools 10–25 acres) based on projected student numbers. New Zealand's network planning similarly forecasts school-age populations within defined catchments, with primary schools typically serving 400–500 students and secondary schools 800–1,200 students per catchment.

Qatar's National Master Plan (QNMP) integrates both population catchments and urban density to guide school provision. Primary school catchments range from 15,000–25,000 people, with walking distances of 750–1,500 meters, while secondary schools serve 30,000–60,000+ residents with access distances up to 2,250 meters. Across all four countries, planning emphasizes flexibility, catchment-based enrolment forecasting, land adequacy, accessibility, and safety, ensuring that schools are neither under- nor over-utilized. These international practices provide a robust framework for ensuring equitable access to education and can serve as benchmarks for comparing or aligning local policies, such as the KP education standards, with global best practices.

Table 76: International Education Policies and Planning standards[43][44][45]

Country / Policy	School Level	Planning Metric	Enrolment / Capacity Standard	Site / Land Requirement	Catchment / Distance
Australia – NSW (EFSG)	Primary	Classroom & facilities per student	1,000 students per school	1.5–2 ha	Catchment defined by local intake; adjustments for high-density urban areas
	Secondary	Classroom & facilities per student	2,000 students per school	2.5–4 ha	Catchment-based enrolment planning
Australia – Queensland	Primary	Forecast enrolment	80–100% utilization triggers new planning	1.5–2 ha	Defined local catchment

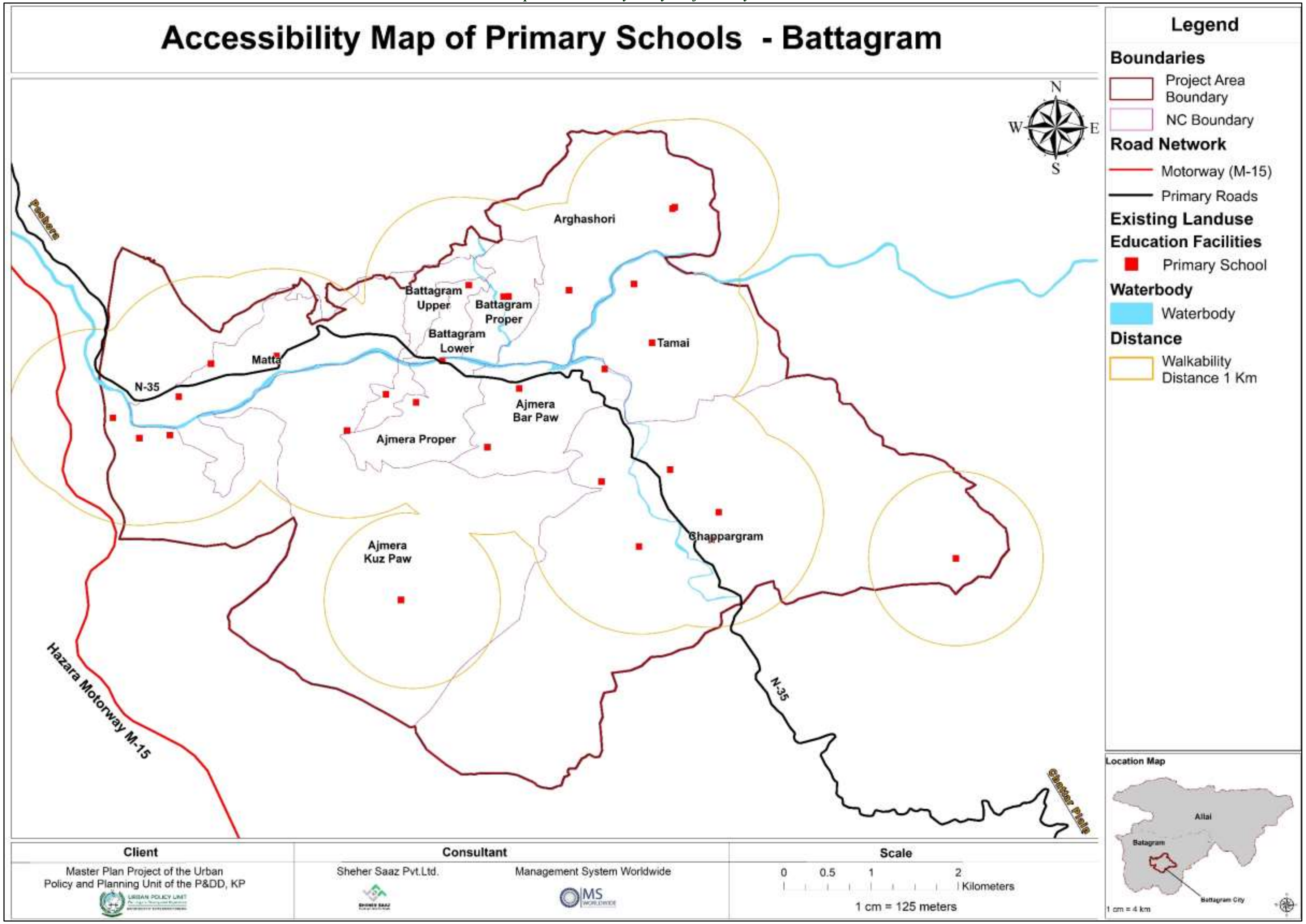
[43] Qatar Education Master Plan https://www.sciencedirect.com/science/article/pii/S1195103624000156
[44] World Bank Guidelines for School https://documents.worldbank.org/en/publication/documents-reports/documentdetail/156591468333603141/guidelines-for-school-location-planning
[45] Internation education standard classification https://unesdoc.unesco.org/ark:/48223/pf0000098243?posInSet=8&queryId=31bdb56d-f010-4069-8db9-20ceeed2a618

Country / Policy	School Level	Planning Metric	Enrolment / Capacity Standard	Site / Land Requirement	Catchment / Distance
	Secondary	Forecast enrolment	80–100% utilization triggers new planning	2.5–4 ha	Catchment boundaries determine access
USA – Federal (EPA)	Primary / Secondary	Safety-based siting	N/A	N/A	Minimum distances from hazards: roads, fuel stations, high-voltage lines
USA – State (e.g., NYSED)	Primary	Land & enrolment sizing	100 students per 1 acre land + 5 acres base	5–8 acres	Feeder schools and local population
	Secondary	Land & enrolment sizing	1,500–2,000 students per school	10–25 acres	Feeder schools and projected enrolment
New Zealand – MoE Network Planning	Primary	Forecast enrolment	400–500 students per catchment	1–1.5 ha	Catchment-based enrolment planning
	Secondary	Forecast enrolment	800–1,200 students per catchment	2–3 ha	Catchment-based enrolment planning
Qatar – QNMP	Primary	Population-based catchment	15,000–25,000 per primary school (density dependent)	1–2 ha (urban)	Walking distance 750–1,500 m
	Secondary	Population-based catchment	30,000–60,000 per secondary school	4–5 ha	Walking distance 1,500–2,250 m

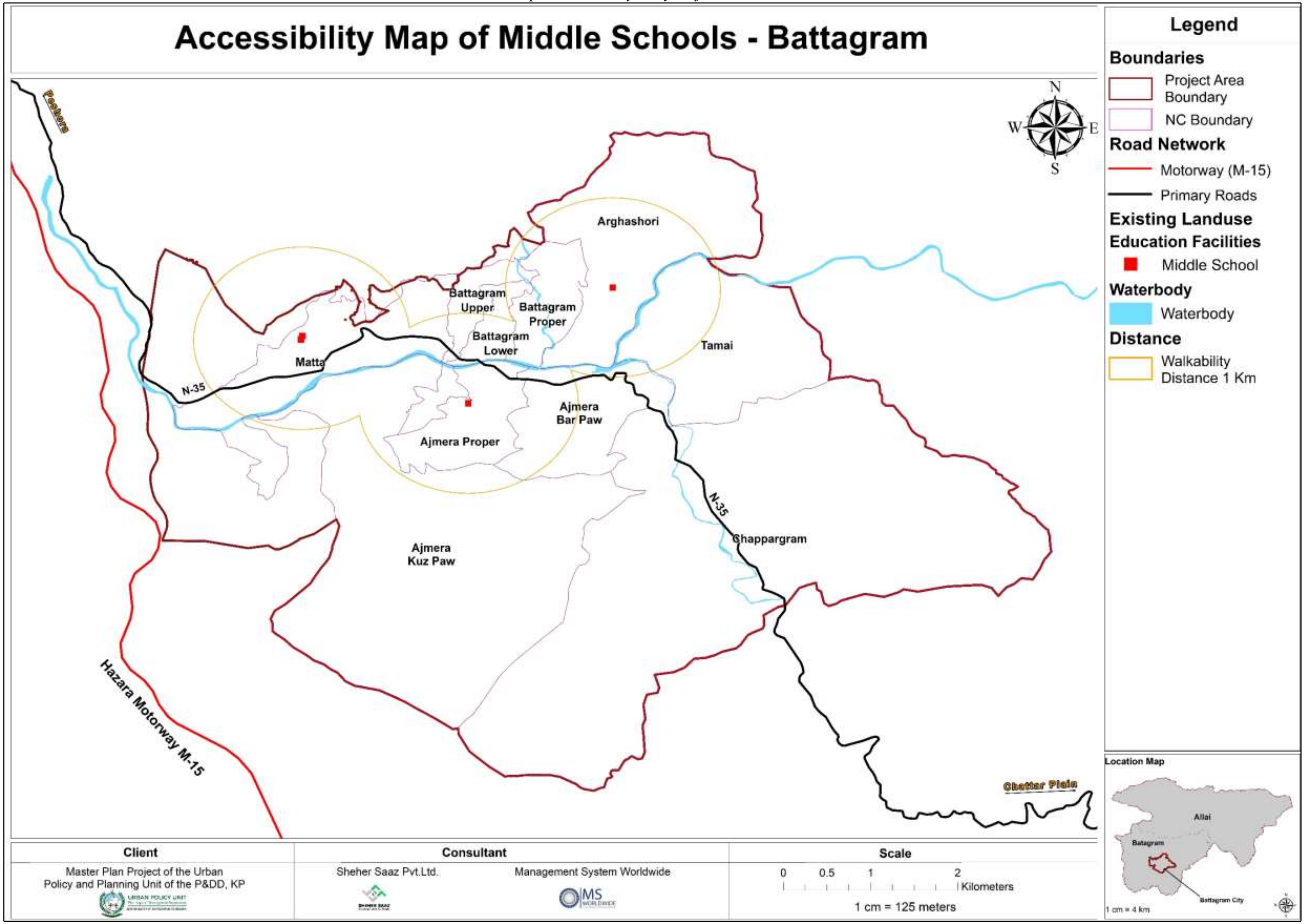
3.1.74. Accessibility of Educational Facilities

A 1 km walking buffer (approx. 10–15 minutes on foot) and a 5 km driving buffer (short car/vehicle trip) were adopted as standard catchments to represent reasonable access to educational facilities and to allow consistent comparison of spatial coverage across all facilities. A 1 km distance corresponds roughly to 10–15 minutes of walking for an average adult or child, which is widely considered a reasonable time for accessing primary services such as basic schools. Short walking catchments like 1 km reduce physical and time barriers, which is important for vulnerable groups (young children, families without vehicles) who may not tolerate long walks, especially in dense or hilly urban environments. In many accessibility studies, driving catchments of about 5–15 km (or 15–30 minutes) are used to represent typical motorized access to higher-level services; 5 km usually falls within a short drive that most households can manage for routine visits to middle, high schools, or colleges. A 5 km driving buffer reflects the idea that distance burdens are lower when a motorized mode is available, so people can reasonably travel farther than walking while still staying within an acceptable travel time and fuel/transport cost.

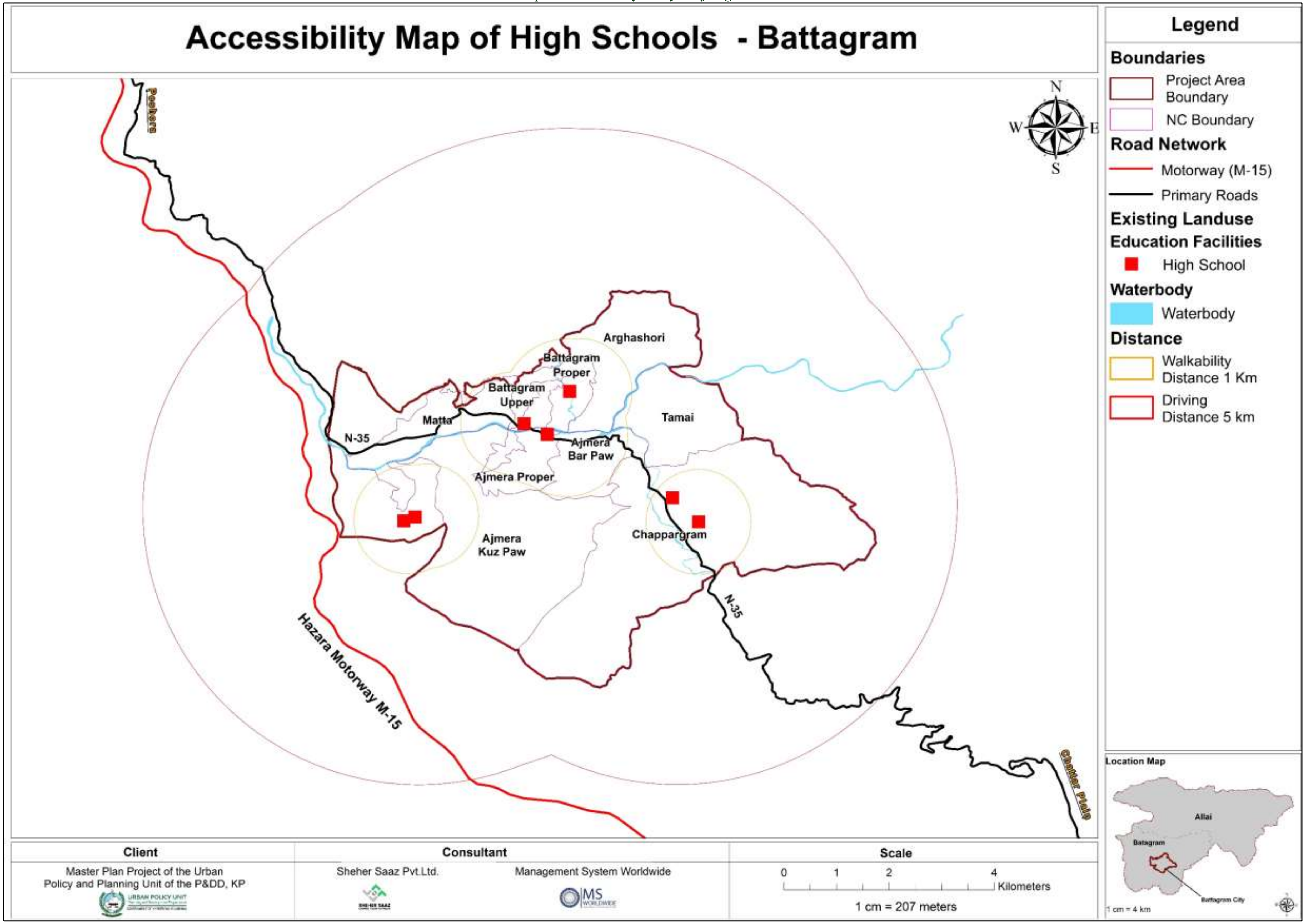
Map 24: Accessibility Analysis of Primary Schools



Map 25: Accessibility Analysis of Middle Schools



Map 26: Accessibility Analysis of High Schools



3.1.75.Gap Analysis of Educational Facilities

The assessment of educational facilities in Battagram has been carried out in accordance with the National Reference Manual (NRM) planning standards to evaluate the adequacy of existing institutions against current and projected population demands. The analysis covers primary schools, middle schools, high schools, and colleges for the base year 2025 and the projected year 2045.

Battagram has an estimated population of 173,148 in 2025, which is projected to increase to 273,271 by 2045, reflecting an overall population increase of 100,123 persons during the planning period. This demographic growth will place additional pressure on the district's educational infrastructure, particularly at the middle and secondary levels.

At the primary education level, the district currently contains 28 primary schools against a requirement of 23 facilities based on the NRM standard of one primary school per 7,500 population. The analysis therefore indicates that no quantitative gap presently exists in primary education provision. By 2045, an additional 13 primary schools will be required to cater to the projected increase in population. However, considering the existing surplus, the overall future requirement is estimated at 8 additional primary schools.

For middle schools, the situation is comparatively inadequate. Against the NRM standard of one middle school per 17,000 population, the district requires 10 middle schools in 2025, whereas only 4 facilities currently exist, resulting in an immediate gap of 6 schools. With future population growth, an additional 6 middle schools will be needed by 2045, increasing the total requirement to 12 middle schools during the planning horizon. This reflects a significant deficiency in intermediate-level educational infrastructure and highlights the need for targeted investment in middle education facilities across both urban and rural settlements.

In the high school category, Battagram currently possesses 3 high schools, while the existing requirement based on the standard of one facility per 74,000 population is 2 schools. Therefore, no current gap exists. Nevertheless, future demographic expansion will generate demand for one additional high school by 2045 to maintain acceptable service standards and accessibility.

At the college level, the district is relatively well served. The existing provision of 3 colleges exceeds the current requirement derived from the NRM standard of one college per 170,000–440,000 population. Although population growth by 2045 may justify the need for one additional college in theoretical terms, the current institutional stock is considered sufficient to absorb future demand, and therefore no quantitative gap is anticipated within the planning period.

Table 77: Existing Gap Analysis and Future requirement 2045

Facility Type	NRM Standard	Existing Facilities (2025)	Population (2025)	Required Facilities (2025)	Gap in 2025	Projected Population (2045)	Increase in Population 2045-2025	Required Facilities (2045)	Total Requirement (Gap+Future)
Primary	1 per 7,500	28	173148	23	No Gap	273271	100123	13	8
Middle	1 per 17,000	4		10	6			6	12
High	1 per 74,000	3		2	No Gap			1	1
College	1 per 170k–440k	3		1	No Gap			1	No Gap

3.1.76. Plot Sizes of Educational Institutions with NRM Standards

As per NRM standards, a primary school should be between 0.6 and 1 hectare in size, a secondary school in an urban setting should be between 1.5 and 2.1 hectares, a college for boys should be between 3.5 and 4.5 hectares in size, and a college for girls should be between 2.3 and 3.5 hectares.

Table 78: Plot Size of Educational Institutions

Education Institute Type	Area Required by One (acre)	
	Min	Max
Primary	1.48	2.47
Middle	3.7	5.18
High	4.9	6.1
College	9.88	19.7

Source: NRM Guidelines

Field observations and secondary data indicate that:

- Most government primary schools comply with minimum plot size standards, though many lack adequate open play areas.
- Several older institutions, particularly in dense urban cores, operate on substandard plots, limiting expansion and extracurricular facilities.
- Private schools, especially those located in converted residential buildings, frequently do not meet NRM plot size requirements, raising concerns regarding safety, open space provision, and long-term sustainability.

3.1.77. Future Requirement (2025-2045)

The assessment of educational infrastructure in Battagram has been conducted in accordance with NRM planning standards, based on a 2025 baseline population of 173,148 and projected growth up to 273,271 by 2045. The analysis evaluates current provision, existing gaps, and future requirements across primary, middle, high, and higher secondary/college levels.

Population is projected to increase incrementally over the planning horizon, with an additional 21,567 persons by 2030, 23,680 by 2035, 26,077 by 2040, and 28,799 by 2045. This steady demographic expansion will directly influence demand for education facilities, particularly at the middle school level where existing deficits are already evident.

At the primary level, the NRM standard of 1 school per 7,500 population results in a requirement of 23 schools for the 2025 population. The district currently has 28 primary schools, indicating no existing gap and a surplus of 3 facilities. However, with population growth, an additional requirement of 13 primary schools emerges by 2045. Despite the current surplus, phased expansion will be required to maintain service standards over time.

For middle schools, the NRM standard of 1 school per 17,000 population yields a requirement of 10 schools in 2025, against an existing provision of 4 schools. This results in a current deficit of 6 middle schools. The projected population increase further amplifies demand, with a total additional requirement of 6 middle schools by 2045. This makes middle-level education the most critical service gap within the district's education sector.

At the high school level, the standard of 1 school per 74,000 population results in a requirement of 2 schools in 2025, while 3 schools currently exist. There is therefore no existing gap. Future projections indicate only marginal additional demand, with 1 additional high school required by 2045 to maintain compliance with standards.

For higher secondary schools and colleges, the NRM standard of 1 institution per 170,000–400,000 population results in a current requirement of 1 institution. The district currently has 3 colleges, indicating adequate provision with no existing or future quantitative gap within the planning period.

Overall, the analysis specifies that Battagram's education sector is adequately served at the primary, high school, and college levels. However, a significant deficit exists in middle school provision, which requires immediate and phased intervention. Future planning should prioritize expansion of middle-level education infrastructure while ensuring incremental augmentation of primary and secondary facilities in line with projected population growth up to 2045.

Table 79: Future Requirement (Year-wise) as per NRM Standards

Facility Types	Current Requirement (2025)				Future Requirement (2025-2045)					NRM Standard
	Existing Facilities (numbers)	*Population 2025*	*Current requirement*	*Current Gap (2025)*	*2030*	*2035*	*2040*	*2045*	*Total Requirement (2025-2045)*	
Increase in Population	-	173148	-	-	21,567	23680	26077	28799		
Primary	28			23	3	3	3	4	13	1 for 7500
Middle	4			10	1	1	2	2	6	1 for 17000
High	3			2	0	0	0	0	1	1 for 74000
Higher Secondary School / College	3			1	0	0	0	0	1	1 for 170,000 - 400,000

3.1.78. Proposed Educational Zones

Distinct educational zones have been identified and proposed within Battagram to accommodate future educational demand during the planning period 2025–2045. At present, the district contains approximately 24.09 acres of existing educational facilities, while an additional 15.97 acres are proposed to strengthen educational accessibility and institutional capacity across the urban and rural settlements of the city. With these proposed interventions, the total area allocated for educational uses is projected to increase to approximately 40.06 acres by 2045. The proposed educational strategy focuses on improving equitable access to education, particularly in underserved areas where educational infrastructure is currently lacking.

A key proposal under this strategy is the establishment of a Community Model School covering approximately 5.42 acres in Shingli Bala, an area where no formal educational facility currently exists. The proposed institution is intended to address the educational gap within the locality by providing accessible primary and secondary education facilities for nearby communities. The development of this school will significantly improve literacy opportunities, reduce travel distances for students, and encourage greater school enrollment, particularly among children from remote and underserved settlements. The Community Model School is envisioned as a modern educational facility equipped with adequate classrooms, administrative spaces, playgrounds, sanitation infrastructure, and community-oriented learning environments to support inclusive and quality education.

In addition to the Community Model School, approximately 10.55 acres have been allocated for broader Educational Zones to accommodate future institutional expansion and emerging educational needs. These proposed zones are strategically distributed to support population growth and ensure balanced educational provision across Battagram. The planning approach emphasizes efficient land utilization through compact and sustainable institutional development, including the encouragement of vertical expansion where feasible. This strategy minimizes excessive horizontal sprawl, preserves valuable land resources, and allows sufficient space for associated amenities such as open spaces, sports facilities, pedestrian circulation, parking, and green infrastructure.

Table 80: Proposed Educational Zones/Facilities

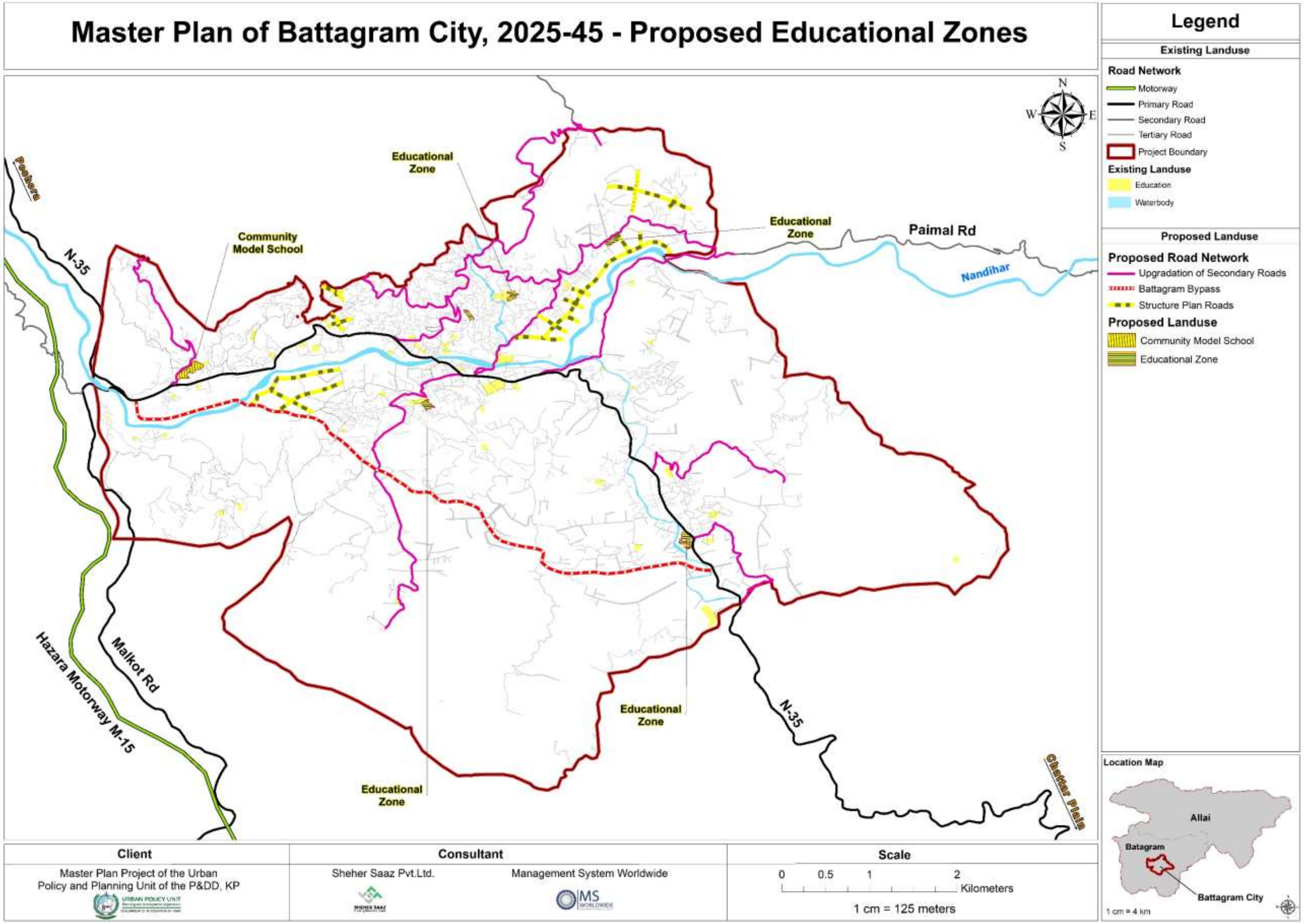
Existing Education	Existing Education	Proposed Educational Zones	Proposed Educational Zones	Total Education (2025-2045)
	(Acres)		(Acres)	Existing and proposed (Acres)
Educational Facilities	24.094	Community Model School	5.416	40.064
		Educational Zone	10.554	
		Total Proposed	15.970	

3.1.79.Zoning Regulations for Educational Uses

Table 81: Zoning Regulations for Educational Zone

Land use Zone	Permitted Land Uses	Permitted on Appeal
Educational Zone	• Schools, Colleges & Other Educational Institutions • Universities • Research Centers • Incubation Centers • Offices of Social and Cultural Organizations • Religious Institutions • Parks, Memorials and Monuments • Library • Language Centers • Parks • Public Utilities and Buildings • Community Facilities, Arts Councils and Auditoriums • Government Offices • Taxi Stands, Bus Halts • Approved Parking Provisions	• Hotels Offices of Commercial Institutions • Restaurants and Clubs • Commercial Recreational uses like theatre halls and cinemas • Petrol and gas filling Station • Limited Retail Shopping

Map 27: Proposed Educational Zones/Facilities



10.3 Safety & Security/Social Welfare

3.1.80. Existing Situational and Infrastructure Analysis

The safety and security infrastructure of Battagram district currently reflects limited technological integration and insufficient surveillance coverage to meet modern urban safety requirements. Secondary data obtained from the Office of the District Police Officer Battagram indicates that the existing monitoring system is primarily conventional, fragmented, and operationally constrained due to infrastructure limitations including unreliable electricity supply, limited internet connectivity, and absence of centralized monitoring systems.

At the district level, the Safe City surveillance initiative has installed a total of 68 CCTV cameras; however, only 46 cameras are currently active while 22 remain inactive, indicating maintenance and operational challenges. The system lacks advanced surveillance technologies such as Facial Recognition (FR) and Automatic Number Plate Recognition (ANPR), which significantly limits its capacity for proactive law enforcement, traffic monitoring, and crime investigation. Existing cameras are mostly conventional non-FR devices with localized monitoring rather than integrated citywide surveillance.

Table 82: District-Level Safe City Surveillance Infrastructure – Battagram

Parameter	Status
Active Cameras	46
Inactive Cameras	22
Total Cameras	68
FR Cameras	Nil
ANPR Cameras	Nil
Non-FR Cameras	46
Operational Coverage	Limited to selected facilities
Remarks	Existing cameras insufficient for required security objectives

Source: Secondary Data from Office of the District Police Officer Battagram

Further assessment reveals that only recently installed surveillance systems at Police Lines and the Judicial Complex are fully functional and capable of meeting basic monitoring requirements. Surveillance coverage across the wider urban area remains minimal, resulting in gaps in public space monitoring and emergency response capacity.

- **Police Station-Level Surveillance Infrastructure**

At the operational level, CCTV systems installed within police stations primarily serve internal monitoring functions such as lock-up surveillance and facility security rather than broader public safety. A total of 24 cameras is installed across seven police stations. However, significant operational constraints exist, including lack of backup power systems, absence of reliable internet connectivity, and outdated surveillance technology that does not meet current policing standards.

Table 83: CCTV Coverage at Police Stations – District Battagram

S.No	Police Station	No. of Cameras	Key Camera Locations	Operational Remarks
1	PS Battagram	04	Lock-up, Front of Lock-up, Roznamcha, Main Gate	Functional
2	PS Kuzabanda	04	Lock-up, Main Gate, Roznamcha, OII Room	Functional
3	PS Thakot	04	CP Front Areas, Main Gate, Building Corner	Functional on electricity only; no backup power
4	PS Shamlai	01	Lock-up	Limited coverage
5	PS Chanjal	04	Main Gate, Building Front & Back, Lock-up	Functional
6	PS Banna	03	Main Gate, Lock-up Areas	Functional
7	PS Pazang	04	Main Gate, Roadside, Building Corner, Lock-up	Functional

Source: Secondary Data from Office of the District Police Officer Battagram

Key Operational Issues Identified

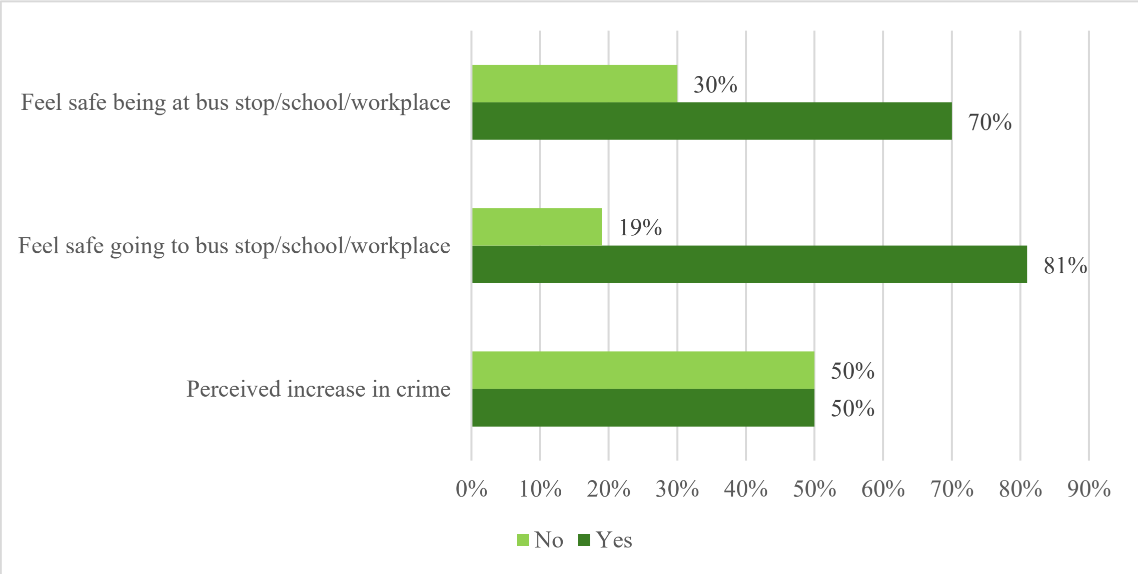
- Surveillance systems rely solely on electricity supply without backup power solutions.
- Frequent electricity shortages disrupt continuous monitoring operations.
- Limited internet connectivity prevents centralized monitoring and real-time coordination.
- Existing CCTV specifications do not meet modern surveillance standards.
- Absence of FR/ANPR technology reduces effectiveness in crime detection and traffic enforcement.
- Surveillance is concentrated within police facilities rather than public urban spaces.

Perception of Crime and Safety

Primary survey results indicate a divided perception regarding crime trends in the city. Exactly 50% of respondents perceive an increase in crime, while the remaining 50% report no noticeable increase, suggesting that crime is present but not uniformly experienced across neighborhoods or social groups.

Despite this perception, personal safety levels remain relatively high in everyday activity spaces. About 81% of respondents feel safe while going to bus stops, schools, or workplaces, and 70% feel safe while being present at these locations. However, a notable minority, 19% during movement and 30% while staying at these locations—express feelings of insecurity, highlighting specific spatial and temporal safety concerns rather than a citywide breakdown of order.

Graph 6: Perception of Crime and Safety (%)



Nature of Crime

The reported crime profile in Battagram City is dominated by property-related and low-intensity offenses. Theft accounts for 68% of reported incidents, followed by robberies (20%). Harassment constitutes 8%, while drug-related or other crimes account for only 4%. This distribution indicates that crime in Battagram is largely opportunistic and economically motivated rather than violent or organized.

Table 84: Reported Types of Crime (%)

Type of Crime	Percentage
Theft	68%
Robberies	20%
Harassment	8%
Drugs / Other	4%

Crime Reporting and Institutional Response

The survey reveals a moderate level of public engagement with law enforcement. Approximately 52% of respondents report incidents to the police, while 48% do not, indicating a near-even split between formal reporting and informal handling of crime. This pattern suggests partial trust in law enforcement, but also highlights barriers such as accessibility, perceived effectiveness, or preference for community-based resolution.

Importantly, 62% of respondents acknowledge that police have taken steps to improve the situation, while 38% believe no effective action has been taken. This reflects a visible but limited enforcement presence, consistent with the operational constraints of a single police facility serving a dispersed population.

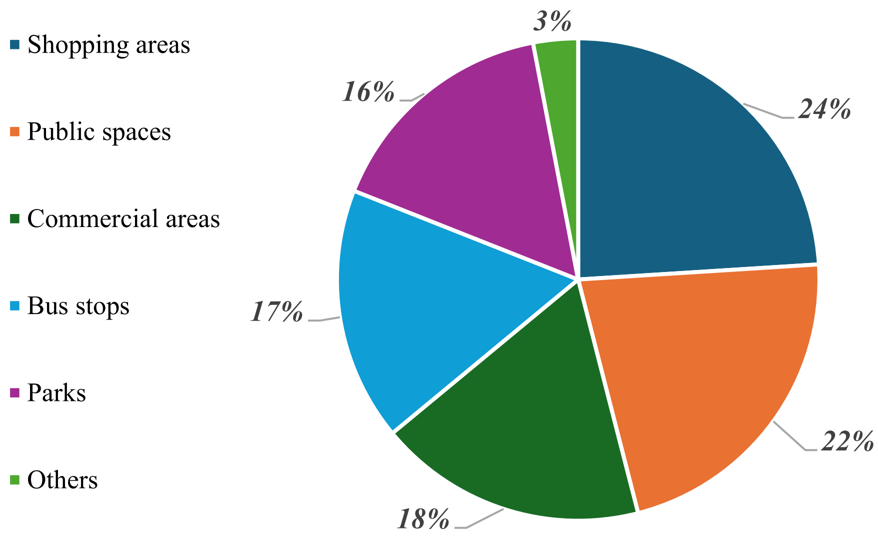
Table 85: Reporting Behaviors and Police Action (%)

Indicator	Yes	No
Crime reported to police	52%	48%
Police have taken steps to improve safety	62%	38%

Spatial Distribution of Unsafe Areas

Perceptions of insecurity are concentrated in activity-intensive public spaces rather than residential neighborhoods. Shopping areas (24%) and public spaces (22%) are identified as the most unsafe locations, followed by commercial areas (18%), bus stops (17%), and parks (16%). These locations correspond to areas with higher footfall, informal activity, weak lighting, limited surveillance, and congestion, particularly during evening hours.

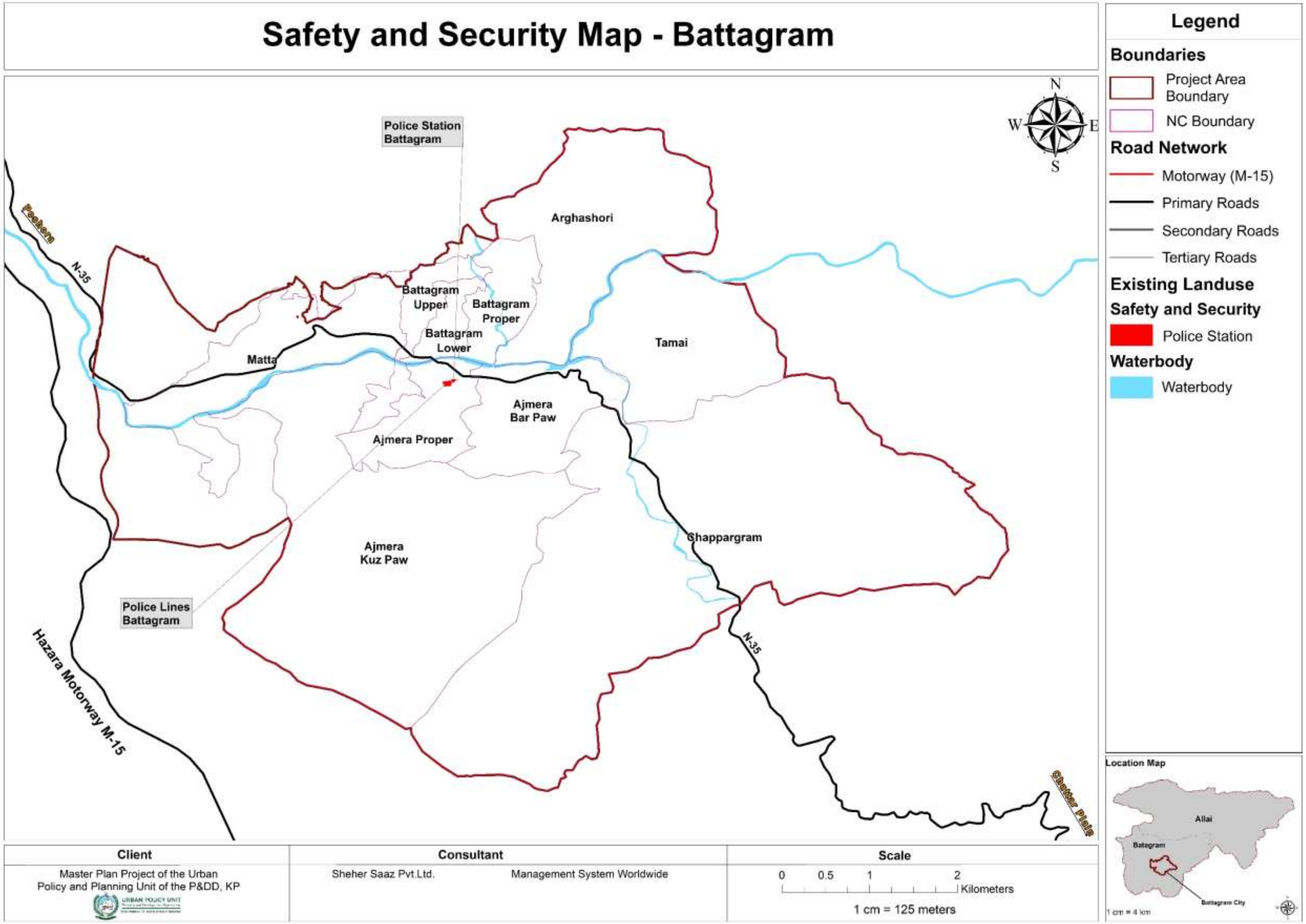
Graph 7: Perceived Unsafe Locations (%)



Overall, Battagram City exhibits moderate crime exposure with relatively strong perceptions of personal safety, supported by social cohesion and community norms. However, safety concerns are spatially concentrated in commercial zones, transport nodes, and public spaces, which are also areas of economic activity and mobility. The limited policing infrastructure, partial underreporting of crime, and absence of dedicated urban safety facilities constrain the city's ability to proactively manage these risks.

From a planning perspective, improving urban safety in Battagram requires better-designed public spaces, improved lighting, organized commercial layouts, safer transport stops, and enhanced coordination between police and municipal authorities, rather than large-scale expansion of enforcement infrastructure alone.

Map 28: Existing Safety and Security Infrastructure



3.1.81. Proposals to improve security situation

Safety and security proposals are essential for maintaining a safe and secure environment in a community. safety and security proposals are crucial for maintaining a safe, secure, and prosperous society. By implementing effective safety and security measures, citizens can live in a community where they feel safe and protected, which can lead to social, economic, and political development. It is recommended to take a comprehensive approach to security by implementing multiple proposals that address different aspects of safety and security.

Based on the primary survey findings, the following recommendations are proposed to strengthen safety, security, and social welfare in Battagram City. Given the city's socio-cultural context including conservative gender norms, strong community and baradari structures, and the central role of mosques and local governance, all interventions are designed to work within, rather than against, these realities.

Theft and robberies together account for 88% of reported crimes in Battagram City. Given the fragmented CCTV infrastructure and absence of advanced surveillance technologies, targeted environmental and community-based interventions are required.

a) Establishment of a Female Safety Force (FSF) – Battagram City

Harassment, physical abuse, and gender-based violence remain significantly underreported in Battagram due to social and cultural barriers that prevent women from approaching male police officers. To address this gap, it is recommended to **Establish a dedicated Female Safety Force (FSF) under the District Police Office Battagram**.

- The FSF should comprise trained female police constables and social welfare workers deployed specifically to respond to cases of harassment, domestic abuse, and physical violence against women and girls. The force should operate from a dedicated unit within the DPO office, with visible deployment at key locations including commercial bazaars, bus stops, girls' schools, and health facilities areas identified in the primary survey as the most unsafe for women.
- The FSF should be supported by a confidential women's helpline, allowing victims to report incidents without visiting a police station. All officers should receive specialized training in gender-sensitive response, survivor support, legal procedures under the Protection Against Harassment Act 2010, and referral pathways to social welfare services.
- Coordination with BISP community workers, the Social Welfare Office, and local female health workers (LHWs) will ensure that the FSF reaches women who cannot access formal institutions independently. A dedicated Safe Room within the police district headquarters should be established to receive, document, and process complaints in a private and non-threatening environment.

This initiative directly responds to the 8% harassment rate recorded in the primary survey widely considered an undercount and aligns with KP Police reform objectives promoting gender-responsive policing across the province.

b) Women's Safety & Harassment

To address this, a dedicated Female Safety Force (FSF) will be established under the District Police Office Battagram, comprising trained female police constables and social welfare workers. The FSF will serve as the primary response unit across all women's safety interventions outlined below.

Lady Police in Commercial Areas

FSF officers will be deployed in uniform at Battagram Bazaar and key commercial zones during peak hours to deter harassment and respond immediately to incidents of abuse or physical violence. Their visible presence provides a formal, approachable point of contact for women who would otherwise be unable to report to male officers, consistent with culturally acceptable approaches across KP.

Safe Waiting Areas at Bus Stops

FSF officers will be stationed at enclosed, well-lit female waiting sections at the most-used bus stops in Battagram City. They will monitor for harassment, assist distressed women, and act as a first response in cases of physical abuse or threatening behaviour. Bus stops represent 17% of unsafe perceptions, making them a priority deployment point for the FSF.

Women-Only Transport Service

FSF officers will accompany and oversee the dedicated women's transport service on high-demand routes such as city centre to girls' schools and health facilities. Their presence will ensure safe boarding, deter harassment on route, and provide immediate assistance in case of any incident, making the service trusted and sustainable within Battagram's prevailing purdah norms.

Grievance Helpdesk for Women

The FSF will staff and operate the confidential women's safety helpdesk, receiving complaints of harassment, domestic abuse, and physical violence. FSF officers will document cases, guide survivors through legal procedures, and coordinate referrals to the Social Welfare Office and other support services. BISP community workers will serve as the first-contact outreach layer, linking vulnerable women directly to the FSF for follow-up and response.

c) Crime & Property Offences

Environmental Improvements (CPTED Approach)

- Install LED Street lighting in commercial bazaars, narrow lanes, and public gathering spaces to reduce opportunities for theft and robbery consistent with Crime Prevention Through Environmental Design (CPTED) principles applied in cities such as Peshawar and Lahore.
- Remove physical obstructions and regularize vendor layouts in high-footfall market areas to improve natural surveillance and reduce blind spots.

Community Watch Committees

- Establish Mohalla Amn Committees in each ward of Battagram City, leveraging existing biradari and mosque (imam) networks.
- Link committees to the Police Assistance Line via a dedicated WhatsApp group or helpline for rapid incident reporting, modelled on community policing approaches adopted under KP Police reforms in Peshawar.

CCTV Network Expansion and Activation

- Prioritize the activation and repair of the 22 currently inactive cameras in the existing Safe City network (as per Secondary Data from Office of the District Police Officer Battagram).
- Install a phased CCTV network at highest-footfall intersections in shopping areas and commercial zones identified as the top two unsafe locations (24% and 22% respectively per field survey) with footage monitored at the DPO office.
- Upgrade camera specifications to meet modern surveillance standards, including consideration of FR and ANPR-capable devices at key entry/exit points of the city.
- Provide solar-powered UPS backup systems for all camera installations to address Battagram's chronic electricity shortages.
- Establish a centralized monitoring room at District Police Headquarters with internet-based connectivity to all camera feeds.

d) Police Station Infrastructure Upgrades

The existing 7 police stations in Battagram currently operate with 24 cameras, most lacking backup power and internet connectivity. The following infrastructure improvements are essential and recommendation for safety and security in Battagram:

- Install solar or UPS backup power systems at all seven police stations particularly PS Thakot, which currently operates on electricity only.
- Extend internet connectivity (fiber or 4G/5G backup) to all police stations to enable real-time data sharing and centralized monitoring.
- Upgrade CCTV systems at PS Shamlai (currently has only 1 camera) to minimum coverage standards of 4 cameras (initially) covering all key access points.
- Extend coverage beyond lock-up areas to include public-facing entrances, parking areas, and station surroundings.

e) Unsafe Locations - Targeted Interventions

Shopping & Commercial Zones (Combined 42%)

- Introduce vendor demarcation and regular TMA enforcement against encroachments in Battagram's main bazaars.

- Implement safe zone signage and engage shopkeeper associations (anjumans) to co-manage safety, framing the initiative around commercial benefit and improved customer confidence.
- Install CCTV cameras and improved lighting at identified hotspots within shopping areas.

Public Spaces & Parks (Combined 38%)

- Introduce family-friendly evening programming in key public spaces and parks (weekly markets, children's activities) to increase passive surveillance through legitimate footfall.
- Improve boundary treatments, lighting, and cleanliness of parks to reduce perceptions of insecurity.

Bus Stops (17%)

- Prioritize the highest-footfall bus stops for shelter upgrades, improved lighting, and emergency call buttons linked to Rescue 1122.
- Assign TMA formal maintenance responsibility for bus stop infrastructure.

f) Social Welfare Services

Coordination Between Welfare Institutions

- BISP, Akhuwat, the Social Welfare Office, and the District Population Welfare Office currently operate in silos. A single-window referral mechanism, where any institution can direct a beneficiary to another would significantly improve service access, particularly for women with limited mobility.

Drug Prevention Through Community Institutions

- Route drug awareness outreach through mosques and madrassas, which have unmatched reach among Battagram's youth population.
- The Anti-Narcotics Unit should focus on supply-side enforcement, while the Social Welfare Office leads prevention avoiding the stigmatization that deters help-seeking.

Rescue 1122 Community Volunteers

- Train basic first-response volunteers (one per ten households at initial stage) in high-density wards of Battagram City through Rescue 1122's existing training infrastructure, improving response coverage in areas beyond current station reach.

g) Improving Crime Reporting & Public Trust

With 48% of residents not reporting crimes to police and 38% believing no effective action is taken, rebuilding public trust in law enforcement is a key planning objective. The following measures are recommended:

- Establish a Police Complaint and Feedback Portal (digital or physical notice board) at each police station to allow citizens to track the status of reported incidents.

- Conduct quarterly community meetings between DPO Battagram and ward-level representatives to discuss crime trends and police responsiveness.
- Introduce an SMS-based or WhatsApp incident reporting system linked to the Police Assistance Line, reducing the barrier for those unwilling to visit police stations.

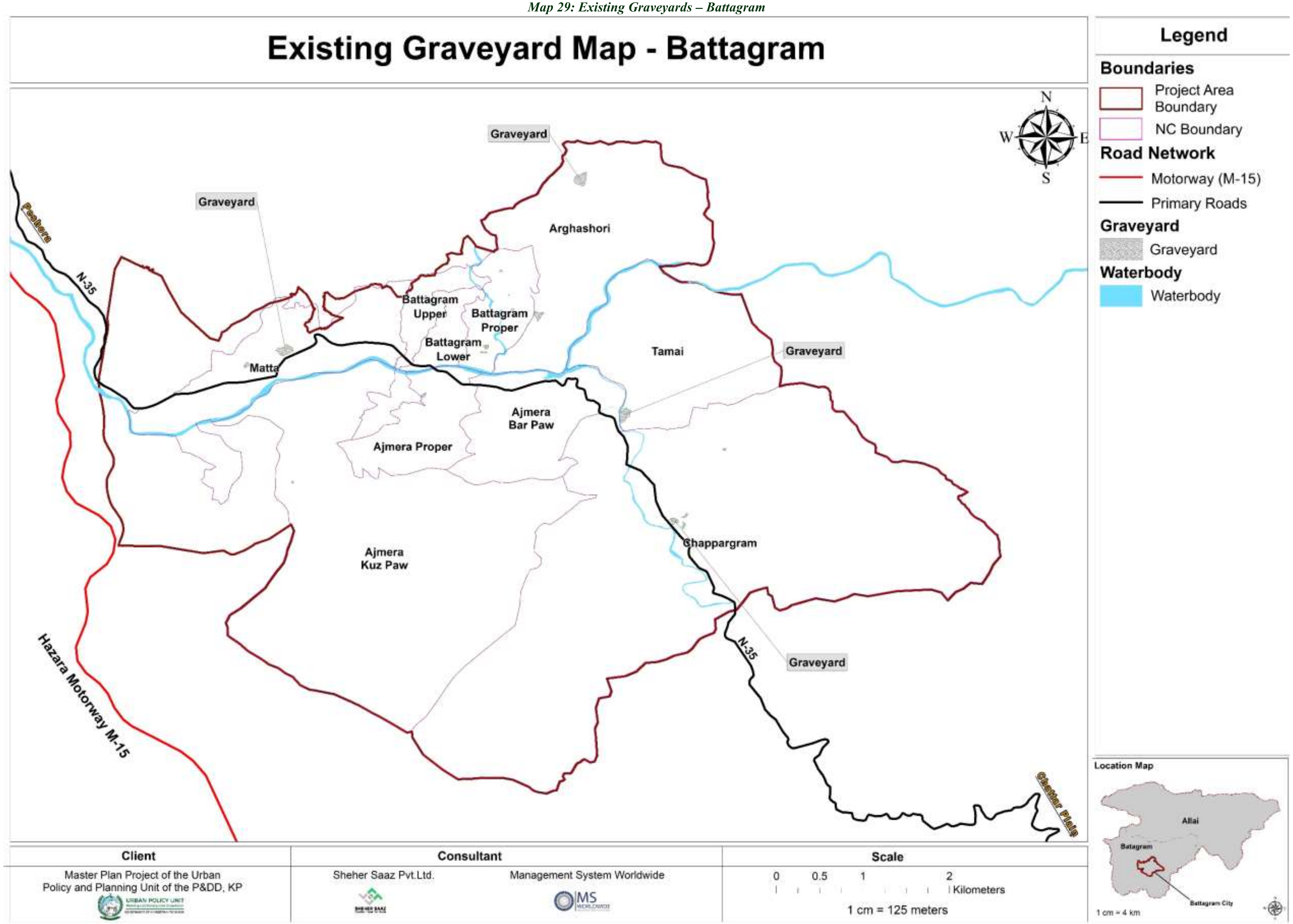
10.4 Graveyards and Religious Buildings

3.1.82. Existing Graveyards

Existing graveyards within Battagram City occupy approximately 13.96 acres, representing only 0.16% of the total study area. The spatial distribution of graveyards is scattered and generally located on the urban periphery or along rural settlement edges, rather than within planned residential neighbourhoods. As illustrated in the existing graveyard map, burial sites are primarily situated near Arghashori, Tamai, Chappargram, and peripheral zones adjacent to the main road corridors and water channels. This dispersed pattern reflects traditional land allocation practices where burial grounds are historically associated with village clusters rather than integrated urban planning frameworks.

From a planning perspective, the current land allocation for graveyards remains significantly below the National Reference Manual (NRM) standards, which recommend approximately 0.5–4% of urban land for burial spaces in cities of comparable population size. The limited availability of designated burial land indicates potential long-term pressures as the population grows, particularly in central urban areas where land conversion pressures are already high. Moreover, the absence of formally planned cemetery extensions or reserved future sites suggests that unmanaged expansion or informal burial practices may emerge if proactive land reservation is not incorporated into future planning strategies. Strategic identification of new cemetery sites, along with improved access roads, boundary demarcation, and environmental safeguards, will be essential to ensure sustainable and culturally appropriate burial infrastructure in Battagram City.

Map 29: Existing Graveyards – Battagram



3.1.82.1. National Standards

According to the National Reference Manual for Infrastructure and Planning, the burial requirement is usually estimated using average mortality rates, burial rotation schedules, and spatial standards for graves. These standards provide a scientific basis for calculating the land required for future cemetery development.

10.4.1.1.1 Grave Dimensions

As shown in the Table below, grave sizes vary by age category. An adult grave typically requires 7 feet by 4 feet (2.13 × 1.22 meters), while children and infants require proportionally smaller spaces. These standard dimensions facilitate the estimation of the total area required for each burial plot, including allowances for circulation paths and spacing between graves.

Category	*Dimensions (Feet)*	*Dimensions (Meters)*
Adults	7' × 4'	2.13 × 1.22
Children under 12	6' × 3'	1.83 × 0.91
Infants	4' × 3'	1.22 × 0.91

Source: National Reference Manual for Infrastructure and Planning

10.4.1.1.2 Land Requirement Estimation

Based on planning norms, a mortality rate of 12 deaths per 1,000 people per year and a grave rotation time of 40 years are assumed for urban graveyards. This results in 480 graves per 1,000 people over one rotation cycle. Each grave, including circulation and non-burial space, occupies an average of 54 square feet, leading to a total requirement of ***0.595 acres per 1,000 people.*** Using an urban density of 35 persons per acre, the required land for graveyards is calculated at 20.8 acres per 1,000 acres of urban space. This equates to 2.1% of the total urban area that should be reserved for graveyard use, as detailed in the Table below.

Parameter	*Value / Calculation*
Mortality rate	12 per 1000 persons
Rotation time for graveyard	40 years
Graves required for one rotation	40 years × 12 deaths/year = 480 graves
Gross size of each grave	9 ft × 6 ft = 54 sq. ft. (includes circulation & other uses)
Total area required per 1000 persons	54 sq. ft × 480 graves = 25,920 sq. ft = 0.595 acres
Urban density	35 persons per acre
Area required for 1000 acres of urban space	0.595 acres × 35 = 20.8 acres

Percentage of urban area dedicated to graveyards	2.1%

Source: National Reference Manual for Infrastructure and Planning

These planning standards must be applied proactively by district authorities when preparing land-use plans, urban expansion strategies, and community-level service allocations. Given the cultural and religious significance of burial grounds, ensuring the timely provision of well-located and adequately sized graveyards should be a key priority for future urban and rural development.

3.1.83.Religious

Religious infrastructure in Battagram City forms a fundamental component of the social and cultural landscape, reflecting the district's predominantly Muslim population and strong community-based religious practices. Mosques serve not only as places of worship but also function as local gathering points for social interaction, community decision-making, and dissemination of religious and social information. Madrassas contribute to religious education, particularly in peri-urban and rural communities where formal educational infrastructure remains limited.

The spatial analysis of existing land use indicates that religious facilities occupy a relatively small proportion of the total urban area; however, their functional importance remains high. Mosques constitute the dominant category of religious infrastructure, reflecting the widespread distribution of neighborhood-level worship facilities across residential areas. Madrassas are limited in number but play an important educational and social role, especially in providing basic religious instruction and community engagement.

In many small and medium-sized cities across Khyber Pakhtunkhwa, including Battagram, religious facilities are typically embedded within residential clusters rather than planned as stand-alone institutional zones.

Table 86: Existing Religious Land Use in Battagram City

Major Land Use Category	Sub-Category	Area (Acres)	Percentage (%)
Religious Buildings	Madrassa	1.10	0.013%
Religious Buildings	Masjid	9.53	0.113%
Total Religious Area	—	**10.63**	**0.126%**

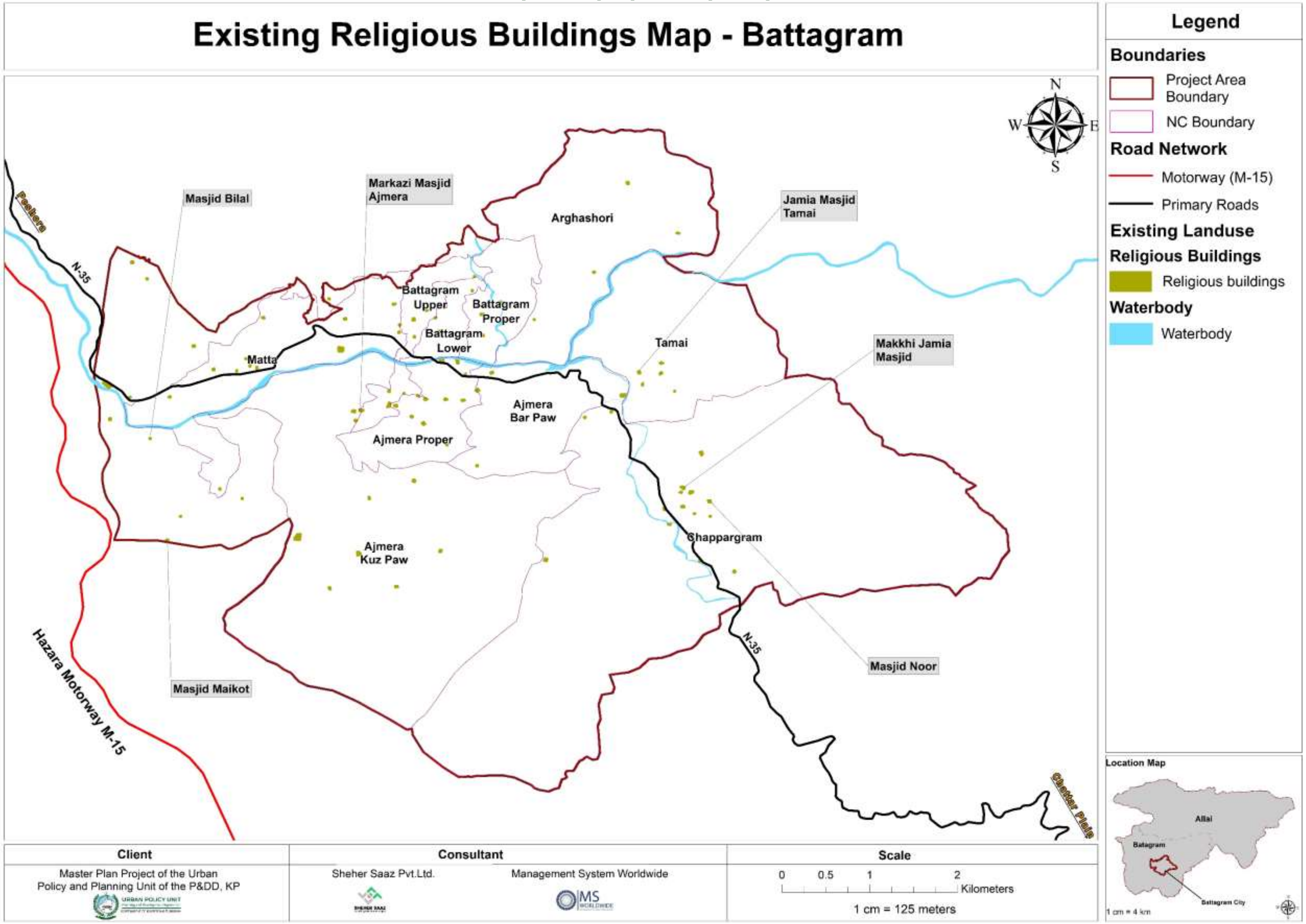
Source: Developed by Consultant

The existing religious infrastructure occupies approximately 10.63 acres, representing 0.126% of the total urban area, indicating minimal spatial allocation despite the high frequency of religious usage in daily life. Mosques account for nearly 90% of total religious land use, highlighting their neighborhood-based presence and functional dominance.

The distribution pattern suggests that religious facilities are primarily community-driven developments rather than outcomes of formal planning processes. While this ensures high local accessibility, it also creates planning challenges such as congestion, inadequate parking, and lack of supporting civic infrastructure around major mosques during peak prayer times and religious events.

Given Battagram's compact settlement structure and strong community networks, religious infrastructure remains socially effective but spatially fragmented. Future urban planning interventions should focus on integrating religious facilities within neighborhood planning frameworks, ensuring proper access, circulation, and provision of ancillary amenities such as parking, sanitation, and public open spaces to accommodate congregational activities safely and efficiently.

Map 30: Existing Religious Buildings – Battagram



3.1.84. Proposed Graveyards

The proposed graveyard extension in Battagram has been planned to address the future burial requirements of the growing population during the planning period 2025–2045. Existing graveyard facilities currently cover approximately 15.49 acres, while an additional 2.18 acres have been proposed to ensure the continued availability of adequate burial space. With this proposed expansion, the total area allocated for graveyard facilities will increase to approximately 17.66 acres by 2045.

The extension strategy focuses on the systematic and respectful expansion of existing graveyard sites in order to accommodate future community needs while maintaining cultural and religious sensitivities. The proposed expansion areas have been identified in locations that provide accessibility for surrounding settlements and compatibility with adjacent land uses. This approach minimizes land-use conflicts and ensures that graveyard facilities remain integrated within the overall urban and rural development framework of Battagram.

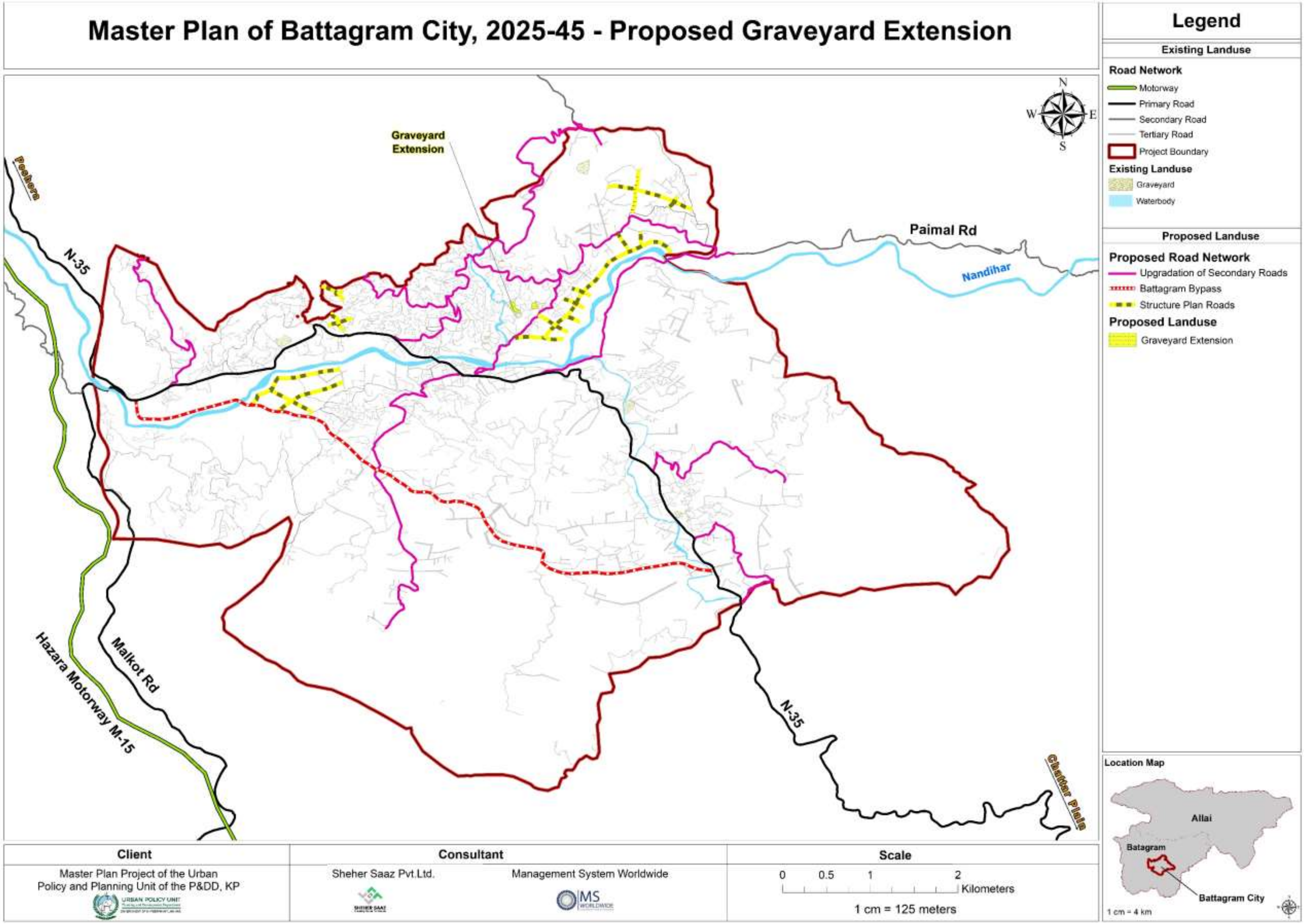
The proposed graveyard extensions are also intended to improve the organization and environmental quality of burial spaces through proper site planning and management. Future development may include boundary walls, internal pathways, landscaping, plantation buffers, drainage systems, and designated circulation areas to improve accessibility and preserve the sanctity of these spaces. Sustainable environmental measures are encouraged to protect surrounding areas from unmanaged runoff and land degradation while enhancing the visual character of the sites.

Through these interventions, the graveyard extension proposal aims to provide sufficient, well-managed, and environmentally responsible burial facilities that can adequately serve the long-term needs of the population while preserving the cultural identity and social values of the community.

Table 87: Proposed Graveyard Extension

Area of Existing Graveyard Facilities 2025 (Acres)	Proposed Area (acres)	Total Area till 2045 (acres)
15.488	2.175	17.664

Map 31: Proposed Graveyard Extension



3.2. Civic, Administrative and Community Facilities

3.2.1. Existing Situation

Public and civic amenities within the planning area collectively occupy 17.241 acres, representing the existing institutional footprint of government administration, public utilities, social welfare, health, and regulatory services. These facilities are spatially distributed across the settlement and function as integral components of day-to-day governance, service delivery, and community support rather than forming a single, designated zone.

The existing public and civic land use includes a wide range of administrative and governance-related offices, such as the Tehsil Dar Office, TMA, District Office, Election Commission Office, FBR Income Tax Office, NADRA Office, Pakistan Post Office, and the District Transport Office. Local governance structures are further supported through Union Council and Village Council, ensuring administrative outreach at neighborhood and community levels.

The public/civic footprint also encompasses social welfare and population support services, including the Benazir Income Support Program (BISP) Tehsil Office, Social Welfare Office, and welfare-related offices, reflecting the role of the public sector in social protection, poverty alleviation, and community well-being.

3.2.2. Proposed Civic / Administrative Zones

The proposed civic amenities framework includes the provision and upgrading of essential public facilities such as administrative offices, community centers, public service institutions, social welfare facilities, emergency response services, and other supporting civic infrastructure required for sustainable urban growth. These facilities are strategically planned to ensure equitable access for surrounding communities while supporting the efficient functioning of Battagram as a growing urban center.

The planning approach emphasizes compact, accessible, and integrated civic development that aligns with the broader urban structure of the city. Proposed civic amenity zones are intended to accommodate future administrative and community service needs while minimizing pressure on existing facilities. Efficient land utilization, improved connectivity, and the incorporation of public open spaces and pedestrian-friendly environments are encouraged to create more functional and inclusive civic spaces.

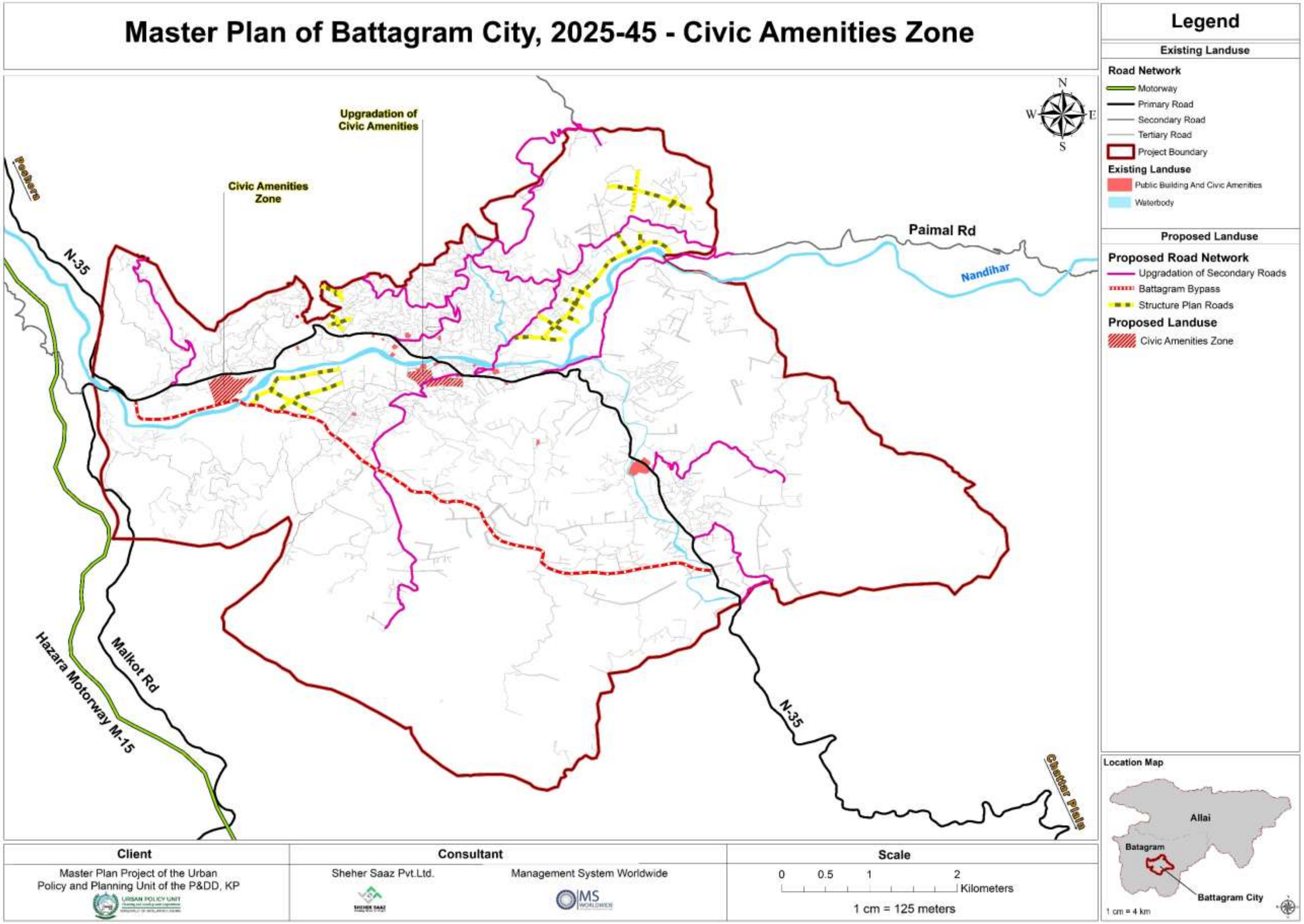
Table 88: Proposed Civic Amenities Zone

Area of Existing Civic Amenities 2025 (Acres)	Proposed Area (acres)	Total Area till 2045 (acres)
17.241	34.024	51.265

3.2.3. Zoning Regulations

Permitted Uses	Permitted on appeal Uses
• **Research centers** • **Offices of Social and Cultural Organizations** • **Parks** • **Public Utilities and Offices (electric supply,etc)** • **Post Office** • **Government Offices** • **Museum** • **Approved Parking Provisions** • **Emergency Facilities (fire station)** • **Libraries** • **Shelter home** • **Municipal office** • **Social welfare institutions** • **Police station** • **Mosque** • **Park, memorial and monument**	• Vocational Training institutes • Recreational Uses • Offices of Commercial Institutions • Theatre halls • Arts Councils and Auditoriums • Convention Center • Restaurants • Limited Retail Shopping • Laboratory • Taxi Stands, Bus Halts

Map 32: Proposed Civic Amenities Zone



11 CHAPTER: PARKS, RECREATION AND OPEN SPACE SYSTEM

Sports and recreational facilities play a critical role in enhancing community well-being, promoting youth engagement, and improving overall quality of life. The Sports Office, District Battagram, has identified a limited number of existing and proposed recreational facilities, reflecting the early stage of formal sports infrastructure development in the district.

At present, only a small number of functional public recreational spaces are available. The Tehsil Playground at Banna (Tehsil Allai) is currently functional and serves as a key recreational facility for local communities. However, the limited number of operational playgrounds indicates insufficient recreational infrastructure relative to population needs.

To address infrastructure gaps, the Sports Department has identified and initiated land acquisition processes for additional recreational facilities:

- **Headquarters Playground – Maidan (Battagram Tehsil):** Land is under Section-4 acquisition, indicating planning and administrative progress. Once completed, it will provide a centralized recreational facility for district residents.
- **Sports Complex – Kuza Banda (Battagram Tehsil):** A large land parcel has been identified for a proposed sports complex aimed at providing multi-functional recreational and training facilities. The project remains in the planning phase pending further approvals.

3.2.4. Spatial Distribution & Planning Implications

The available and proposed sports infrastructure demonstrates:

- Concentration of facilities in Battagram and Allai tehsils, with limited coverage in other rural settlements.
- Ongoing land acquisition efforts indicating institutional recognition of recreational infrastructure shortages.
- Significant need for additional neighborhood-level parks and sports facilities to ensure equitable access.

Table 89: Sports Faculties – District Battagram

Sr. No	District	Tehsil	Mouza	State Land	Status of Land	Lat	Long	Type	Remarks
1	Battagram	Allai	Banna	40 k	Available	3483812	73.055283	Tehsil Play ground	Functional
2	Battagram	Battagram	Maidan	41 k 16 M	Under section 4	34.675327	73.00395	Proposed site for headquarter	Proposed

								s play ground	
3	Battagra m	Battagra m	Kuza Banda	100 k	Under section 4	34.62825 2	73.01010 5	Proposed site for Sports Complex	Proposed

Source: Secondary data from District Sports Office, Battagram

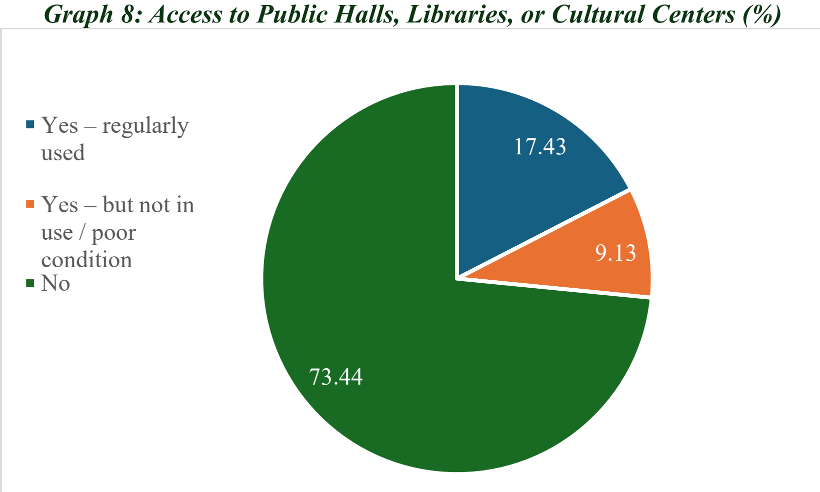
3.2.5. Primary Data Analysis

The availability, accessibility, and condition of recreational and public places in Battagram City remain highly constrained, as reflected by the primary household survey. The findings indicate a severe shortage of functional public spaces, weak maintenance of existing facilities, and limited supporting infrastructure, all of which directly affect residents' quality of life and social interaction.

3.2.5.1. Availability of Public Halls, Libraries, and Cultural Centers

Survey results show that 73.44% of respondents report no access to any public halls, libraries, or cultural centers within their community. Only 17.43% indicate that such facilities exist and are regularly used, while 9.13% report the presence of facilities that are either non-functional or in poor condition. This highlights an almost complete absence of formal indoor community spaces for cultural activities, learning, gatherings, or civic engagement, particularly significant in a city with limited private recreational alternatives.

Graph 8: Access to Public Halls, Libraries, or Cultural Centers (%)



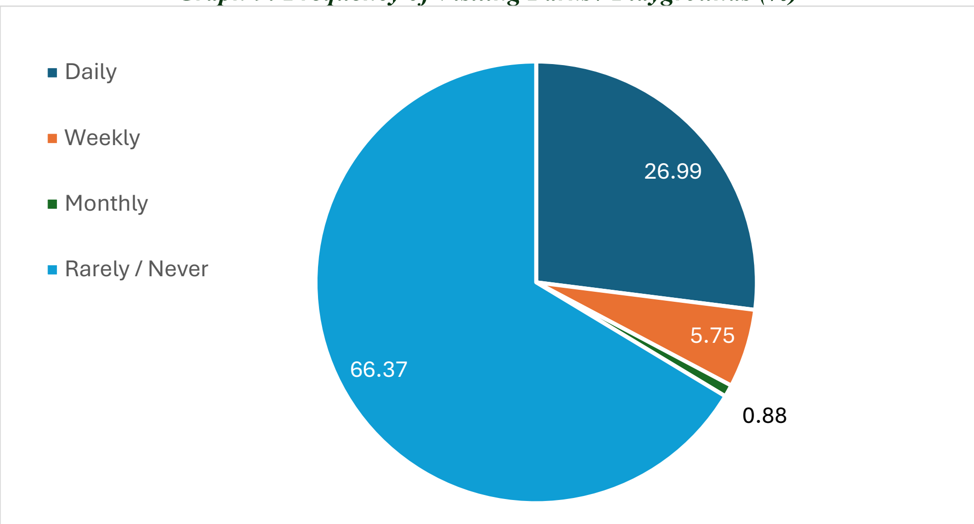
3.2.5.2. Access to Parks within Walking Distance

Access to open recreational spaces is similarly limited. Only 22% of households have a park within walking distance, while a substantial 78% report no nearby park. This lack of Neighborhood-level green spaces reduces opportunities for daily recreation, informal social interaction, and physical activity, especially for children, elderly residents, and women who are less likely to travel long distances for leisure.

3.2.5.3. Frequency of Use of Parks and Playgrounds

The limited availability and poor condition of parks are reflected in usage patterns. 66.37% of respondents report that they rarely or never visit parks or playgrounds. Only 26.99% visit daily, while 5.75% visit weekly and less than 1% visit monthly. These figures indicate that recreational spaces are not embedded into everyday urban life and are used primarily by a small segment of the population, likely those living close to the few available facilities.

Graph 9: Frequency of Visiting Parks / Playgrounds (%)



3.2.5.4. Condition of Existing Parks

Among respondents who assessed park conditions, 62% describe parks as poorly maintained or neglected, while 13% rate them as average and only 25% consider them well maintained. This confirms that even where parks exist, inadequate maintenance, lack of basic facilities, and neglect significantly reduce their usability and attractiveness, discouraging regular visitation.

3.2.5.5. Supporting Public Realm Infrastructure

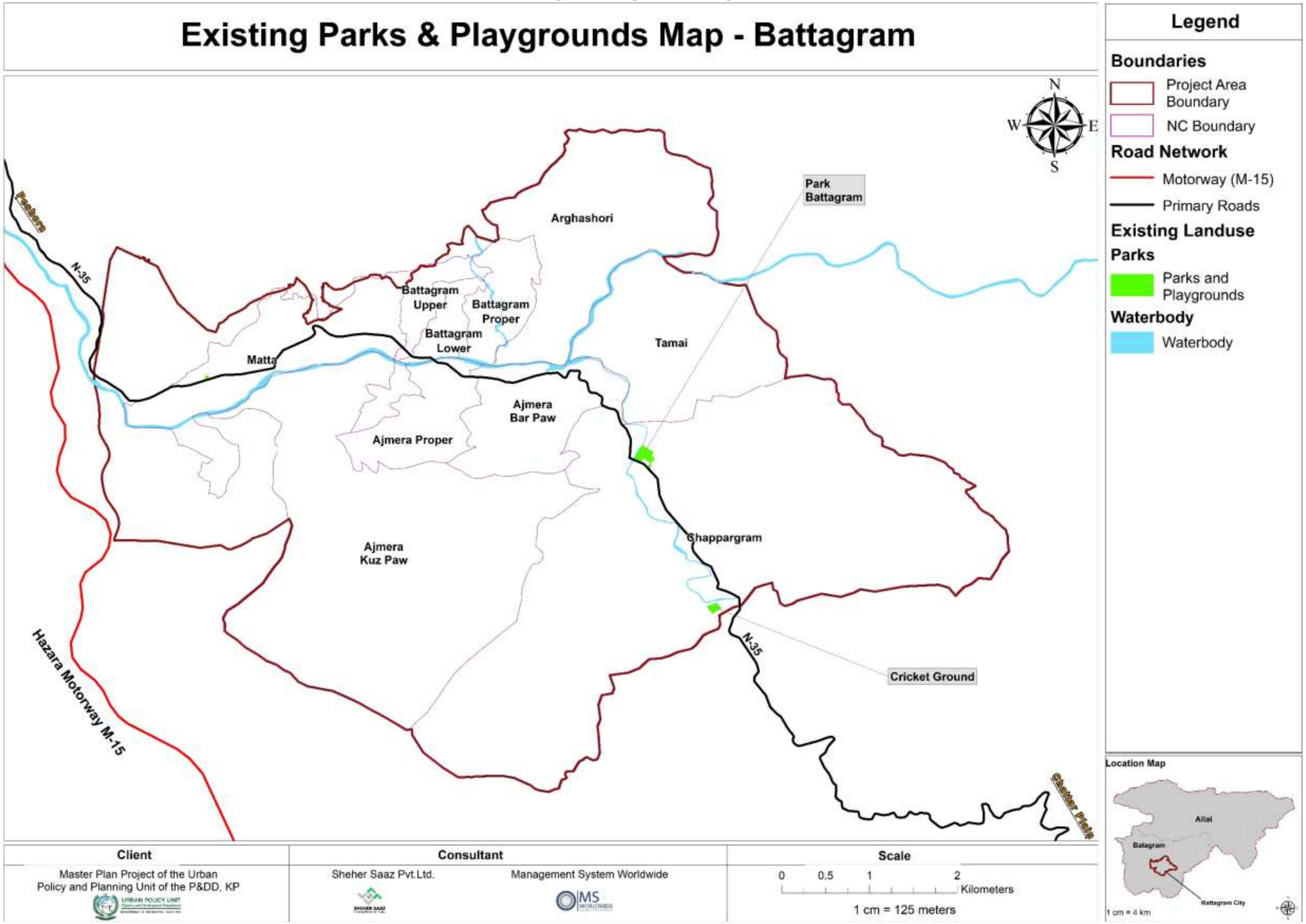
Supporting infrastructure for public spaces and mobility is notably weak. 72% of respondents report that no streetlights are working in their area, while only 21% report fully functional streetlights and 7% partial functionality. Poor lighting directly affects safety perceptions, evening mobility, and the usability of public spaces after sunset.

Similarly, 71% of respondents report no designated parking areas, while only 23% consider available parking adequate and 6% inadequate. The absence of organized parking contributes to roadside congestion, encroachment on public spaces, and conflicts between vehicles and pedestrians, particularly near markets and activity nodes.

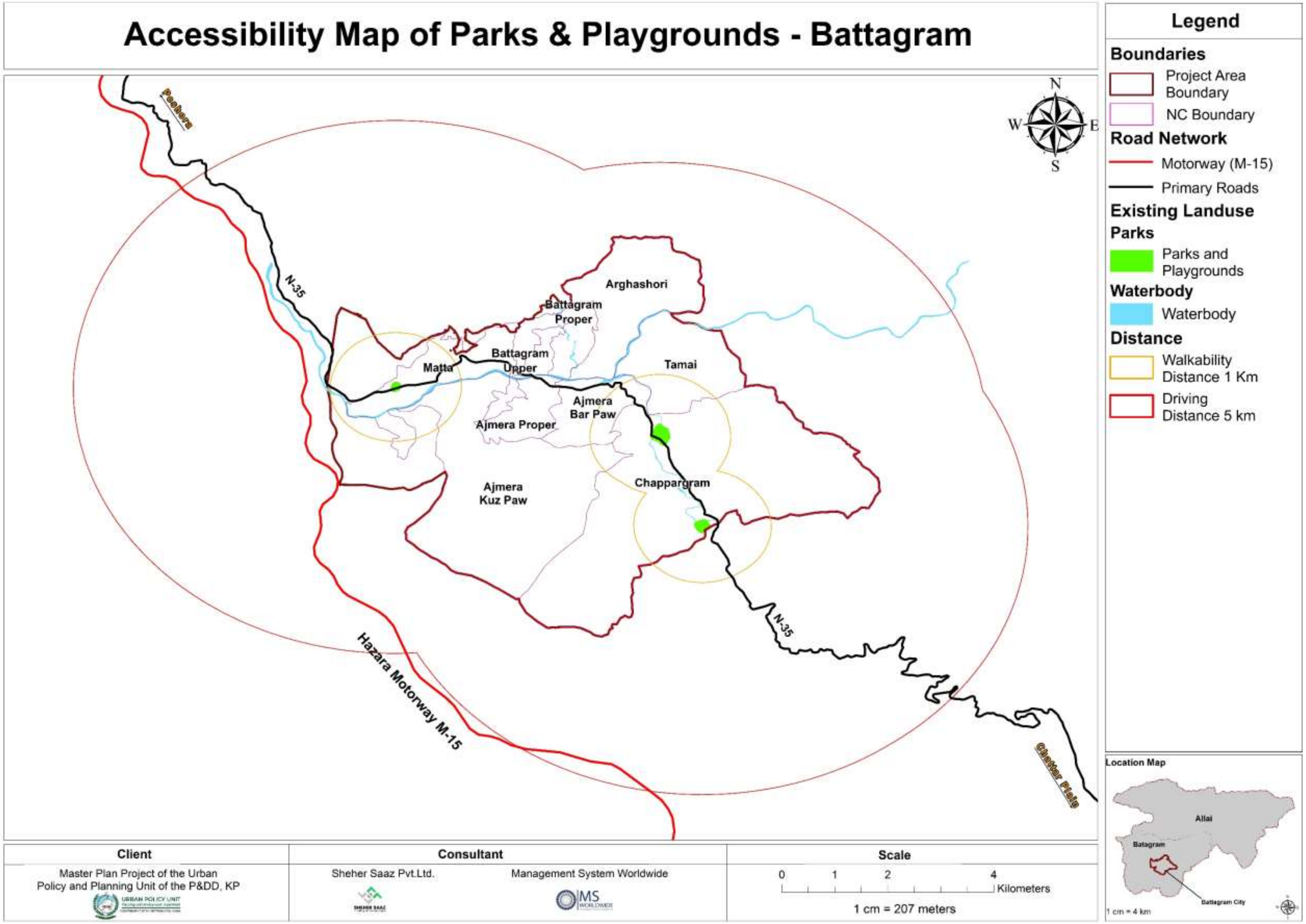
The primary data clearly demonstrates that recreational and public place infrastructure in Battagram City is critically insufficient, both in terms of quantity and quality. The absence of accessible parks, public halls, and cultural facilities, combined with poor maintenance, inadequate lighting, and lack of parking, has resulted in extremely low usage of public spaces.

These conditions limit social cohesion, restrict healthy recreational activities, and reduce the overall livability of the city.

Map 33: Existing Recreational Spaces



Map 34: Existing Recreational Spaces



11.1 Proposed Parks and Recreational Zones

Existing parks and playground facilities within Battagram currently cover approximately 8.57 acres. To address the increasing recreational, social, and environmental needs of the growing population during the planning period 2025–2045, a substantial addition of approximately 66.74 acres has been proposed for parks, recreational spaces, and tourism-related activities. With these proposed interventions, the total area allocated for parks and recreational uses is expected to increase to approximately 75.31 acres by 2045. The proposed recreational framework aims to improve public open spaces, promote healthy lifestyles, strengthen tourism potential, and enhance the environmental quality of the city.

The proposed recreational strategy includes the development of a Sports Complex covering approximately 13.65 acres to provide modern facilities for indoor and outdoor sports activities, youth engagement, and community events. This facility is envisioned to support physical wellbeing, organized sports, and social interaction while encouraging recreational participation among all age groups. In addition, a River-Front Park of approximately 2.22 acres has been proposed to utilize the natural landscape and river corridor as an attractive public recreational space. The river-front development is intended to provide scenic open areas, pedestrian walkways, seating spaces, and environmental enhancement while strengthening the relationship between urban development and natural features.

To improve accessibility to open spaces at the local level, approximately 3.90 acres have been allocated for Neighbourhood Parks within residential areas. These parks are intended to provide convenient recreational spaces for nearby communities, particularly children, families, and elderly residents. Similarly, a Family Park covering approximately 11.76 acres has been proposed as a major public recreational destination equipped with landscaped gardens, walking tracks, children’s play areas, seating spaces, and community gathering facilities to support social cohesion and urban livability.

The proposal also recognizes the tourism and ecological potential of Battagram through the allocation of approximately 12.07 acres for an Eco-Tourism and Recreational Zone. This zone is intended to promote environmentally sensitive tourism activities while preserving natural landscapes and biodiversity. The proposed eco-tourism area may include nature trails, viewing points, picnic areas, and environmentally sustainable recreational facilities designed to attract visitors and support local economic development without compromising environmental integrity.

The overall planning approach emphasizes sustainable and integrated recreational development through the provision of accessible open spaces, environmental conservation measures, pedestrian-friendly environments, and green infrastructure. The proposed recreational facilities are intended not only to improve the physical and mental wellbeing of residents but also to enhance urban aesthetics, environmental resilience, and the long-term livability of Battagram.

Table 90: Proposed Parks and Recreational Zones

Existing	Existing Parks and Playground	Proposed Parks/Recreational Zones	Proposed Zones	Total (2025-2045)

	(Acres)		(Acres)	Existing and Proposed (Acres)
Existing Parks and Playground	8.569	Sports Complex	13.648	45.83
		River-Front Park	2.218	
		Neighbourhood Parks	3.896	
		Family Park	11.759	
		Eco-Tourism and Recreational Zone	5.74	
		Total Proposed	37.267	

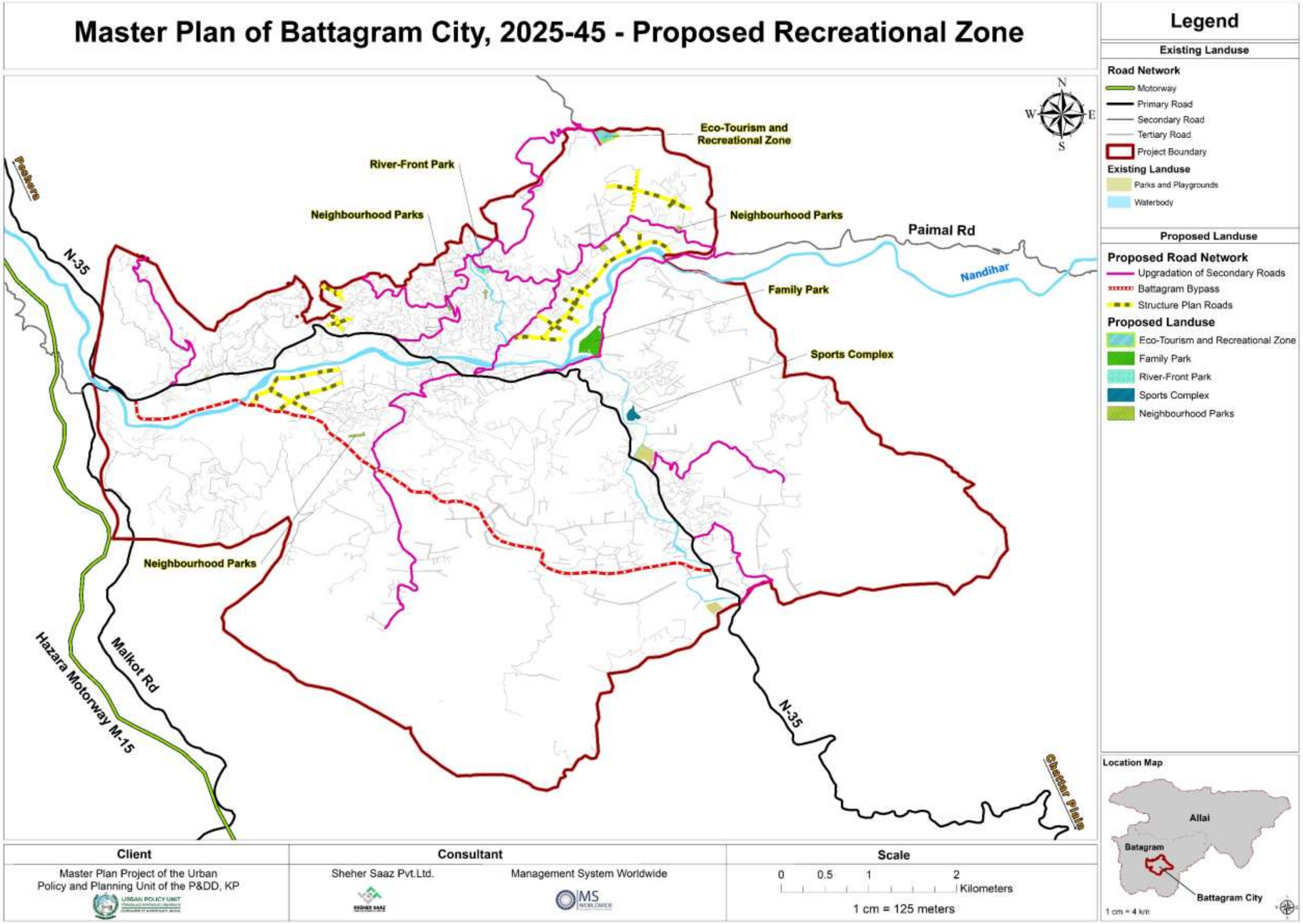
11.2 Zoning Regulations for Recreational and Open Space Uses

Table 91: Zoning Regulations for Recreational Zone

Land use Zone	Permitted Land Uses	Permitted on Appeal
Recreational Areas	• Recreational areas including parks, playgrounds and related uses. • Amusement Parks and Playlands • Youth hostels and clubs • Bus halts and car parking areas. • Dwellings for watch and ward staff. • Urban Forest • Orchard • Plant Nurseries • Botanical Garden • Swimming Pool • Picnic Hut • Shooting Range • Botanical Garden	• Restaurants and establishments selling eatables • Incidental recreational uses. • Graveyards • Guest house

	• Public utilities and municipal facilities.	

Map 35: Proposed Parks and Recreational Zones



12 CHAPTER: HISTORICAL/CULTURAL/HERITAGE AND TOURISM

12.1 Existing Historical & Cultural Places

Among the most historically significant yet most threatened heritage elements in the immediate vicinity of Battagram city are the ruins of ancient Buddhist settlements along the road from Battagram city centre toward Pishora on the Paimal Sharif road. These were described in a 2018 travel narrative published in Greater Kashmir newspaper: 'Had we taken a right turn from the Battagram city centre towards Pishora on the Pemal Sharif road we would've encountered the first of a series of ruins of ancient Buddhist settlements, most of which have now been levelled as fields' (Mukhtar, A Tryst of the Heart and History along the Karakoram Highway, Greater Kashmir, 25 April 2018). This first-hand account, while not constituting formal archaeological documentation, corroborates the district-level findings of the 2023 Hazara University survey.

The Department of Archaeology at Hazara University Mansehra formally lists 'Archaeological exploration of the unexplored districts (Torghar, Battagram, Kohistan Upper and Lower, Kolai Palas)' as a completed project. The 2024 GIS Mapping paper references 'Figure 6: Map of District Batāgrām showing Buddhist sites,' confirming the mapping of Buddhist-period sites within the district, though the precise number and locations remain to be published in the full survey report.

Figure 14: Heritage Buddhist Sites in Battagram

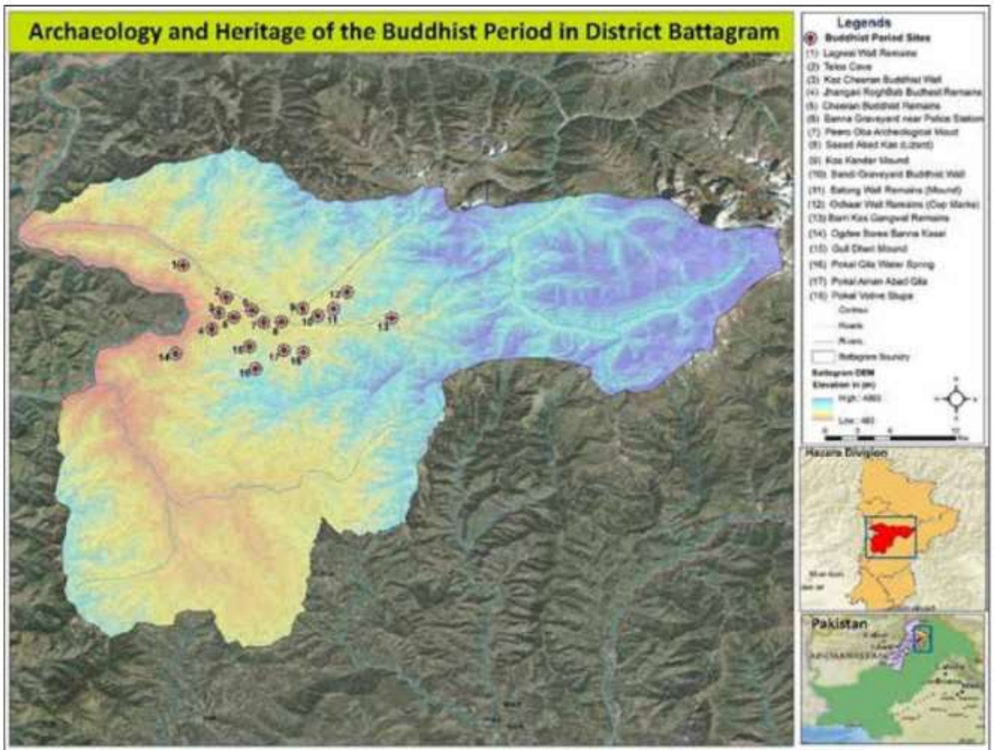


Figure 6. Map of district Batāgrām showing Buddhist sites

Source: https://www.researchgate.net/publication/380531917_GIS_Mapping_of_the_Buddhist_Relics_of_Hazara_Division_Pakistan

Battagram District's Buddhist sites are contextually linked to the broader Gandhara civilization, which flourished from approximately 300 BCE to 700 CE across the Peshawar Valley, Swat, Dir, and eastern Hazara regions. The Kushan Empire (c.30–375 CE) was the great patron of Gandhara Buddhist art, sponsoring the construction of stupas, viharas (monasteries), and rock-cut imagery across this zone. Trade along the Silk Road brought wealth, artisans, and patronage that transformed this region into one of the world's most vibrant centres of Buddhist culture. The schist stone used for Buddhist sculptures in Hazara has been mineralogically traced to specific quarry sources (Journal of Asian Civilizations, 2022), and the proximity of Battagram District to confirmed Mansehra-area sites such as Zar Dheri and Bado Dheri indicates a shared geological and cultural resource base.

Of particular concern is the condition of these sites. The Greater Kashmir account explicitly notes that Buddhist ruins near Pishora 'have now been levelled as fields,' indicating severe and possibly irreversible damage. This mirrors the documented situation across Hazara, where the Department of Archaeology at Hazara University has warned that 'plundering of the Buddhist sites on the hands of antique dealers and the site owners is still in progress in the Mansehra and its surrounding regions at an alarming rate' (ResearchGate, Haripur Archaeological Survey paper). Battagram's sites, being even less documented and supervised than those in adjacent districts, are presumed to be at equivalent or greater risk.

The masterplan must treat the Pishora Buddhist zone as a heritage priority area for immediate survey, documentation, and provisional protection. Even without formal legal listing, the municipality can designate the zone as a 'Heritage Study Area' in planning instruments, restricting development that would disturb potential sub-surface archaeology pending formal assessment. Given the proximity to Battagram city (accessible directly from the city centre), these sites also represent a significant cultural tourism opportunity if properly excavated and interpreted. Source references: Greater Kashmir article (greaterkashmir.com, 2018); Arch.hu.edu.pk project list; Academia.edu GIS Mapping paper (2024/2025); ResearchGate Haripur survey paper.

Thakot (also written Takot and in Pashto: تاکوټ) is the principal historical town of Battagram, located approximately 30 kilometers north of Battagram city on the west bank of the Indus River, at the point where the Karakoram Highway meets the river. It serves as a Union Council within Battagram Tehsil and is the site of the historically important Thakot Fort, an ancient river-crossing garrison, and a place of documented British military action in 1888. Thakot has been described as 'a strategic crossroads for centuries, attracting traders, travelers, and conquerors alike' with historical layers from Buddhist civilization through Hindu Shahi, Ghaznavid, Ghurid, Mughal, Turkic, Swati, Sikh, and British colonial periods[46].

The most historically documented event at Thakot is the fall of the Jhanjer Fort (Jhanjal Fort), the Karlugh Turkic fortification to Swati forces in 1703 CE. Shamsher Khan, the loyal Turkish general of the last Karlugh ruler Sultan Mehmud Khurd, defended the fort 'with great valour' for 'several months' before Swati forces prevailed. This marks a watershed moment in the political history of the Battagram–Hazara region, signaling the end of three centuries of Turkic

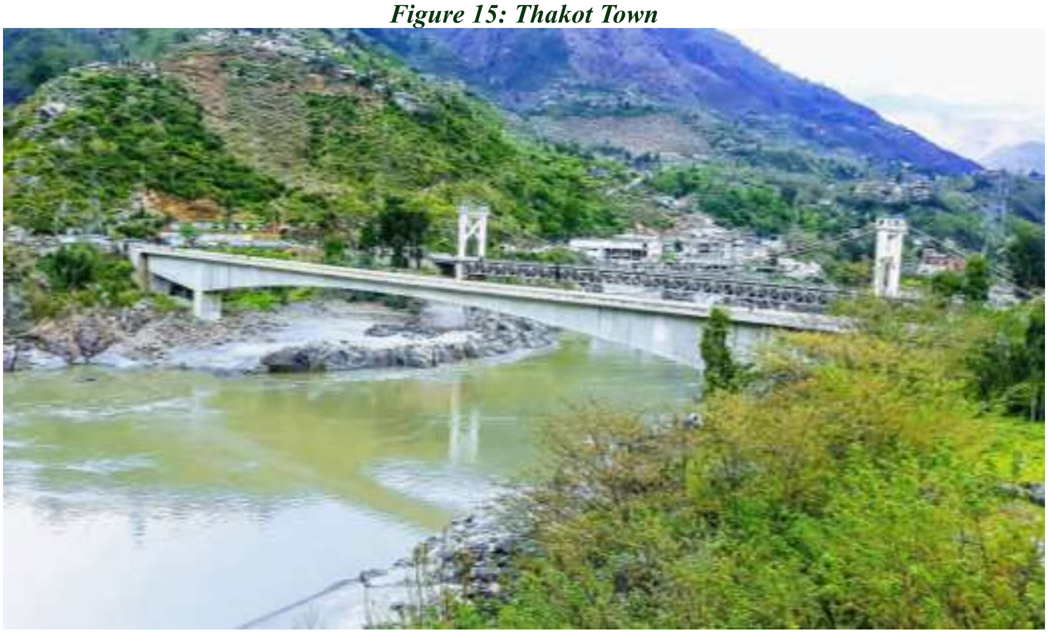
[46] https://www.graana.com/blog/a-tourist-guide-to-thakot/

rule and the beginning of Swati dominance. The 'Khans of Thakot' from the Arghushal family of the Swati tribe subsequently ruled the area, with a documented lineage of at least eleven Khans.

The British military operations at Thakot in 1888 constitute a well-documented historical record. During the First Hazara Expedition (*Black Mountain Campaign*) of 1 October to 13 November 1888, a British force under Brigadier-General Channer marched to Thakot on 28 October 1888. On reaching Thakot, the brigadier marched his force through the village to the sound of Seaforth Highlanders bagpipes. The British forces engaged enemy fire from the village of Daut across the Indus River, used Gatling guns to suppress fire from the heights, and shelled Daut before withdrawing. Thakot itself was not damaged as its inhabitants had not resisted. These events are part of Thakot's colonial heritage record.

Today, Thakot also hosts the site of a major proposed ***2,800 MW hydroelectric power project*** (Thakot Hydel Power Project, to be built by WAPDA at an estimated cost of USD 5 billion), which will significantly alter the landscape of the Indus at Thakot. Heritage impact assessments for this project must include sub-surface archaeological surveys, since any reservoir created would potentially inundate historically sensitive terrain along the Indus valley. The modern Youyi (Friendship) Bridge at Thakot, a steel suspension bridge on the KKH is itself a heritage of Pak-China cooperation and a landmark of the district. The bridge site replicates the function of the ancient Indus ford or ferry crossing that made Thakot significant throughout history.

Figure 15: Thakot Town



12.2 Conservation & Preservation Assessment

At present, Battagram lacks any formal conservation, documentation, or preservation framework for historical or cultural assets. No heritage inventories, protected structures, or conservation guidelines exist. As a result, traditional buildings and culturally significant sites are gradually being altered, replaced, or neglected due to modern construction practices, population pressure, and the absence of regulatory oversight.

The cultural landscape of Battagram is preserved primarily through continued use rather than intentional conservation. Traditional housing, religious practices, and community customs remain intact largely because of limited urban transformation rather than proactive heritage management. While this organic continuity sustains cultural identity, it also leaves heritage elements vulnerable to irreversible loss as road expansion, commercial activity, and unregulated development increase.

Museums, cultural centers, art galleries, or performance spaces are entirely absent in the city. There are no institutional mechanisms for documenting local history, preserving oral traditions, or showcasing indigenous crafts, architecture, or social practices. Cultural learning and immersion occur informally through daily interaction with local communities rather than through structured cultural infrastructure.

3.2.6. Issues & Problems

At present, Battagram lacks any formal conservation, documentation, or preservation framework for historical or cultural assets. No heritage inventories, protected structures, or conservation guidelines exist at the municipal or district level during field survey and data collection stage. As a result, traditional buildings and culturally significant sites are gradually being altered, replaced, or neglected due to modern construction practices, population pressure, and the absence of regulatory oversight.

The cultural landscape of Battagram is preserved primarily through continued use rather than intentional conservation. Traditional housing, religious practices, and community customs remain intact largely because of limited urban transformation rather than proactive heritage management. While this organic continuity sustains cultural identity, it also leaves heritage elements vulnerable to irreversible loss as road expansion, commercial activity, and unregulated development increase.

Museums, cultural centers, art galleries, or performance spaces are entirely absent in the city. There are no institutional mechanisms for documenting local history, preserving oral traditions, or showcasing indigenous crafts, architecture, or social practices. Cultural learning and immersion occur informally through daily interaction with local communities rather than through structured cultural infrastructure.

12.3 Existing and Potential Tourism Sites

12.3.1.1.1 Chattar Top & Chattar Plain

Chattar Top is an elevated plateau perched at over 2,800 metres, often described as the ***'balcony of Hazara'***. Located approximately 20 kilometres from Battagram city and straddling the boundary between Battagram and Mansehra districts, it offers 360-degree panoramic views of surrounding hill ranges, dense pine forests, terraced fields, and traditional Swati stone-and-timber villages.

The Chattar Plain below the top is a broad, verdant meadow that has historically served as a seasonal gathering ground for local tribes during festivals and inter-clan meetings. Elders of the area recount its use as a strategic lookout point during historical conflicts and migrations, lending the site a layer of cultural significance beyond its scenic beauty.

Access: *A 4x4 vehicle is recommended, especially in wet or snowy conditions. The drive from Battagram takes approximately 1.5–2 hours; from Mansehra, about 2.5 hours via KKH and local roads.*

Best Season: *May to November; fog and rain can obscure visibility in monsoon months.*

12.3.1.1.2 Allai Valley

Allai Valley, located in the high mountains of what was formerly Allai Tehsil (now Allai District), remains the most celebrated natural attraction associated with Battagram. Bounded by mountain ranges exceeding 15,000 feet on the Kohistan side and another range extending from the Afghan border to the Indus River near Thakot, the valley stretches approximately 24 kilometres in average breadth across a total area of around 520 sq km. The valley ranges in elevation from approximately 1,200 to 3,000 metres, offering a diverse landscape of alpine meadows, dense conifer forests, cascading waterfalls, and glacially fed streams.

The valley has cultural roots in the Gandhara civilisation and is known for its Pashtun and Kohistani heritage. It was ruled by the Beebal Khans (tribal chiefs) until 1949, when they signed the Instrument of Accession with Pakistan. The last Nawab of Allai, Nawab Muhammad Ayub Khan, ruled until 1971. Locally grown wheat, barley, maize, and rice sustain the villages, and the valley's produce described by agricultural experts and journalists as essentially organic has recently been introduced to urban markets including Karachi Farmers Market.

Access: *From Battagram city, the journey to Allai town takes approximately 2 hours. The road is navigable by 4x4, with some rough sections particularly after rain. Travellers from Naran/Kaghan can access Allai via Babusar Top in summer.*

12.3.1.1.3 Sukai Sar — The Trekking Peak

Sukai Sar is the highest peak in the former Allai Valley, surrounded by dense pine forests, alpine meadows, and glacial streams. Its remote location and challenging terrain have kept it largely free from mass tourism, preserving its pristine ecological character. It is a multi-day expedition destination, beginning at Shamsher Village the last motorable point in Allai and proceeding on foot through steep inclines and rocky terrain.

Two main trekking routes exist: the Kas Khwar Route, which offers a more gradual ascent through Ghazian Pass, and the steeper Jari Bela Route, recommended only for experienced mountaineers. The trek passes the stunning Khapero Lake, a glacial lake whose bluish-grey waters reflect the surrounding peaks before reaching the summit. Climbers typically require a minimum of two to three days for the full ascent and descent.

Equipment: *Full mountaineering equipment including tents, sleeping bags rated for sub-zero temperatures, and navigation tools are required. Local guides are available from Thakot Bazaar and Allai town.*

12.3.1.1.4 Galai Meadows (Galai Medan Gantar)

Tucked within the Allai Valley, Galai Meadows — locally known as Galai Medan Gantar or simply Galai Medan — is a vast, rolling expanse of green at an elevation of over 2,500 metres. The meadow is characterised by fruit orchards, alpine flora, and crystal-clear streams fed by glacial melt from peaks above. It is frequently described by domestic adventure travellers and photographers as among the most peaceful and photogenic spots in northern Pakistan.

The journey from Battagram to Galai Meadows follows the road toward Thakot Bazaar on the Karakoram Highway, then turns off through the Allai Valley, passing through villages such as Biari and Rashang. Traditional Swati homes and wooden bridges en route add cultural context to the approach. Local guides are available at Thakot Bazaar, and the trek to the meadows from the last vehicular point typically takes 2–3 hours.

12.3.1.1.5 Chor Valley

One of the most ecologically rich sub-valleys in the district, Chor Valley is celebrated for its emerald-green waters, towering cliffs, biodiversity, and dense forests. Plain pastures occupy the upper valley floor, and the approach passes through landscapes that have been largely untouched by agricultural development. Access to Chor Valley requires planning for multi-day camping, as the round trip typically takes several days.

12.3.1.1.6 Khapero Lake

Situated at the foot of Sukai Sar near the trek's base camp, Khapero Lake is a glacially formed water body whose distinctive bluish-grey colouration reflects the surrounding rock and ice. It serves as a primary waypoint on the Kas Khwar trekking route to Sukai Sar. The lake's remote position and unspoiled environment make it a compelling destination for serious trekkers and wilderness photographers.

12.3.1.1.7 Thakot — Gateway on the Indus

Located approximately 30 kilometres from Battagram city, Thakot is the point at which the Karakoram Highway first meets the Indus River (locally called Abasin). The Thakot Bridge spans the mighty Indus at this junction and marks the administrative boundary between Battagram and Shangla Districts on the Silk Route corridor. Travellers heading north on the KKH toward Gilgit-Baltistan, Skardu, or Hunza pass through Thakot, and its position as the KKH's original starting point has endowed it with historical significance. The bridge and the confluence of the highway with the Indus are themselves scenic attractions, set against a dramatic mountain backdrop.

12.3.1.1.8 Chattar Top — Harmony Hill (Shanti Parot)

Situated atop Jhangeeri Top on the Chattar Plain, Harmony Hill, locally known as Shanti Parot is a viewpoint that offers sweeping vistas of surrounding valleys and mist-kissed peaks. The site carries a resonance of peace and spiritual calm that gives it its name. It is rated a perfect 5.0 by travellers on review platforms and is particularly popular for meditation, photography, and quiet contemplation away from urban noise.

12.3.1.1.9 Battagram Heights Agri-Tourism Foundation

Located in UC Rockban, Battagram, this foundation represents a growing trend of community-based agri-tourism in the district. Visitors can immerse themselves in traditional farming practices, explore orchards, engage in hands-on agricultural activities, and sample locally sourced produce in a setting of mountain tranquillity. The initiative has received a perfect 5.0 rating from visitors and serves as a model for sustainable, community-driven tourism that channels economic benefit directly to local families.

12.3.1.1.10 Chinarona

Chinarona is a scenic natural attraction located on the outskirts of Battagram city, notable for its crisp mountain air, expansive views over verdant valleys, and tranquil ambiance, it serves as an accessible day excursion from the city centre for those seeking a quick immersion in natural beauty without venturing far into the highlands.

12.3.1.1.11 Danda Patey, Sokar

Danda Patey in the Sokar area is a natural landscape attraction. Characterised by rolling hills, pine trees, and open skies, it offers a typical Battagram highland experience ideal for picnics, nature walks, and photography. The terrain is moderate and accessible, making it a popular destination for families and casual visitors.

12.3.1.1.12 Aziz Abad

Aziz Abad, accessible via Ajmera in the district, is a hidden natural gem rated 5.0/5 by visitors. The site is characterised by rolling hills, traditional dwellings, birdsong, and panoramic vistas that encapsulate the authentic rural character of Battagram. It is particularly well-suited to travellers interested in cultural immersion alongside natural beauty.

12.3.1.1.13 Trout Fishing — Nandhyar & Allai Khwar

The streams of Battagram district particularly Nandhyar Khwar and Allai Khwar, along with numerous smaller tributaries are well-documented fishing destinations for trout. The Pakistan Almanac notes that trout fishing is conducted commercially in the district and that a government-operated fish hatchery is maintained in Allai. These streams represent a niche but growing attraction for angling enthusiasts visiting northern Pakistan.

12.3.1.1.14 The Karakoram Highway (N-35) Scenic Corridor

The section of the Karakoram Highway that passes through Battagram District is itself a significant tourism asset. Often referred to as the 'Eighth Wonder of the World', the KKH was jointly constructed by Pakistan and China between 1962 and 1979 and opened to the public in 1986. At its maximum elevation, the highway reaches 4,714 metres near Khunjerab Pass, though the Battagram section traverses lush, wooded terrain before reaching the more dramatic mountain landscapes further north.

Travellers on the KKH through Battagram pass through thickly forested ridges and picturesque villages, with views of the Chattar Plain, the Indus River gorge, and distant snow-capped peaks. Battagram city and Thakot Bazaar serve as natural rest stops and hospitality points on this internationally significant route.

12.4 Proposed Sustainable Eco-Tourism Development

Battagram District is distinguished by a rare convergence of assets. Its valleys Allai, Chor, Tikri, and Chattar contain alpine meadows, glacial lakes, dense Himalayan pine forests, trout-bearing streams, and peaks exceeding 4,000 metres. Its people are known for their hospitality, and its villages produce essentially organic food due to geographic isolation from chemical supply chains. The Karakoram Highway the ***'Eighth Wonder of the World'*** passes through its heart, providing a ready stream of transit travellers who currently stop only for fuel and tea.

Despite this wealth, a peer-reviewed study published in Mountain Research and Development documented the characteristic failure mode of Pakistani mountain tourism: benefits captured by influential landowning families and external operators, with general communities relegated to seasonal daily-wage labour. The same study warned of deforestation, unplanned accommodation growth, and out-migration of young people as symptoms of unsustainable, externally driven tourism. Battagram has not yet reached that tipping point; the window for designing tourism correctly from the outset remains open but it is narrowing as domestic visitor numbers to KPK continue to rise.

Furthermore, a UNDP-funded Eco-Tourism and Camping Villages Project[47] has already established a camping village in Battagram as part of a KPK-wide programme, training 210 youth in eco-tourism and hospitality management and extending economic benefits to over 162,500 people across participating districts. This existing momentum provides an institutional foundation upon which Battagram-specific proposals can be built.

Opportunity Window: Battagram's tourism infrastructure is currently minimal. This is not a weakness; it is a strategic advantage. Planning for low-impact eco-tourism before mass tourism arrives is far easier than attempting to retrofit sustainability onto an already-damaged destination (Nepal's hard-learned lesson from Everest Base Camp and Annapurna Circuit overuse).

3.2.7. Core Principles Governing These Proposals

All proposals are governed by the following non-negotiable principles:

- No major permanent construction in ecologically or culturally sensitive zones.
- Visitor management through carrying-capacity limits, not growth-maximisation.
- Community ownership and profit-sharing as structural requirements, not aspirations.
- Cultural protocols respected and enforced tourism adapts to community, not vice versa.
- Waste, water, and energy management embedded into all site plans from the outset.
- Long-term ecological monitoring built into every programme.

3.2.8. International Precedents and Their Lessons

3.2.8.1. Nepal: The Annapurna Conservation Area Project (ACAP)

The Annapurna Conservation Area Project[48], launched in 1986 by the King Mahendra Trust for Nature Conservation, is widely regarded as the defining model for mountain eco-tourism in the developing world. The ACAP covers 7,629 sq km of the Nepalese Himalayas at elevations comparable to Battagram's upper valleys, and manages a tourism economy worth ten of millions of dollars annually without a single large hotel being constructed inside the conservation area.

At its core, the ACAP model works through community homestays, managed trekking trails, a graduated permit and entry-fee system, and village conservation committees with genuine authority over land use. The village of Ghandruk, a Gurung settlement at 2,000 metres, strikingly similar in scale and character to Battagram's Swati villages became the programme's flagship site. Before ACAP, Ghandruk had no road, no electricity, and no sanitation. Within

[47] UNDP Pakistan. 'Eco-Tourism and Camping Villages Project.' undp.org/pakistan. Accessed 2026
[48] K.C., A., Rijal, K., & Sapkota, R.P. (2015). Role of ecotourism in environmental conservation and socioeconomic development: a case study of Annapurna Conservation Area, Nepal. Journal of Institute of Forestry Nepal, 12.

two decades, it had running water, a community health post, a school, and a thriving homestay economy in which families retained 100% of accommodation revenue.

> *Ecotourism generated employment for 79% of households in ACAP communities and contributes nearly 2% to Nepal's GDP primarily through tourism-related activities. Success is attributed to coordination of local community members, line agencies, and government; transparency in homestay programme development; hospitality training; and women taking local-level ownership and control[49].*

The Battagram parallel is direct: Swati villages in the Allai and Chattar valleys share the same alpine setting, the same strong community social structures, and the same tradition of hospitality (hujra culture) that made Ghandruk's homestay programme viable. The ACAP model's entry-permit system, conservation levy, and community committee structure can be adapted with minimal modification.

3.2.8.2. Bhutan: High-Value, Low-Volume Tourism Policy[50]

Bhutan introduced tourism in 1974 under the guidance of King Jigme Singye Wangchuck with an explicit rejection of mass tourism. The foundational policy '***High Value, Low Volume***'[51] operates on the principle that the number of visitors must remain compatible with the carrying capacity of the natural environment and cultural institutions. Rather than maximizing arrival numbers, Bhutan charges a Sustainable Development Fee (SDF) per visitor per night, the revenues of which are channeled directly into free healthcare, education, cultural preservation, and environmental conservation[52].

The London Business School has characterized this approach as targeting 'mindful travellers who are sensitive to our culture, environment and aspirations.' Bhutan has won multiple international awards for sustainable tourism. Tourist arrivals grew from 287 in 1974 to around 315,000 by 2019, yet the country's forests, monasteries, and communities remain intact.

> **Policy Lesson for Battagram:** *Bhutan demonstrates that a district or nation can build a global reputation not through volume of visitors but through the quality and exclusivity of the experience offered. A Battagram that positions itself as a rare, authentic, off-the-beaten-path Himalayan destination with controlled access to Sukai Sar, Chor Valley, and Galai Meadows will attract higher-spending, lower-impact travellers than a Battagram that attempts to compete with Naran or Swat on hotel room count[53].*

3.2.8.3. Costa Rica: Certification for Sustainable Tourism (CST)

Costa Rica's tourism transformation began in the 1970s when the government dedicated more than 25% of its national territory to protected areas, establishing the principle that nature is a living heritage to be preserved and shared responsibly not a resource to be exploited. The pivotal institutional innovation was the Certification for Sustainable Tourism (CST)[54], launched in 1997 by the Costa Rican Tourism Board. The CST evaluates businesses on four

[49] K.C., A. (2016). Ecotourism and Its Role in Sustainable Development of Nepal. In L. Butowski (Ed.), Tourism — From Empirical Phenomena to Theoretical Concept. InTech.
[50] International Trade Centre (ITC). 'Bhutan: A Model for Sustainable Tourism Development.' intracen.org. Accessed 2026
[51] The Bhutanese. (2025, November 10). 'The Birth of High Value, Low Volume Tourism Policy.' thebhutanese.bt.
[52] Tavassoli, N. (2023, December 11). Pricing Solutions to Bhutan's Sustainable Tourism Policy. London Business School Think. london.edu.
[53] The Explorers India. (2025, September 8). 'Sustainable Tourism in Bhutan: The World's Leading Model.' theexplorersindia.com.
[54] Costa Rica Tourism Board. Certification for Sustainable Tourism (CST). visitcostarica.com. Accessed 2026.

pillars: management of the physical-biological environment, service facilities, customer service management, and interaction with local communities. Businesses achieving certification receive a Green Leaf rating, internationally recognised by the Global Sustainable Tourism Council (GSTC)[55].

Over 400 hotels, ecolodges, and tour operators have earned CST certification. Many ecolodges use locally sourced materials and follow traditional building techniques. The country has developed extensive networks of hiking trails specifically designed to minimize environmental impact. Indigenous communities manage several ecotourism projects, helping to preserve their cultural heritage. Tourism now accounts for the largest source of foreign income for Costa Rica's economy without the ecological damage that has afflicted comparably scenic destinations that followed conventional mass-tourism models[56].

> **Implementation Parallel:** *Battagram can create a KP Eco-Certification mark or work within existing PTDC and KP Tourism Department frameworks to certify homestays, trekking guides, campsites, and food producers that meet defined environmental and community-benefit standards. This creates market differentiation, price premium, and quality assurance simultaneously.*

3.2.8.4. Pakistan Precedents: UNDP Eco-Tourism Programme and KPK Camping Villages

Within Pakistan itself, relevant precedents are accumulating. The UNDP Eco-Tourism and Camping Villages Project[57] have established ten camping villages across scenic KPK locations, including one in Battagram, on a model that avoids permanent construction, trains local youth, and hands over management to the KP Tourism Department. The project has demonstrated that 162,500 people can benefit economically from a model that prioritizes small-scale, environmentally friendly sites over large infrastructure[58].

Simultaneously, research published in the Journal of Ecotourism and Management in Northern Pakistan[59] has shown that mass tourism even in pristine Himalayan settings rapidly degrades ecosystems when not managed through ecotourism principles. The study's authors explicitly recommend shifting from mass tourism to ecotourism as the sustainable path for Pakistan's mountain districts. Battagram, being less visited than Hunza or Naran, has the rare opportunity to adopt ecotourism frameworks before damage occurs.

3.2.9. Proposals

12.4.1.1.1 Community Homestay and Hujra Network

Battagram's existing tradition of the hujra, the communal men's guesthouse of Pashtun culture is a natural foundation for a managed homestay network. The hujra already functions as a hospitality institution, formalizing it as a licensed, quality-certified guest accommodation simply requires defined standards, basic training, and a booking interface. This mirrors exactly

[55] Travel Around Costa Rica. (2026, March 3). 'Costa Rica Ecotourism.' travelaroundcostarica.com.
[56] Sacred Treks. (2025). '65 Interesting Facts About Costa Rica Ecotourism and Sustainability.' sacredtreks.com.
[57] UNDP Pakistan. 'Eco-Tourism and Camping Villages Project.' undp.org/pakistan. Accessed 2026.
[58] Price, M.F. (2002). 'Ecotourism in Pakistan: A Myth?' Mountain Research and Development, 22(2), 110–112. BioOne.
[59] Rauf, A., et al. (2021). 'Issues and Opportunities Associated with Trophy Hunting and Tourism in Khunjerab National Park, Northern Pakistan.' PMC (PubMed Central), NCBI.

the mechanism used by the ACAP in Ghandruk and other Nepalese villages, where traditional communal hospitality structures were the entry point for the entire eco-tourism economy.

- Identify and map 20–30 willing households (initially) and hujras in three villages: one on the Chattar Plain, one in the Allai Valley, and one along the Chor Valley approach road.
- Develop a standardized **Battagram Homestay** Standard covering bedding hygiene, food safety, waste disposal, water access, and cultural protocol briefings for guests.
- Deliver a 10-day hospitality and eco-tourism training programme (at starting stage) for household hosts, covering food preparation, basic English, visitor management, and Leave No Trace principles.
- Register each certified homestay under a 'Battagram Authentic Homestay' mark, displayed publicly and listed on the proposed digital platform.
- Establish a Community Tourism Fund, a 10–15% levy on each booking channeled into a village-level fund for trail maintenance, sanitation, and emergency response.
- Ensure at least 40% of registered homestays are managed by women or women-led households, consistent with the documented success of women's leadership in Nepal's ACAP homestay programmes.

12.4.1.1.2 Certified Trekking Trail System

Costa Rica has developed extensive networks of hiking trails explicitly designed to minimize environmental impact staying on marked trails prevents erosion and protects sensitive plant species. The ACAP similarly manages trekking through defined routes with altitude-differentiated permits. Battagram's existing jeep tracks and goat trails already trace routes through its most spectacular terrain, formalizing these as a certified trail network requires mapping, ecological assessment, light waymarking, and a system of managed access not road construction.

- Commission a professional trail assessment for five priority routes, classifying each by difficulty, ecological sensitivity, and maximum daily visitor carrying capacity.
- Erect weather-resistant, bilingual (Urdu/English/Pashto) trail markers at junctions using locally sourced stone and timber, no concrete posts or metal signage that degrade the visual landscape.
- Assign carrying capacity limits per route per day, enforced through a permit system managed by trained local rangers.
- Develop a Trail Stewardship Agreement with each village through whose land a trail passes, formalizing land-use rights, maintenance responsibilities, and fee-sharing arrangements.
- Create a graded trail classification system, Green (family accessible), Blue (moderate hiker), Red (experienced trekker), Black (technical mountaineer), corresponding to the international colour-coding standard used in alpine tourism worldwide.

No-construction rule: *All trail infrastructure rest points, emergency shelters, water points shall use reversible, locally sourced materials: stone, timber, and compacted earth. No concrete, no steel, no permanent structures in wilderness zones.*

12.4.1.1.3 Battagram Eco-Tourism Charter and Carrying Capacity Policy

- ***Draft a Battagram Eco-Tourism Charter*** through a participatory process involving village councils, women's groups, religious leaders, the District Administration, and KP Tourism Department. The charter should articulate Battagram's eco-tourism vision, it carrying capacity philosophy, and its community benefit-sharing obligations.
- ***Establish seasonal and site-specific visitor limits***: Sukai Sar maximum 20 trekkers per day; Galai Meadows maximum 40 visitors, Chor Valley maximum 15, Chattar Top day visitors monitored but uncapped initially, with a cap mechanism triggered if ecological indicators deteriorate. ***Note:*** *These visitor limits are proposed as initial management thresholds to guide sustainable tourism activity during the early implementation phase. The limits will remain adaptive and subject to periodic review based on ecological monitoring, visitor pressure, and management capacity. If the pilot measures prove successful and environmental indicators remain stable, additional management mechanisms and revised carrying capacities may be introduced in the future to support controlled expansion of tourism activities.*
- ***Institute an Eco-Tourism Conservation Levy*** for designated eco-tourism zones, channeled as follows: 50% to Village Community Tourism Fund; 30% to KP Tourism Department for trail and site maintenance; 20% to a District Environmental Monitoring Fund.
- Prohibit the following activities across all designated eco-tourism zones: open fires outside designated cooking points, removal of flora or fauna, motorized vehicles beyond defined access points; loudspeakers or amplified music, construction of any permanent structure without District Council approval and environmental impact assessment.
- Establish an annual review mechanism: ***Battagram Eco-Tourism Review Board*** comprising district officials, community representatives, and one independent environmental expert to assess ecological and social indicators and adjust limits and levies accordingly.

Policy Note: *The KPK government has already demonstrated political will on related issues: its anti-encroachment drive in Kaghan Valley to remove illegal constructions, and its partnership with UNDP on eco-tourism camping villages in Battagram, provide direct institutional anchors for this charter.*

12.4.1.1.4 Organic Agri-Food Tourism Circuit

The Pakistan Almanac and peer-reviewed agricultural literature note that the farms of Battagram particularly in the former Allai Valley produce essentially organic food due to the district's geographic isolation from fertilizer and pesticide supply networks. This is not merely a curiosity; it is a marketable premium asset. Organic certification and Agri-tourism are among the fastest-growing travel niches globally. The Battagram Heights Agri-Tourism Foundation has already demonstrated visitor demand for exactly this experience, achieving a perfect travellers rating. The task is to scale and formalize what is already working.

- Commission a rapid organic certification assessment for farms in the Battagram in collaboration with the KP Agriculture Department or an international organic certifying body (e.g., IMO or ECOCERT). ***Establish a 'Battagram Organic Valley' brand***.
- ***Design a Battagram Agri-Food Trail***, a mapped circuit of 8–12 participating farms (initially), orchards, trout hatcheries, and honey-producing households, each offering a 1–2-hour structured visitor experience.
- ***Develop a 'Farm-to-Table' dining programme*** in partnership with homestay operators, offering menus composed entirely of locally grown, seasonally appropriate produce, a concept that commands significant price premium among both domestic and international eco-tourists.
- ***Establish a Battagram Farmers Market***: a weekly market in Battagram city where certified organic producers sell directly to passing KKH travellers, connecting the agri-tourism circuit with a quick, accessible purchase point for transit visitors.
- ***Package Trout Fishing Experiences*** on Nandhyar and Allai Khwar as licensed, fee-bearing activities managed by local fishing cooperatives, with catch-and-release protocols for wild fish and sustainable harvesting rules for hatchery stock.

12.4.1.1.5 Cultural Heritage Documentation and Living Culture Programme

Field-based documentation and regional historical accounts specify that Battagram contains a significant concentration of unexplored archaeological and historical resources, including traces of Gandharan civilization, Alexander-era artefacts, and Mughal-period settlements. However, despite this rich cultural landscape, no heritage sites within the district are presently protected under the national legal framework. This represents a critical institutional and policy gap, as undocumented sites remain vulnerable to natural degradation, infrastructure development, encroachment, and unregulated excavation, resulting in the irreversible loss of valuable cultural heritage assets. Cultural tourism when managed as a living culture programme rather than a museum exercise is among the most rewarding and highest-value travel experiences.

- Commission a comprehensive Heritage Survey of Battagram District in partnership with Hazara University's archaeology and history departments, producing a georeferenced database of identified sites.
- Submit priority sites for formal protection under the KP Antiquities Act, preventing any construction or excavation within defined buffer zones.
- Establish a Battagram Living Culture Programme: a calendar of traditional events, craft demonstrations, oral history sessions, and music performances, offered to visitors as structured cultural experiences on defined dates. These should be held in existing community spaces (jirga halls, open grounds), not purpose-built 'culture centres'.

- Train a cohort of Community Cultural Interpreters local young people, including women, fluent in Urdu and English, trained to explain Swati-Pashtun traditions, agricultural practices, architectural styles, and oral histories to visiting audiences.
- Document endangered oral traditions folk songs, epic poetry, seasonal agricultural chants through a community audio-visual archive held by the District Library and digitally accessible through the Battagram tourism website.

Cultural Protocol: *All cultural programming must be designed and led by the communities themselves. Visitor photography of people, homes, or religious practices requires explicit consent. No aspect of Battagram's living culture should be staged, commercialized, or altered for visitor entertainment without community agreement.*

12.4.1.1.6 Local Guide Accreditation and Eco-Ranger System

The UNDP Eco-Tourism and Camping Villages Project has already trained 210 youth in Battagram and surrounding KPK districts in eco-tourism, hospitality, and tourism management demonstrating both demand and feasibility. The key gap is trail-specific guiding and environmental monitoring: skills that require a distinct, structured accreditation programme tied to Battagram's specific geography, ecology, and cultural protocols.

Research consistently shows that local guides are the single most important factor in visitor satisfaction and ecological compliance on mountain trails. A tourist with a knowledgeable, accredited local guide is statistically less likely to deviate from marked trails, less likely to damage vegetation, and more likely to return for a second visit and recommend the destination to others. Furthermore, local guide employment is the most direct mechanism for transferring tourism income to households that would otherwise be excluded from the tourism economy.

- Design a Battagram Certified Mountain Guide curriculum covering: trail navigation and emergency first aid; local ecology, geology, and biodiversity; cultural history and oral traditions of the district; Leave No Trace principles; basic English for tourism; visitor management and conflict resolution.
- Deliver the curriculum in partnership with KP Tourism Department, PTDC, and an experienced mountain training institution (e.g., Alpine Club of Pakistan or a Nepalese partner institution through a South-South cooperation arrangement).
- Issue a graded certification: Level 1 (day-trek guide), Level 2 (multi-day trekking guide), Level 3 (high-altitude expedition guide). Require annual renewal tied to continued service and ecological compliance record.
- Appoint 10–15 Eco-Rangers drawn from certified guides, empowered to enforce carrying capacity limits, collect conservation levies, remove litter, and report ecological violations. Rangers should be compensated through the Conservation Levy Fund.
- Require that all foreign and domestic tour operators bringing visitors to Battagram's designated eco-tourism zones engage only KP-accredited Battagram guides. This is analogous to the mandatory guide requirement for Bhutan's trekking zones.

12.4.1.1.7 Digital Promotion and Authentic Storytelling Platform

Battagram's most significant practical tourism constraint is invisibility. The district has no dedicated digital presence, no curated visual portfolio, and no mechanism by which potential visitors passing through on the KKH or planning a northern Pakistan itinerary can discover, book, or plan a Battagram eco-tourism experience. Digital promotion, executed through authentic storytelling rather than commercial advertising, is the lowest-cost and highest-reach marketing tool available to a low-budget destination.

The emphasis must be on authenticity and restraint: an overproduced promotional campaign risks misrepresenting Battagram's character and attracting the wrong profile of visitor. The most effective eco-tourism digital promotions globally feature community voices, candid photography, and honest descriptions of access conditions and visitor expectations. They attract self-sufficient, culturally respectful travellers precisely the visitor profile Battagram's carrying capacity and community welfare can support.

- Develop a dedicated Battagram Eco-Tourism Website in Urdu and English, containing: a curated trail directory with difficulty ratings and permit information; a certified homestay booking interface; a seasonal calendar of cultural events and agricultural experiences; ecological guidelines and visitor codes of conduct; and a contact directory for accredited local guides.
- Establish a Battagram Stories social media account managed by trained local youth, publishing weekly content: short-form video of trails and villages, farmer portraits, seasonal landscape photography, elder storytelling clips. All content should priorities local voices over external narrators.
- Ensure all listed sites on Google Maps are accurately described, photographed, and tagged with eco-tourism attributes, routing KKH transit travellers to Battagram stops through the platform's navigation layer.
- Partner with Pakistan's growing community of responsible travel bloggers and documentary filmmakers who have demonstrated significant reach for KPK destinations for a familiarization visit to Battagram, generating organic long-form content.
- Strictly prohibit paid promotion or advertising partnerships that would create commercial obligations inconsistent with the eco-tourism brand (e.g., no sponsored content from vehicle rental chains, no hotel affiliate links for non-certified properties).

13 CHAPTER: AGRICULTURE, CONSERVATION AND PROTECTED AREAS

Agriculture remains one of the dominant land uses and primary livelihood sources within Battagram City and its surrounding peri-urban settlements. The district's mountainous terrain, terraced cultivation patterns, and agro-climatic suitability for horticulture shape its agricultural economy. Farming activities are generally small-scale and subsistence-oriented, supplemented by fruit orchards, seasonal crops, and livestock rearing.

According to existing land use analysis, agricultural terraces occupy approximately 3733.86 acres, representing 44.60% of the total study area. This substantial proportion highlights the continued dependence of local communities on agriculture despite gradual urban expansion. Agricultural lands are typically distributed along valley slopes and lower hill terraces, where soil depth and water access allow cultivation.

Battagram's agricultural practices are characterized by mixed cropping systems, including cereals, vegetables, and fruit orchards. Orchard-based agriculture has become increasingly important as a cash-generating activity, particularly in areas where terrain restricts large-scale mechanized farming.

13.1 Existing Agricultural Land Use Pattern

Agricultural land within the Battagram study area primarily consists of terraced fields developed along hill slopes to prevent soil erosion and optimize water retention. These terraces are traditionally constructed using local stone and earthen embankments and represent a long-standing adaptation to mountainous environments.

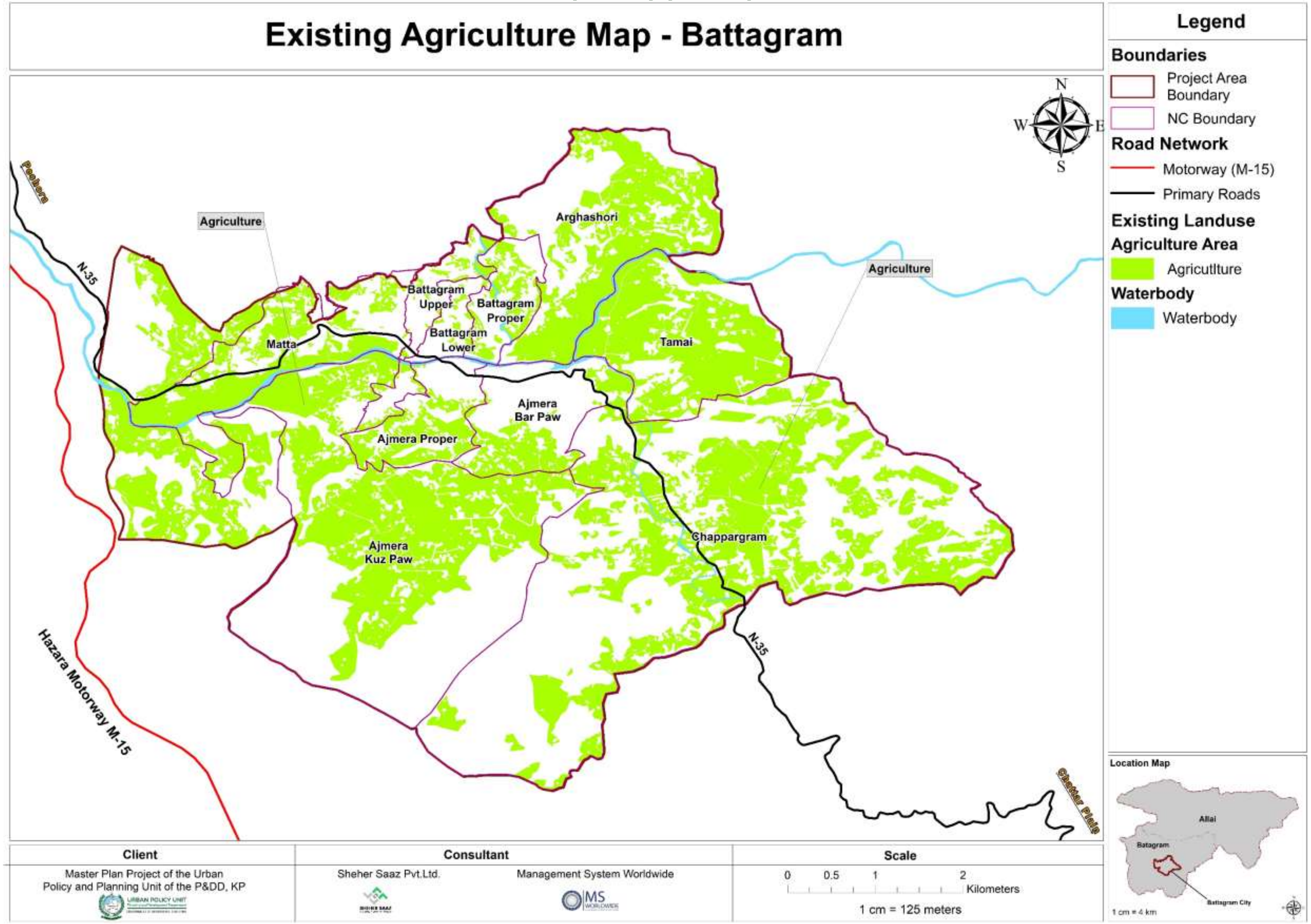
The dominance of agricultural terraces reflects both ecological necessity and cultural agricultural practices. While this land use supports local food security and livelihoods, it also faces increasing pressure from residential expansion, infrastructure development, and fragmentation due to inheritance patterns.

Table 92: Existing Agricultural Land Use – Battagram City

Major Land Use Category	***Sub-Category***	***Area (Acres)***	***Percentage (%)***
Agriculture	Agricultural Terrace	3773.86	44.60%

The large share of agricultural land indicates that urban expansion remains relatively limited compared to fully urbanized cities. However, gradual encroachment of residential development onto agricultural terraces has been observed in peri-urban areas, contributing to land fragmentation and reduced agricultural productivity.

Map 36: Existing Agriculture Map



13.2 Existing Irrigation & Flood Protection Infrastructure

Agricultural productivity in Battagram District is highly dependent on small-scale irrigation channels and natural watercourses due to the mountainous terrain and limited canal-based irrigation systems. To improve agricultural resilience and reduce flood risks, multiple irrigation and flood protection projects are currently being implemented under the Annual Development Programme (ADP) through the Irrigation Department.

These ongoing projects primarily focus on two components: (i) flood protection works along seasonal streams and vulnerable settlements, and (ii) construction and improvement of civil irrigation channels to enhance water conveyance to agricultural terraces and orchards.

3.2.10.Flood Protection Works

Flood protection interventions are being implemented across multiple Union Councils including Kuza Banda, Pemal Sharif, Shah Murad, Dedal, Shangli Bala, and surrounding settlements. The projects aim to reduce soil erosion, prevent agricultural land loss, and protect rural infrastructure from seasonal flooding events.

The ongoing flood protection works vary in length from approximately 60 to 120 meters with right-of-way widths ranging between 4 to 5 meters. These interventions are expected to stabilize vulnerable stream banks, safeguard cultivated land, and reduce disaster risk in flood-prone agricultural zones.

Table 93: Ongoing Flood Protection Works – Battagram

No.	Location	Length (m)	ROW Width (m)	Status
1	Kuza Banda	100	5	Ongoing ADP
2	Kas Pull, Shangli Bala	80	4	Ongoing ADP
3	Pemal Sharif	70	4.5	Ongoing ADP
4	Shah Murad	80	4	Ongoing ADP
5	Landi Kas Garhi	70	4	Ongoing ADP
6	Dharayan Takia	100	5	Ongoing ADP
7	Taya Jadeed	60	5	Ongoing ADP
8	Dedal	105	5	Ongoing ADP

9	Shalkhy–Chohan Gulmera–Dagay–Taya Qadeem	120	5	Ongoing ADP
10	Amlok Pur Khawar	80	5	Ongoing ADP

3.2.11.Civil Irrigation Channel Development

A major component of agricultural development in Battagram involves the construction and improvement of civil irrigation channels across both Battagram and Allai tehsils. These channels are designed to enhance water supply to terraced agricultural fields, reduce conveyance losses, and improve crop productivity.

The ongoing irrigation projects range from approximately 650 meters to 1,400 meters in length with an average right-of-way width of 4 meters. Key project locations include Pemal Sharif, Shah Murad, Takri, Sokar, Jalbangi, Nogram, Rupkani, Bela Karg, Sakargah, Chanjol, Sejbiar, Rashang, and Banna among others.

These schemes are expected to:

- Improve irrigation efficiency in mountainous agricultural terraces
- Support orchard cultivation and high-value crops
- Reduce dependence on rain-fed agriculture
- Enhance climate resilience and water availability during dry seasons

Table 94: Ongoing Civil Irrigation Channel Projects – Battagram & Allai

No.	Location	Length (m)	ROW Width (m)	Status
1	Pemal Sharif	790	4	Ongoing ADP
2	Shah Murad	690	4	Ongoing ADP
3	Takri & Qadar Abad	990	4	Ongoing ADP
4	Blandkot Bela	720	4	Ongoing ADP
5	Sokar	810	4	Ongoing ADP
6	Jalbangi Charchori	1400	4	Ongoing ADP
7	Nogram	790	4	Ongoing ADP
8	Panjol	700	4	Ongoing ADP
9	Konshay Rupkani	800	4	Ongoing ADP
10	Rupkani	790	4	Ongoing ADP
11	Bada Road to Gatto	1200	4	Ongoing ADP
12	Biari to Haji Abad Pokal	1000	4	Ongoing ADP
13	Bela Karg Karket	700	4	Ongoing ADP
14	Bela Karg	770	4	Ongoing ADP

15	Bela Kund	890	4	Ongoing ADP
16	Manda Khawar Shagai Seri	877	4	Ongoing ADP
17	Sakargah	870	4	Ongoing ADP
18	Bari	795	4	Ongoing ADP
19	Chanjol	800	4	Ongoing ADP
20	Sejbiar	889	4	Ongoing ADP
21	Rashang	798	4	Ongoing ADP
22	Banna	650	4	Ongoing ADP
23	Koyar	850	4	Ongoing ADP

Source: Secondary Data obtained from Irrigation Department, Battagram

13.3 Horticulture and Orchard Distribution

Secondary data obtained from the Agriculture Extension Department indicates the presence of diversified orchard cultivation across multiple Union Councils in Battagram Tehsil. A total orchard area of approximately 165.63 acres has been recorded, comprising a mix of temperate fruits and citrus varieties.

Major fruit crops include plum, apricot, apple, walnut, olive, persimmon, and peach, reflecting the district's favorable climatic conditions for high-value horticulture. Among these, plum orchards occupy the largest share, followed by apricot and walnut plantations.

Orchard cultivation is dispersed across rural settlements rather than concentrated in large commercial estates, indicating a predominantly smallholder-based horticultural system.

Table 95: Distribution of Orchard Crops in Battagram Tehsil

S. No	Union Council	Apple	Pear	Apricot	Plum	Peach	Persimmon	Walnut	Olive	Lemon	Sweet Orange	Miscellaneous	Total Area (in Acre)
1	Ajmera			1	9.5		3	2.5	6	1	0.5		23.5
2	Rajdhari	1		2.5					0.5				4
3	Gijbori			1.5	0.5								2
4	Trand			2.5	1			1.5					5
5	Shamlai			1				2.25					3.25
6	Battamori	1		2	0.5								3.5
7	Thakot			1						1	1		3
8	Peshora				1						0.5		1.5
9	Banian	4	2	6.5	40	8.25	6.625	8.5		1	2		78.875
10	Kuzabanda	8	0.5	4.5	2.5	2	2.5	6	1		0.5		27.5
11	Battagram				1.5			1.5	2			1.5	6.5
12	Paimal Sharif	0.5							6	0.5			7
	Total	**14.5**	**2.5**	**22.5**	**56.5**	**10.25**	**12.125**	**22.25**	**15.5**	**3.5**	**4.5**	**1.5**	**165.625**

Source: Secondary Data Provided by Agriculture Extension Field Staff

13.4 Sustainable Agriculture & Land Preservation Proposals

a) Reserved Orchard Protection Zones

Designate Reserved Orchard Zones to conserve existing fruit orchards and prevent their gradual conversion into scattered urban development. Orchards in Battagram contribute significantly to the local economy, household livelihoods, environmental quality, and regional landscape character. Rapid urban expansion and informal subdivision of agricultural land pose a major threat to these productive areas, making long-term protection measures essential.

The proposed orchard reservation policy should include strict land-use controls restricting non-agricultural conversion, subdivision, and incompatible construction activities within designated orchard zones. Incentives should be introduced to encourage orchard maintenance, fruit processing, high-value horticulture, and climate-resilient farming practices. Farmers should also be supported through improved irrigation systems, farm-to-market connectivity, cold storage facilities, and technical assistance for modern orchard management techniques.

The master plan further recommends the integration of agroforestry practices within orchard zones through the plantation of native and nitrogen-fixing tree species along field boundaries and terrace edges. This approach will enhance biodiversity, improve soil fertility, strengthen watershed protection, and increase overall agricultural productivity while maintaining the ecological balance of the area.

b) Reserved Agriculture Zones & Controlled Urban Expansion

Introduce Reserved Agriculture Zones within the study area to preserve highly productive agricultural land and manage future urban growth in a controlled and sustainable manner. These zones will function as long-term agricultural protection areas where urban expansion, housing schemes, and incompatible commercial development shall be restricted. The strategy aims to prevent haphazard urban sprawl, safeguard food-producing land, and maintain the rural landscape character of Battagram.

The proposed agricultural reservation framework should prioritize fertile valley lands, irrigated fields, and active cultivation areas for long-term protection. Development within these zones should be limited to agriculture-related infrastructure, farmhouses, storage facilities, irrigation structures, and small-scale Agro-support activities compatible with agricultural use.

The strategy also supports sustainable farming practices including crop diversification, organic farming, water-efficient irrigation systems, and climate-resilient agricultural methods. Reserved agricultural zones will serve as strategic land reserves that ensure future food security, environmental sustainability, and balanced urban-rural development within Battagram City.

c) Integrated Pest Management (IPM) & Sustainable Farming Programme

Promote an Integrated Pest Management (IPM) programme for farmers within the reserved agricultural and orchard zones to reduce excessive dependence on chemical pesticides and improve long-term environmental sustainability. The programme should encourage biological pest control methods, crop rotation, resistant crop varieties, and carefully regulated pesticide application only where necessary.

Implementation may be carried out through Farmer Field Schools (FFS), demonstration farms, and extension services coordinated with the Agriculture Department and local research institutions. The programme will improve crop productivity, reduce soil and water contamination, lower production costs, and strengthen sustainable agricultural practices across Battagram's farming communities.

13.5 Agro-Industrial Development & Agritourism Strategy

a) Agro-Industrial Zone Development

Establish dedicated Agro-Industrial Zones within suitable locations of Battagram City to support value-added agricultural processing, local employment generation, and rural economic development. The proposed agro-industry framework should focus on industries directly linked to local agricultural and horticultural production including fruit processing, dry fruit packaging, honey processing, herbal products, dairy processing, olive oil extraction, grain storage, food packaging, and cold-chain logistics.

The agro-industrial zones should be strategically located near major road corridors and agricultural production areas to improve supply chain efficiency and market accessibility. Infrastructure provision within these zones should include access roads, electricity, water supply, waste management systems, storage facilities, and processing infrastructure to support small and medium-scale Agro-based enterprises.

The development of agro-industrial activities will reduce post-harvest losses, enhance local value addition, create employment opportunities, and diversify the local economy while strengthening the linkage between urban development and rural production systems. The master plan therefore recommends reserving suitable land for future agro-industrial expansion and promoting public-private partnerships for investment and operational development.

b) Olive Cultivation & High-Value Horticulture Programme

Promote olive cultivation and high-value horticulture within suitable agricultural and terrace farming zones of Battagram by utilizing the district's favorable climatic and topographical conditions. The programme should encourage plantation of improved olive varieties alongside traditional fruit orchards and terrace agriculture through technical support, subsidized saplings, and modern irrigation systems such as drip irrigation.

The initiative should also support the establishment of olive processing and extraction facilities within the proposed agro-industrial zones to encourage local value addition and market development. The integration of olive cultivation with terrace farming and orchard preservation strategies will improve agricultural productivity, strengthen climate resilience, and enhance farmer incomes through diversification into high-value crops.

c) Integrated Agritourism & Mountain Landscape Tourism Strategy

Develop an integrated agritourism strategy that utilizes Battagram’s terraced landscapes, orchards, reserved agricultural areas, and mountain scenery as a sustainable tourism asset. The proposal encourages the development of farm-based tourism activities including orchard visits, seasonal harvesting experiences, traditional farming demonstrations, local food experiences, eco-trails, and village-based tourism initiatives.

The agritourism strategy should promote community participation, local handicrafts, cultural experiences, and small-scale hospitality services to generate supplementary income opportunities for rural households. Special emphasis should be placed on preserving the natural landscape, traditional agricultural practices, and cultural identity of the region while promoting environmentally responsible tourism development.

By integrating agriculture, tourism, and local economic development, Battagram can establish a unique mountain agritourism identity that supports both rural livelihoods and sustainable urban growth while preserving the district’s environmental and agricultural heritage.

13.6 Reserved Agriculture Areas

Agriculture remains one of the most significant land uses and economic activities within Battagram, with approximately 3,797.28 acres currently under agricultural use in 2025. In order to protect agricultural productivity, strengthen food security, and support sustainable rural livelihoods during the planning period 2025–2045, additional areas have been proposed for agricultural preservation and enhancement. The proposed agricultural framework includes the development of approximately 24178 acres as Reserved Agricultural Areas to safeguard fertile land from unplanned urban encroachment and environmental degradation.

The Agriculture Zones are specifically intended to address the topographic and environmental conditions of Battagram, where steep slopes and hilly terrain create challenges for conventional farming practices. The terracing strategy aims to improve land stability, reduce soil erosion, conserve water resources, and enhance agricultural productivity through scientifically planned terrace farming techniques. These zones are envisioned to support sustainable cultivation practices while protecting fragile mountainous landscapes from land degradation and uncontrolled runoff. The terracing approach will also contribute to climate resilience by improving water retention capacity and minimizing the impacts of seasonal flooding and soil loss.

In addition to improving agricultural productivity, the proposed terracing zones are expected to support local communities by increasing cultivable land availability and promoting diversified agricultural activities such as horticulture, fruit orchards, agro-forestry, and high-value crop production. The integration of modern irrigation systems, soil conservation techniques, and environmentally sustainable farming practices is encouraged to improve long-term agricultural efficiency and rural economic stability.

The Reserved Agricultural Areas, covering approximately 2417.8 acres, are proposed to preserve strategically important agricultural lands from conversion into non-agricultural uses. These reserved zones are intended to maintain the rural character of Battagram, protect fertile soils, and ensure the continued availability of land for future agricultural activities. The proposal emphasizes strict land-use control measures to prevent unplanned urban expansion and ribbon development that may threaten productive agricultural landscapes.

The agricultural preservation strategy also encourages institutional coordination among the Agriculture Department Khyber Pakhtunkhwa, the Forest Department Khyber Pakhtunkhwa, the Local Government, Elections and Rural Development Department, and relevant environmental and irrigation authorities to support sustainable land management, farmer assistance programs, and climate-responsive agricultural development initiatives.

Overall, the proposed agricultural framework for Battagram aims to balance environmental conservation with rural economic development by protecting productive farmland, promoting sustainable terracing practices, improving resilience against environmental hazards, and strengthening long-term food security and livelihood opportunities for the local population throughout the planning horizon 2025–2045.

Table 96: Reserved Agriculture

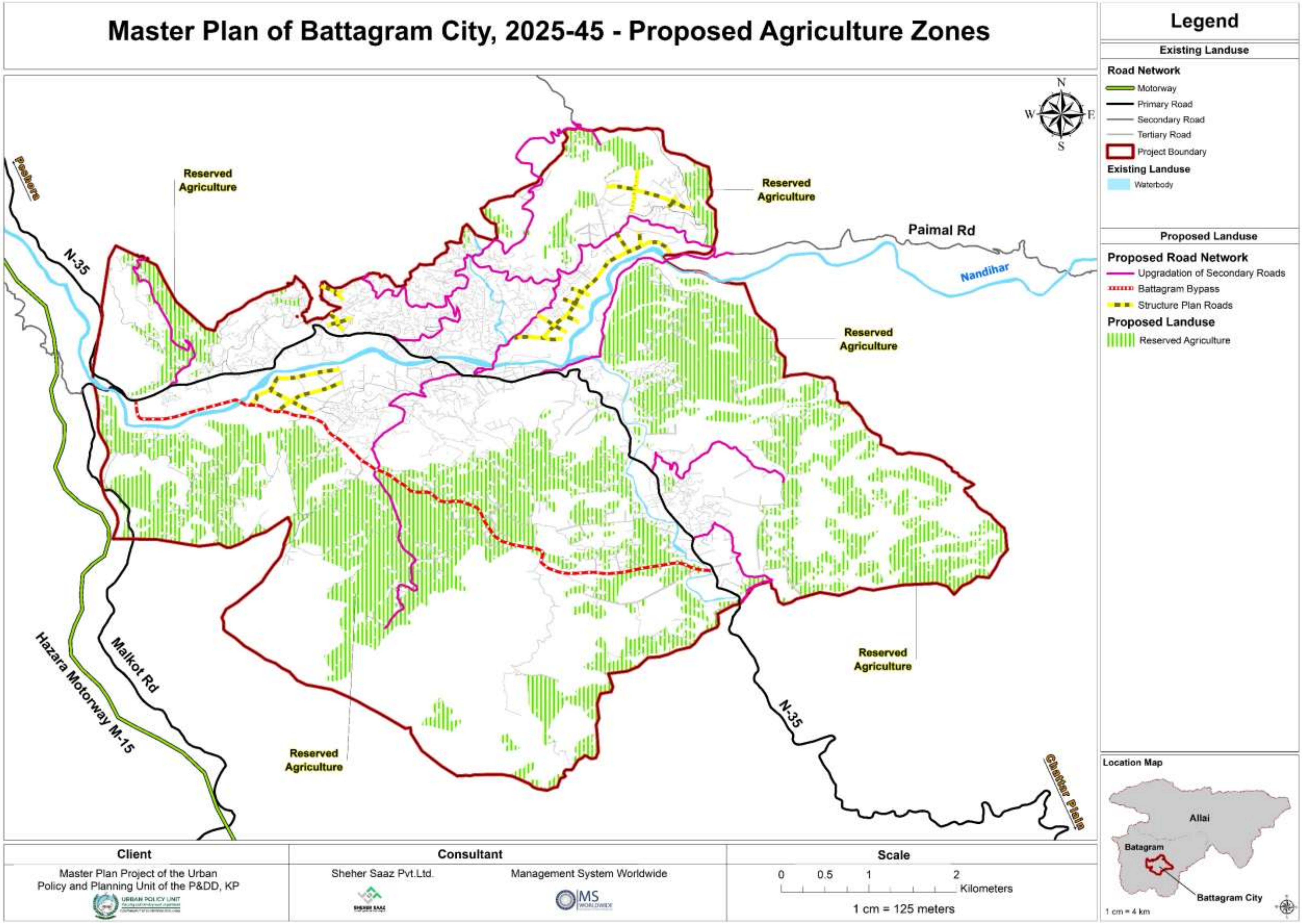
Existing	Area of Existing 2025 (Acres)	Proposed Area (acres)	Total Area till 2045 (acres)
Agriculture	3797.282	Reserved Agriculture	2417.87

3.3. Zoning Regulations for Agriculture and Conservation Land

Table 97: Zoning Regulations for Agriculture and Conservation Land

Permitted Uses	Allied Permitted Uses	Prohibited Uses
Develop land use for proposed agriculture in designated areas and prohibit the conversion of agricultural lands to non-agricultural uses. Incentives for farmers to adopt modern technologies and improve their productivity. Development of farmer's markets and direct marketing of agricultural products to consumers. Agricultural research and development.	Related land activities with respect to its rules and regulations Agro-processing industries (e.g., food processing, textile manufacturing, etc.) Renewable energy generation (e.g., solar panels on farms) Rural tourism (e.g., farm stays, guided tours, etc.) Forestry and agroforestry Accommodation for farmers and labor in associations with MC.	Conversion of agricultural land to non-agricultural uses, e.g. residential, commercial, or industrial development. Use harmful agrochemicals or practices that degrade soil quality or pollute water sources. Cultivation of crops or raising livestock that are not appropriate for the region or that require excessive amounts of water or other resources. Any activities that are illegal or harmful to the environment or public health.

Map 37: Proposed Agriculture Zones



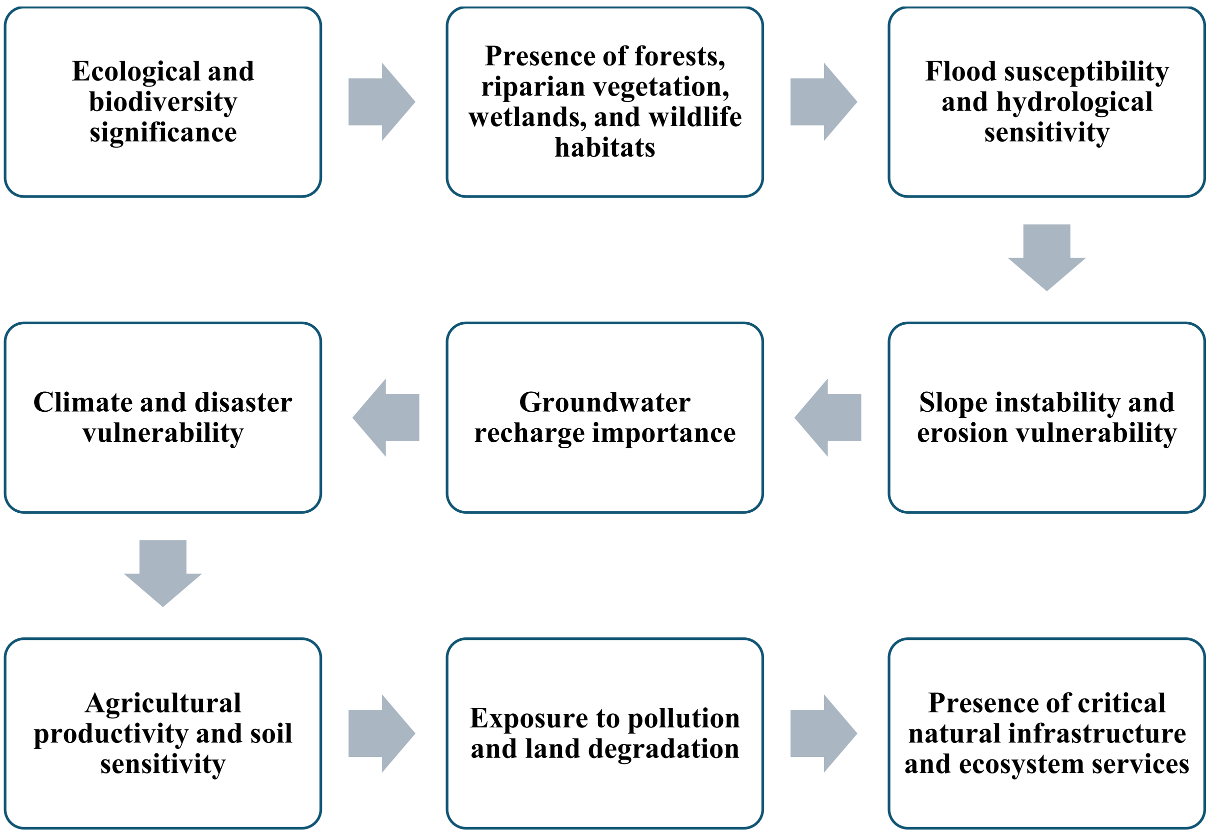
14 CHAPTER: ENVIRONMENT AND DISASTER RISK REDUCTION

14.1 Identification of Environmentally Sensitive Areas

The identification of Environmentally Sensitive Areas (ESAs) within Battagram District was undertaken to support environmentally sustainable land-use planning, disaster risk reduction, climate adaptation, and infrastructure development under the Battagram Environment and Disaster Risk Reduction Master Plan (2025–2045). The assessment integrates ecological sensitivity, hydrological importance, disaster exposure, biodiversity significance, slope instability, and anthropogenic pressures using available baseline data, household surveys, hazard assessments, and environmental profiling.

Battagram District exhibits a diverse environmental landscape comprising riverine corridors, irrigated agricultural plains, hill tracts, forest patches, wetlands, and rapidly urbanizing settlements. These ecosystems provide critical ecological services including groundwater recharge, flood attenuation, biodiversity conservation, soil stabilization, agricultural productivity, and climate regulation. However, increasing urbanization, unregulated land conversion, deforestation, quarrying, waste dumping, and climate-induced hazards are placing significant pressure on environmentally fragile zones.

The ESA identification process considered the following technical criteria:



Based on the environmental baseline and hazard analysis, the following areas are identified as environmentally sensitive and requiring priority protection, regulation, and climate-resilient management interventions.

Table 98: Key Environmentally Sensitive Areas Identified in Battagram

Category	Key Locations	Primary Sensitivities
Hilly Terrain	Gadoon Amazai, Shewa Hills, Battagram-Buner belt	Landslides, erosion, deforestation
Forest & Biodiversity Areas	Foothill vegetation zones, riparian forests	Habitat loss, biodiversity decline
Agricultural Protection Zones	Irrigated plains and canal command areas	Soil degradation, urban encroachment
Wetlands & Drainage Systems	Nullahs, ponds, low-lying drainage zones	Pollution, flooding, ecosystem degradation
Hazard-Prone Zones	Floodplains and seismic-sensitive settlements	Multi-hazard exposure

14.2 Air Quality Improvement Measures

Air quality in Battagram District is increasingly deteriorating due to rapid urbanization, transport emissions, open waste burning, construction dust, diesel generators, and localized industrial activities. Household surveys indicate that transport emissions are perceived as the dominant source of air pollution, followed by waste burning and industrial activities. Communities also reported increasing respiratory illnesses, cardiovascular problems, and environmental health concerns associated with declining air quality.

The proposed Air Quality Improvement Measures aim to reduce pollutant emissions, improve public health, strengthen climate resilience, and establish a sustainable urban environmental management system aligned with national environmental standards and international good practices.

Table 99: Priority Air Quality Intervention Areas

Intervention Area	Priority Locations
Installation of at least 1 Air Monitoring Stations	Battagram City, Topi, Jahangira Corridor
Transport Emission Management	entry and exit points in Urban corridors and transport hubs
Waste Burning Control (specifically agriculture waste)	Peri-urban settlements and dumping hotspots
Dust Control Measures	Construction and road expansion zones
Brick Kiln Regulation	Peripheral industrial and kiln clusters
Strengthening Urban Forestry	Major roads, public spaces, river corridors

14.3 Noise Quality Improvement Measures

Noise pollution is emerging as a significant environmental and public health concern in Battagram District due to increasing urbanization, traffic congestion, commercial expansion, construction activities, and mixed land-use development. Household surveys indicate that approximately 77% of respondents experience noise pollution in their localities, primarily associated with vehicular movement, pressure horns, roadside commercial activities, generators, and construction operations.

Uncontrolled environmental noise contributes to stress, sleep disturbance, reduced productivity, cardiovascular risks, and deterioration of overall urban livability. The proposed Noise Quality Improvement Measures aim to reduce excessive noise exposure, improve public health conditions, and establish a more environmentally sustainable and livable urban environment.

Key Noise Quality Improvement Measures

Traffic and Transport Noise Control

- Enforce restrictions on pressure horns and modified vehicle exhaust systems.
- Introduce traffic calming measures in densely populated urban areas.
- Improve traffic flow management to reduce congestion-related noise.
- Promote regular vehicle maintenance and silencers compliance.
- Designate silent zones near schools, hospitals, courts, and sensitive institutions.

Urban Planning and Land Use Regulation

- Strengthen zoning controls to separate residential areas from high-noise commercial and transport activities.
- Restrict incompatible mixed land-use development in sensitive urban zones.
- Introduce buffer zones and green belts along major roads and commercial corridors.
- Ensure future urban expansion integrates environmental noise considerations.

Construction and Commercial Activity Regulation

- Regulate construction timings in residential and institutional areas.
- Require temporary noise barriers and mitigation measures at major construction sites.
- Control the use of loudspeakers and high-volume commercial sound systems.
- Enforce environmental compliance for generators, workshops, and roadside businesses.

Noise Monitoring and Enforcement

- Establish periodic environmental noise monitoring at key urban hotspots.
- Develop district-level permissible noise standards aligned with KP-EPA regulations.

- Identify and map high-noise corridors and sensitive receptors using GIS tools.
- Strengthen enforcement capacity of municipal authorities and environmental agencies.

Green Infrastructure and Noise Buffers

- Increase roadside plantation and urban green belts to reduce sound propagation.
- Promote vegetation buffers around highways, transport hubs, and commercial zones.
- Protect existing green spaces and ecological corridors within urban settlements.

Public Awareness and Community Engagement

- Conduct awareness campaigns on health impacts of noise pollution.
- Promote responsible driving behavior and reduced horn usage.
- Engage schools, transport unions, and commercial associations in noise reduction initiatives.
- Encourage community reporting mechanisms for excessive noise violations.

14.4 Water Quality Improvement Measures

Water resources in Battagram District are increasingly under pressure from rapid urbanization, untreated wastewater discharge, agricultural runoff, solid waste dumping, and climate-induced hydrological variability. Household surveys indicate that more than half of respondents perceive water pollution as a growing environmental concern, particularly in urban and peri-urban settlements. Key sources of contamination include open drains, unmanaged solid waste disposal, sewage discharge, agricultural chemicals, and localized industrial activities.

The degradation of surface and groundwater quality poses significant risks to public health, agricultural productivity, aquatic ecosystems, and long-term water security. The proposed Water Quality Improvement Measures aim to strengthen water resource protection, reduce contamination, improve environmental health conditions, and enhance climate resilience across the district.

14.4.1. Water Quality Improvement Measures

- Conduct quarterly water quality testing at major water supply sources, tube wells, canals, and urban drainage points through KP-EPA and Public Health Engineering Department.
- Clean and rehabilitate urban drains and nullahs regularly to prevent sewage overflow, stagnant water, and contamination during monsoon seasons.
- Strictly prohibit dumping of solid waste and wastewater into canals, streams, and river corridors through municipal enforcement and community monitoring.
- Introduce small-scale wastewater treatment and septic management systems in densely populated urban and peri-urban areas lacking sewerage infrastructure.
- Promote farmer awareness on controlled fertilizer and pesticide application and encourage plantation along canals and water bodies to reduce runoff and erosion.

14.4.2.Soil and Ecosystem Protection

- Implement plantation and bioengineering measures in erosion-prone areas of Gadoon Amazai, Shewa Hills, and Battagram–Buner belt to control soil erosion, slope instability, and rainfall-induced land degradation.
- Control illegal sand and gravel extraction along the Kabul and Indus river corridors to reduce riverbank erosion, habitat degradation, and sedimentation risks.
- Promote organic manure application, crop rotation, and balanced fertilizer use in intensive agricultural zones to address declining soil organic matter and nutrient depletion in Battagram's cultivated lands.
- Protect canal corridors, wetlands, and natural drainage channels from waste dumping, encroachments, and unplanned urban expansion to maintain groundwater recharge and ecosystem functions.
- Strengthen community-led plantation and watershed protection programs to reduce deforestation, overgrazing, and ecosystem degradation in vulnerable rural and hilly areas of Battagram District.

14.4.3.Urban Forestation and Green Corridors

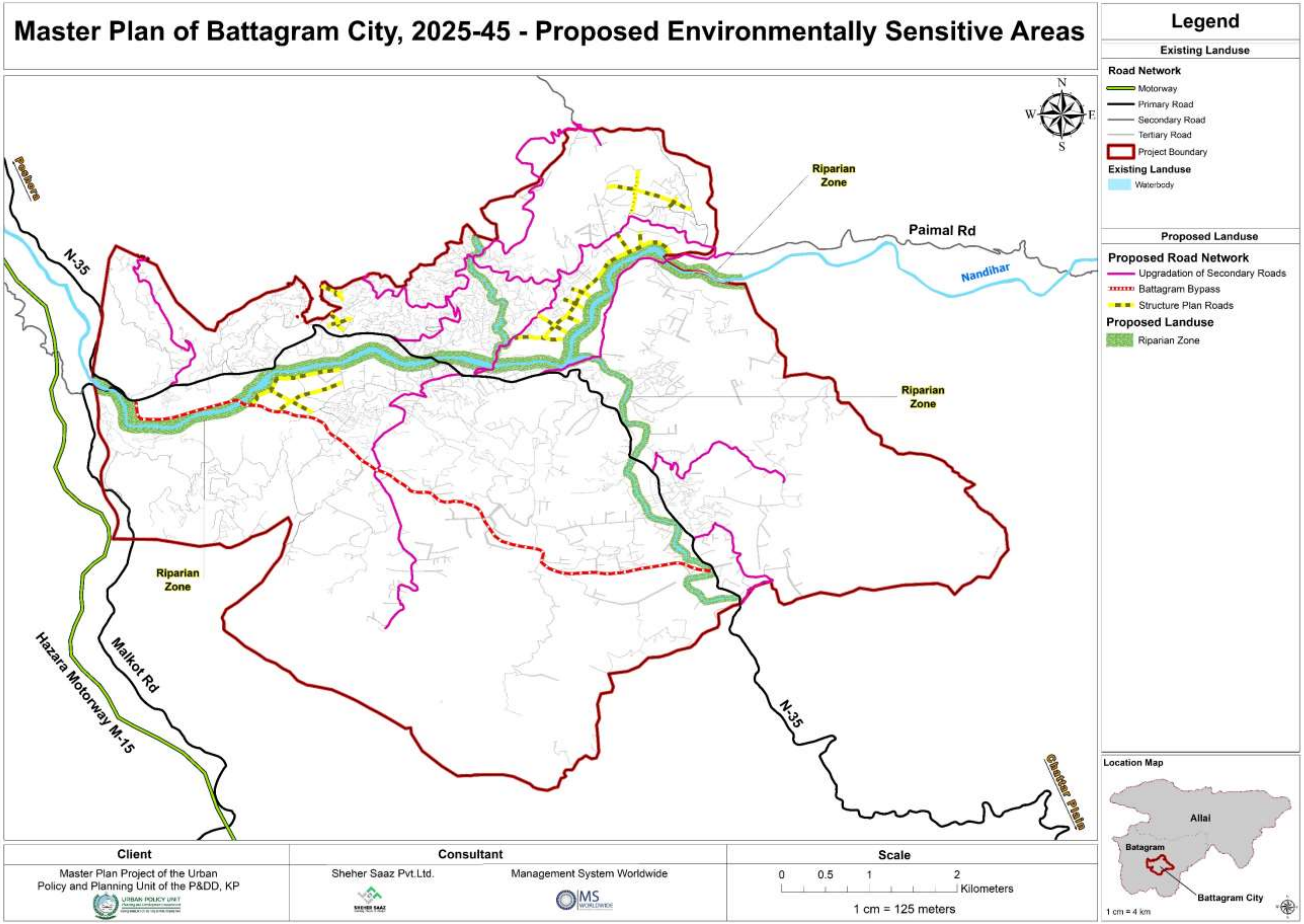
- Develop roadside green belts and plantation corridors along Battagram–Jahangira Road, Topi corridors, and major urban roads to reduce dust, traffic emissions, and urban heat stress.
- Establish urban plantation zones in public spaces, schools, hospitals, parks, and government institutions to increase green cover in rapidly urbanizing areas of Battagram City and Topi.
- Restore and protect riparian vegetation along canals, nullahs, and river corridors to improve microclimate regulation, erosion control, and ecological connectivity.
- Introduce native and drought-resistant species plantation programs in peri-urban and heat-prone areas to enhance climate resilience and reduce maintenance requirements.
- Develop interconnected green corridors linking urban settlements, agricultural buffers, and ecological zones to improve biodiversity, air quality, and urban environmental sustainability.

14.4.4.Climate Change and Resilience

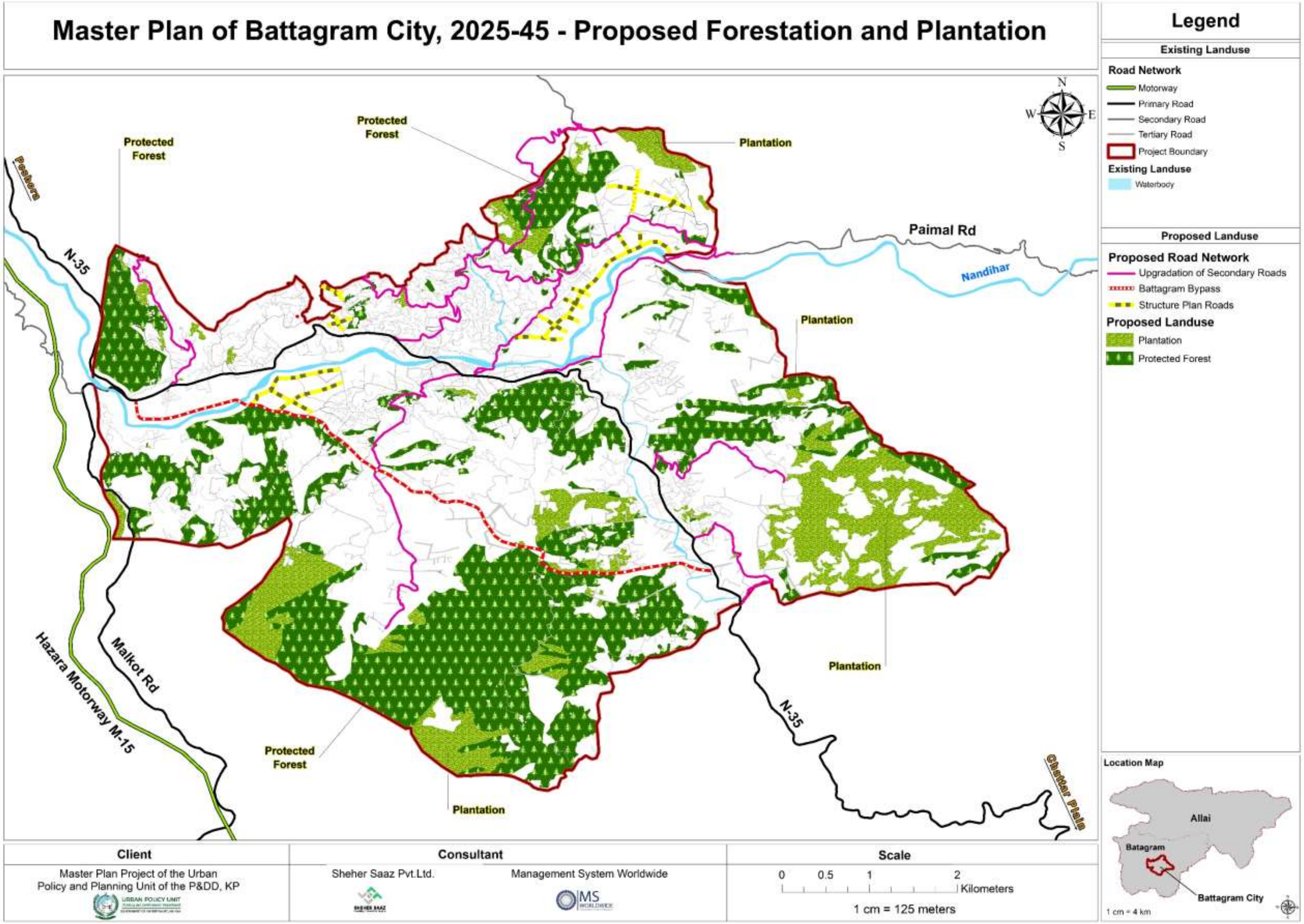
- Develop localized early warning systems for floods, heatwaves, heavy rainfall, and extreme weather events in coordination with PDMA, irrigation authorities, and district administration.
- Improve urban drainage and flood management infrastructure in flood-prone settlements and low-lying areas, particularly near river corridors and major nullahs.
- Promote rainwater harvesting, groundwater recharge, and water conservation practices to address increasing water stress and climate variability in agricultural and urban areas.

- Strengthen climate-resilient agriculture through drought-resistant crops, efficient irrigation systems, and farmer awareness programs to reduce vulnerability of Battagram's farming communities.
- Expand plantation, watershed management, and green infrastructure initiatives to reduce heat stress, soil erosion, and climate-related environmental degradation across vulnerable areas of Battagram District.

Map 38: Proposed Environmentally Sensitive Areas



Map 39: Proposed Forestation and Plantation



14.5 Hazard Profile of Battagram

Battagram City is situated within a mountainous and seismically active landscape where steep slopes, intense seasonal rainfall, fragile terrain, winter weather, and constrained road access collectively create a complex multi-hazard environment. The district was severely affected by the 2005 Kashmir earthquake, while official disaster-management documents identify earthquakes, landslides, flash floods, heavy snowfall, avalanches, and road-access disruption among the principal hazards affecting Battagram and its surrounding mountainous areas. Landslides are particularly associated with monsoon rainfall, flash floods, earthquakes, and heavy snow loading, while PDMA also identifies Battagram among districts vulnerable to winter-related hazards and seismic events.

The following table provides a planning-level hazard profile for Battagram City, ranking hazards according to their likely severity, frequency, historical significance, physical setting, and implications for urban development. The rankings should be further refined through detailed GIS-based flood, landslide, seismic, drainage, and building-vulnerability assessments at the city level.

Rank	Hazard Type	Technical Justification	Priority Level
1	**Earthquakes / Seismic Risk**	Battagram lies within a seismically active regional setting and was severely affected by the catastrophic **2005 earthquake**, which caused extensive loss of life, injuries, homelessness, and infrastructure damage across the district. Vulnerability remains significant where buildings consist of unreinforced masonry, non-engineered construction, irregular structural additions, and older public facilities without adequate seismic retrofitting.	**Critical Priority – Life Safety and Structural Resilience**
2	**Landslides / Slope Failure / Rockfall**	Battagram's steep mountainous terrain, fragile slopes, road cuttings, intense rainfall, seismic activity, and snow loading create favorable conditions for slope failure. The District Disaster Risk Management Plan specifically identifies earthquakes, flash floods, and heavy snow burden as triggers of landslides, particularly during the monsoon season. Such events may damage houses, block roads, disrupt utility networks, and isolate settlements.	**Critical Priority – Slope Management Focus**

3	**Flash Floods / Urban Flooding / Cloudburst Events**	Intense monsoon rainfall and rapid runoff from surrounding slopes can produce sudden flows in streams, nullahs, ravines, and natural drainage channels. Expansion of built-up surfaces, construction near drainage routes, blocked culverts, and inadequate stormwater infrastructure may intensify localized flooding within the city. In mountainous areas, flash flooding can also trigger debris flows and slope instability.	**High Priority – Drainage and Flood-Risk Management**
4	**Heavy Rainfall / Drainage Congestion**	Prolonged or intense rainfall can overwhelm roadside drains, culverts, and natural watercourses while simultaneously saturating slopes and increasing the likelihood of landslides. In built-up areas, inadequate drainage maintenance, encroachment, and uncontrolled construction may increase waterlogging and infrastructure damage.	**High Priority – Monsoon Preparedness**
5	**Heavy Snowfall / Cold Waves / Winter Access Disruption**	Battagram is officially identified as vulnerable to winter-related hazards, while higher parts of the district may experience heavy snowfall, avalanches, poor accessibility, and disruption of roads and essential services. Even where Battagram City itself experiences less severe snowfall than remote valleys, winter conditions can disrupt regional connectivity, supply chains, emergency access, and movement from surrounding settlements to the district headquarters.	**High Priority – Winter Resilience and Emergency Access**
7	**Riverbank Erosion / Streambank Instability / Debris Flow**	Streams, nullahs, and drainage channels receiving rapid runoff from steep catchments may experience erosion, bank cutting, sediment deposition, and debris movement. Unregulated construction or cultivation near these corridors can increase exposure and reduce natural flood-conveyance capacity. This hazard is closely linked with flash flooding and slope instability.	**Medium–High Priority – Riparian Protection**

8	**Extreme Heat / Heatwaves**	Although Battagram's mountainous setting moderates heat relative to lower-elevation plains, periods of extreme summer temperature can still create health risks, particularly for outdoor workers, elderly residents, children, markets, transport areas, and neighborhoods with limited tree cover. PDMA recognizes heatwaves as an increasingly important summer hazard across Khyber Pakhtunkhwa.	**Medium Priority – Climate Adaptation**

14.5.1. Earthquake and Seismic Hazard

Earthquake risk is one of the most significant natural hazards affecting Battagram City because the district lies within a seismically active mountainous region and was severely affected by the **2005 Kashmir earthquake**. The District Disaster Risk Management Plan for Battagram identifies earthquakes as a major hazard, while the area's mountainous terrain and vulnerable building stock increase the potential consequences of a future seismic event.

The principal vulnerability in Battagram City is associated with:

- unreinforced stone and masonry construction;
- buildings constructed without formal structural design;
- incremental additions to existing structures;
- older schools, hospitals, government buildings, and commercial structures;
- dense construction along narrow streets;
- buildings located close to unstable slopes; and
- limited emergency access in densely built-up neighbourhoods.

The consequences of an earthquake may extend beyond structural collapse. Seismic shaking can also trigger landslides, rockfalls, road blockages, damage to water supply systems, and interruption of electricity and communication networks. The mountainous setting of Battagram therefore creates a potential **multi-hazard chain**, where an earthquake may simultaneously affect buildings, slopes, roads, and emergency access. The Battagram disaster management plan specifically identifies seismic activity as one of the triggers for landslides in the district.

Planning response: A city-wide rapid visual seismic screening programme should be undertaken for schools, hospitals, government offices, emergency facilities, major commercial buildings, and other critical infrastructure. Buildings identified as vulnerable should be prioritized for structural assessment and retrofitting. All new construction should comply with applicable seismic provisions of the Building Code of Pakistan, while development on steep or unstable terrain should require both structural and geotechnical assessment.

14.5.2. Landslide, Slope Failure and Rockfall Hazard

Landslides and slope instability represent one of the most important physical hazards for Battagram because of its steep mountainous terrain, fragile slopes, intense monsoon rainfall, road cutting, seismic activity, and seasonal snow loading. The official District Disaster Risk Management Plan states that landslides in Battagram may be triggered by **earthquakes, flash floods, and heavy snow burden** and occur particularly during the monsoon season.

The highest vulnerability is expected in areas characterized by:

- steep natural slopes;
- uncontrolled hillside construction;
- road cuttings without adequate slope stabilization;
- areas below exposed rock faces;
- locations with evidence of previous slope movement;
- deforested or sparsely vegetated hillsides;
- poorly drained slopes;
- settlements located at the base of unstable terrain; and
- road corridors vulnerable to falling rocks and debris.

The hazard becomes more serious where buildings, roads, and utilities are located directly below unstable slopes or where construction involves uncontrolled excavation. Removal of vegetation can further reduce soil stability, while blocked slope drainage may increase pore-water pressure and trigger failure during prolonged rainfall.

Planning response: Battagram should adopt a **slope-sensitive development control framework** under which very steep, unstable, or historically active slopes are designated as restricted or no-build areas. New development on moderate slopes should require geotechnical investigation, controlled excavation, properly engineered retaining structures, surface and subsurface drainage, and slope stabilization.

The proposed **Protected Forest Zone of 2,291.73 acres** and **Plantation Zone of 843.79 acres** should play a direct role in reducing erosion and strengthening slope stability. Native deep-rooted vegetation should be prioritized in erosion-prone areas, while the removal of established vegetation from steep slopes should be strictly regulated.

14.5.3. Flash Flood and Drainage Hazard

Battagram's mountainous catchments can generate rapid runoff during intense monsoon rainfall, resulting in flash floods along streams, nullahs, ravines, and natural drainage corridors. The steep terrain reduces the time available between rainfall and peak runoff, increasing the potential for sudden water flows, erosion, sediment movement, and localized damage. The district's official disaster risk plan recognizes flash flooding as a significant hazard and also identifies it as a potential trigger of landslides.

For Battagram City, areas of particular concern include:

- natural streams and nullahs;
- low-lying areas adjoining drainage corridors;
- road crossings with undersized or blocked culverts;
- buildings constructed close to natural watercourses;
- areas where drainage channels have been narrowed or encroached upon;
- locations downstream of steep catchments;
- areas affected by sediment and debris accumulation; and
- newly developed areas without planned stormwater drainage.

Flash floods in mountainous environments may carry not only water but also stones, soil, tree branches, and other debris, making them more destructive than conventional urban waterlogging. Structures located directly within drainage paths are therefore particularly vulnerable.

Planning response: The proposed **316.66-acre Riparian Zone** should serve as Battagram's principal ecological and flood-risk management corridor. Permanent construction should be restricted within active drainage paths and high-risk stream edges. Appropriate uses may include native plantation, ecological restoration, walking trails, controlled recreation, and essential flood-management infrastructure where technically suitable.

Drainage corridors should be mapped and classified according to catchment size, flow behaviour, slope, and flood exposure before major future development is approved.

14.5.4. Urban Flooding and Stormwater Drainage

Urban flooding in Battagram differs from flash flooding in natural streams. It occurs when intense rainfall exceeds the capacity of roadside drains, culverts, and local drainage systems, causing water to accumulate on roads and in low-lying built-up areas. The problem can become more severe as urban development increases impervious surfaces and natural infiltration areas are replaced by buildings and roads.

The highest-risk locations are likely to include:

- the main bazaar and dense commercial areas;
- low-lying residential pockets;
- narrow roads without continuous side drainage;
- road intersections where runoff accumulates;
- blocked or undersized culverts;
- built-up areas developed across natural drainage paths;
- construction sites with uncontrolled soil and sediment discharge; and
- new residential zones developed without an integrated drainage network.

Given Battagram's steep terrain, even localized drainage failure can produce fast-moving surface runoff. Poorly designed roadside drainage may also discharge water directly onto slopes, contributing to erosion or slope instability.

Recommended intervention: A dedicated **Urban Stormwater and Drainage Master Plan** should be prepared for Battagram City. It should include:

- catchment delineation;
- high-resolution terrain analysis;
- identification of natural drainage paths;
- hydraulic assessment of existing drains and culverts;
- low-point and water-accumulation mapping;
- sediment and debris management;
- slope drainage;
- detention and retention measures where feasible; and
- protection of drainage outfalls.

Future residential zones, the Model Village, commercial areas, institutional zones, and transport facilities should be required to incorporate stormwater management into their site planning.

14.5.5. Heavy Rainfall, Snowfall, Cold Waves and Winter Access Disruption

Battagram's mountainous setting makes seasonal weather hazards particularly important. Heavy rainfall can trigger slope failures, increase runoff, damage roads, and overwhelm drainage systems, while snowfall and cold conditions can disrupt transport, electricity, water supply, and access to essential services. PDMA's winter contingency planning specifically identifies Battagram among districts where earthquake vulnerability may be compounded by winter-related hazards.

The main areas of concern include:

- higher-elevation settlements;
- roads exposed to snowfall, ice, or slope failure;
- isolated communities dependent on a single access road;
- schools and health facilities serving remote catchments;
- weak roofs vulnerable to snow accumulation;
- water supply systems exposed to freezing conditions;
- electricity infrastructure affected by storms or falling trees; and
- households lacking adequate heating and winter protection.

For Battagram City, winter hazard planning is particularly important because the city functions as an administrative, health, commercial, and service centre for a much wider mountainous hinterland. Even where severe snowfall is less pronounced in the main urban centre, blockage of connecting roads can prevent surrounding communities from accessing hospitals, markets, schools, and government services.

Planning response: Critical access roads should be identified and maintained as all-season emergency corridors. Priority measures should include road drainage, stabilization of vulnerable cut slopes, emergency machinery positioning, snow and debris clearance planning, backup power for essential services, and winterization of health and emergency facilities.

14.5.6. Riverbank Erosion, Stream Instability and Debris Flow

Riverbank and streambank erosion are closely connected with Battagram's flash flood and landslide hazards. Rapid runoff from steep catchments can erode channel banks, transport sediment and debris, destabilize adjacent land, and damage nearby infrastructure.

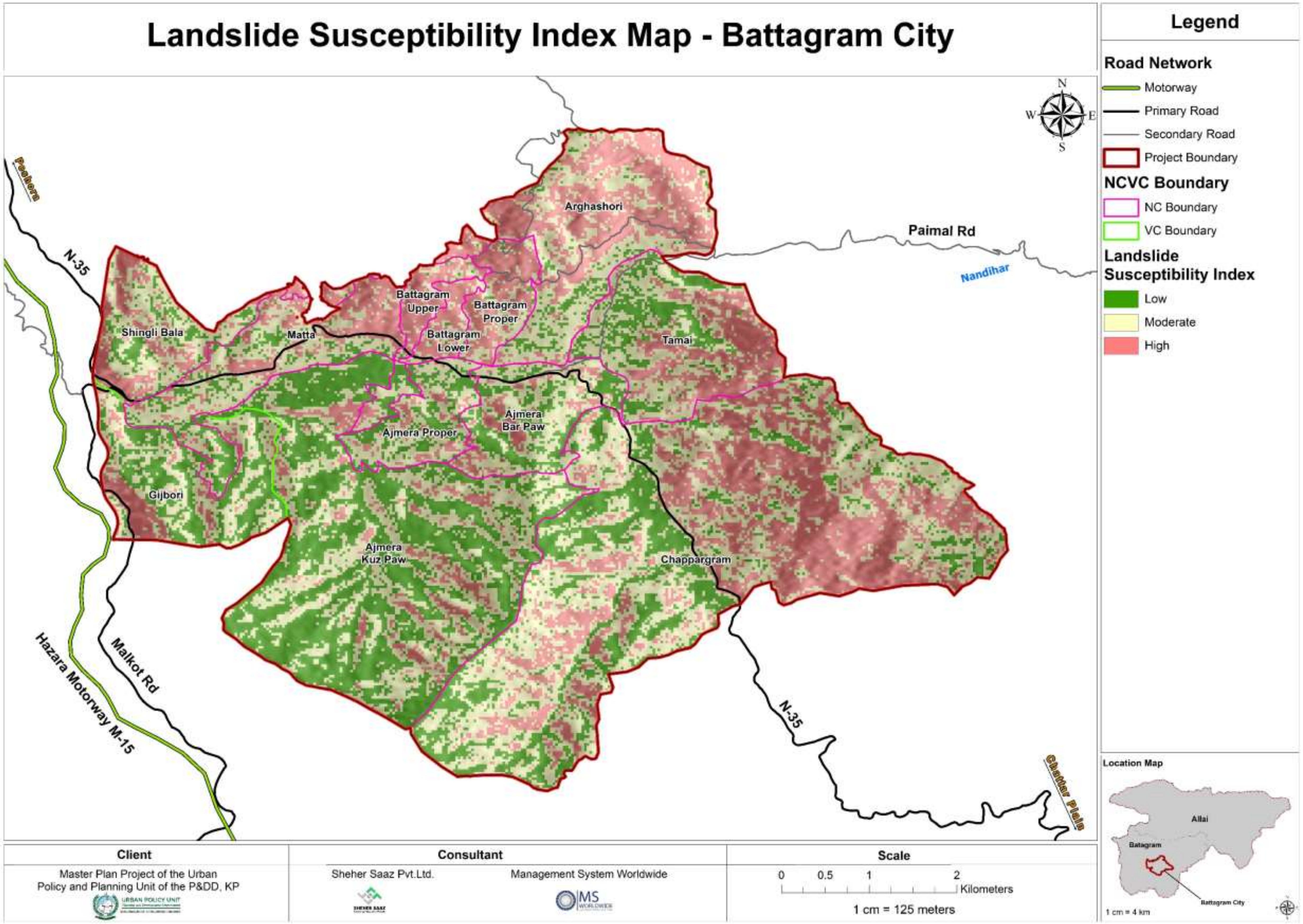
The risk increases where:

- buildings are constructed close to watercourses;
- riverbanks or stream edges have been cleared of vegetation;
- channels have been artificially narrowed;
- roads or retaining structures obstruct natural drainage;
- waste is dumped into streams or nullahs;
- cultivation extends into unstable stream margins; and
- upstream erosion increases sediment deposition downstream.

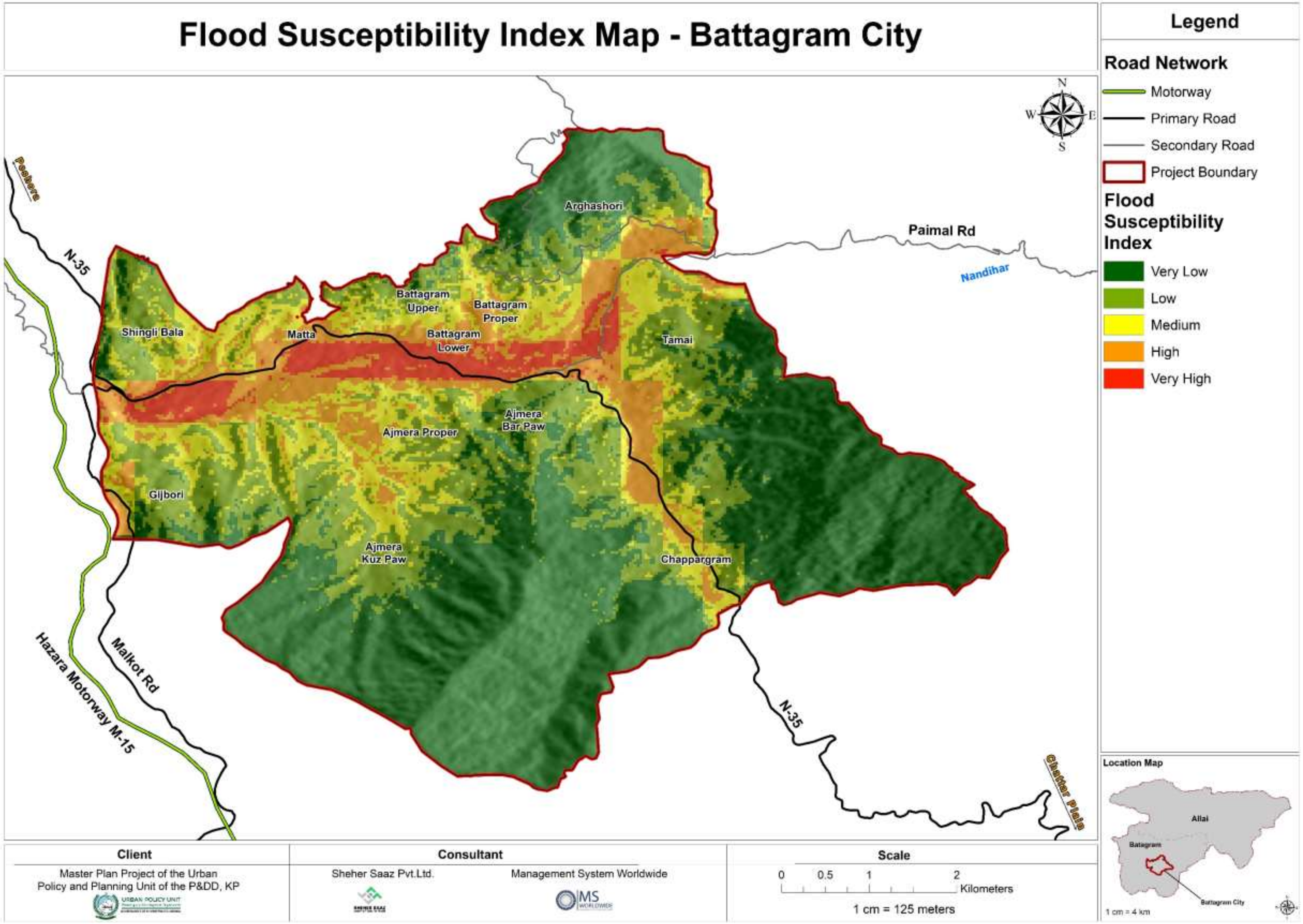
The proposed **316.66-acre Riparian Zone** should therefore be managed as protected ecological and hazard-management infrastructure. Its functions should include:

- flood conveyance;
- streambank stabilization;
- erosion control;
- runoff moderation;
- sediment management;
- water-quality protection;
- habitat continuity; and
- restriction of inappropriate construction.

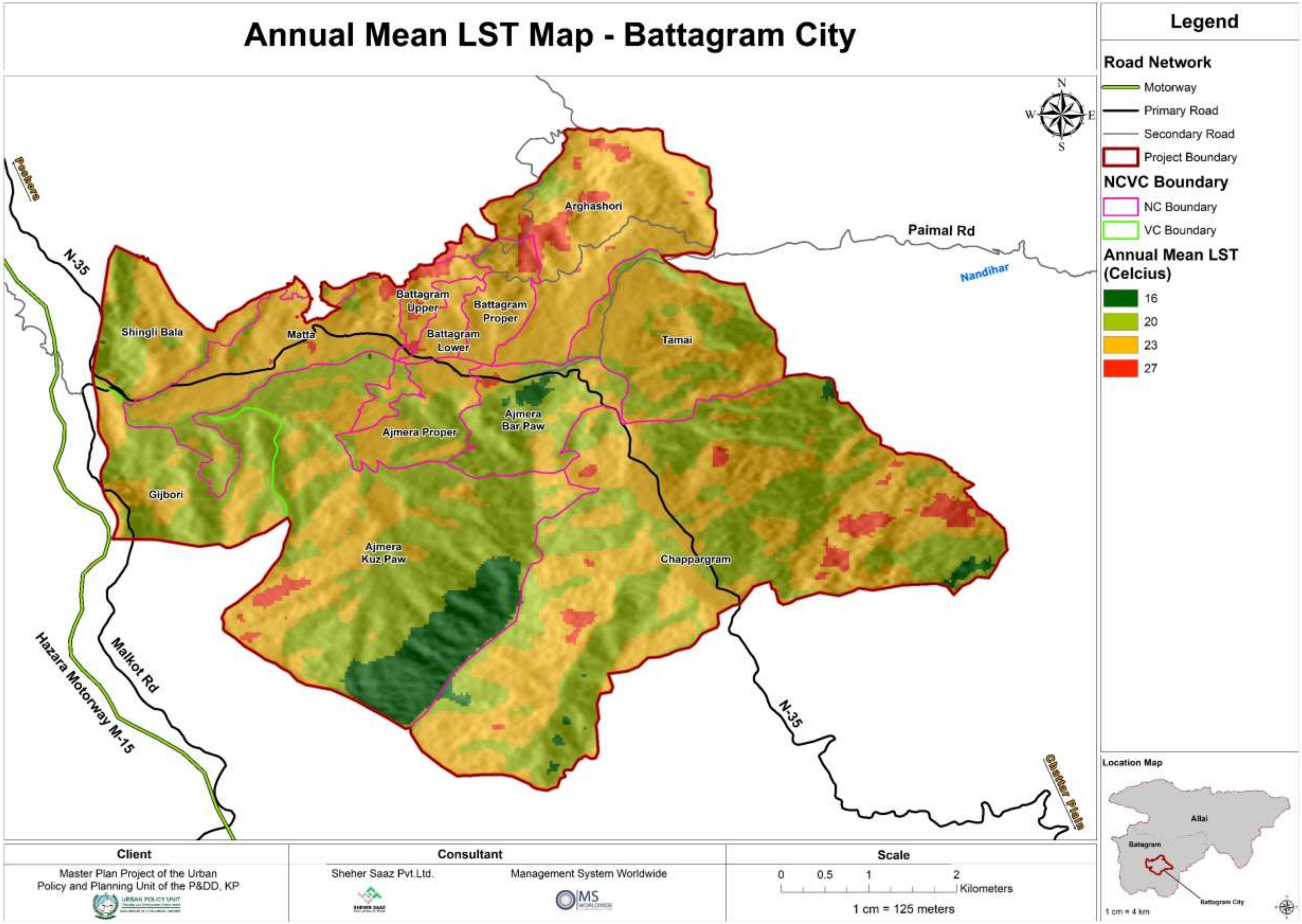
Planning response: Native vegetation, bioengineering, planted terraces, vegetated retaining systems, and selective structural protection should be prioritized. Continuous concrete channelization should be avoided except at locations where engineering analysis demonstrates that hard protection is essential for critical infrastructure or public safety.



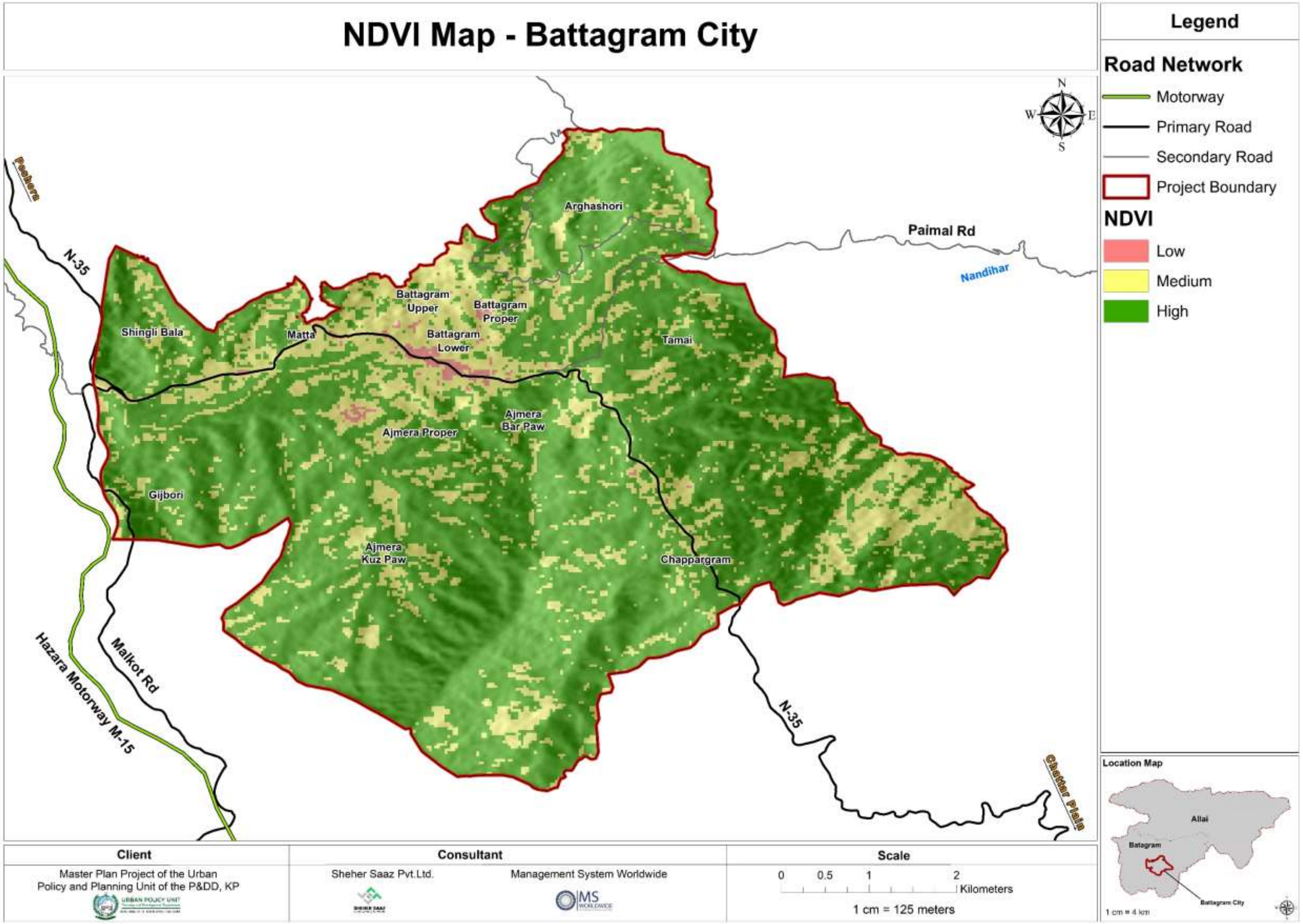
Map 40: Landslide Susceptibility Index Map



Map 41: Flood Susceptibility Map



Map 42: Annual Mean LST – Battagram



Map 43:NDVI Map – Battagram City

14.6 Disaster Risk Reduction Framework for Land Use Planning

The Disaster Risk Reduction (DRR) Framework for Land Use Planning aims to integrate hazard risk considerations into future urban expansion, infrastructure development, environmental protection, and settlement planning in Battagram District. Given the district's exposure to floods, riverbank erosion, landslides, earthquakes, heat stress, and climate-induced environmental degradation, land use planning must prioritize risk-sensitive and climate-resilient development approaches.

The framework promotes controlled urban growth, protection of environmentally sensitive areas, and reduction of population and infrastructure exposure to natural hazards through hazard-based zoning, resilient infrastructure planning, and environmental safeguards.

14.6.1. Key DRR Land Use Planning Measures

- Restrict construction and unplanned settlements within floodplains, river corridors, drainage channels, unstable slopes, and other high-risk hazard zones identified through GIS-based hazard mapping.
- Integrate flood risk, seismic vulnerability, landslide susceptibility, and climate exposure assessments into all future land use plans, housing schemes, and infrastructure development approvals.
- Establish environmentally sensitive buffer zones along rivers, canals, nullahs, wetlands, forests, and ecological corridors to reduce environmental degradation and disaster exposure.
- Promote climate-resilient urban expansion through controlled zoning, green infrastructure, urban forestry, permeable surfaces, and preservation of natural drainage systems.
- Enforce seismic-resistant building regulations and slope-specific construction guidelines in earthquake-prone and hilly areas of Battagram District.
- Develop designated emergency access routes, evacuation corridors, and safe open spaces within urban and peri-urban settlements for disaster response and emergency management.
- Prevent illegal hill cutting, quarrying, riverbank encroachments, and environmentally damaging land conversion activities through strengthened municipal regulation and environmental enforcement.
- Integrate community participation, institutional coordination, and GIS-based monitoring systems into district-level land use governance and disaster risk management processes.

15 CHAPTER: TRANSPORTATION & MOBILITY

The detailed transportation surveys conducted for Battagram reveal that the district's mobility system is predominantly road-based and heavily dependent on the Karakoram Highway (N-35), which serves as the primary regional and intercity transport corridor connecting Battagram with Mansehra, Besham, Dasu, and Gilgit–Baltistan. Unlike major urban centers, Battagram's transport system remains largely informal and is characterized by the extensive use of rickshaws, Qingqi, Suzuki pickups, wagons, minibusses, and private cars/jeeps, which collectively cater to the daily mobility needs of residents. However, the system lacks route organization, formal terminals, integrated operations, and institutional regulation, leading to inefficient traffic circulation and growing operational challenges in the urban area. The public transport user survey indicates that public transport plays a significant role in supporting daily mobility, particularly for government employees (36%), students (28%), and skilled workers (24%). Approximately 74% of respondents use public transport daily, reflecting residents' dependence on shared, low-cost mobility options for work and educational trips. Although users generally considered service frequency and number of stops satisfactory, significant concerns were raised regarding safety, comfort, and affordability. Around 44% of respondents rated public transport safety as poor, while 33% expressed dissatisfaction with onboard comfort, and 32% considered travel costs high. These findings indicate that while public transport demand remains stable, substantial improvements in service quality, passenger safety, and operational management are required to maintain and enhance ridership levels.

The Origin–Destination survey demonstrates that most daily trips are concentrated between Battagram Bazaar and surrounding settlements, including Chappargram, Kuzabanda, Thakot, and adjacent rural areas. Work-related trips dominate travel patterns, accounting for up to 84% of observed movements at some cordon points, while educational trips also form a significant proportion of daily commuting demand. The survey further reveals that private cars and jeeps are the dominant travel mode, accounting for approximately 40–48% of total trips, indicating increasing dependence on private mobility due to limited formal public transport coverage, difficult terrain, and inadequate last-mile connectivity. If unmanaged, this trend is likely to increase congestion levels and place additional pressure on the district's limited road infrastructure. Traffic survey analysis indicates that major entry corridors, particularly the Mansehra–Battagram and Motorway–Battagram approaches, are currently operating at LOS "C" during peak periods, reflecting moderate traffic stress and reduced operational efficiency. Similarly, College Chowk, one of the city's key intersections, experiences increasing delays during peak hours, operating at LOS "C" in the evening peak according to SIDRA analysis. Although current traffic conditions remain manageable compared to larger urban centers, the results indicate that several corridors and junctions are gradually approaching their operational limits.

Ribbon development, mixed traffic conditions, narrow carriageways, roadside commercial activity, and lack of geometric improvements further reduce effective road capacity and contribute to localized congestion. The household interview survey findings indicate that traffic congestion is perceived to be worsening in Battagram, with nearly half of the respondents reporting increasing congestion levels. The primary contributing factors include rapid growth in motorcycle ownership (26%), increasing private car ownership (22%), unregulated rickshaw operations (18%), poor driving behavior (16%), and inadequate parking management (12%). Weak enforcement of traffic regulations, lack of organized traffic management systems, and insufficient road infrastructure further aggravate mobility conditions, particularly within commercial areas and along the urban section of the Karakoram Highway. Parking surveys reveal that illegal on-street parking is a major contributor to traffic disruption in Battagram City. Commercial corridors such as Battagram Bazaar Main Road, Allai Road, College Chowk, and the KKH urban segment experience severe roadside encroachments due to informal parking. Field observations indicate that up to 90% of cars and 72% of motorcycles are parked illegally in major commercial areas, substantially reducing the effective carriageway width and causing frequent traffic bottlenecks.

Although limited off-street parking facilities exist near DHQ Hospital, administrative offices, and commercial establishments, several are already operating near saturation. The absence of organized parking management systems, designated parking bays, signage, and enforcement mechanisms continues to undermine overall traffic operations within the city. Traffic safety also emerged as a significant concern, particularly for vulnerable road users. Survey findings indicate that bicycling and motorcycle riding are widely perceived as unsafe, while many respondents also expressed concerns about pedestrian road-crossing safety. Poor driving behavior, increasing traffic volumes, lack of traffic education, inadequate road facilities, and poor road conditions were identified as major factors affecting road safety. Respondents strongly emphasized the need for improved enforcement of traffic bylaws, better road conditions, traffic awareness campaigns, and more effective traffic management measures to reduce accident risk and improve overall urban mobility.

Considering these findings, it is evident that Battagram is gradually transitioning from a relatively low-traffic mountainous town into an emerging regional urban center experiencing increasing mobility pressures due to urban growth, rising motorization, and expanding economic activity along the Karakoram Highway corridor. A growing gap exists between the increasing demand for safe, reliable, and efficient transport services and the existing level of transport infrastructure and management capacity. Therefore, a comprehensive and integrated transport strategy is required, focusing on corridor improvements, intersection upgrades, parking management, public transport enhancements, pedestrian safety measures, and strengthened traffic enforcement.

Future mobility interventions should also align with the objectives of the Khyber Pakhtunkhwa Urban Policy 2022-2030, particularly regarding non-motorized transport, sustainable mobility, parking regulation, public transport prioritization, and road safety enhancement. Given the existing transportation and traffic conditions, the following section outlines proposed interventions to improve mobility, enhance safety, and support sustainable transport development in Battagram City.

15.1. Road Proposals

The existing traffic conditions of Battagram are very critical. Traffic congestion is very common during peak hours, making it a serious issue to analyze. For this purpose, traffic surveys such as MCC and TMC were conducted, and traffic volumes were obtained for peak and non-peak hours. The vehicle mix observed on roads was converted to a single Passenger Car Unit (PCU) basis to enable further analysis of traffic conditions. These PCUs are given in the table below for each vehicle type.

Table 100: PCU Factors by JICA

Vehicle Type	PCU Factors	Vehicle Type	PCU Factors
Truck	3	Car	1
Bus	3	Auto-Rickshaw	0.75
Minibus	3	Motorcycle	0.75
Utility	1	Non-Motorized Vehicles	1

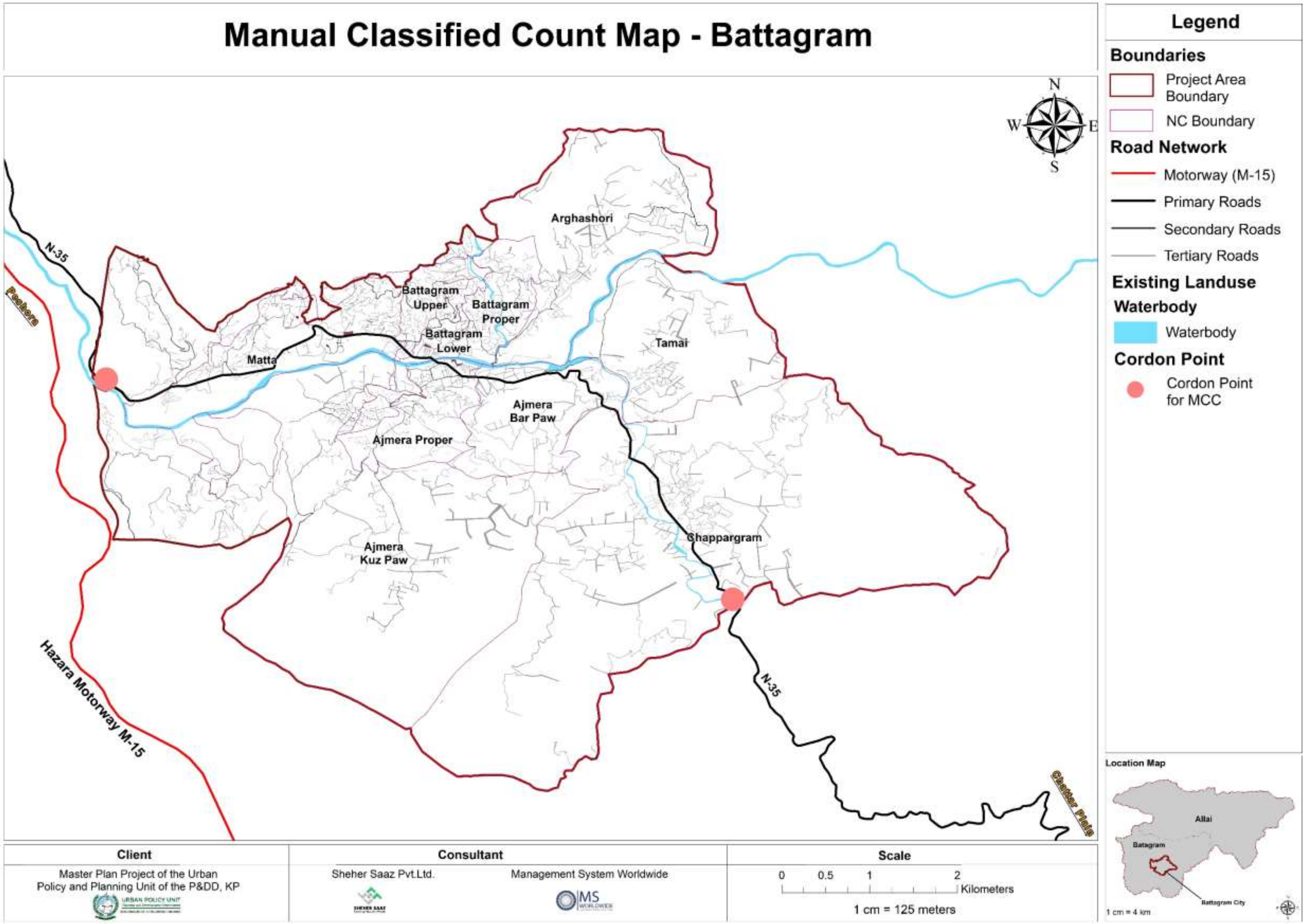
Source: Geometric Design of RHD Roads Ver. 4 (JICA)

The level of Service (LOS) of the road represents the quality of the road in terms of the number of vehicles flowing smoothly through it in one hour. To determine the LOS of roads, the volume and capacity analysis is performed according to the Highway Capacity Manual's criteria, as shown in the table below

Table 101: LOS Criteria of HMC for Capacity Analysis

LOS Criteria for Volume/Capacity (V/C) Analysis	
V/C Ratio	LOS
0.00-0.60	A
0.60-0.70	B
0.70-0.80	C
0.80-0.90	D
0.90-1.00	E
> 1.00	F

Source: Highway Capacity Manual, Transportation research board, 2010.



Map 44: MCC Cordon Points Map
Source: Developed by Consultant

The existing N-35 volume in Battagram was analyzed by comparing volume-to-capacity ratios, and their LOS were determined based on the current geometry. LOS is acceptable in the current geometry, but future inventions may be required.

Now, to determine the LOS of these roads under future demand, traffic volume projections are based on a 2.55 % growth rate.

Two scenarios are discussed for comparison.

i. Future traffic demand with current geometry
ii. Future traffic demand with interventions (improved geometry)

The results for N-35, including their respective traffic volumes, peak hours, and required interventions to improve the LOS in 2045, are shown in the following table.

Table 102: Manual Classified Count results for Future Scenario – Battagram City

Cordon Point	Point ID	Direction	Peak Hour	Current Demand with Existing Geometry - 2025						Future Demand with Existing Geometry - 2045				Future Demand with Interventions - 2045				
				Duration	Road Capacity (pcu/hr)	No. of Lanes	Peak Hour Volume (pcu)	V/C Ratio	LOS	Existing No. of Lanes	Peak Hour Volume (pcu)	V/C	LOS	Proposal	Road Capacity (pcu/hr)	Peak Hour Volume (pcu)	V/C	LOS
	MCC-1	Inflow	9:00-10:00	AM	1,200	1	660	0.55	A	1	1,092	0.91	E	1 additional lane and Bypass	2300	1,092	0.47	A
			3:00-4:00	PM	1,200	1	850	0.71	C	1	1,406	1.17	F	1 additional lane and Bypass	2300	1,406	0.61	B
		Outflow	8:00-9:00	AM	1,200	1	841	0.7	B	1	1,392	1.16	F	1 additional lane and Bypass	2300	1,392	0.61	B
			11:30-12:30	PM	1,200	1	478	0.4	A	1	791	0.66	B	1 additional lane and Bypass	2300	791	0.34	A
	MCC-2	Inflow	10:00-11:00	AM	1,200	1	493	0.41	A	1	816	0.68	B	1 additional lane and Bypass	2300	816	0.35	A
			3:30-4:30	PM	1,200	1	705	0.59	A	1	1,167	0.97	E	1 additional lane and Bypass	2300	1,167	0.51	A
		Outflow	11:00-12:00	AM	1,200	1	860	0.72	C	1	1,423	1.19	F	1 additional lane and Bypass	2300	1,423	0.62	B
			2:30-3:30	PM	1,200	1	906	0.76	C	1	1,499	1.25	F	1 additional lane and Bypass	2300	1,499	0.65	B

Source: Developed by Consultant

15.1.1. Existing Road Widening

The future demand analysis indicates that the major entry and exit corridors of Battagram City will experience significant operational pressure by 2045 under the existing roadway configuration. The Mansehra–Battagram corridor (MCC-1), which currently operates between LOS "A" and "C," is projected to deteriorate substantially under future traffic growth. The PM inflow and AM outflow directions are expected to reach LOS "F" conditions with V/C ratios exceeding 1.15, indicating that traffic demand will surpass the available roadway capacity. Similarly, the Battagram–Motorway corridor (MCC-2), although currently operating at acceptable service levels, is projected to experience severe congestion by 2045. The PM inflow direction is expected to operate at LOS "E," while both AM and PM outflow directions are projected to deteriorate to LOS "F," with V/C ratios reaching up to 1.25 under existing roadway geometry. The analysis clearly demonstrates that the current single-lane corridor configuration will not be sufficient to accommodate future traffic growth generated by increasing urbanization, regional mobility demand, tourism activity, and expanding economic interactions along the Karakoram Highway corridor. Without capacity-enhancement measures, these corridors are likely to experience severe congestion, increased travel delays, reduced travel reliability, and deteriorating traffic safety conditions during peak periods. To address future traffic demand and improve corridor performance, a combination of roadway widening and bypass development has been proposed for both major corridors. The proposed interventions include the provision of one additional lane along the existing corridors, combined with the development of bypass facilities to divert through traffic away from the urban core. These improvements increase the effective corridor capacity from 1,200 pcu/hr to approximately 2,300 pcu/hr, significantly improving overall traffic operations. Following the proposed interventions, the operational performance of both corridors improves substantially under projected 2045 demand conditions. The Mansehra–Battagram corridor improves from LOS "F" and "E" conditions to LOS "A" and "B," with V/C ratios reducing to between 0.34 and 0.61 during peak periods. Similarly, the Battagram–Motorway corridor improves from projected LOS "F" conditions to LOS "A" and "B," with V/C ratios reducing to between 0.35 and 0.65 after the provision of the additional lane and bypass network. These results indicate that the proposed interventions will restore acceptable operating conditions and provide sufficient reserve capacity to accommodate long-term traffic growth. In addition to improvements to the primary regional corridors, it is also recommended that secondary and local urban roads within Battagram City be upgraded and widened wherever feasible, subject to available Right-of-Way (ROW), terrain conditions, and the surrounding built-up environment. Improving the secondary road network is essential to distribute traffic more efficiently across the urban area, reduce pressure on the Karakoram Highway urban segment, improve accessibility between residential and commercial areas, and support safer movement for pedestrians and local traffic. Such improvements will also strengthen emergency access, enhance public transport circulation, and improve overall urban mobility.

The analysis therefore highlights the urgent need for strategic transportation infrastructure improvements in Battagram to ensure that future traffic growth is accommodated efficiently and safely. The proposed bypass corridors, additional roadway lanes, and urban road widening measures are critical to maintaining acceptable Levels of Service (LOS), improving regional connectivity, reducing congestion within the urban core, and supporting the long-term sustainable growth of Battagram City in accordance with the objectives of the Khyber Pakhtunkhwa Urban Policy 2022-2030.

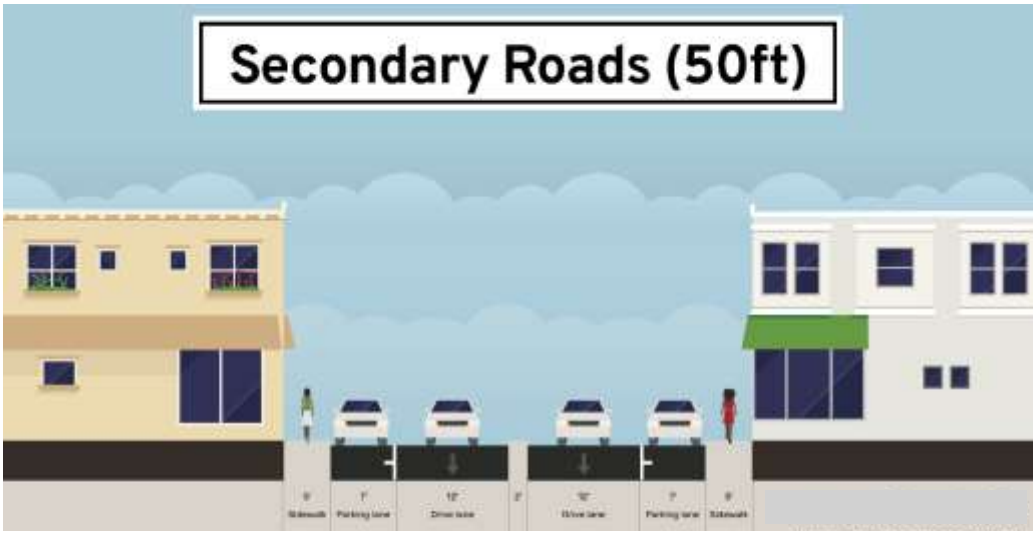
Table 103: Existing Road Proposals - Battagram City

Road name	Road Hierarchy	Existing ROW (ft)	Proposed ROW (ft)	Road Length (Km)	Remarks
KKH (N-35)	Primary Road	40	65	9	Primary arterial corridor; proposed improvements include pavement markings, lane delineation, median/channelization, improved junction control, pedestrian crossings, roadside drainage, signage system, and provision for ITS-based traffic management.
Romai Road	Secondary Road	30	50	2.85	Linear commercial corridor; provision of pedestrian footpaths, parking bays/service lanes, pavement marking, directional signage, loading/unloading zones, street lighting, and access management control.
Ajmera Road		30	40	4.31	Secondary urban road; pavement marking, traffic signage, pedestrian walkway provision, roadside drainage improvement, and basic intersection control at junctions.
Gujar Abad Road		30	40	2.24	Secondary road with mixed traffic; pavement marking, regulatory signage, pedestrian safety provisions, drainage improvement, and traffic calming measures near settlements.
Paimal Sharif Road		30	40	2.88	Secondary connector; pavement marking, signage, pedestrian facilities at key locations, improved drainage, and speed calming interventions in built-up sections.
Colony Road		30	40	4.68	Residential-urban secondary road; pavement marking, pedestrian footpaths, street lighting, traffic signage, and speed control measures to ensure safe local access.
Girls College Road		20	40	1.68	Educational corridor; school-zone traffic calming, pedestrian crossings, speed reduction measures, safety signage, footpaths, and controlled parking restrictions near institutional frontage.
Char Gali Feroz Road		30	40	2.1	Secondary road; pavement marking, signage, pedestrian walkway provision, drainage improvement, and intersection safety enhancements at connecting nodes.

Source: Developed by Consultant

Figure 16: Road Cross-Sections - Battagram City

Karakoram Highway Cross-Section



Secondary Road Cross-Section (Commercial Corridors)

Secondary Road Cross-Section

Local Road Cross-Section

Source: Developed by Consultant

15.1.2.Proposed New Roads

To accommodate future urban growth, improve regional connectivity, and reduce traffic congestion within the urban core of Battagram, a bypass road is proposed under the transport and structural planning framework. The proposed road infrastructure aims to distribute traffic efficiently, support planned urban expansion, and enhance accessibility between residential, commercial, and institutional areas. The proposed road network consists of a Bypass Corridor and internal structural plan roads, all designed to accommodate projected traffic demand and future land-use patterns.

Bypass Road

The proposed Battagram Bypass is planned with a Right-of-Way (ROW) of 40 feet to accommodate future traffic demand and improve regional mobility along the Karakoram Highway corridor. The bypass will help divert through traffic, particularly heavy vehicles and intercity traffic, away from the congested urban core of Battagram City, thereby reducing traffic pressure within commercial and residential areas. The proposed ROW is considered appropriate for providing a two-lane carriageway along with shoulders, drainage infrastructure, and limited pedestrian facilities where feasible. In addition to improving traffic circulation and reducing travel delays, the bypass will enhance road safety, minimize roadside congestion, and support the long-term urban growth and economic development of Battagram City.

Structural Plan Roads

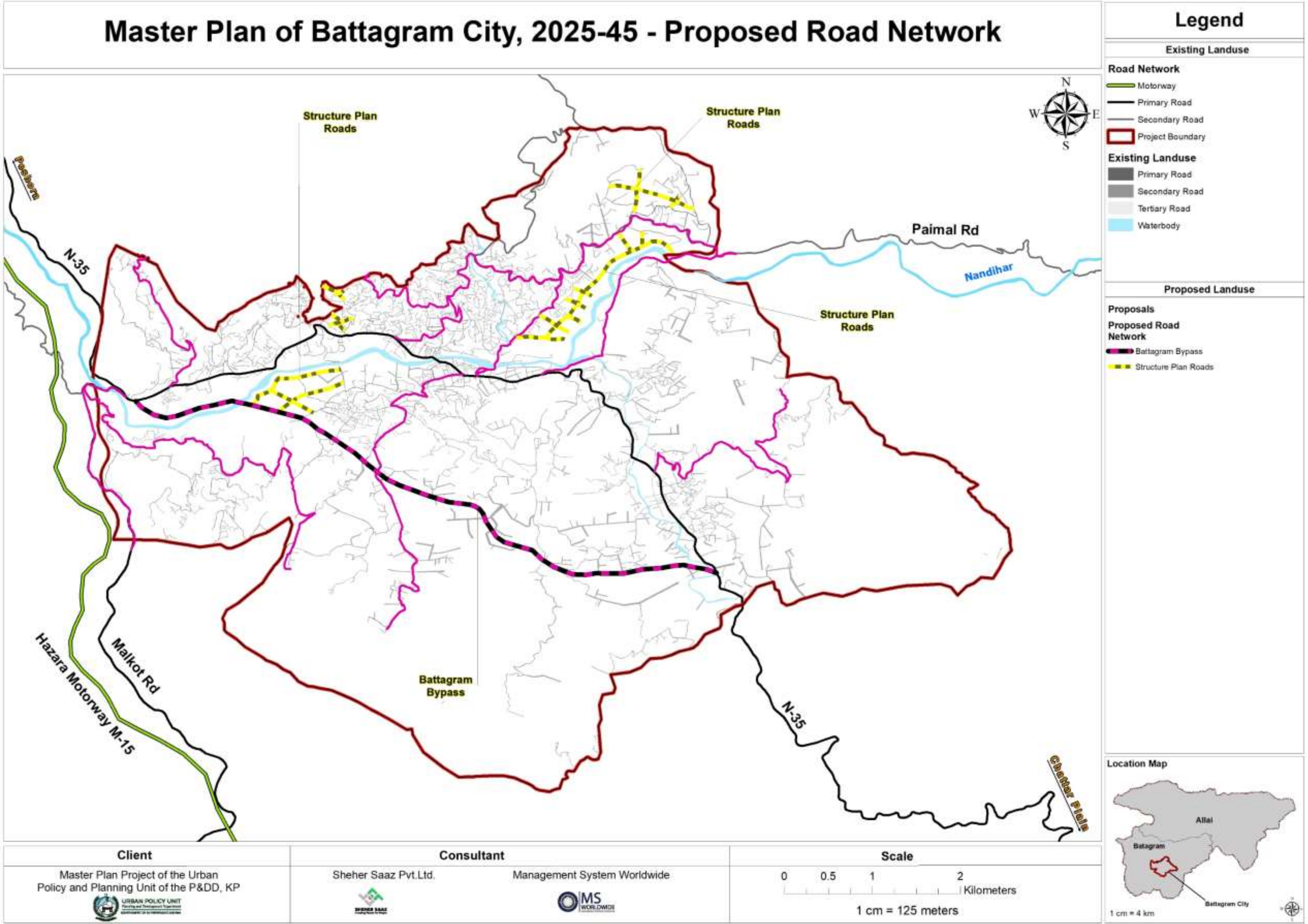
In addition to the regional road network, a hierarchy of Structural Plan Roads is proposed within future residential expansion areas to guide planned urban development and discourage unplanned and haphazard growth. These roads are proposed primarily in newly planned residential sectors and will provide organized internal connectivity between neighbourhoods, public facilities, commercial areas, and collector roads. The proposed structural roads will have a minimum Right-of-Way (ROW) of 30 feet to ensure adequate space for vehicular movement, utility corridors, pedestrian access, and future service infrastructure. The provision of these roads will support sustainable urban expansion, improve accessibility, and establish an integrated transportation framework for future residential development areas.

Table 104: Proposed New Roads - Battagram City

Sr. No.	Road	Proposed Width (ft)	Length (Km)
1	Battagram Bypass	40	6.25

Source: Developed by Consultant

Map 45: Proposed Road Network Map – Battagram City



Source: Developed by Consultant

15.2. Junction Improvement Proposals

College Chowk is one of the most important urban intersections in Battagram City and serves as a critical node on the Karakoram Highway (N-35), accommodating both regional through traffic and local urban movements. The intersection connects traffic coming from Mansehra, the Motorway corridor, Ajmera, and the central commercial areas of Battagram, making it a strategically significant junction for passenger movement, freight transport, public transport operations, and local accessibility. Due to its central location within the urban area, the intersection experiences a complex mix of traffic, including heavy vehicles, passenger cars, motorcycles, rickshaws, public transport vehicles, and pedestrian activity throughout the day.

Sr.	Junction Name	Current Demand with Current Geometry				Future Demand with Existing Geometry - 2045				Future Demand with Interventions - 2045			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	College Chowk	10.4	B	22.2	C	16.6	C	924	F	8	A	20.5	C

Source: Developed by Consultant

The existing analysis shows that College Chowk is currently operating at acceptable levels, with LOS “B” in the AM peak (10.4 sec delay) and LOS “C” in the PM peak (22.2 sec delay). However, the intersection already experiences localized congestion due to mixed traffic, roadside activities, on-street parking, informal public transport stops, and limited geometric capacity, further worsened by the absence of proper channelization and traffic control. By 2045, without intervention, performance is expected to deteriorate significantly. The AM peak is projected to reach LOS “C” (16.6 sec delay), while the PM peak is expected to collapse to LOS “F” with delays up to 924 seconds, indicating severe operational failure. This deterioration is driven by rising traffic volumes, urban growth, increased private vehicle ownership, and growing regional mobility along N-35. To address this, a combined intervention of an additional lane on N-35 and full signalization of College Chowk is proposed. This is expected to restore efficient operations, improving the AM peak to LOS “A” (8 sec) and the PM peak to LOS “C” (20.5 sec).

Supporting measures such as lane marking, signage, pedestrian facilities, designated public transport stops, parking control, encroachment removal, and strict enforcement are also essential to ensure long-term intersection efficiency and safety.

Figure 17: College Chowk - Battagram City
Source: Developed by Consultant

Overall, the analysis demonstrates that College Chowk will become one of the most critical traffic bottlenecks in Battagram City if timely infrastructure and traffic management interventions are not implemented. The proposed additional lane along the N-35 corridor and long-term signalization strategy are therefore essential to maintain acceptable Levels of Service (LOS), support regional and urban mobility, improve travel efficiency, and ensure safer traffic operations within Battagram City. These interventions are also consistent with the objectives of the Khyber Pakhtunkhwa Urban Policy 2022-2030, particularly those related to sustainable mobility, improved traffic management, enhanced road safety, and integrated urban transport planning.

15.3. Public Transport Improvement

The proposed public transport network for Battagram has been developed based on the findings of the Origin-Destination (OD) Survey, accessibility assessment, and public transport buffer analysis conducted within the study area. The proposed routes are designed to improve urban mobility, strengthen connectivity among residential areas, commercial centers, educational institutions, and public facilities, and provide accessible, efficient public transport services throughout the urban area. The route alignments and proposed bus stops were identified through spatial accessibility analysis to maximize population coverage within acceptable walking distances and improve access to major activity generators, including Battagram Bazaar, educational institutions, healthcare facilities, administrative offices, and surrounding residential neighbourhoods. The proposed network aims to ensure that a significant proportion of the urban population falls within the service catchment area of public transport stops. The proposed public transport system for Battagram has been planned considering the existing urban structure, travel demand patterns, and the hierarchy of road infrastructure. The Karakoram Highway (N-35) has been identified as the primary public transport corridor because it serves as the main regional spine connecting Battagram with adjoining districts and carries the highest passenger and traffic volumes. This corridor will function as the backbone of the proposed public transport system and facilitate both intra-city and intercity passenger movement.

In addition to the primary corridor, several secondary urban routes have been proposed to improve neighbourhood-level accessibility and strengthen connectivity with the main transport spine. These include Ajmera Road, Gujar Abad Road, Paimal Sharif Road, Colony Road, Girls College Road, and Romai Road. The proposed routes will improve access to residential settlements, local commercial areas, schools, healthcare facilities, and community services while also providing feeder connectivity to the Karakoram Highway corridor. The integration of these secondary routes with the primary corridor will help establish a more comprehensive and efficient urban public transport network for Battagram.

Table 105: Proposed Public Transport Routes - Battagram City

Route	Road	Starting Point	End Point
1	Karakoram Highway (N-35)	34°38'33.83"N 73° 3'39.44"E	34°42'23.43"N 72°58'40.25"E
2	Ajmera Road	34°40'32.08"N 73° 1'45.10"E	34°38'58.30"N 73° 1'18.33"E
3	Gujar Abad Road	34°40'31.09"N 73° 0'11.40"E	34°41'14.62"N 72°59'47.03"E
4	Paimal Sharif Road	34°40'31.09"N 73° 0'11.40"E	34°41'9.02"N 73° 1'12.15"E
5	Colony Road	34°40'31.09"N 73° 0'11.40"E	34°41'16.19"N 73° 3'25.54"E
6	Girls College Road	34°40'31.09"N 73° 0'11.40"E	34°41'16.19"N 73° 3'25.54"E
7	Romai Road	34°40'31.09"N 73° 0'11.40"E	34°41'16.19"N 73° 3'25.54"E

Source: Developed by Consultant

To support the proposed public transport operations and reduce congestion around the existing Battagram Adda, a new bus terminal has been proposed at a strategically suitable location within the urban area. The proposed terminal will help improve the organization of passenger movement, reduce roadside public transport encroachments, and facilitate more efficient operation of both intra-city and intercity transport services. The proposed terminal is intended to function as an integrated passenger facility supporting route management, vehicle parking, passenger boarding and alighting, and public transport circulation.

The proposed bus terminal should incorporate essential passenger-oriented facilities, including waiting areas, passenger shelters, ticketing spaces, washrooms, designated parking areas for public transport vehicles, pedestrian access facilities, and organized boarding bays. Proper circulation management within the terminal area will also help reduce operational conflicts and improve overall traffic flow efficiency around the surrounding road network.

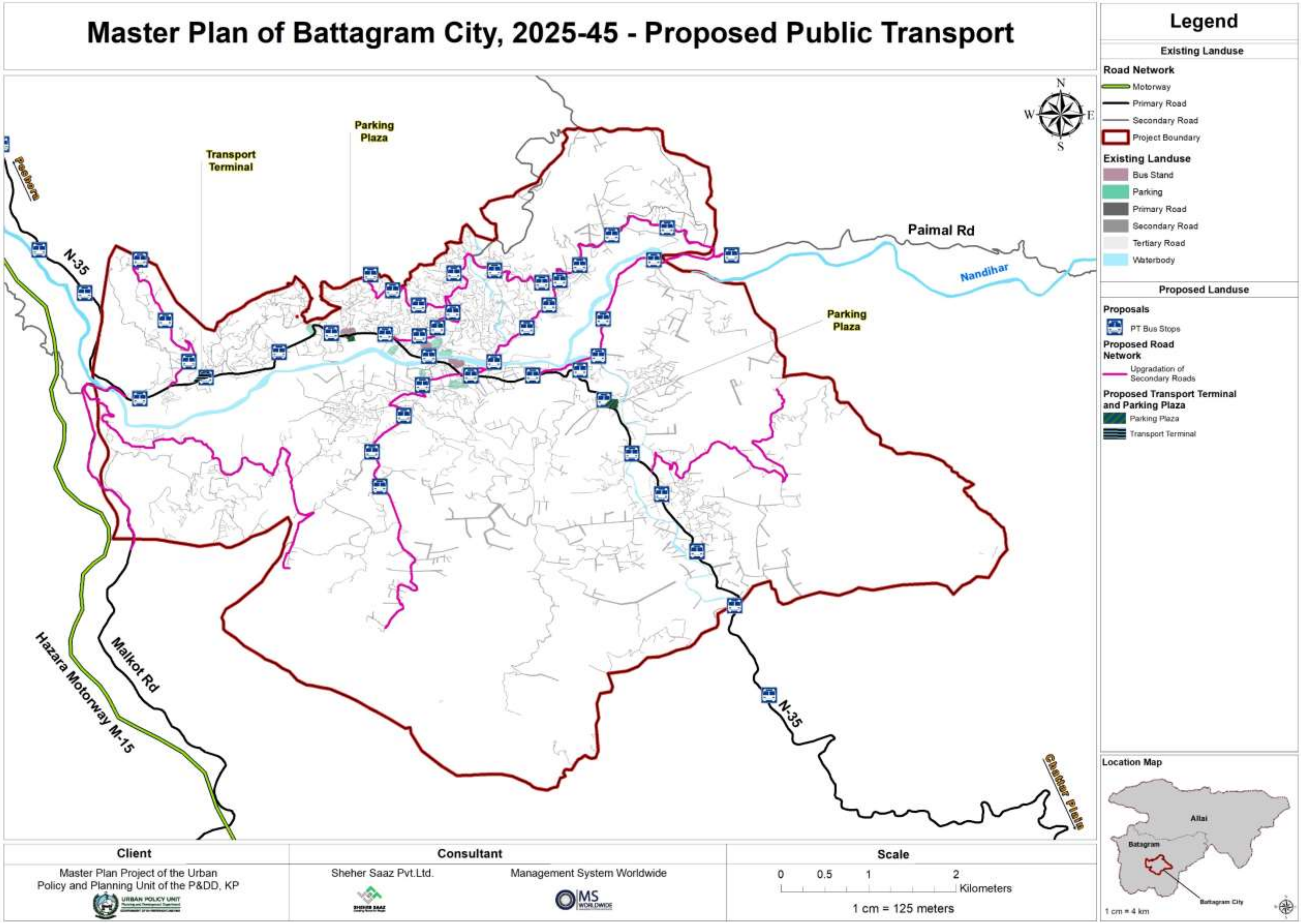
Table 106: Proposed Bus Terminals - Battagram City

Sr. No.	Bus Terminal	Area (Acres)	Location	Remarks
1	Battagram	2.14	34°40'31.09"N 73° 0'11.40"E	Proposed to reduce congestion at Battagram Adda and support urban public transport operations with waiting areas, parking, passenger shelters, and boarding facilities

Source: Developed by Consultant

In addition to route and terminal development, it is recommended that designated bus stops, bus bays, passenger shelters, pedestrian crossings, route signage, and safe boarding and alighting facilities be developed along all proposed public transport corridors. Integration with pedestrian infrastructure, parking management systems, and future non-motorized transport facilities should also be ensured to establish a safe, inclusive, and sustainable urban mobility system for Battagram. In line with the provisions of the Khyber Pakhtunkhwa Urban Policy 2022–2030, priority should also be given to public transport operations by providing dedicated bus bays, improving pedestrian accessibility, and enhancing intermodal integration.

Map 46: Proposed Public Transport Network Map – Battagram City



Source: Developed by Consultant

15.4. Parking Proposals

Considering the projected parking demand generated by the proposed 300-acre commercial zone, two centralized multi-story parking plazas are proposed, totaling 3.67 acres. Due to urban land constraints and high commercial land value considerations, the parking structures are designed as vertically efficient facilities comprising one basement level and G+3 floors, providing five effective parking levels. The proposed facilities are estimated to accommodate approximately 2,000–2,200 ECS, including dedicated provisions for cars, motorcycles, rickshaws, disabled parking spaces, and integrated smart parking management systems to ensure efficient circulation, real-time guidance, and optimized space utilization. In the context of Battagram's existing urban mobility challenges, particularly the concentration of parking demand along Battagram Bazaar, Karakoram Highway (N-35) urban stretch, Bus Stand, and DHQ Hospital, the proposed parking infrastructure is intended to function as a demand management and congestion mitigation intervention. Field observations confirm that a significant proportion of on-street parking currently occurs in an unregulated manner, especially for motorcycles and private cars, thereby directly reducing carriageway capacity and contributing to recurrent congestion in core commercial corridors. Accordingly, the proposed parking supply is structured as a distributed system to ensure balanced absorption of demand across the urban core:

Both facilities are designed as smart parking structures incorporating controlled entry and exit systems, CCTV surveillance, adequate lighting, pedestrian circulation networks, digital ticketing and payment systems, and clearly demarcated parking bays for different vehicle types, ensuring operational safety and efficiency. In addition to these structured facilities, residual parking demand will be managed through mandatory basement parking requirements in new commercial developments, shared parking arrangements between compatible land uses (commercial, institutional, and residential, where applicable), and strict enforcement of regulated on-street parking zones, including designated no-parking and limited-duration parking areas in accordance with emerging urban mobility and parking management policies.

Table 107: Parking Plaza Proposals - Battagram City

Sr. No.	Parking Plaza	Area (Acres)	Location	Remarks
1	Near Proposed Commercial Zone In the center	1.09	34°40'45.71"N 73° 1'4.95"E	Smart parking facility with controlled entry/exit, CCTV security, lighting, pedestrian access, and provision for car, motorcycle, and bicycle parking to reduce on-street congestion.
2	Near Proposed Commercial Zone At the start	2.58	34°40'26.25"N 73° 2'33.99"E	Smart parking facility with controlled entry/exit, CCTV security, lighting, pedestrian access, and provision for car, motorcycle, and bicycle parking to reduce on-street congestion.

Source: Developed by Consultant

Overall, the proposed strategy ensures that future parking demand associated with the 300-acre commercial expansion is addressed through a compact, high-capacity, and vertically optimized parking system, significantly reducing reliance on on-street parking, improving traffic circulation efficiency along the N-35 corridor and urban bazaars, and enhancing the overall functionality and accessibility of Battagram's urban transport network.

15.5. Conclusions

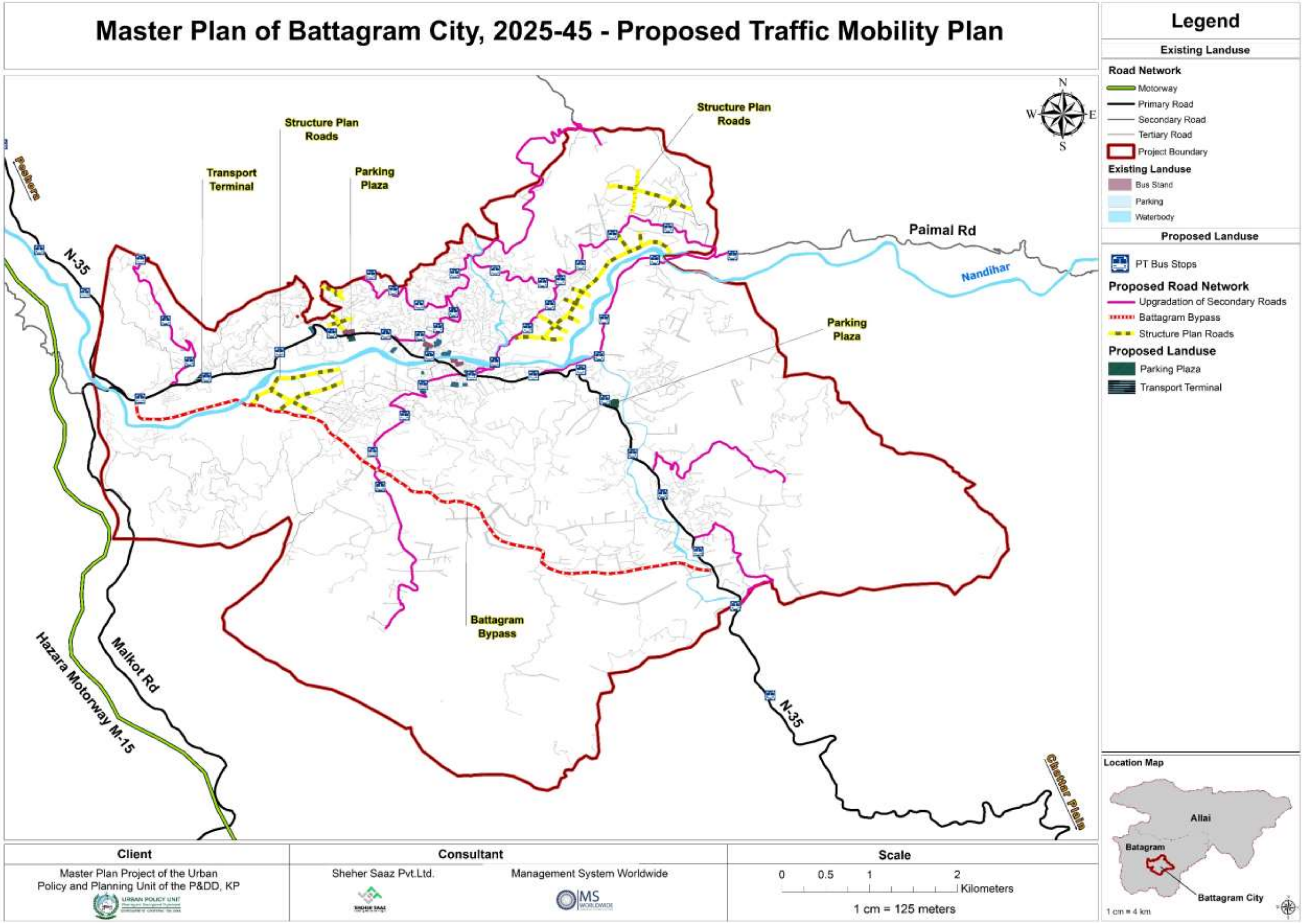
The transportation and mobility assessment for Battagram City highlights a system currently operating under moderate but steadily increasing pressure, primarily driven by rapid urbanization, rising motorization, and the strategic importance of the Karakoram Highway (N-35) as a regional mobility corridor. While existing traffic conditions remain operationally acceptable in selected corridors, survey findings clearly indicate that the city is transitioning to a higher-congestion environment, particularly within the urban core, commercial bazaars, and key junctions such as College Chowk. The analysis of traffic volumes, Level of Service (LOS), and projected growth scenarios demonstrates that several critical corridors and intersections will experience significant performance deterioration by 2045 if no interventions are implemented.

In particular, peak-hour conditions along the –Battagram and Battagram–Motorway corridors are projected to exceed capacity thresholds, resulting in severe congestion, increased delays, and reduced network reliability. Similarly, localized bottlenecks within the urban fabric are expected to intensify due to ribbon development, inadequate geometric design, and unmanaged roadside activities. Public transport assessment reveals that although the system plays a vital role in supporting daily mobility, especially for students, workers, and low-income groups, it remains informal and lacks structured routing, terminal facilities, and service quality standards. Key concerns include safety, comfort, and affordability, which, if not addressed, may further accelerate the shift toward private-vehicle dependence and exacerbate congestion and parking demand.

Parking analysis further confirms that uncontrolled on-street parking is one of the most critical constraints in Battagram's urban mobility system. High parking accumulation along commercial corridors, particularly Battagram Bazaar and N-35, significantly reduces effective road capacity and contributes to recurrent traffic delays. The limited off-street parking supply is already approaching saturation at key activity nodes, reinforcing the need for structured parking management and enforcement mechanisms. In response to these challenges, the proposed transport strategy adopts a comprehensive, integrated approach that combines road capacity enhancements, intersection improvements, public transport restructuring, parking management, and traffic demand-control measures. Key interventions, such as corridor widening, bypass development, signalization of critical junctions, and the introduction of organized public transport routes and terminals, are expected to significantly improve operational efficiency and network performance under future demand conditions.

The proposed multi-level parking plazas, along with mandatory basement parking in new developments and regulated on-street parking policies, will play a critical role in reducing congestion within the urban core and improving traffic circulation. Furthermore, alignment with the Khyber Pakhtunkhwa Urban Policy 2022–2030 ensures that the proposed interventions support sustainable mobility principles, including prioritizing public transport, improving road safety, and better integrating land use with transport plannin

Map 47: Proposed Traffic Mobility Plan – Battagram City



Source: Developed by Consultant

16 CHAPTER: WATER SUPPLY, SEWERAGE

Battagram faces critical challenges in water supply and sanitation, including intermittent municipal supply, heavy reliance on multiple unprotected sources (springs, streams, open wells), vulnerability to contamination and climate-induced disruptions (floods, landslides), and limited sewerage infrastructure. These issues result in public health risks, environmental degradation, and low user satisfaction despite reasonable access levels.

This Master Plan presents a comprehensive, phased strategy to achieve universal access to safe drinking water and modern sanitation services by 2045. It aligns with Pakistan's National Water Policy (2018), National Drinking Water Policy, KP Drinking Water Policy, National Environmental Quality Standards (NEQS), and KP Urban Policy.

Deliver safe, reliable, and sustainable water supply at 100–120 liters per capita per day (lpcd) average consumption (phased increase from current lower levels). Achieve 100% coverage of piped water supply and sewerage services. Treat 100% of generated wastewater before reuse or disposal. Protect springs, streams, and natural water bodies while enhancing watershed management. Ensure long-term financial and operational sustainability.

The plan is based on the projected 2045 population of 273,271 (primarily focusing on Battagram's urban and peri-urban areas within the district's mountainous terrain). Total design water supply requirement is estimated at 35–50 MLD by 2045, accounting for terrain-specific losses and peak demands.

16.1 Existing Water Supply and Sanitation Situation

The household survey results show that drinking water supply in the study area is obtained from multiple sources. Piped municipal or community tap water serves 91 households (38.2%). River/stream or canal water is used by 43 households (18.1%), while 40 households (16.8%) rely on private boreholes or tube wells. Open dug wells serve 33 households (13.9%), and spring or gravity-fed systems serve 23 households (9.7%). Tanker, bottled, and other sources have minimal usage.

Municipal or community water supply is mostly intermittent. Out of 88 households reporting municipal availability, 76.1% receive water once a day, 22.7% twice a day, and only 1.1% three times a day. Payment for water services is minimal: 87.7% of households pay nothing monthly. User satisfaction is mixed, with 66% neutral, 19% satisfied, and 15% dissatisfied. Key concerns include reliability, quality, and frequency.

Battagram was recently declared Open Defecation Free (ODF). Sanitation is predominantly dependent on septic tanks, soakage pits, and open drains. Untreated wastewater discharge into natural streams and khawars contributes to pollution. Institutional responsibilities are divided among PHED, TMA Battagram, and community schemes, with weak O&M and negligible cost recovery. Gravity-fed schemes from springs are common but face pressure from population growth, sedimentation during monsoons, and climate variability. Groundwater is limited due to mountainous geology.

16.2 Water Demand Projections for Battagram City

The projected water demand for Battagram has been estimated based on the future population growth and a progressive increase in average per capita consumption, ultimately targeting 120 liters per capita per day (lpcd) by the design horizon. This consumption level aligns with urban planning standards for a growing mountain town, accounting for domestic, institutional, and limited commercial needs while promoting efficiency.

As per the detailed projections, the average daily water demand is expected to rise from 20.78 MLD in 2025 to 32.79 MLD by 2045.

Considering peak factors (1.5–2.0), additional provisions for institutional, commercial & industrial demand, fire-fighting reserve, and system losses, the Design Water Supply is estimated to increase from 31.17 MLD in 2025 to 49.19 MLD by 2045. Correspondingly, the Peak Hour Water Demand will grow from 46.76 MLD in 2025 to 73.78 MLD by 2045.

These projections form the basis for planning, designing, and phasing the water supply infrastructure up to the design horizon of 2045. The plan incorporates a targeted reduction of Non-Revenue Water (NRW) to 15–20% through improved network management, metering, and leak detection.

Year	Population	Average Demand (MLD)	Design Water Supply (MLD)	Peak Hour Water Demand (MLD)
2025	173,148	20.78	31.17	46.76
2030	194,715	23.37	35.05	52.58
2035	218,395	26.21	39.31	58.97
2040	244,472	29.34	44.01	66.01
2045	273,271	32.79	49.19	73.78

Average Demand is calculated on a progressive increase toward 120 lpcd.

Design Water Supply includes peak factors, provisions for non-domestic demand, fire-fighting reserve, and system losses. The figures reflect the growing water requirements of Battagram and will guide the sizing of source development, treatment facilities, storage reservoirs, and distribution networks.

16.3 Storage Capacity

The recommended storage capacity for Battagram has been calculated to provide a reliable buffer for daily demand fluctuations, peak hour requirements, emergency situations, firefighting needs, and operational flexibility. A minimum of 24-hour storage based on the Design Water Supply is proposed, with an overall range of 100% to 120% of the daily Design Water Supply volume.

This approach ensures equitable water pressure across the distribution network, particularly important in Battagram's hilly and mountainous topography. The total storage will be distributed zonally, with 40–50% allocated to Ground Reservoirs (GRs) and 50–60% to Overhead Reservoirs (OHRs) to optimize gravity distribution and maintain adequate residual pressure in elevated and remote areas.

Year	Population	Average Demand (MLD)	Design Water Supply (MLD)	Peak Hour Demand (MLD)	Recommended Storage Capacity (ML)
2025	173,148	20.78	31.17	46.76	31 – 37 ML
2030	194,715	23.37	35.05	52.58	35 – 42 ML
2035	218,395	26.21	39.31	58.97	39 – 47 ML
2040	244,472	29.34	44.01	66.01	44 – 53 ML
2045	273,271	32.79	49.19	73.78	49 – 59 ML

Storage capacity is based on 100–120% of the Design Water Supply to ensure resilience.

Zonal distribution of storage reservoirs will be finalized during detailed engineering design, giving due consideration to topography, pressure zoning, and future expansion. Priority will be given to covered reservoirs to maintain water quality and protect against contamination.

This storage strategy will play a critical role in transitioning Battagram from intermittent supply to a reliable 24/7 water supply system.

16.4 Proposed Water Supply Master Plan

Strategy and Sources

Transition from fragmented, intermittent sources to a centralized, resilient municipal system with strong community involvement, while protecting springs and watersheds.

Primary Sources:

Protected springs and gravity-fed systems (upgraded and expanded). Surface water from local streams/rivers (with intake structures and treatment). Deep tube wells where feasible (limited due to geology).

Supplementary: Rainwater harvesting (mandatory in new constructions) and potential small reservoirs/check dams.

Major Interventions:

Rehabilitation and expansion of gravity schemes with solarization for pumping were needed. Construction of centralized and zonal Water Treatment Plants (WTPs) with coagulation, filtration, disinfection, and seasonal turbidity handling.

Zonal storage reservoirs and distribution network using HDPE pipes, pressure management, District Metered Areas (DMAs), and universal metering. Comprehensive leak detection, NRW reduction, and source protection (watershed management, afforestation). Phased piped coverage targets: 75–80% by 2030, over 90% by 2035, and 100% by 2045, with equitable pressure in hilly terrain.

Water Quality and Conservation

Establishment of a modern Water Quality Testing Laboratory with regular monitoring. Public awareness campaigns and household-level support during transition. Demand management measures: Increasing block tariffs, rainwater harvesting regulations, and wastewater reuse for non-potable purposes.

Aquifer recharge initiatives through checking dams on khawars and planned recharge using treated effluent.

16.5 Proposed Sewerage and Drainage Master Plan

Strategy

The Sewerage and Drainage Master Plan for Battagram adopts a separate sewerage system consisting of a dedicated sanitary sewer network for wastewater and a separate stormwater drainage system. Given the mountainous terrain, steep slopes, and scattered urban settlements of Battagram, the plan emphasizes covered drains and multiple outfalls to ensure efficient gravity flow, minimize pumping requirements, reduce flood risk, and facilitate phased implementation.

The sanitary sewerage component will consist of an underground gravity sewer network using durable RCC or HDPE pipes for house connections, laterals, and trunk mains. The network will be designed to maintain self-cleansing velocities (minimum 0.6–0.8 m/s) while minimizing maintenance issues. House connections will be mandatory for all households and commercial establishments, with targeted subsidies provided to low-income areas.

Covered Drains

All primary, secondary, and tertiary drains will be covered wherever feasible, especially in densely populated and commercial areas. Covered drains will significantly reduce solid waste dumping, mosquito breeding, unpleasant odors, and direct human contact with wastewater. In less dense or upper slope areas, a combination of covered and improved open drains with proper fencing and regular desilting will be adopted. The stormwater drainage system will be completely separated from the sanitary sewers to eliminate the current practice of mixed flows and to enhance monsoon resilience.

Multiple Outfalls Approach

Owing to the undulating topography and dispersed settlement pattern of Battagram, a decentralized system with multiple outfalls is proposed instead of a single centralized system. This approach offers several advantages:

- Reduced length of trunk sewers and minimized deep excavations.
- Lower pumping requirements through maximum use of gravity.
- Easier and more cost-effective phased implementation.
- Reduced risk in case of any single system failure.

Treated effluent from multiple Sewage Treatment Plants (STPs) will be discharged through several designated outfalls into natural streams at downstream locations after meeting NEQS standards.

Sewage Treatment Plants:

Multiple decentralized Sewage Treatment Plants (STPs) will be developed at suitable locations corresponding to the identified outfalls. Cost-effective and low-energy technologies such as Waste Stabilization Ponds (where land is available), Sequencing Batch Reactors (SBR), or Moving Bed Biofilm Reactors (MBBR) will be adopted based on detailed site-specific feasibility. These STPs will be constructed in phases to match the city's growing sewage flows, targeting a combined capacity of approximately 45–50 MLD by 2045. Sludge generated will be dewatered, digested (with potential biogas recovery), and reused as bio-fertilizer after safety testing.

16.6 Protection and Restoration of Natural Streams/Khawars

Special emphasis will be placed on the protection and ecological restoration of natural streams and khawars. This includes demarcation of boundaries, anti-encroachment drives, development of green riparian buffers, desilting, bank stabilization, and biodiversity enhancement. All wastewater flows will be intercepted and diverted to STPs. Direct discharge of untreated sewage into natural water bodies will be strictly prohibited.

Key Components:

- Underground gravity sanitary sewer network with house connections.
- Covered drains for stormwater across the urban area.
- Multiple decentralized Sewage Treatment Plants with multiple outfalls.
- Phased development to reach ~45–50 MLD combined treatment capacity by 2045.
- Full compliance with NEQS for treated effluent.
- Sludge management and reuse as bio-fertilizer or for energy recovery.
- Rehabilitation and upgrading of natural drainage channels with green buffers.
- On-site sanitation (septic tanks) restricted only to low-density peri-urban and rural pockets, supported by regular desludging services.
- Wastewater Reuse Target: 30–50% of treated effluent for irrigation, horticulture, and non-potable uses by 2045.

This amended approach of covered drains and multiple outfalls is particularly suitable for Battagram's topography, making the system more resilient, economical, and easier to maintain while delivering faster improvements in public health and environmental quality.

Institutional Strengthening

To ensure efficient planning, implementation, and sustainable operation of the water supply and sanitation infrastructure, it is recommended to establish a dedicated Battagram Water & Sanitation Authority or a specialized Water & Sanitation Wing within the Tehsil Municipal Administration (TMA) Battagram.

A clear delineation of roles and responsibilities shall be adopted, whereby the Public Health Engineering Department (PHED) will be responsible for planning and execution of major infrastructure schemes, while the TMA Battagram will handle day-to-day operation and maintenance (O&M) of the systems.

The involvement of the private sector will be actively promoted through Public-Private Partnership (PPP) models, particularly for the development and operation of Water Treatment

Plants (WTPs) and Sewage Treatment Plants (STPs). Additionally, comprehensive capacity building programs for staff and robust community engagement initiatives will be implemented to foster ownership, improve service delivery, and ensure long-term sustainability of the project.

Financial Sustainability & Tariff Strategy:

To achieve long-term financial viability of the water supply and sanitation system, the following measures are proposed:

- Introduction of a universal metered billing system with lifeline tariffs to ensure affordability for low-income households while promoting water conservation.
- Progressive increase in cost recovery to cover 70–100% of Operation and Maintenance (O&M) costs through realistic and equitable tariff adjustments over the project period.
- Mobilization of funds from multiple sources, including provincial and federal government grants, and international financing institutions such as the Asian Development Bank (ADB), World Bank, and other development partners.

Expected Outcomes

The successful implementation of the Battagram Water Supply and Sewerage Master Plan will deliver significant benefits, including A substantial reduction in waterborne diseases through the provision of safe, reliable, and adequate drinking water.

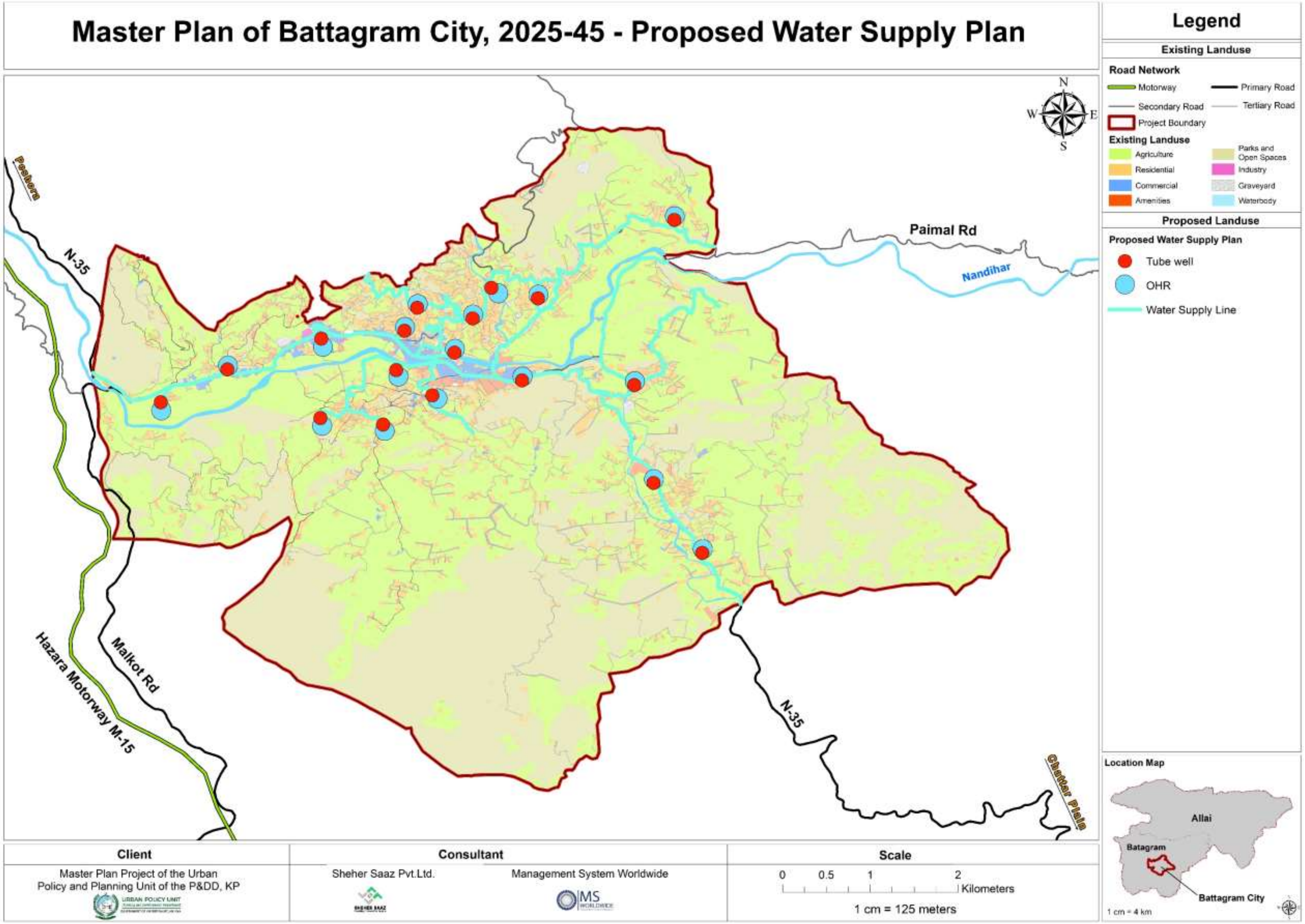
Elimination of untreated wastewater discharge into natural streams and khawars, thereby protecting springs, groundwater resources, and downstream river ecosystems. Improved environmental sustainability and public health outcomes. Support for planned, resilient, and sustainable urban growth of Battagram in its challenging mountainous terrain.

Recommendations

- Commence Detailed Feasibility Studies, Detailed Engineering Designs, and Environmental & Social Impact Assessments (ESIA) at the earliest. Ensure full integration of this Master Plan with the overall Battagram Urban Development and Land Use Master Plan. Establish a high-level Steering Committee for inter-departmental coordination and smooth project execution.
- Launch quick-impact projects such as solarization of existing schemes, universal metering, DMA implementation, covered drain construction, and pilot treatment facilities to generate early visible improvements. Conduct periodic reviews of the Master Plan every five years with adaptive management to respond to emerging needs and changing conditions.

This Water Supply and Sewerage Master Plan provide a technically sound, economically viable, and environmentally sustainable roadmap for the transformation of Battagram's water and sanitation sector. Its successful execution will significantly enhance public health, environmental quality, and overall quality of life for the residents of Battagram up to 2045 and beyond.

Map 48: Proposed Water Supply Plan



17 CHAPTER: SOLID WASTE MANAGEMENT

Rapid population growth, combined with unplanned urban expansion, has placed increasing pressure on municipal services, particularly solid waste management (SWM). Solid waste management in this region is lacking any institutional and irregular collection, and unmanaged dumping as recurring issues across multiple NCs and VCs, particularly in peri-urban and newly developing areas. These challenges pose risks to public health, environmental quality, and urban livability and underscore the need for a structured and integrated SWM system.

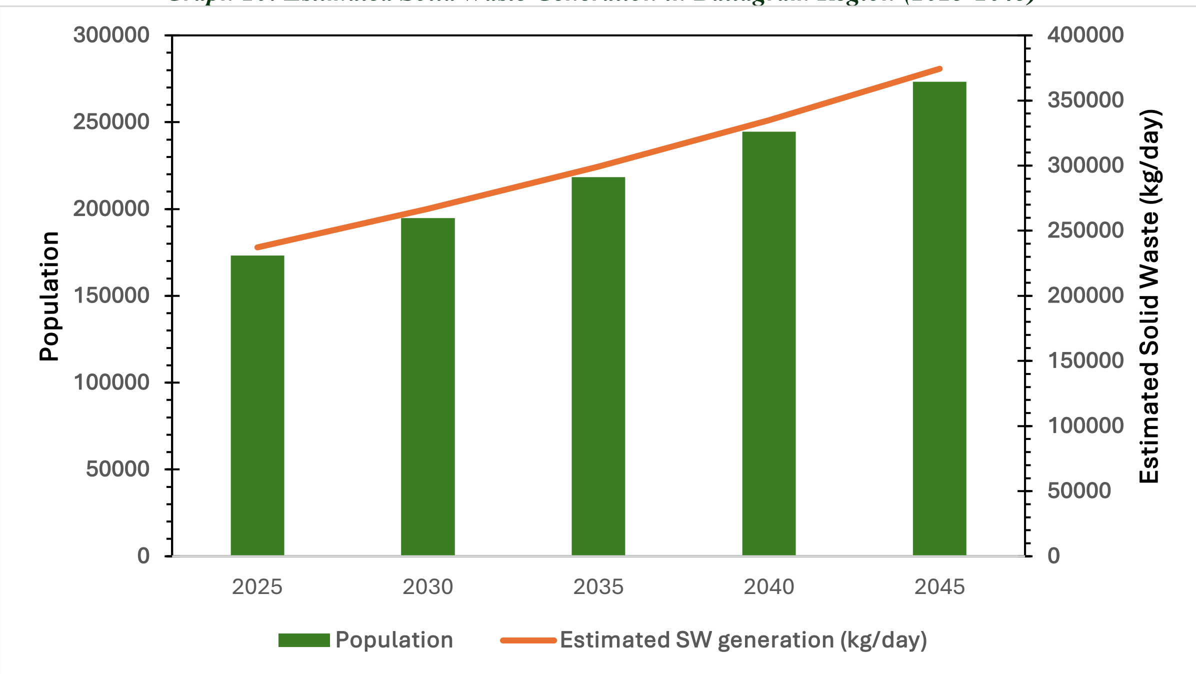
17.1 Existing Institutional and Operational Situation

Solid waste management in Battagram falls under the mandate of the Tehsil Municipal Administration (TMA). However, institutional capacity remains limited in terms of human resource, equipment, financial resources, and enforcement of sanitation by-laws. Stakeholder consultations conducted as part of the Vision Development exercise highlighted weak enforcement, inadequate service coverage, and limited accountability mechanisms as key institutional constraints. Stakeholders including the community members, emphasized the need for public–private partnerships (PPPs) in waste collection, transportation, recycling, and disposal, consistent with national and international best practices.

17.2 Waste Generation and Future Projections

The projected population growth in Battagram District indicates a corresponding and steady increase in municipal solid waste generation over the planning horizon from 2025 to 2045. Population is projected to increase from approximately 173,000 in 2025 to more than 273,000 by 2045, while estimated solid waste generation is expected to rise from nearly 240,000 kg/day to over 370,000 kg/day.

Graph 10: Estimated Solid Waste Generation in Battagram Region (2025-2045)



This increasing waste burden will place substantial pressure on the district's currently limited waste collection, transportation, recovery, and disposal infrastructure. The projections highlight the need for a phased and decentralized solid waste management system incorporating communal collection, transfer facilities, material recovery infrastructure, and environmentally controlled disposal systems adapted to Battagram's mountainous terrain and dispersed settlement patterns.

17.3 Collection, Transfer and Disposal Analysis

Based on the proposed land-use structure, the solid waste collection system should follow a hybrid service model. Door-to-door collection is recommended for residential areas, commercial areas, and mixed-use corridors because these land uses generate regular and concentrated municipal waste. For community facilities, recreational areas, graveyards, roadsides, reserved areas, and low-density institutional/open spaces, communal bins are recommended due to scattered waste generation and lower collection efficiency through household-level service.

17.4 Scenario Alternatives for SWM

17.4.1. Collection System

Door-to-door collection should be introduced in all residential and commercial zones using small vehicles, handcarts, mini-tippers, or loaders depending on street width and settlement density. Commercial and mixed-use areas should be served daily, while residential areas may be served daily or on alternate days depending on waste volume. Communal bins of 660–1,100 liters should be placed at community facilities, parks, graveyards, road intersections, transport stops, and low-density public areas.

17.4.2. Transfer System

A decentralized transfer system is recommended to reduce long-haul transportation costs and improve operational efficiency. Waste collected through door-to-door service and communal bins should be transported to secondary collection points or transfer stations located near major road access points. Transfer stations should include sorting space, temporary storage, compaction facility, and space for recyclable recovery.

17.4.3. Disposal System

Final disposal should be shifted from open dumping to an engineered controlled disposal site or sanitary landfill. The landfill site should be located away from residential settlements, water bodies, flood-prone areas, agricultural productive land, and environmentally sensitive zones. The disposal system should be supported by composting of organic waste and material recovery to reduce the quantity of waste reaching the landfill.

17.5 Selected Strategy

17.5.1. Vehicle Requirement Calculation

Assumptions:
D2D service = Residential + Commercial = 55.5% of active waste-generating land uses
Small trike capacity = 1 ton/day

Secondary vehicle capacity = 16 tons/day
Reserve fleet = 15%

Table 108: Vehicular requirement calculation for Battagram residential and commercial area.

Year	Total Waste kg/day	D2D Waste kg/day	Small Trikes Required	Secondary Vehicles Required
2025	237,000	131,573	152	18
2030	262,000	145,452	168	19
2035	296,000	164,327	189	22
2040	329,000	182,647	211	24
2045	375,000	208,185	240	27

17.5.2.Calculate Waste for Communal Bin System

$$Communal\ Waste = Total\ waste\ X\ Communal\ collection\ share$$

Assumptions for the calculation of communal bins in Battagram

Communal collection share= 44.5%

Bin size= 1,100 liters

Waste density= 0.25 kg/L

Effective bin capacity= 275 kg/bin/day

Reserve factor= 15%

Table 109: Requirement of communal bins in Battagram

Year	Total Waste kg/day	Communal Waste 44.5% kg/day	Required 1,100 L Bins	Bins incl. 15% Reserve
2025	237,000	105,465	384	**441**
2030	262,000	116,590	424	**488**
2035	296,000	131,720	479	**551**
2040	329,000	146,405	533	**613**
2045	375,000	166,875	607	**698**

By 2045, approximately 700 communal bins of 1,100 L capacity will be required for non-door-to-door areas, including community facilities, roadsides, recreational areas, graveyards, reserved areas, and dispersed public-use locations.

17.6 Proposed Sites / Facilities / Phasing

Based on projected waste generation, land use characteristics, settlement distribution, and future urban growth trends, a phased and decentralized solid waste management system is proposed. The system emphasizes source collection, transfer efficiency, material recovery, composting, and environmentally safe final disposal.

17.6.1.Short-Term Plan (2025–2030)

Waste generation projection is approx. 230–276 tons/day. So, the strategic focus will be to;

- Establish primary waste collection system
- Develop pilot recovery and transfer infrastructure
- Eliminate uncontrolled dumping in major urban centers

Table 110: Proposed facilities for solid waste management (short term)

Facility / Infrastructure	Proposed Location / Coverage	Purpose
Primary Collection Zones	Residential and commercial areas	Door-to-door collection
Communal Bin Points	Institutions, parks, roadsides, public spaces	Waste storage for communal collection
Small Transfer Points	Near urban centers and major roads	Temporary waste consolidation
Initial Material Recovery Facility (MRF)	Near main urban/commercial corridor	Sorting and recyclable recovery
Decentralized Composting Units	Agricultural/peri-urban zones	Organic waste treatment
Controlled Disposal Site	Outside settlements and flood-prone areas	Interim controlled waste disposal

17.6.2.Medium-Term Plan (2030–2040)

Approximate waste generation in Battagram during medium term is 262–329 tons/day. For this, the main strategic objective is to expand district-wide waste infrastructure and improve operational efficiency.

- Expand district-wide recovery infrastructure
- Strengthen decentralized transfer network
- Improve recycling and organic waste diversion

Table 111: Proposed facilities for solid waste management (Medium term)

Facility / Infrastructure	Proposed Location / Coverage	Purpose
Expanded MRF Facility	Main transport corridor	Plastic, paper, metal, and dry waste recovery
Secondary Transfer Stations	Urban growth clusters and rural aggregation points	Reduce transport distance and fuel cost
Large Composting Facility	Agricultural interface areas	Organic waste processing and compost production
Dedicated Healthcare Waste Cell	Utility/service zone	Safe disposal of hazardous waste

Engineered Landfill – Phase I	Environmentally suitable site	Controlled sanitary disposal

Map 49: Proposed Landfill Sitee

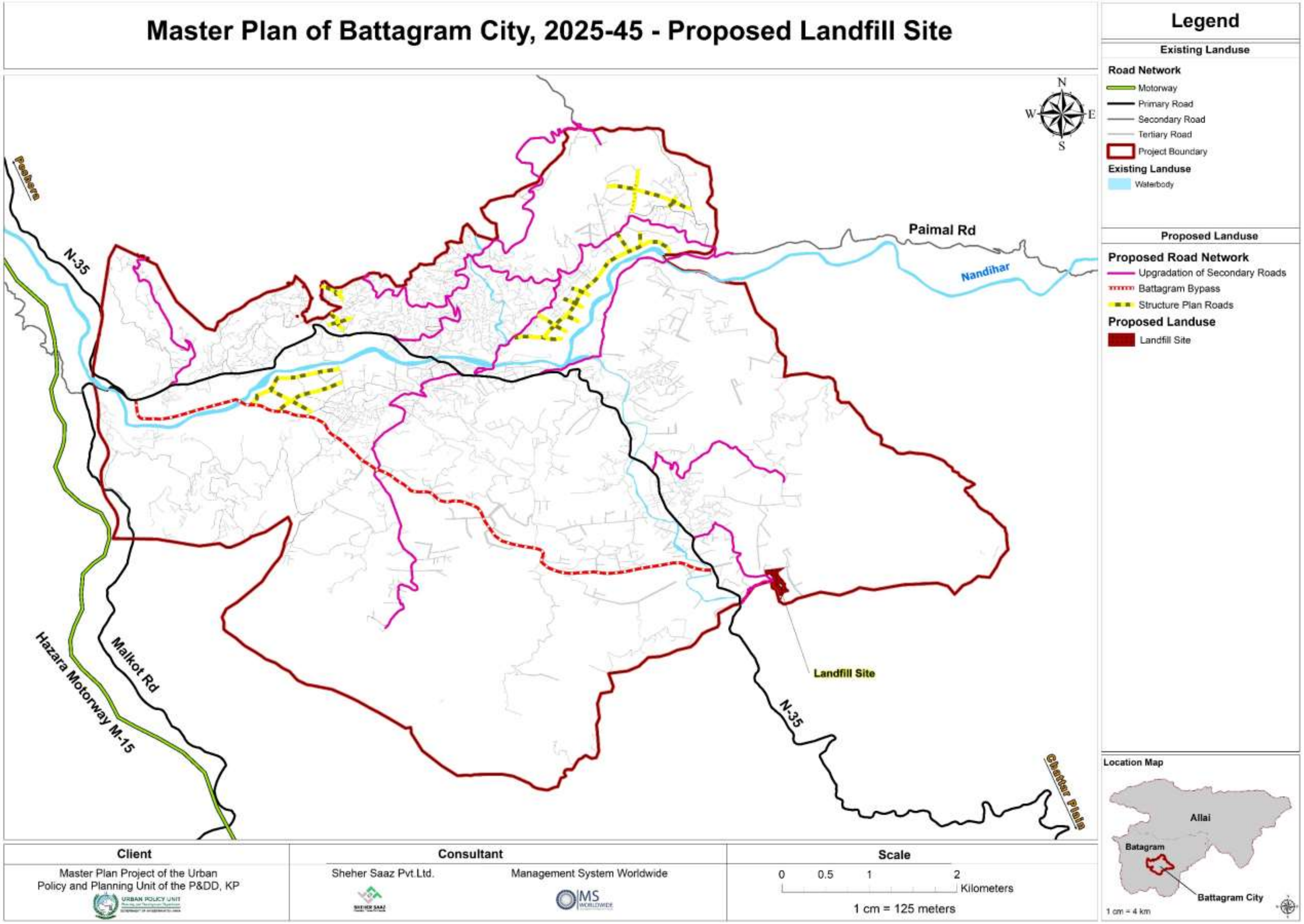


Figure 18: Integrated Solid Waste Management Framework: Collection, Segregation, Transportation, Material Recovery, and Environmentally Safe Disposal System for Battagram

17.6.3. Long-Term Plan (2040–2045)

Approximate waste generation in Battagram during long term is 329–375 tons/day. For this, the main strategic objective is to develop integrated and climate-resilient regional waste management system.

Table 112: Proposed facilities for solid waste management (Long term)

Facility / Infrastructure	Proposed Location / Coverage	Purpose
Integrated Waste Management Complex	Centralized regional site	MRF + landfill + composting + transfer operations
Advanced Recycling Facility	Commercial/industrial corridor	High-value recyclable processing
Full Engineered Sanitary Landfill	Final designated disposal site	Long-term environmentally compliant disposal
Smart Transfer Stations	High waste-generating zones	Waste compaction and bulk transfer
Organic Waste-to-Compost/Biogas Facility	Agricultural zones	Resource recovery and renewable energy

17.6.4. Landfill Requirements for Battagram District (2025–2045)

Based on projected municipal solid waste generation increasing from approximately 240 tons/day in 2025 to nearly 375 tons/day by 2045, Battagram District requires a phased and environmentally controlled landfill system integrated with material recovery and composting facilities. Due to the district's mountainous terrain, dispersed settlements, steep slopes, and environmentally sensitive watersheds, landfill planning must prioritize slope stability, groundwater protection, flood safety, and climate resilience.

Battagram should adopt a decentralized collection and transfer system combined with one integrated engineered landfill facility rather than multiple uncontrolled dumping sites. Priority should be given to:

- Waste diversion through composting and recycling
- Environmentally compliant disposal
- Protection of streams and mountain ecosystems
- Climate-resilient infrastructure development
- Long-term land reservation for future waste growth

Projected Landfill Disposal Quantity is assumed as;

- 45–50% waste diversion through composting and material recovery
- Remaining waste requiring engineered disposal

Table 113: landfill requirements

Year	Total Waste (tons/day)	Estimated Landfill Waste (50%)
2025	240	120 tons/day
2030	262	131 tons/day
2035	296	148 tons/day
2040	329	165 tons/day
2045	375	188 tons/day

The estimated land requirement for solid waste disposal facilities has been phased in accordance with projected waste generation trends and the anticipated expansion of urban settlements across the district. During the short-term phase (2025–2030), a land area of approximately 6–10 acres is considered sufficient to accommodate disposal capacities ranging from 120–135 TPD, primarily through controlled dumping and basic waste management infrastructure.

In the medium-term phase (2030–2040), increasing waste volumes and service coverage will necessitate the expansion of disposal infrastructure, requiring an estimated 12–18 acres to manage projected capacities of 135–170 TPD. This phase may also incorporate improved waste handling systems, segregation facilities, and engineered landfill components.

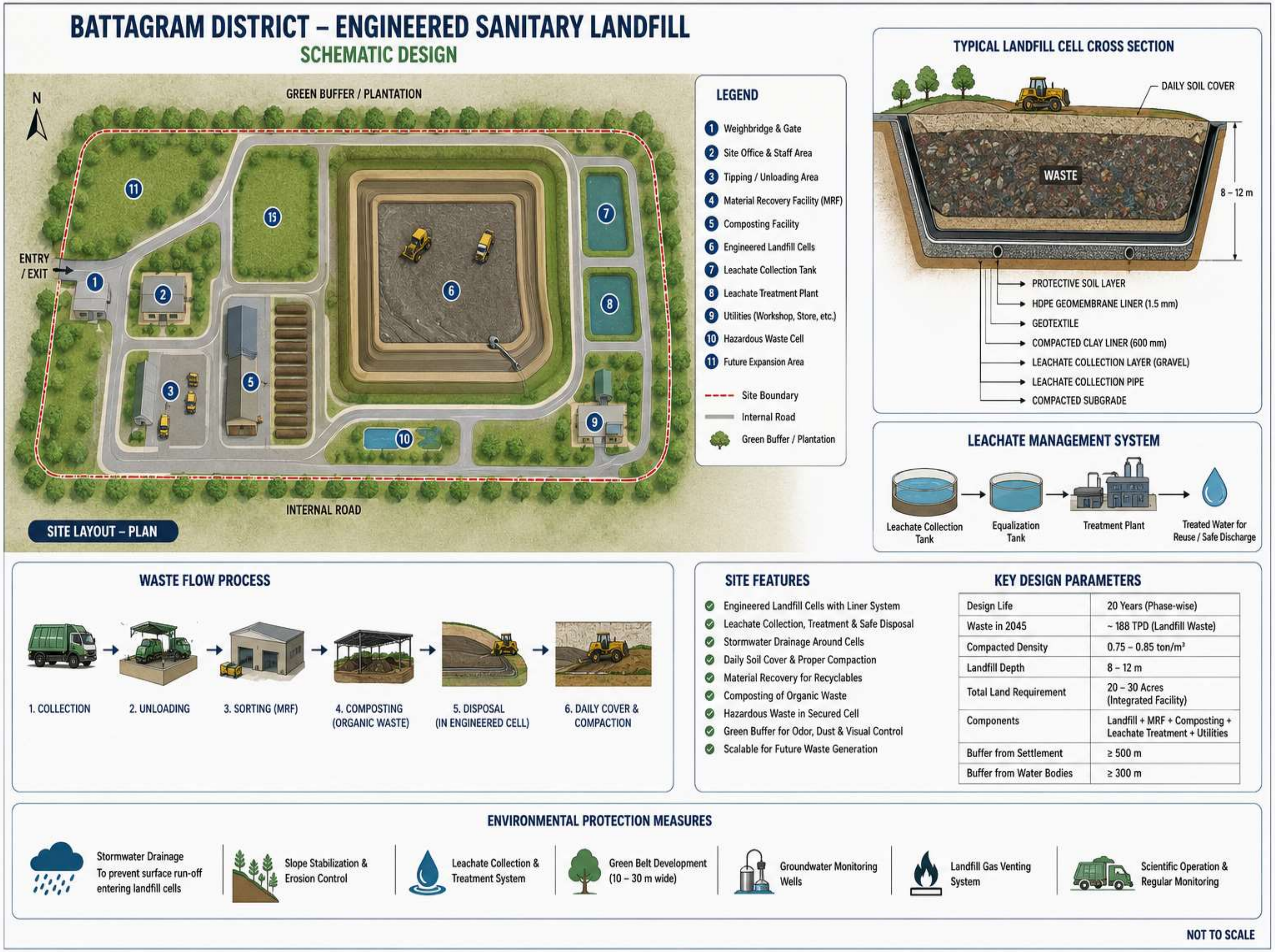
By the long-term phase (2040–2045 and beyond), waste generation is expected to increase substantially, requiring an integrated waste management site with a total land allocation of approximately 20–30 acres to accommodate disposal capacities of 170–190 TPD. This integrated facility may include sanitary landfill cells, recycling and recovery areas, composting zones, leachate management systems, and future expansion reserves to ensure environmentally sustainable waste management over the planning horizon.

Table 114: Phase-wise Estimated Land Requirement

Planning Phase	Disposal Capacity	Estimated Land Requirement
Short-Term (2025–2030)	120–135 TPD	6–10 acres
Medium-Term (2030–2040)	135–170 TPD	12–18 acres
Long-Term (2040–2045+)	170–190 TPD	20–30 acres total integrated site

A 9.17-acre integrated landfill site is recommended for Battagram District for long-term planning up to 2045. The site should include engineered landfill cells, Material Recovery Facility (MRF), Composting zone, Transfer and unloading area, Leachate management system, green buffer zone, and future expansion area.

Figure 19: Landfill requirements for MSW management in Battagram



17.7. Hazardous waste management plan

The proposed hazardous waste management framework has been structured in a phased manner to gradually strengthen the district's institutional, technical, and infrastructural capacity for the safe handling, treatment, and disposal of hazardous waste streams. The strategy primarily addresses healthcare-related hazardous waste in the initial stages, while progressively incorporating larger medical facilities, laboratories, and industrial hazardous waste sources in the later phases.

During the short-term phase (2025–2030), the focus will remain on establishing basic hazardous waste management systems for existing BHUs, private clinics, pharmacies, laboratories, and small healthcare units. This phase emphasizes source segregation through color-coded bins and safety containers, provision of temporary storage rooms, staff training, and the establishment of scheduled collection and transportation mechanisms. Initial interventions will also aim to eliminate unsafe disposal practices such as open dumping and uncontrolled burning of medical waste.

In the medium-term phase (2030–2040), the hazardous waste management system will be expanded to accommodate growing healthcare infrastructure, including proposed RHCs, MCH facilities, diagnostic centers, and commercial healthcare establishments. The development of district-level storage and transfer facilities, small-scale treatment systems such as autoclaves or incinerators, and dedicated transport vehicles will support a more organized and regulated waste management network. Institutional strengthening, monitoring systems, and regulatory compliance mechanisms will also be enhanced during this phase.

By the long-term phase (2040–2045), the district is expected to require a fully integrated hazardous waste management system capable of serving DHQ and THQ hospitals, expanded private healthcare facilities, laboratories, and emerging industrial hazardous waste sources. This phase proposes the establishment of integrated treatment and disposal facilities, engineered hazardous waste disposal cells, regional recovery systems, and climate-resilient technologies to ensure environmentally safe and sustainable management practices. Emergency response protocols, spill management systems, and long-term monitoring frameworks will also form an essential component of the future hazardous waste management strategy.

Table 115: Hazardous waste Management plan

Phase	Timeline	Hazardous Waste Sources	Proposed Facilities / Infrastructure	Key Management Measures	Responsible Agencies
Short-Term Phase	**2025–2030**	Existing BHU, private clinics, pharmacies, laboratories, small healthcare units	- Temporary hazardous waste storage rooms at BHUs and clinics - Color-coded segregation bins and safety containers - Small centralized collection point near urban health cluster	- Introduce source segregation for infectious, sharps, pharmaceutical, and chemical waste - Train healthcare staff on hazardous waste handling - Establish scheduled collection and safe transportation	Health Department, TMA, EPA KP

				system - Eliminate open dumping and uncontrolled burning of medical waste	
Medium-Term Phase	**2030–2040**	Expanded BHUs, proposed RHC/MCH facilities, diagnostic centers, commercial healthcare facilities	- District-level hazardous waste storage and transfer facility - Small-scale autoclave/incineration unit - Dedicated hazardous waste transport vehicles	- Develop district hazardous waste collection network - Implement healthcare waste tracking and monitoring system - Establish separate handling system for infectious and chemical waste - Strengthen institutional compliance and inspections	District Health Department, EPA KP, Hospital Administration
Long-Term Phase	**2040–2045**	DHQ Hospital, THQ facilities, expanded private healthcare sector, laboratories and industrial hazardous waste	- Integrated hazardous waste treatment facility - Engineered hazardous waste disposal cell within sanitary landfill - Regional treatment and recovery facility	- Establish fully compliant hazardous waste treatment and disposal system - Introduce regional hazardous waste management and monitoring framework - Develop emergency response and spill management protocols - Integrate climate-resilient and environmentally safe disposal technologies	Health Department, EPA KP, District Administration, Waste Management Authority

Figure 20: Hazardous waste management plan for Battagram district

HAZARDOUS WASTE GENERATION SUMMARY (2025)

Source	Type of Health Facility	Existing Facilities	Min Requirement (2025)	Existing Gap (2025)
DHQ Hospital	1	17	26	15
RHC/MCH	0	2	4	2
CD	0	12	18	12
Private Facilities	22	–	2	–
TOTAL	–	31	50	19

Note: Min requirement includes existing + future (population growth to 2025).

SHORT TERM (2025–2030)
Establish Basic Stystem & Compliance

- Establish basic hazardous waste management system
- Ensure safe handling, storage & transport
- Eliminate open burning and unsafe disposal

- Provide color-coded containers and safety kits to all facilities
- Develop standard operating procedures (SOPs)
- Train staff on segregation, handling & documentation
- Establish temporary storage area at DHQ Hospital

Safety Boxes (all facilities) · Color-coded Waste Bins · Temporary Storage Area (DHQ Hospital) · PPEs & Safety Kits

Dedicated municipal vehicle (small closed body)
Regular collection schedule

On-site treatment for small quantity (e.g., autoclave, disinfection) → Secure landfill pit (Hazardous waste cell)

- Training for healthcare staff and waste handlers
- Awareness on infection prevention and waste segregation
- Display of guidelines and posters at all facilities

- Appointment of focal person in each facility
- Register & record keeping
- Quarterly monitoring by District Health Office (DHO)
- Coordination with District Administration & Municipal Committee

MEDIUM TERM (2030–2040)
Strengthen Infrastructure & Services

- Strengthen treatment, storage and transportation
- Establish district-level hazardous waste facility
- Ensure compliance with national guidelines

- Establish dedicated collection route and logistics
- Upgrade storage facilities for all hospitals and RHCs
- Introduce tracking system and manifest
- Develop engineered hazardous waste cell

Centralized Temporary Storage Facility · Incinerator / Autoclave Unit · Hazardous Waste Landfill Cell · Spill Kits & Safety Equipment

Dedicated hazardous waste collection vehicle with leak-proof & marked containers
Weekly/bi-weekly fixed schedule

Autoclaving / Incineration for infectious waste → Engineered hazardous waste cell (secured & lined)

- Regular training and certification programs
- Capacity building for incinerator operation & maintenance
- Community and health worker awareness programs

- Digital record keeping & tracking system
- Annual audits and inspections
- Integration with Environmental Protection Agency (EPA)
- Performance reporting and compliance monitoring

LONG TERM (2040–2045+)
Sustainability, Optimization & Compliance

- Achieve full compliance with national & international standards
- Expand safe treatment and disposal capacity
- Move towards zero unsafe disposal

- Establish integrated hazardous waste management facility
- Introduce advanced technologies (shredder, plasma/advanced incineration where feasible)
- Strengthen regulatory enforcement and PPP models

Integrated Hazardous Waste Facility · Shredder / Advanced Treatment · Laboratory for Testing & Monitoring · Renewable Energy (incinerator)

Dedicated fleet for hazardous waste with GPS Tracking & real-time monitoring

Advanced treatment (Incineration / Shredding / Thermal treatment) → Secured Engineered Hazardous Waste Landfill

- Continuous professional development
- Research and innovation in hazardous waste management
- Community participation and behavior change programs

- Real-time digital monitoring & reporting
- Integration with national digital health & environment systems
- Third-party audits and certification
- Periodic review and policy updates

OBJECTIVES

KEY ACTIONS

INFRASTRUCTURE REQUIREMENTS

COLLECTION & TRANSPORT

TREATMENT & DISPOSAL

CAPACITY BUILDING & AWARENESS

MONITORING & GOVERNANCE

WASTE CATEGORIES & HANDLING

Waste Type	Examples	Container Code	Treatment
Infectious Waste	Blood, body fluids, soiled materials		Autoclave / Incineration
Sharps Waste	Needles, syringes, blades, scalpels		Needle destroyer / Incineration
Chemical Waste	Disinfectants, solvents, X-ray chemicals		Chemical treatment / Secure landfill
Pharmaceutical Waste	Expired medicines, cytotoxic drugs		Incineration / Secure landfill
General Hazardous Waste	Batteries, mercury, laboratory waste		Stabilization / Secure landfill

HAZARDOUS WASTE MANAGEMENT FLOW

KEY GUIDING PRINCIPLES

- Polluter pays and responsibility at source
- Precautionary approach and risk reduction
- Compliance with National Environmental Quality Standards (NEQS)
- Integration with district health and waste management systems
- Sustainability, safety, and environmental protection

EXPECTED OUTCOMES

- Safe management of all healthcare and hazardous wastes
- Reduced risk of infection and environmental contamination
- Strengthened health system compliance and capacity
- Protection of community and ecosystem
- Sustainable and cost-effective hazardous waste management system

18 CHAPTER: URBAN REGENERATION AND SPECIAL AREA PROPOSALS

18.1 Inner City / Existing Built-up Upgradation

The urban form of Battagram City is largely organic and unplanned, shaped by topography, incremental growth, and limited regulatory control rather than structured urban design principles. Development has occurred primarily along the main arterial road and secondary link roads, resulting in a linear and ribbon-based settlement pattern. Buildings are closely packed, with minimal setbacks, irregular plot sizes, and inconsistent building heights, creating a visually fragmented streetscape.

Public spaces within the city are extremely limited in both number and quality. Streets function as the primary public realm, accommodating not only movement but also social interaction, informal commerce, parking, and service activities. However, these streets are generally narrow, lack proper footpaths, and are encroached upon by informal vending, building extensions, and parked vehicles, reducing pedestrian safety and comfort.

There is no defined hierarchy of streets in terms of design treatment. Primary, secondary, and tertiary roads differ mainly in width rather than function, and none are supported by coordinated street furniture, signage, landscaping, or lighting. As a result, the city lacks visual coherence and legibility, making navigation difficult for visitors and contributing to traffic congestion and safety concerns.

Open spaces and green areas are sparse and poorly integrated into the urban fabric. Where vacant land exists, it is either undeveloped, privately controlled, or gradually being absorbed by informal construction rather than being reserved for public use.

18.1.1. Primary Data Analysis & Results

Primary survey findings indirectly reflect the weaknesses of Battagram's public realm. A large majority of residents report the absence of parks within walking distance and rarely or never use public recreational spaces. Where parks or playgrounds exist, most respondents describe them as poorly maintained or neglected, indicating limited functionality rather than lack of demand.

Street-level infrastructure performs particularly poorly. A significant proportion of households report non-functional streetlights, which directly affects nighttime safety, walkability, and use of public spaces. Similarly, the absence of designated parking areas forces vehicles to occupy road space, further reducing pedestrian mobility and increasing conflict between users.

The lack of accessible public halls, libraries, or cultural centers reinforces the absence of structured civic spaces in the city. Social interaction therefore remains confined to informal settings such as streets, mosques, shops, and private spaces, limiting opportunities for inclusive community engagement, youth activities, and cultural expression.

18.1.2.Issues & Problems

The most pressing urban design issue in Battagram City is the absence of a public realm framework. There are no design guidelines governing streetscapes, building frontage treatment, public space provision, or integration of open spaces into new development. As a result, growth continues in a piecemeal manner that erodes urban quality over time.

Encroachment and informal use of public rights-of-way have become normalized, weakening the distinction between public and private space. This not only degrades visual quality but also constrains future infrastructure upgrades, including road widening, drainage, and pedestrian facilities.

Topography further complicates urban design challenges. Slopes, limited buildable land, and drainage paths are often ignored during construction, leading to poor accessibility, erosion risks, and vulnerability during heavy rainfall. Without design controls, buildings and streets fail to respond to natural contours, increasing long-term maintenance and disaster risks.

Institutionally, urban design is not treated as a planning priority. Limited technical capacity, absence of urban designers at the local level, and a focus on short-term service provision mean that public realm quality is rarely addressed in development decisions.

Planning Implication:

For Battagram, urban design interventions should prioritize street-based public realm improvement, pedestrian safety, lighting, and small-scale public spaces rather than large landmark projects. Introducing simple, enforceable design guidelines—aligned with local topography and socio-economic realities—can significantly improve livability, safety, and the overall image of the city.

18.2 Slum / Katchi Abadi / Informal Area Upgradation

Slum areas in Battagram City present a complex mix of poverty, overcrowding, inadequate housing, lack of basic services, and informal land tenure. A sustainable, inclusive, and participatory development plan is crucial to improve the quality of life for slum dwellers while integrating these areas into the formal urban fabric of Battagram. This plan adopts a comprehensive, multi-pronged approach to prioritize urgent needs, strengthen institutional support, and enable transformative reforms across Battagram City's informal settlements.

18.2.1. Slum Identification and Mapping

Conduct a complete separate study on identification of slums and perform spatial surveys utilizing GIS, satellite imagery, and drone technology to determine boundaries, density, housing quality, and access to essential services across Battagram City.

- Output: Digital Slum Inventory and Classification Index (Low-risk, Moderate, Hazard-prone).
- Calculate overall population by gender, employment, income, etc., and continuously update this information periodically, like every three years, to assess improvements.

18.2.2. Provision of Sehat Cards for Healthcare Access

Providing Sehat Cards (health insurance) in informal settlements of Battagram City is crucial for improving access to healthcare for families. These cards would enable households to receive free or subsidized health services, including medical check-ups, vaccinations, and treatment for common diseases. The implementation could involve:

- Partnering with government health departments or local NGOs to distribute Sehat Cards to families in informal settlements.
- Raising awareness about available healthcare services to ensure that families make use of the Sehat Card benefits.
- Ensuring that healthcare facilities in these areas are equipped to handle paediatric cases and have trained staff to provide quality care.

18.2.3. Establishment of Slum Upgradation Committees

Mobilize community stakeholders (elders, youth, women, NGOs) into neighborhood-based Slum Upgradation Committees (SUCs) for decision-making and local monitoring across Battagram City's slum settlements.

- Role: Facilitate participatory planning, conflict resolution, and slum database verification.

18.2.4. Improvement in Housing Conditions

Housing in slums of Battagram City is characterized by a range of issues that can have serious consequences for the health, safety, and well-being of the residents. Governments and organizations are working to address this problem through various initiatives such as providing low-cost housing, improving infrastructure, and upgrading informal settlements. However, progress is often slow and challenging due to the complex social, economic, and political factors that underlie the issue.

Some of the most common issues faced by poor housing in slums include overcrowding, lack of sanitation, poor quality housing, and lack of access to basic services, land tenure insecurity, crime and environmental hazards. All of these issues can contribute to a cycle of poverty and poor health outcomes for slum dwellers. Addressing the issues of housing in slums requires a comprehensive approach that involves improving housing conditions, providing access to basic services, and addressing broader issues of poverty and inequality.

Strategies adopted for uplifting quality of life in slum settlements of Battagram City involve:

- Improvements in physical conditions of housing units located within the slum areas.
- Provision of affordable housing options to the slum dwellers.
- Improving physical accessibility from and towards the slum settlements.

- Formulate legal and policy frameworks tailored to the identified slum areas in Battagram City, ensuring adequate protection, regularization, and provision of basic services.
- Design and implement legal mechanisms to prevent the expansion or establishment of new slum areas within Battagram City, promoting sustainable urban development practices.

18.2.5. Physical Infrastructure Development

To improve the living conditions in slum areas of Battagram City, the provision and upgrading of essential physical infrastructure is a core priority. Upgrades will focus on ensuring that all settlements meet minimum urban service standards and have reliable access to basic amenities. The initiative aims to enhance mobility, safety, water access, sanitation, and overall quality of life.

Key Components

- Road paving and development of internal pedestrian pathways.
- Installation of water pipelines and boreholes for safe drinking water.
- Electrification and installation of public lighting systems.
- Construction of community latrines and functional drainage networks.

18.2.6. Emergency Service Delivery

Health Services

- Implement mobile clinics (clinic on Wheel) *Inspired from Punjab Government initiatives* for maternal health, vaccination, and basic treatment.
- Distribute hygiene kits; promote sanitation awareness campaigns.

Water and Sanitation

- Install temporary hand-pumps, borewells, and public toilets.
- Initiate door-to-door garbage collection with tricycles.

Education

- Set up non-formal learning centers using available community spaces.
- Launch school enrollment drives with incentives for girl education.

18.2.7. Slum-Specific Legal and Planning Guidelines

Draft a "Slum Regularization and Prevention Policy" for Battagram City in line with the KP Land Use and Building Control Act, 2021.

This policy aims to provide a structured approach for recognizing and upgrading existing slums while preventing the emergence of new ones. Key components include the establishment of clear and context-specific criteria for slum recognition, ensuring targeted and justifiable interventions. It also outlines tenure regularization pathways to provide legal certainty and improved living conditions for residents, contributing to social and economic stability. Furthermore, the policy will incorporate mechanisms for controlled relocation, prioritizing community consent, adequate compensation, and integration into improved housing schemes to minimize disruption and promote inclusivity in urban development.

18.2.8. Community Awareness and Legal Literacy

Objective: Enhance community understanding of housing rights, hygiene practices, and civic responsibilities through targeted awareness campaigns in Battagram City's slum areas.

Key Activities	Description
Legal Aid Workshops	Sessions to educate residents on housing rights and legal procedures.
Women-led Hygiene Sessions	Community-led hygiene promotion, focusing on women as key facilitators.
Radio & Social Media Campaigns	Broadcasting awareness messages through local stations and digital platforms.

Implementing Partners: UNDP, Legal Aid Societies, Local Radio/Communication Stations, Community-Based NGOs and Local Societies

18.2.9. Community Feedback and Monitoring Platform

Objective: Establish an accessible and responsive system for community feedback, complaints, and service tracking in Battagram City's slum areas.

Component	Features
Digital Platform	Mobile App and SMS interface for service requests, complaints, and quick surveys.
Offline Support	Community Helpdesks set up within zonal TMA offices to assist residents directly.

Purpose: To ensure transparent monitoring, community engagement, and improved municipal responsiveness in slum areas.

18.2.10. Pilot Skills and Livelihood Programs for vulnerable groups

To promote economic empowerment and skill development among underserved populations in Battagram City, a targeted vocational training initiative will be launched in 3 to 5 (tentative) slums/informal areas based on vulnerability, population density, and existing community readiness. The program will focus on equipping youth and women with practical, income-generating skills that align with local market demand and urban service needs.

Proposed Training Areas

- Tailoring & Stitching: Focused on women and girls, with potential linkages to home-based enterprises and local garment markets.
- Electrician & Plumbing Skills: Targeting young men and out-of-school youth to support self-employment and labor market entry.
- Community Health Work: Preparing female health workers to support basic healthcare awareness, hygiene promotion, and act as liaisons for public health campaigns.

Key Components

- Skills certification in partnership with TVET institutions and technical boards.
- Post-training support through micro-grants, toolkits, or job placement facilitation.
- Community mobilization through local NGOs and youth networks.
- Monitoring employment outcomes and gender inclusion indicators.

This pilot initiative aims to serve as a scalable model for slum-based skill development in Battagram City, improving livelihoods, reducing dependency, and promoting safer, healthier urban communities.

18.3 Streetscape and Public Realm Improvement

18.3.1.Principles to Adopt

The city's Vision for Sustainable Tourist Destination, given in Task A – Vision Report, sets out a vision ***"A socially and economically vibrant, disaster-resilient Battagram city, powered by hydel energy, with good governance, modern facilities, and a clean, integrated environment for all"*** that has good transport connectivity, with private cars limited to the edge of the city during daylight hours, and walkable and attractive spaces that support a range of activities, attracts tourists and increases the economic activities within the city. The primary data analysis carried out in Task B – Background Studies Report lists the following principles which are to be followed in order to achieve the aforementioned vision:

- Provide ample, accessible, and well-maintained pedestrian walkways and crossing areas to promote alternative modes of transportation.
- Provide seating options in high pedestrian traffic areas that are durable, accessible, and designed to enhance the character of the city.
- Regularly maintain public spaces and enforce responsible waste disposal to create a clean and well-maintained environment.
- Create a consistent design language and ensure new developments respect the existing character and context of the city.

- Implement design features and policies that prioritize safety and security, such as visible street lighting and crime prevention strategies.
- Encourage activity and social interaction in public spaces through the design and programming of public spaces.
- Promote green spaces, such as parks and street trees, to enhance the environmental quality of the city.
- Provide well-designed and well-maintained street furniture, such as benches and litter bins, to enhance the character and usability of public spaces.
- Design the street network to prioritize pedestrian, bicycle, and public transportation use and minimize negative impacts on the surrounding environment.
- Ensure that public spaces are designed to be safe and accessible for children through features such as playgrounds and inclusive design elements.

18.3.2.Proposals to Improve Design Façade

a) Improving Building Facades

The city's current building facades are poorly designed and lack consistency, detracting from the city's overall appearance. The buildings appear outdated and unappealing, and many have inadequate lighting, which makes the city feel dark and gloomy at night. The problem is compounded by the lack of proper maintenance and upkeep, which further detracts from the city's appearance.

The proposed solution is to implement a comprehensive program for improving the façades of the buildings. The program will involve the following key components:

- **Building Bylaws Formulation**: Develop Battagram specific building bylaws keeping in view its architectural and heritage significance in consideration to ensure that all new and existing buildings have aesthetically pleasing facades. This will be achieved by setting clear guidelines for the design and construction of building facades, including materials, colors, lighting, and other key design elements.
- **Design Guidelines**: In addition to the building bylaws, the city will also develop design guidelines for the improvement of existing building facades. These guidelines will provide recommendations on how to improve the appearance of buildings while also addressing functional issues such as lighting and ventilation.
- **Incentives for Property Owners**: Encourage property owners to improve their building facades, the city will provide financial incentives such as tax breaks or grants. This will help to offset the costs of the improvements and make it easier for property owners to take part in the program.
- **Technical Assistance**: The city will provide technical assistance to property owners who need help with the design and implementation of the building facade

improvements. This will include access to architects, engineers, and contractors who can provide expert guidance and support.

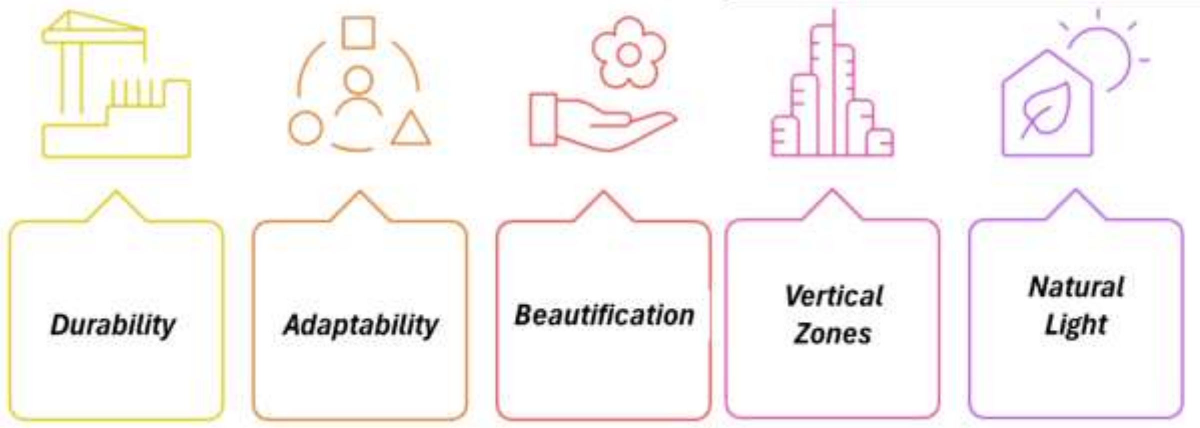
- **Community Outreach and Education**: Finally, the city will conduct a comprehensive outreach and education campaign to educate property owners, residents, and other stakeholders about the benefits of the program. This will help to build support for the initiative and encourage greater participation.

The implementation of this proposal is expected to result in a significant improvement in the appearance of Battagram's buildings, making the city more visually appealing and inviting. The program will also help to improve the functionality of the buildings, including lighting and ventilation, which will improve the overall quality of life in the city. In addition, the program will provide a boost to the local economy by creating job opportunities and encouraging investment in the city.

b) Improving Building Conditions

Following are some aspects that are proposed to be incorporated into new development and existing development to ensure that new development is sustainable and existing buildings' conditions are improved:

Figure 21: Proposals for Improving Building Conditions



Source: Devised by Consultants

- Durability: New buildings will use durable, energy-efficient materials like tempered glass, steel, stone, and pre-cast concrete to ensure long-lasting structures.
- Adaptability: Buildings will feature modular designs, making interior modifications easier and cost-effective while maintaining complex exterior elements for long-term flexibility.
- Beauty: Battagram's indigenous architecture, using mud, stone, and wood, will be preserved through maintenance, reinforcement of traditional features, integration of local art, and enhanced landscaping.
- Mixed Vertical Zones: Buildings will support multi-functional use on different levels, such as retail on the ground floor, offices or accommodations above, and rooftop gardens, ensuring efficient space utilization.

- Maximize Natural Light: Strategic building orientation, large windows, skylights, reflective surfaces, and vegetation will enhance natural lighting while regulating temperature and reducing energy costs.
- Shedding Water: Buildings will manage rainwater through green roofs, rain gardens, swales, and underground storage, aligning with NEQS standards for sustainable water management.
- **General Landscaping Requirements**

Priority will be given to attractive landscape design in the following areas:

  - Entrances to the city through roads, airport, and waterways.
  - Focal points within the city
  - Front yards and exposed exterior side yards and building faces
  - Buffers and transitions between commercial and tourist sites
  - Parking areas of commercial and tourist sites

- **Landscape Design Style**

The preferred approach for landscape style is to group trees and shrubs to frame building frontage. Dense landscaping and/or berming will be used to screen parking areas that are not adequately screened by the building frontages. These landscape areas that are used for screening visually uninteresting building surfaces or parking areas will be coniferous planting for year-round protection.

- **Signage**

Building identification signs will include the name of the building. When signs are proposed on building facades, they must be on the front elevation and within a signed band illustrated in the architectural drawings and must be approved and consistent with the design plan. Freestanding identification signs may include the building address and ground mounted in a landscape setting. Materials and colours used on the sign will be consistent and compatible with the building design. Building signs must not dominate the streetscape by their size or height and may be internally or externally lit. For size details and approvals, refer to the building bylaws that are to be developed by the local government.

18.3.3.Proposal for Street Furniture

The city of Battagram has a rich cultural heritage and stunning natural beauty, making it a prime tourist destination. However, a lack of street furniture makes it difficult for tourists and residents to fully enjoy the city's amenities. To enhance the experience for both visitors and residents, we propose the installation of street furniture at various locations throughout the city.

The street furniture proposed for installation in Battagram will include benches, waste bins, and bike racks. These functional and practical elements will serve to improve the comfort and convenience of residents and visitors, while also enhancing the overall aesthetic appeal of the city.

a) Street Benches

Design Considerations

The proposed street furniture system is developed to create an inclusive, accessible, and user-friendly public realm within urban spaces of Khyber Pakhtunkhwa. The core intent is to ensure that street furniture is not only functional and durable but also responsive to the needs of all user groups, including children, elderly persons, women, and persons with disabilities. The design is grounded in universal design principles, ensuring that public space is usable without physical, perceptual, or social barriers. This vision translates directly into the spatial and dimensional logic shown in the drawings, where all elements are calibrated in feet and inches for construction clarity.

Spatial Organization (Plan-Level Integration)

The furniture system operates as a continuous urban layer integrated within pedestrian corridors.

Plan-Level Dimensional Logic (as per drawings):

- Modular bench units follow a repeatable grid system with lengths ranging from **4'-0" to 6'-0"**.
- Seat height is standardized at **1'-6" (18 inches)** for universal accessibility.
- Clear pedestrian circulation is maintained at **6'-0" to 8'-0"**, ensuring unobstructed movement.
- Minimum spacing of **3'-0"** is maintained between seating clusters to avoid congestion.
- Wheelchair-accessible seating bays provide a clear area of **3'-6"** × **4'-0"** integrated within the seating layout.

These spatial decisions ensure a balanced relationship between movement, pause, and accessibility.

Accessibility and Universal Design Integration

The design prioritizes inclusive usability across all user groups.

Key Accessibility Dimensions (as reflected in sections):

- Seat height: **1'-6"** from finished ground level
- Seat depth: **1'-4" to 1'-6"** for ergonomic comfort
- Backrest height: **2'-6" to 3'-0"**, inclined at 100°–110°
- Armrest height: **2'-0" to 2'-3"** for elderly support
- Minimum wheelchair knee clearance: **2'-6"**

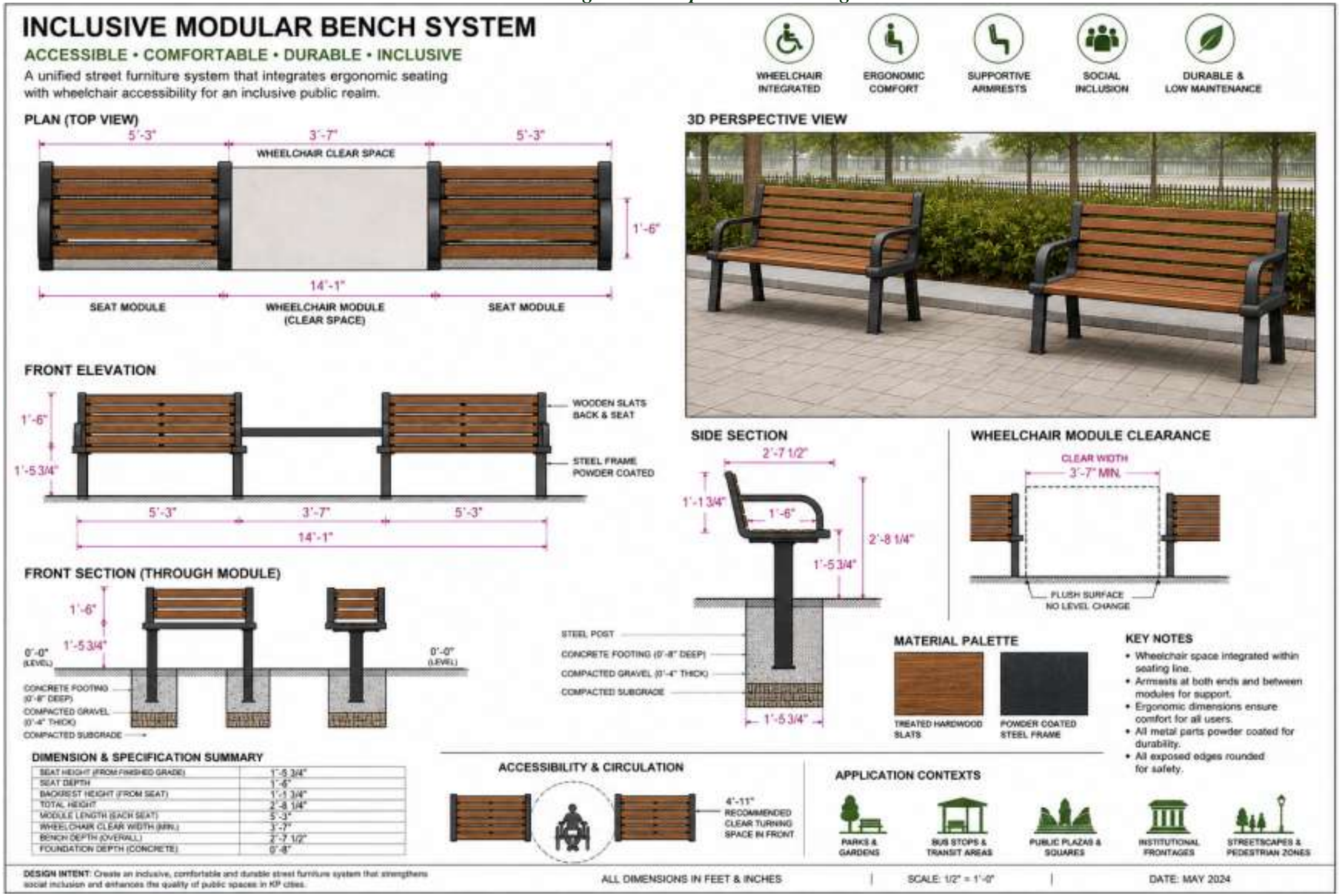
A dedicated wheelchair-accessible zone is integrated without elevation change, ensuring seamless transition from pedestrian pathway to seating area.

Note: Dimensions and accessibility standards used in this design are derived from internationally recognized guidelines including the ADA Standards for Accessible Design (2010), BS 8300 (2018), Neufert Architects' Data, CABE Urban Design Compendium, and UN-Habitat Public Space Toolkit (2015). These sources collectively inform ergonomic seating heights, circulation widths, wheelchair accessibility clearances, and shaded public space design requirements.

Benefits for Tourism

The installation of street furniture will help to promote tourism in Battagram by providing visitors with the amenities they need to comfortably enjoy their time in the city. The provision of benches and bike racks, for example, will allow visitors to take a rest and store their bikes securely. This will encourage them to explore more of the city, promoting the local economy and increasing tourism.

Figure 22: Proposed Bench Designs



b) Street Lights

Street and public lighting stand as indispensable services for residents, playing a critical role in road safety, personal security, and urban ambiance. As per the Illuminating Engineering Society (IES) guidelines, residential streets should maintain an average illumination level of 10 lux, while commercial streets should aim for 15 lux.

It is recommended to install Optimal Lighting Solutions; LED Lamps which are efficient and cost-effective paramount in street lighting. LED lamps emerge as the preferred choice, offering enhanced illumination, longer lifespan, and economical operation. The selection of the lamp type influences light output, lamp longevity, and operational costs. The design of the streetlight luminaire, significantly impacts light distribution, glare reduction, and the overall aesthetic of the streetlight. Striving for energy efficiency, longevity, environmental safety, and smart functionality is crucial to minimize public resource expenditures.

Furthermore, another sustainable approach has been proposed with the installation of photovoltaic street lights. This not only reduces utility costs for cities and municipalities but also allocates tax dollars to more beneficial applications, such as enhancing schools and public facilities.

Figure 23: Recommended Light /poles Design for Battagram City

Anther recommendation is for the installation of Solar Street lights, which contribute significantly to environmental conservation by reducing carbon emissions. Unlike traditional grid-powered lights, solar street lights operate on clean and renewable energy from the sun, mitigating climate change and improving local air quality. Solar street lights efficiently harness sunlight during the day, converting it into electricity stored in batteries for nighttime use. This self-sufficient energy system eliminates the need for grid reliance, reducing overall energy consumption and promoting sustainable energy practices. Solar street lights offer a practical advantage in their lower installation requirements. With poles set without the need for underground trenching, these lights necessitate less heavy equipment, simplifying even large installations.

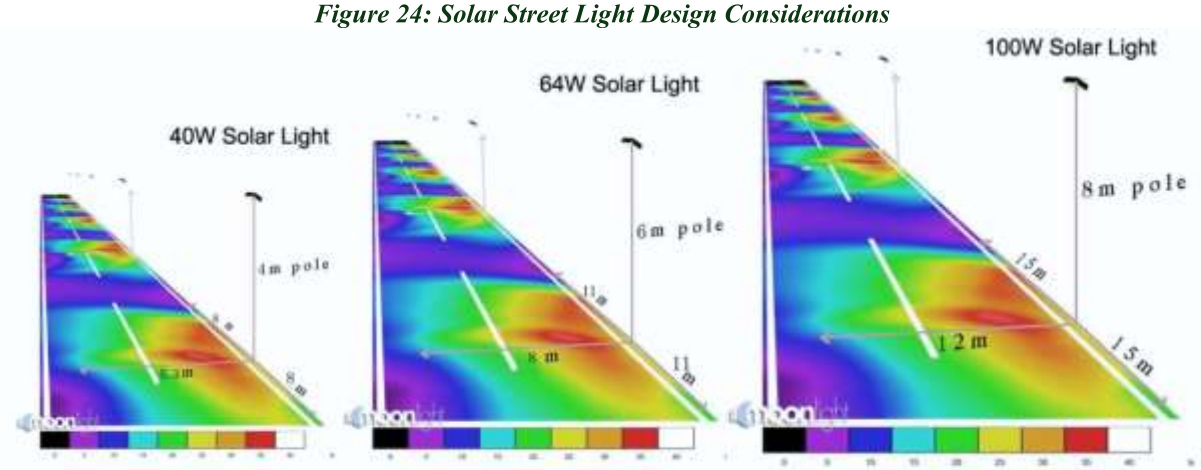
Recommendation

In the context of scenic spots and parks, the optimal installation height for solar power street lights is approximately 7 meters. Considering the lower nocturnal pedestrian and vehicular traffic, a one-sided interactive lighting approach is typically employed, with an installation distance ranging between 20-25 meters. It's crucial to maintain this distance to ensure that the entire area receives adequate illumination, as distances less than 20 meters may result in compromised lighting coverage. Additionally, to mitigate any potential lighting blind spots, an extra street light should be strategically installed at corners. This meticulous approach guarantees effective and reliable lighting solutions in both scenic and rural settings.

When considering the installation of solar power street lights with an 8-meter pole height, it is imperative to ensure a proper spacing between lights, ranging from 25 to 30 meters. Utilizing the cross-lighting method on both sides is recommended, especially for roadways with a width between 10 to 15 meters.

For roads featuring 12-meter light poles, a longitudinal spacing of 30 to 50 meters is generally recommended. It is essential to employ symmetrical lighting on both sides, particularly when the width of the road lighting exceeds 15 meters. These meticulous guidelines aim to optimize the effectiveness and uniformity of solar power street lighting, catering to diverse pole heights and road configurations.

Figure 24: Solar Street Light Design Considerations



Source: Solar Street Light Suppiers, Belinda Wang

c) Fire hydrant

Fire hydrants provision on commercial or crowded places in Shigar play a vital role in safeguarding the well-being of both residents and visitors. Their strategic placement and immediate accessibility contribute significantly to emergency preparedness and the preservation of cultural heritage.

The proposed implementation of dry fire hydrants represents a significant leap forward in enhancing city's firefighting capabilities. Their integration into Shigar's firefighting infrastructure promises a drastic reduction in response times during fire emergencies. This swift and efficient response system not only limits property damage but also holds the potential to save precious lives. This proactive approach bolsters community safety and serves as a preventive measure against fire-related disasters.

Important Aspects of Implementation:

- **Location Selection:** Identifying strategic locations near crowded places or fire hazard prone area crucial.
- **Technical Specifications:** The design of the dry fire hydrants should account for Shigar's freezing temperatures. Specification details must include the necessary pump capacity and hose requirements for effective water extraction and distribution.
- **Community Engagement:** Raising awareness among the local community about the purpose and operation of dry fire hydrants is vital. Active involvement of stakeholders, including authorities and residents, ensures cooperation and support.
- **Regulatory and Administrative Aspects:** Adherence to local regulations and securing necessary permits are essential. Close coordination with relevant authorities streamlines the installation process and integration into the existing firefighting infrastructure.

d) Public Signage

All public traffic control\ directional\construction and temporary signage will include a design that is compatible with the building character or other site signage.

19 CHAPTER: QUALITY OF LIFE

19.1 Existing Situation

Quality of life in Battagram City is shaped by limited access to public amenities, weak urban services, and a strong reliance on informal social networks rather than structured civic infrastructure. While social cohesion remains relatively strong due to close-knit community structures, overall urban livability is constrained by inadequate recreational facilities, poor public realm conditions, and service gaps that directly affect daily life.

Primary survey findings indicate that access to public amenities is severely limited. A large majority of residents report the absence of public halls, libraries, or cultural centers in their communities, and where such facilities exist, they are either underutilized or in poor physical condition. This lack of civic infrastructure restricts opportunities for learning, cultural activities, and organized community engagement, particularly for youth and women.

Access to green and recreational spaces is another major determinant of quality of life. Most households do not have a park or playground within walking distance, and park usage is very low, with a significant proportion of residents reporting rare or no visits. Among those who do use parks, the prevailing perception is that these spaces are poorly maintained or neglected, reducing their attractiveness and limiting their role in promoting physical activity, social interaction, and mental well-being.

Urban service deficiencies further undermine livability. Non-functional or partially functional street lighting is widespread, affecting nighttime safety, mobility, and the use of public spaces after dark. The lack of designated parking areas forces vehicles to occupy streets and open spaces, contributing to congestion, reduced walkability, and frequent conflicts between pedestrians and traffic. These conditions disproportionately affect elderly residents, children, and women.

Despite these physical and service-related shortcomings, perceptions of personal safety during routine activities such as commuting to schools, workplaces, and bus stops remain relatively positive during daytime hours. However, concerns related to crime, poor lighting, and inactive public spaces at night indicate a fragile sense of security that is closely linked to environmental conditions rather than policing alone.

19.2 Public's Perception on Public Amenities

Public perception data reveals a clear mismatch between residents' needs and the availability of urban amenities. The majority of respondents express dissatisfaction with the quantity, accessibility, and condition of parks, public spaces, and community facilities. Poor maintenance and lack of basic services—such as lighting, seating, cleanliness, and security—are consistently cited as reasons for underuse.

Street lighting emerges as one of the most critical perceived deficiencies, directly influencing feelings of safety and comfort. Similarly, inadequate parking and congested streets are viewed as daily irritants that reduce convenience and increase stress, particularly in commercial and mixed-use areas.

These perceptions suggest that quality of life concerns in Battagram are not abstract or aspirational but rooted in everyday functional issues that affect mobility, safety, and social life.

19.3 Issues & Problems

The primary quality of life issues in Battagram City stem from the absence of a coordinated urban service and public space provision strategy. Recreational and cultural infrastructure has not kept pace with population growth, resulting in spatial and social exclusion, especially for vulnerable groups.

Maintenance of existing facilities is weak due to unclear institutional responsibility and limited financial resources. As a result, even the few available public spaces fail to deliver meaningful benefits. Environmental factors such as poor lighting, unmanaged traffic, and encroachment further degrade the usability of public areas.

Without targeted interventions, these conditions risk reinforcing outward migration, reduced economic vibrancy, and declining urban character. Addressing quality of life in Battagram therefore requires integrated, small-scale, and locally appropriate planning responses focused on improving everyday urban experiences rather than symbolic projects.

19.4 Quality of Life Enhancement Proposals

The Quality-of-Life Action Plan for Battagram City, Khyber Pakhtunkhwa presents a comprehensive framework for improving the living conditions, urban environment, economic opportunities, and public services available to all residents. This plan adopts a multi-pronged approach, covering assessment and research, physical infrastructure, environmental sustainability, economic development, cultural enrichment, and institutional governance. The interventions outlined herein are designed to create a resilient, inclusive, and forward-looking urban environment across Battagram City.

19.4.1. Public Awareness and Community Training

a) Public Awareness Campaigns

Launch awareness campaigns on hygiene, waste segregation, and green living through schools, mosques, media, and mobile vans in underserved neighborhoods of Battagram City. These campaigns will be designed to reach diverse segments of the population and promote behavior change on key environmental and public health issues.

b) Community Training on Environmental Stewardship

Initiate training programs for residents on composting, recycling, and eco-friendly waste disposal in collaboration with NGOs and university partners. Training will be delivered at the neighborhood level and will equip residents with practical skills to manage waste, reduce environmental impact, and contribute to a cleaner city.

c) SME and Employment Awareness Campaigns

Launch targeted outreach for youth and women on entrepreneurship support, microfinance, and upskilling opportunities in Battagram City. These campaigns will connect underserved communities with existing programs, financial services, and training opportunities to promote economic empowerment and self-reliance.

19.4.2. Urban Greening and Environmental Sustainability

a) Pilot Greening Initiatives

Start school-based and neighborhood-level tree plantations, kitchen gardens, and awareness walks to promote environmental stewardship across Battagram City. These pilot initiatives will build public appreciation for green spaces, create visible improvements in the urban environment, and lay the groundwork for large-scale greening interventions.

b) Green Public Spaces

Revitalize abandoned plots and neglected open areas as parks, school playgrounds, and green buffers, ensuring equitable spatial distribution across Battagram City. The development of green public spaces will improve physical and mental well-being, support biodiversity, and provide safe recreational areas for children and families.

c) Urban Greening Integration

Develop green corridors along canals and highways, promote rooftop gardens, and integrate green walls into building regulations across Battagram City. These measures will enhance the city's resilience to heat, improve air quality, reduce stormwater runoff, and create a more liveable urban environment.

d) Urban Forestry and Biodiversity Directorate

Create an Urban Forestry and Biodiversity Directorate to manage tree planting, native species protection, and climate-sensitive landscaping across Battagram City. This dedicated institutional body will provide long-term stewardship of the city's green assets and ensure that urban greening goals are embedded in all planning and development decisions.

19.4.3. Housing, Sanitation, and Urban Amenities

a) Urban Amenities Improvement

Install benches, trash bins, directional signage, and shaded structures in key commercial and recreational areas of Battagram City. These improvements will enhance the comfort, usability, and attractiveness of public spaces and signal a visible commitment to improving the quality of the urban environment.

b) Public Safety Enhancements

Improve lighting in high-risk public spaces, especially near girls' schools, health facilities, and informal markets across Battagram City. Enhanced public lighting will reduce crime and safety risks, encourage greater use of public spaces by women and girls, and contribute to a safer and more inclusive city.

c) Affordable Housing Planning

Begin land acquisition and layout planning for affordable housing schemes near mass transit corridors and urban fringes of Battagram City. Early planning work will secure suitable sites, develop viable financial models, and establish the regulatory frameworks needed to deliver affordable housing at scale.

d) Sanitation Infrastructure Development

Construct and maintain gender-sensitive public sanitation blocks, especially in markets, hospitals, and educational institutions across Battagram City. Gender-sensitive design will ensure that facilities meet the specific needs of women, girls, and persons with disabilities, and contribute to improved public health and dignity for all residents.

e) Home Improvement Support

Offer micro-grants or subsidies for low-income home repairs, including latrine installation, ventilation upgrades, and flood proofing across Battagram City. These targeted financial interventions will help low-income households improve the safety, health, and resilience of their homes without requiring large upfront investments.

f) Citywide Sanitation Coverage

Ensure 100% sanitation service coverage with decentralized processing, household-level segregation compliance, and e-monitoring across Battagram City. Achieving full sanitation coverage will require sustained investment in infrastructure, strong regulatory enforcement, and ongoing community engagement to promote behavioral compliance.

19.4.4. Waste Management and Clean Energy

a) Waste-to-Energy Pilots

Set up community-level biogas digesters and composting units in selected zones, supported by municipal coordination and public-private partnerships across Battagram City. These pilot projects will demonstrate the viability of decentralized waste-to-energy solutions, generate valuable operational experience, and lay the groundwork for broader rollout.

b) Decentralized Waste Networks

Expand composting units, sorting centers, and recycling hubs with waste-picker cooperatives and private contractors across Battagram City. A decentralized approach to waste management will reduce transportation costs, create livelihoods for informal waste workers, and increase the overall efficiency and effectiveness of the city's waste management system.

c) Renewable Energy Deployment

Commission solar microgrids for schools, clinics, and municipal buildings; expand household-level solar and water-saving subsidies across Battagram City. Renewable energy investments will reduce dependence on the national grid, lower energy costs for public institutions, and demonstrate the feasibility of clean energy solutions at a community level.

d) EV Policy Rollout

Draft and begin implementing EV incentives, route planning for electric rickshaws and buses, and pilot e-mobility integration with public fleets in Battagram City. A phased approach to electric vehicle adoption will reduce air pollution, lower transportation costs, and position Battagram City as a leader in sustainable urban mobility in Khyber Pakhtunkhwa.

e) Smart Energy Systems

Fully implement smart grid operations for power conservation, load balancing, and integrating renewable energy sources citywide across Battagram City. Smart energy systems will optimize the use of available power resources, reduce energy waste, improve the reliability of supply, and enable the seamless integration of distributed renewable energy generation.

f) Public Transport Electrification

Transition major bus routes and school transport to EVs; provide subsidies and technical support for private electric fleet conversion in Battagram City. The electrification of public transport will deliver immediate air quality benefits, reduce carbon emissions, and set a clear direction for the long-term decarbonization of the city's transport system.

19.4.5. Economic Development and Vocational Empowerment

a) SME Service Hubs

Establish urban SME facilitation desks offering financial literacy, legal aid, business registration, and linkages to e-commerce platforms across Battagram City. These one-stop service hubs will lower the barriers to formalization for small businesses, connect entrepreneurs with financial and technical support, and help integrate the informal economy into the city's formal economic structures.

b) Vocational Training and Inclusion

Expand specialized training centers for underrepresented groups in crafts, food technology, hospitality, digital media, and solar installation across Battagram City. Vocational training will be tailored to local market demand, with a strong emphasis on inclusion of women, youth, and persons with disabilities to ensure that the benefits of economic growth are widely shared.

c) Industrial Zone Development

Complete infrastructure for industrial parks and introduce incentives including tax holidays, utilities, and logistics support for SMEs and exporters in Battagram City. Well-serviced industrial zones will attract investment, create employment, and strengthen the city's economic base by providing businesses with the infrastructure they need to grow and compete.

d) Vocational Expansion through Regional Technical Colleges

Launch regional technical colleges offering certifications in IT, green tech, logistics, and construction, especially for young women and disadvantaged youth in Battagram City. Regional colleges will expand access to high-quality technical education, equip a new generation of skilled workers, and help align the local workforce with the demands of a growing and diversifying economy.

e) Microfinance and Market Linkages

Provide small loans and create links with local markets to support entrepreneurship and economic resilience among residents of Battagram City. Microfinance programs will be complemented by business development services, mentoring, and market access support to maximize the impact of financial investments in local enterprises.

19.4.6. Cultural Programming and Social Development

a) Cultural Programming in Public Spaces

Organize periodic cultural events in parks and open plazas, such as night markets, craft expos, and local food festivals across Battagram City. Regular cultural programming will animate public spaces, celebrate local identity and traditions, foster social cohesion, and support the growth of the creative and cultural economy.

b) Cultural Hub Establishment

Repurpose civic buildings into multipurpose cultural centers offering arts education, youth co-working spaces, and event venues across Battagram City. Cultural hubs will provide dedicated spaces for creative expression, community gathering, and skills development, and will serve as anchors for broader neighborhood regeneration efforts.

c) Permanent Cultural Institutions

Institutionalize city-supported cultural centers with local artists' registries, educational partnerships, and international exchange programs in Battagram City. Permanent cultural institutions will provide sustained support for the arts, preserve local cultural heritage, and connect Battagram City's creative community with national and international networks and audiences.

19.4.7. Active Mobility, Public Safety, and Urban Systems

a) Active Mobility Infrastructure

Build bike lanes, EV charging stations, and walking paths connecting residential areas to commercial centers and transit stops across Battagram City. Active mobility infrastructure will encourage walking and cycling, reduce dependence on private motorized transport, and contribute to improved public health, reduced air pollution, and greater social equity in access to urban opportunities.

b) Urban Safety Systems

Install CCTV, panic buttons, and emergency response infrastructure in city parks, pedestrian zones, and transit stations across Battagram City. Integrated urban safety systems will deter crime, enable rapid emergency response, and create a more secure environment in which all residents can move freely and use public spaces with confidence.

c) Civic Engagement Platforms

Launch citizen reporting apps and web dashboards to gather feedback on cleanliness, park maintenance, and service access across Battagram City. Digital civic engagement tools will give residents a direct channel to communicate service needs and complaints, enable real-time monitoring of service delivery, and strengthen accountability between municipal government and the communities it serves.

20 INTEGRATED MASTER PLAN

20.1 Salient Features of the Proposed Master Plan

The Proposed Land Use Plan for Battagram District establishes a comprehensive and forward-looking spatial framework for guiding land development, conservation, and infrastructure over the planning horizon of 2025 to 2045. Covering a total proposed area of 7,301.480 acres, the plan delineates 33 distinct land use zones, each assigned specific functions aligned with the district's development vision, environmental carrying capacity, and socioeconomic needs.

The land use plan seeks to achieve a balanced distribution of land resources across productive, protective, residential, commercial, institutional, and recreational functions. It reflects a deliberate approach to spatial planning that prioritizes environmental sustainability, community well-being, economic growth, cultural preservation, and disaster resilience. The plan is structured around six broad thematic categories: Natural & Environmental Zones, Agricultural Zones, Residential Zones, Commercial & Economic Zones, Institutional & Civic Zones, and Recreation & Tourism Zones.

20.1.1.Residential Zones

Residential zones collectively account for 910.689 acres or 12.47% of the total planned area. The plan distributes residential development across five distinct residential typologies four density-based residential zones, an infill residential zone, a model village zone, and an apartment complex reflecting a graduated approach to housing provision that accommodates diverse household needs, income levels, and settlement patterns.

Residential Zone 1 - 355.532 Acres (4.87%)

Residential Zone 2 - 257.712 Acres (3.53%)

Residential Zone 3 - 87.809 Acres (1.20%)

Residential Zone 4 - 92.536 Acres (1.27%)

The Infill Residential zone, covering 91.695 acres, targets vacant, underutilized, or subdivided parcels within or adjacent to existing built-up areas. Infill development is a sustainable urban growth strategy that maximizes the use of existing infrastructure, reduces sprawl, and strengthens established neighborhood fabric.

By channeling residential growth into already-served areas, the infill residential designation reduces the cost of infrastructure extension, preserves agricultural land at the urban periphery, and promotes more compact and walkable settlement patterns.

20.1.2.Model Village

The Model Village zone covers 129.515 acres and represents a planned rural settlement typology designed to provide organized, well-serviced housing for rural and peri-urban communities. Model villages integrate residential plots with civic amenities, communal green spaces, basic infrastructure, and livelihood support facilities within a planned layout.

This designation is particularly relevant for relocating communities from hazard-prone areas such as flood plains, unstable slopes, and landslide zones, as well as for upgrading informally settled rural communities into planned habitation environments. Model villages embody a holistic approach to rural housing that balances physical planning with social and economic development objectives.

20.1.3. Apartment Complex - 25.405 Acres (0.35%)

The Apartment Complex zone covers 25.405 acres and is designated for purpose-built, high-density multi-storey residential development. Apartment complexes serve the housing needs of urban and semi-urban populations, particularly government employees, service sector workers, and households requiring rental accommodation. This typology maximizes land efficiency in areas where land values and demand are highest.

20.1.4. Commercial & Economic Zones

Commercial and economic zones collectively cover 326.300 acres or 4.47% of the total planned area. These zones provide the spatial framework for retail commerce, service industries, trade, and mixed-use economic activity across the district, structured to serve both local residents and visiting populations at varying scales.

20.1.4.1. Linear Commercial Zone

The Linear Commercial Zone is the largest commercial designation, covering 170.797 acres. Linear commercial strips are typically aligned along major arterial roads and highways, capturing passing vehicular and pedestrian traffic. This zone accommodates a range of commercial uses including retail shops, service providers, restaurants, petrol stations, vehicle workshops, banks, and small business establishments.

The linear commercial typology is characteristic of roadside economic activity in districts such as Battagram, where economic activity concentrates along major transport corridors. Planning guidelines for this zone will address frontage standards, parking provision, setback requirements, and signage controls to maintain an organized and functional commercial corridor.

20.1.4.2. Commercial Zone

The Commercial Zone, covering 53.895 acres, designates concentrated commercial nodes or market centers intended to serve the retail and service needs of surrounding residential populations. Unlike the linear commercial strip, the Commercial Zone is organized in compact, accessible centers with defined boundaries, parking, and pedestrian infrastructure.

Permissible uses include general retail, supermarkets, restaurants, offices, banks, pharmacies, and personal service establishments. The Commercial Zone is planned to evolve into organized market centers that improve the quality, safety, and convenience of commerce in the district.

20.1.4.3. Mixed Use Zone

The Mixed-Use Zone covers 10.964 acres and provides flexibility for integrated development combining residential, commercial, and light institutional uses within a single zone. Mixed use development is a globally recognized urban planning best practice that promotes walkability, reduces the need for motorized travel, activates street frontages, and creates more vibrant and economically resilient urban environments.

Buildings within the Mixed Use Zone may have retail and commercial uses on ground and lower floors with residential or office uses on upper floors. This zone is typically designated in transitional areas between residential neighborhoods and commercial corridors.

20.1.5. Social Infrastructure & Civic Zones

Institutional and civic zones provide the essential social infrastructure needed to serve the district's population across education, health, cultural, community, and administrative functions. Collectively, these zones cover 106.271 acres or 1.46% of the total planned area, reflecting a deliberate investment in the social capital and service infrastructure of Battagram.

20.1.5.1. Civic Amenities Zone

The Civic Amenities Zone, covering 34.024 acres, is the largest institutional designation, allocated for general-purpose civic infrastructure including government offices, public administration buildings, community centers, utility installations, fire stations, police facilities, and other essential public services. This zone ensures that sufficient space is reserved for public sector service delivery as the district's population grows over the planning horizon.

20.1.5.2. Educational Zone

The Educational Zone covers 10.554 acres and is designated for the development of schools, colleges, vocational training institutes, and other educational facilities serving the district's growing student population. Adequate and well-planned educational infrastructure is a prerequisite for human capital development and long-term socioeconomic progress in the district. The Educational Zone will accommodate purpose-built institutional campuses with classrooms, laboratories, libraries, administrative facilities, sports grounds, and open spaces, designed to meet contemporary standards for educational environments.

20.1.5.3. Community Model School

The Community Model School zone, covering 5.416 acres, is designated for a purpose-built model school facility intended to demonstrate high standards of educational infrastructure, teaching methodology, and community engagement. Model schools serve as flagship educational institutions that set benchmarks for school development across the district and provide quality education to underserved communities.

20.1.5.4. Health Care Zone

The Health Care Zone covers 9.533 acres and is designated for the development of hospitals, health centers, clinics, maternity facilities, diagnostic laboratories, and allied health services.

Ensuring access to quality healthcare is a fundamental development priority for Battagram, where existing health infrastructure remains limited relative to the district's population and geographic extent.

The Health Care Zone is planned to accommodate a district-level health facility with inpatient, outpatient, emergency, and specialized care services, supported by adequate parking, ambulance access, utility connections, and green open spaces.

20.1.5.5. Graveyard Extension

The Graveyard Extension zone, covering 2.175 acres, provides for the planned expansion of existing burial grounds to meet the long-term needs of the district's population. Adequate and properly managed burial grounds are an essential civic requirement. This designation ensures that expansion is planned in an organized manner, with appropriate access, boundary protection, and maintenance provisions.

20.1.6.Landfill Site

The Landfill Site zone, covering 9.17 acres, is designated for solid waste disposal and management infrastructure. Proper solid waste management is a critical environmental and public health requirement for the district. The landfill site is to be designed and operated in compliance with environmental protection standards, including provisions for leachate management, gas venting, groundwater protection, and eventual site rehabilitation and closure planning. The long-term solid waste management strategy for Battagram should also consider waste reduction, recycling, composting, and waste-to-energy approaches to minimize the volume of waste reaching the landfill over the planning horizon. Site selection criteria includes minimum 1 km buffer from nearest habitation (Pakistan EPA SRO 549, 2000), placement downwind of prevailing winds relative to population and slope gradient less than 15% and 500m from water sources(WHO guideline)

20.1.7.commercialTransport Terminal

The Transport Terminal zone, covering 1.740 acres, is designated for an organized public transport hub providing facilities for buses, minivans, and other public and private transport vehicles serving the district's internal and inter-district transport needs. The terminal will include passenger waiting areas, ticketing facilities, sanitation infrastructure, vehicle parking, and loading/unloading bays. A well-functioning transport terminal is essential for improving mobility, reducing traffic congestion, and supporting the district's economic connectivity.

20.1.8.Parking Plaza

The Parking Plaza, covering 3.680 acres, provides dedicated multi-vehicle parking infrastructure for the district's commercial and institutional centers. As Battagram grows and vehicular ownership increases, the provision of organized off-street parking becomes increasingly important to managing traffic flow, reducing congestion, and maintaining the functionality of commercial and civic zones.

20.1.9.Recreation & Tourism Zones

Recreation and tourism zones collectively cover 57.411 acres or 0.79% of the total planned area. While modest in areal extent, these zones play a disproportionately important role in enhancing quality of life, promoting physical and mental health, supporting community cohesion, and driving tourism development in Battagram.

20.1.10. Eco-Tourism and Recreational Zone

The Eco-Tourism and Recreational Zone covers 5.736752 acres and is designated for nature-based tourism and outdoor recreational activities that leverage Battagram's exceptional natural environment. This zone is planned to accommodate hiking trails, nature interpretation centers, picnic grounds, camping facilities, birdwatching platforms, and other low-impact recreational activities that bring visitors into contact with the district's landscapes, forests, and biodiversity.

Eco-tourism development in this zone will be guided by sustainability principles, ensuring that visitor activities do not degrade the ecological resources upon which the tourism experience depends. Locally managed eco-tourism enterprises will be promoted to maximize economic benefits for resident communities while fostering environmental stewardship.

20.1.10.1. Family Park

The Family Park zone covers 11.759 acres and is designated for a purpose-built public park designed to serve the recreational needs of families, children, and all community members. The Family Park will provide a safe, green, and accessible urban open space with facilities including children's play equipment, seating areas, walking paths, landscaped gardens, picnic shelters, and outdoor fitness installations.

Access to quality public open space is a fundamental urban amenity that significantly contributes to residents' physical health, mental well-being, and social interaction. The Family Park will serve as a major recreational anchor for Battagram's urban population.

20.1.10.2. River-Front Park

The River-Front Park, covering 2.218 acres, is designated as a linear public open space along the riverfront, providing residents and visitors with direct access to the visual and recreational amenity of the river environment. River-front parks serve as important public gathering spaces and contribute to the transformation of urban waterfronts into vibrant, accessible, and attractive public destinations.

The River-Front Park will include walking and cycling promenades, riverside seating, viewing platforms, landscaping, and lighting. Development within the river-front park will be carefully designed to avoid adverse impacts on the Riparian Zone and river ecology.

20.1.10.3. Neighbourhood Parks

Neighbourhood Parks, covering a total of 3.896 acres distributed across the residential areas of the district, provide small-scale, locally accessible green open spaces for everyday recreational use by nearby residents. These parks serve the fundamental planning principle of ensuring all residents have access to open green space within walkable distance of their homes.

20.1.10.4. Sports Complex

The Sports Complex zone, covering 3 acres, is designated for a multi-purpose sports and physical activity facility serving the district's youth and general population. The complex is envisioned to include cricket grounds, football pitches, athletics tracks, badminton and basketball courts, and associated support infrastructure including changing rooms, spectator areas, and administrative offices.

Investment in sports infrastructure is recognized as a crucial social development intervention, providing structured recreational opportunities for youth, promoting physical fitness, fostering community identity, and potentially serving as a talent development pipeline for competitive sports at provincial and national levels.

20.1.11. Agricultural Zones

Agricultural zones collectively represent 32.41% of the total planned area. The plan recognizes agriculture as a foundational pillar of Battagram's rural economy and food security, and accordingly allocates substantial land for both traditional farming practices and innovative agro-based enterprise.

20.1.11.1. Reserved Agriculture

Reserved Agriculture is the second-largest land use designation in the plan, covering 2417.86 acres. This zone encompasses the district's most productive and agriculturally viable farmlands, including alluvial valley floors, terraced hillside fields, and irrigated cultivable areas.

The primary purpose of this designation is to safeguard Battagram's productive agricultural land base from conversion to non-agricultural uses, ensuring long-term food security, rural livelihood sustenance, and maintenance of the district's agrarian character. Permitted activities include cultivation of seasonal and perennial crops, horticulture, orchards, livestock grazing on designated pasture areas, and agro-forestry systems.

Subdivision, built development, and industrial activity within Reserved Agriculture areas are prohibited except for essential agricultural support infrastructure such as irrigation channels, storage facilities, and access paths. Agricultural modernization initiatives including improved irrigation systems, precision farming, and high-value crop development are encouraged within this zone.

20.1.12. Agro-Industrial Zone

The Agro-Industrial Zone, covering 45.60 acres, is designated to accommodate value-adding agro-processing and agri-based industrial activities that are directly linked to Battagram's agricultural production. This zone bridges the primary agricultural sector and the industrial economy, facilitating the processing, packaging, storage, and distribution of locally produced agricultural goods.

Permitted land uses within this zone include food processing units, cold storage facilities, grain and produce warehouses, fruit and vegetable processing plants, dairy processing, and agri-input supply centers. The zone is sited to maintain accessibility to both agricultural production areas and the district's road network, ensuring efficient supply chain connectivity.

20.1.12.1. Farmers Market

The Farmers Market zone, covering 7.318 acres, provides dedicated physical infrastructure for the direct marketing of locally produced agricultural goods by farmers and rural producers. Farmers markets serve as vital economic nodes that connect agricultural producers to consumers, reduce dependency on intermediary traders, improve farmgate prices, and stimulate local food economies.

The proposed Farmers Market will include covered market stalls, cold storage facilities, vehicle unloading areas, weighing and grading facilities, sanitation infrastructure, and open-air display areas. Seasonal markets, agricultural fairs, and rural product exhibitions may also be hosted in this zone to promote local produce and attract both residents and tourists.

20.1.13. Natural & Environmental Zones

Natural and environmental zones constitute the largest and most critical component of the proposed land use plan, collectively covering approximately 3,659.402 acres or 50.12% of the total planned area. This substantial allocation underscores Battagram's ecological significance and the planning authority's commitment to environmental conservation, climate resilience, and sustainable resource management.

20.1.13.1. Protected Forest

The Protected Forest zone is by far the largest single land use designation in the plan, covering 2,291.730 acres nearly one-third of the total planned area. This designation applies to forested tracts that hold critical ecological, hydrological, and biodiversity significance for the district and the wider region.

Protected forests in Battagram serve multiple ecological functions including watershed protection, slope stabilization, carbon sequestration, and provision of habitat for native fauna and flora. These forests are a primary defense against soil erosion, flash flooding, and landslides hazards of particular relevance to the mountainous topography of the district.

Under this designation, all commercial logging, agricultural encroachment, and built development are strictly prohibited. Forest management activities, including controlled maintenance, ecological monitoring, and reforestation of degraded patches, will be conducted under the oversight of the relevant forestry and environmental departments. Controlled, low-impact eco-tourism trails may be considered in select zones provided they do not compromise ecological integrity.

20.1.13.2. Riparian Zone

The Riparian Zone covers 316.663 acres along the banks and floodplains of rivers, streams, and water bodies flowing through the district. Riparian zones are among the most ecologically sensitive landscapes, serving as natural buffers between aquatic and terrestrial ecosystems.

The designation of this zone serves to protect water quality, regulate stormwater runoff, prevent streambank erosion, and preserve the natural hydrology of watercourses. Riparian corridors also serve as wildlife movement pathways and support rich biodiversity through the presence of water-dependent plant and animal communities.

Development within the Riparian Zone is strictly regulated. Permissible activities are limited to passive recreation such as walking trails and nature observation platforms, ecological restoration, riparian revegetation, and limited flood management infrastructure. Any construction, landfilling, or agricultural activity that compromises the natural function of the riparian corridor is prohibited.

20.1.13.3. Plantation Zone

The Plantation Zone, covering 843.78 acres, represents a proactive land use strategy aimed at expanding vegetative cover across degraded, bare, or marginally productive lands within the district. Unlike the Protected Forest zone which conserves existing natural forest, the Plantation Zone targets areas where structured afforestation and reforestation programs are to be implemented.

The plantation program is envisioned to utilize a mix of native tree species, commercially viable timber species, and fruit-bearing trees suited to local climatic and soil conditions. The objectives of this zone include increasing overall forest cover in the district, restoring degraded hillslopes and ravines, supporting livelihoods through community-managed plantation enterprises, and contributing to climate change adaptation through enhanced carbon storage and microclimate regulation.

Community-based forest management models are recommended for plantation zones, allowing local populations to participate in planting, maintenance, and eventual sustainable harvest, thereby creating economic incentives for conservation.

20.1.13.4. Green Buffer Zone

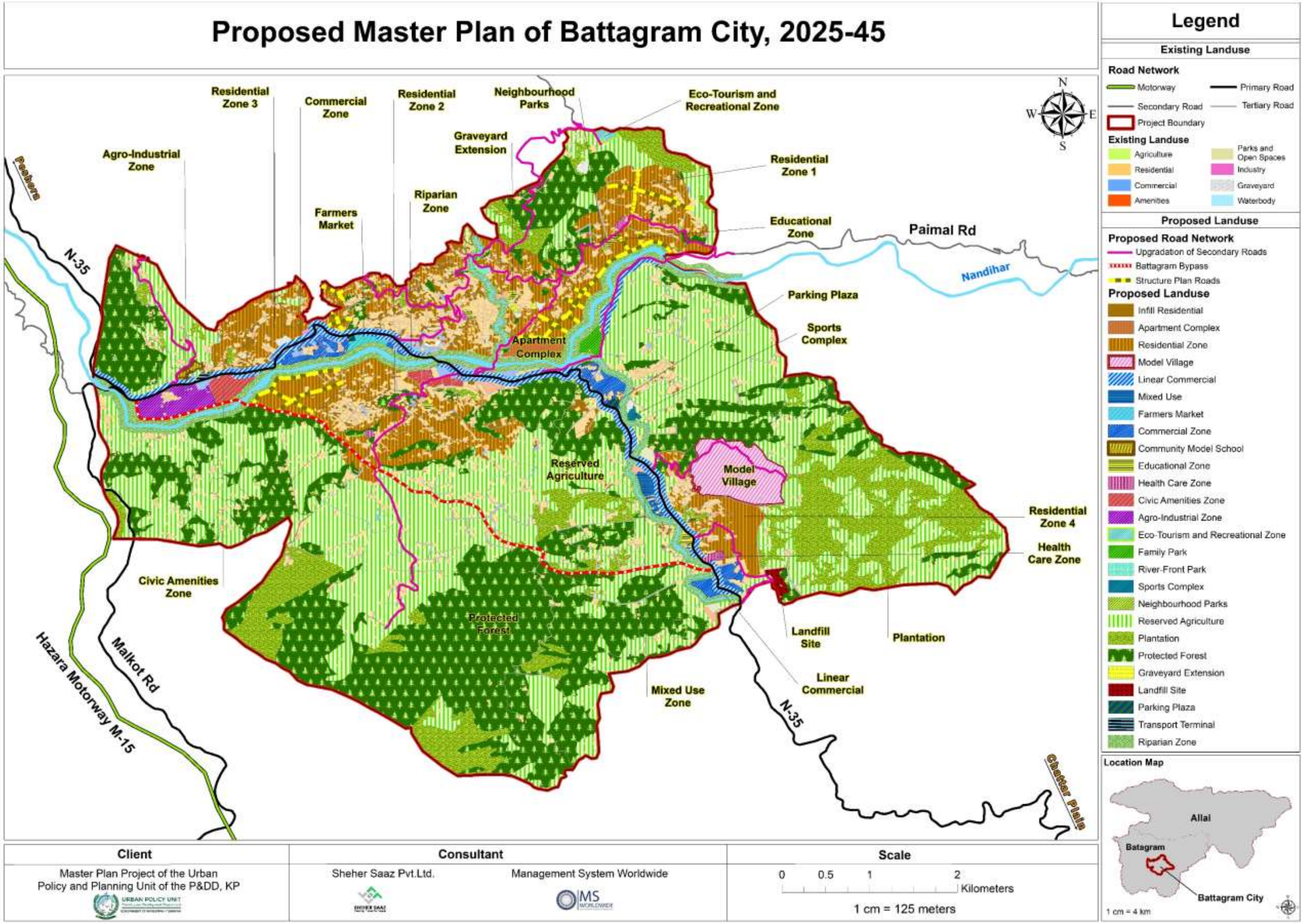
Green Buffer Zones, covering 18.307 acres, are designated at transitional boundaries between incompatible land uses for example, between industrial or high-traffic commercial areas and residential or sensitive ecological zones. These buffers serve as spatial separators that reduce noise pollution, visual intrusion, air pollution, and other negative externalities generated by high-intensity land uses.

Green buffers are to be planted with dense, multi-layered vegetation including trees, shrubs, and ground cover. They also contribute to urban greening, microclimate moderation, and the visual amenity of the district's built environment. Green buffers are non-buildable and must be maintained as permanently vegetated open spaces.

Map 50: Proposed Landuse Zone – Battagram

Proposed Land Use Zones	Area(Acres)	Percentage
Agro Industrial Zone	45.605821	0.62
Apartment Complex	25.405477	0.35
Civic Amenities Zone	34.024029	0.47
Commercial Zone	53.894781	0.74
Community Model School	5.416139	0.07
Eco-Tourism and Recreational Zone	5.736752	0.08
Educational Zone	10.553825	0.14
Family Park	11.759063	0.16
Farmers Market	7.317901	0.10
Graveyard Extension	2.175302	0.03
Health Care Zone	9.532948	0.13
Infill Residential	91.694568	1.26
Landfill Site	9.179035	0.13
Linear Commercial	170.79719	2.34
Mixed Use	10.964221	0.15
Model Village	129.5149	1.77
Neighbourhood Parks	3.896063	0.05
Parking Plaza	3.680337	0.05
Plantation	843.78682	11.56
Protected Forest	2291.7297	31.38
Reserved Agriculture	2417.8689	33.11
Residential Zone 1	355.53153	4.87
Residential Zone 2	257.71185	3.53
Residential Zone 3	87.809113	1.20
Residential Zone 4	92.535843	1.27
Riparian Zone	316.66316	4.34
River-Front Park	2.218202	0.03
Sports Complex	3.061981	0.04
Transport Terminal	2.14085	0.03
Total	7302.21	100

Map 51: Proposed Masterplan - Battagram City 2025-2045



21 ANNEXURES

21.1 Annexure 1: Housing Scenarios

Projected Population for 2025		**173,148**
Projected Population for 2045		273,271
Increase in Population		100,123
Household Size from 2025 till 2045	5.64	
Future Requirements Housing Units for 2045		17752
Backlog carry forward		358
Total Requirement till 2045	Future Requirement + Backlog	18,110
Total Population to be accommodated till 2045		102,142

20.1.14. Scenario I - 100% Horizontal Development

Detailed Calculations

Table 116: Detailed Area Requirement – scenario I

Apartment Type	%age	Population	Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses (45%)	Total Area Required
3 Marla Single Story Units	**10%**	10,214	1,811	5,433	34	15	49
5 Marla Single Story Units	**25%**	25,536	4,528	22,638	141	64	205
7 Marla Single Story Units	**20%**	20,428	3,622	25,354	158	71	230
10 Marla Single Story Units	**25%**	25,536	4,528	45,276	283	127	410
1 Kanal Single Story Units	**20%**	20,428	3,622	72,441	453	204	656
Total	100%	102,142	18,110	171,142	1,070	481	**1,551**
Residential Density (Persons Per acre) = 66 PPA							

20.1.15. Scenario II - 10% Vertical Development (Multi-Storey Apartments) & 90% Horizontal Development

Detailed Calculations

Table 117: Apartments Criteria – Vertical Development

Apartment Type	Size of Apartment (sq ft)	Size of Apartment (Marla)	Units each floor	Area of Each Floor (Sq ft)	Area of Each Floor (Marla)	Additional area for Mandatory spaces	Total Area of Each apartment

							Building (Marla)
	A	A1	B	C	C1	D	E
		A*0.00367309		B*A	C*0.00367309	C1*0.4	C1+D
1 bedroom Apartment	1000	3.7	4	4000	14.7	5.9	20.6
2-bedroom Apartment	1200	4.4	4	4800	17.6	7.1	24.7
3 Bedroom Apartment	1600	5.9	4	6400	23.5	9.4	32.9

Table 118: Detailed Area Requirement – scenario II

Apartment/Unit Type	%age	Population	Housing Units	Number of Storeys	Housing units Accommodated in one apartment building	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
	F	F1	F2	G	H	I	I1	I2	J
		Pop*F	HU*F		B*G	(F2/H)*A	I*0.00625001	I1 *0.50	
3 Marla Single Story Units	**20%**	20,428	3,622	**1**	1	10,866	68	27	95
5 Marla Single Story Units	**25%**	25,536	4,528	**1**	1	22,638	141	57	198
7 Marla Single Story Units	**25%**	25,536	4,528	**1**	1	31,693	198	79	277
10 Marla Single Story Units	**10%**	10,214	1,811	**1**	1	18,110	113	45	158
1 Kanal Single Story Units	**10%**	10,214	1,811	**1**	1	36,221	226	91	317
1 bedroom Apartment	2%	2,043	362	5	20	373	2	1	3
2 bedroom Apartment	3%	3,064	543	5	20	671	4	2	6
3 Bedroom Apartment	5%	5,107	906	5	20	1,490	9	4	13
Total	100%	102,142	18,110			122,061	763	305	**1,068**
Residential Density (Persons Per acre) = 96 PPA									

20.1.16. Scenario III - 30% Vertical Development (Multi-Storey Apartments) & 70% Horizontal Development

Detailed Calculations

Table 119: Detailed Area Requirement – scenario III

Apartment/Unit Type	%age	Population	Housing Units	Number of Storeys	Housing units Accommodated in one apartment building	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required

	F	F1	F2	G	H	I	I1	I2	J
		Pop*F	**HU*F**		**B*G**	**(F2/H) *A**	**I*0.0062 5001**	**I1 *0.50**	
3 Marla Single Story Units	**15 %**	15,321	2,717	**1**	1	8,150	51	25	76
5 Marla Single Story Units	**15 %**	15,321	2,717	**1**	1	13,583	85	42	127
7 Marla Single Story Units	**20 %**	20,428	3,622	**1**	1	25,354	158	79	238
10 Marla Single Story Units	**20 %**	20,428	3,622	**1**	1	36,221	226	113	340
1 bedroom Apartment	5%	5,107	906	4	16	1,164	7	4	11
2 bedroom Apartment	15%	15,321	2,717	4	16	4,191	26	13	39
3 Bedroom Apartment	10%	10,214	1,811	4	16	3,725	23	12	35
Total	100 %	102,142	18,110			92,387	577	289	**866**
Residential Density (Persons Per acre) = 181 PPA									