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PLANNING & DEVELOPMENT DEPARTMENT
GOVERNMENT OF KHYBER PAKHTUNKHWA

DRAFT LAND USE PLAN

DISTRICT KHYBER

December, 2025



District Land Use plans of 8 newly Merged Districts of Khyber Pakhtunkhwa

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LIST OF ACRONYMS

ADP	Annual Development Plan
KP	Khyber Pakhtunkhwa
LUBCA	Land Use and Building Contral Act
MDs	Merged Districts
NWFP	North-Western Frontier Province
P&DD	Planning and Development Department
PLUP	Provincial Land Use Plan
UPPU	Urban Planning and Policy Unit
MCDA	Multi Criteria Decision Analysis

1 CHAPTER I: INTRODUCTION & BACKGROUND

1.1 Project Overview and Background

The concept of scarcity is a fundamental principle in economics, and Land is considered an essential factor of production and a scarce resource. This means that its availability is limited in relation to the demand for it. With urbanization, the universal phenomena take place, and the population expands rapidly, the demand for land increases, while the total supply remains fixed. Keeping in view the fixed supply of land and its diminishing rate, the NWFP Housing Authority Act 2005, under Section 4, Sub-Section 2 (xv), established the NWFP Housing Authority (PHA) and was tasked with creating a provincial land use plan or policy. As a result, the PHA's Housing Department's Project Management Unit was established on April 1, 2010. The Provincial Land Use Plan was initiated in this regard. In 2013, on the instruction of the Honorable Chief Minister of Khyber Pakhtunkhwa, the Project Management Unit of the Land Use Plan was transferred to the Urban Policy Unit. Later, the Provincial Land Use Plan was used instead of the Project Management Unit for the Land Use Plans.

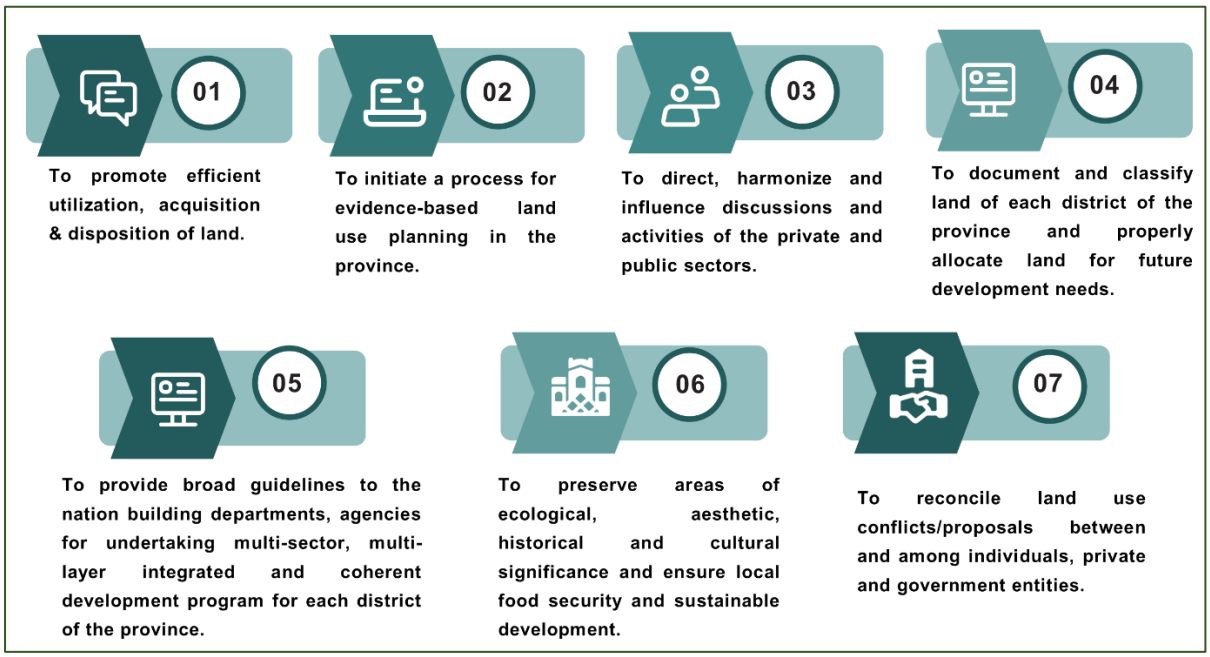
The land, which is in limited supply, must be used to meet the fundamental necessities of food, water, fuel, clothes, and shelter. The demand for resources increases as the population grows. The available Land must be utilized to satisfy the new needs brought on by the population growth. The amount of land that is accessible for farming and agriculture is dwindling daily because of additional housing projects.

The uncontrolled Urban sprawl over agricultural land is putting great pressure on the available resources of the province, and these resources shall be equally distributed among the population of the province. Planned towns & villages will be developed, and as a result of this planning, resources shall be equally distributed among the population of the province. The guided land use distribution will also result in a healthy living environment and better utilization of human resources. Proper sanitation, drinking water supply, and forestation will make the environment clean and healthy. It will also minimize the chances of epidemics and other man-made disasters and will contribute to upgrading the living standards of the area.

To develop an integrated land use plan for the province of KP the Urban Policy Unit of P&D Department organized consultative conferences for the development of Terms of Reference for the District Land Use Plan on May 29th, 2014, with various stakeholders including district administration, government officials, policy planners, academia, and civil society organizations. A Provincial land use plan is a planning and policy document for integrated, coordinated, evidence based and systematic planning. This successful completion of Land Use Plans will increase developmental activities, generate employment for the urban and rural areas. It aims at establishing hierarchy of settlements and developments of satellite, intermediate, Secondary, and existing towns/settlements as focal points for future development. This will help in increasing the standards of the people and optimum utilization of natural resources.

1.1.1 Project Objectives

The project aims to develop a comprehensive and enduring planning vision through a cooperative effort known as a "Land Use Plan." In shaping the future physical manifestation of Urban Centers, this framework will play a critical role. The objectives of the project include



1.1.2 Status of the Land Use and Master Plan Project in Khyber Pakhtunkhwa

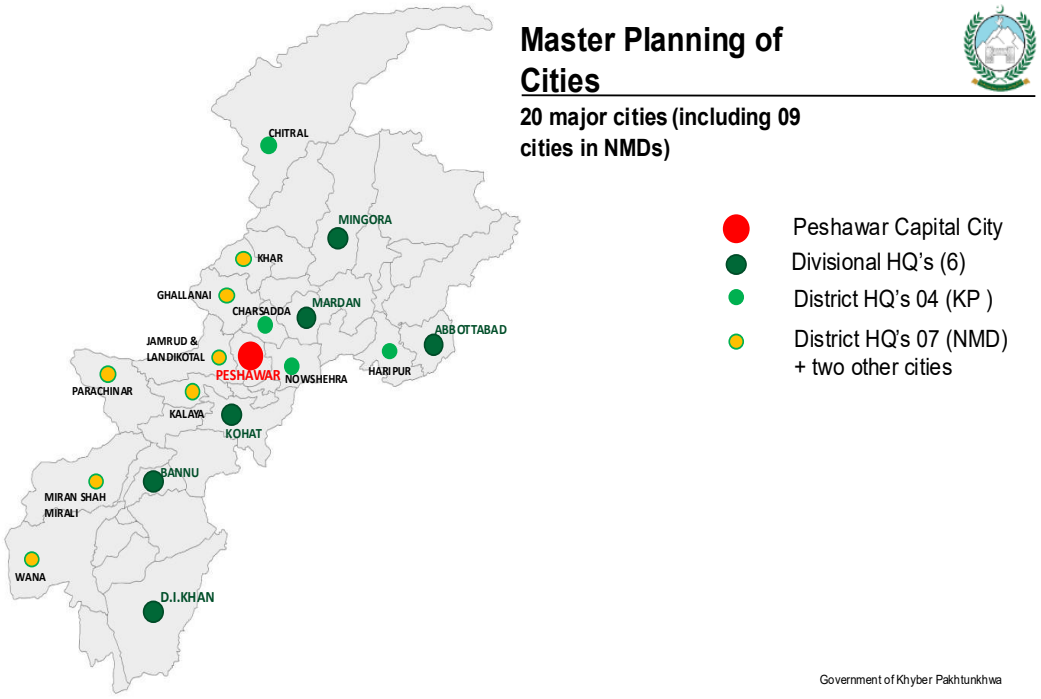
Urban Policy and Planning unit, of the planning and development department Khyber-Pakhtunkhwa is in the process of preparation of district land use plans of all the districts including MDs. Six (06) District Land Use Plans (Peshawar, Nowshera, Charsadda, Mardan, Swabi and Abbottabad) were completed in December 2018 and were handed over to LGE&RDD in December 2019 for further approval of the competent authority/forum. Later, in July 2022, all these six completed DLUPs were handed over to DG-LU&BCA for further processing and approval of the Provincial Land use and Building Control Council. Provincial Land Use and Building Control Council approved these six plans under Section 4 (f) of the Land Use and Building Control Authority Act, 2021. The approved district land use plans have been handed over to the concerned district administration for execution/implementation. For implementation/execution at district level, district land use planning and management committees have been notified under section-14 of the land use and building control act 2021, under the chairmanship of the concerned Deputy Commissioners.

1.1.2.1 Current status of Master plans

The urban centers in the Province of Khyber Pakhtunkhwa have been neglected in the past. This has resulted in unregulated urban growth, with less-than-optimal infrastructure, inefficient institutions and poor quality and outreach of civic services, which has led to low quality of life. Instantaneously, to the District Land Use Plan (DLUP) project, the Urban Policy

Unit is also preparing long term Master Plans for all the divisional and district headquarter cities of Khyber Pakhtunkhwa including the provincial capital Peshawar, Divisional HQs Mardan, Abbottabad, Kohat, Mingora, Bannu and DI Khan and other major cities of KPK including NMDs. The figure 1 shows the detail of master plan.

Figure 1: Current Status of the Cities Master Plan in KP



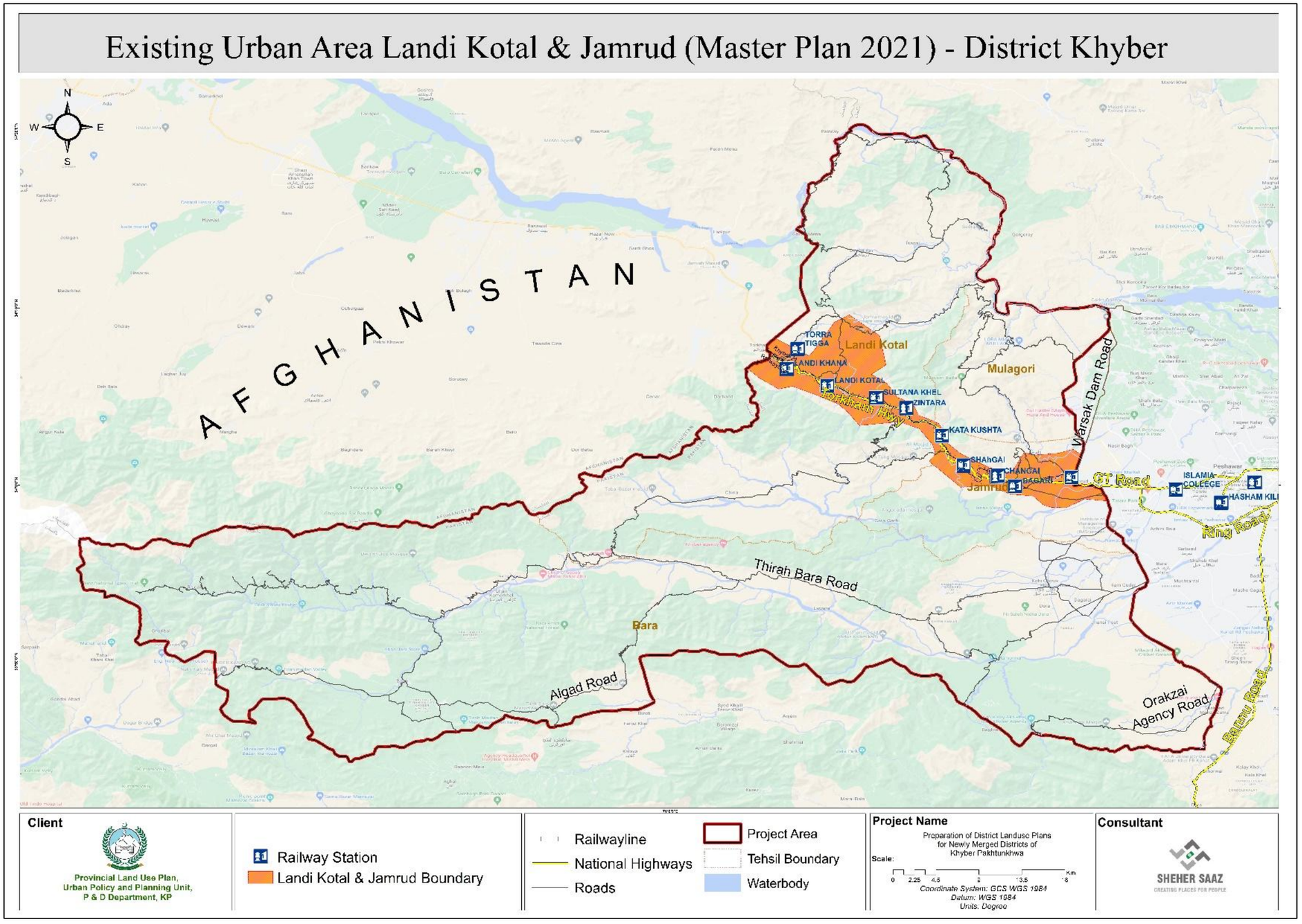
Three (03) cities Master plan Plans (Mardan, Mir Ali/Miran Shah, District North Waziristan and Wana, District south Waziristan) were completed and approved from the Land Use and Building Control Council. Further the said plans were handed over to DG-LU&BCA and concerned DCs for implementation/Execution.

1.1.2.2 Status of Jamrud and Landi Kotal Master Plan

Jamrud is a major town in the Khyber District, located in the Peshawar Valley on the western edge of Peshawar city. It serves as the gateway to the Khyber Pass, which lies immediately to the west. Jamrud Tehsil borders Peshawar District to the east, Yake Ghund Tehsil of Momand District to the north, Landi Kotal Tehsil to the west, and Bara Tehsil to the south. According to the 2017 census, Jamrud Tehsil covers an area of 311 sq. km, with a total population of 227,557 and a population density of 731.6 persons per sq. km. Of this population, 51% are males and 49% are females. Only 28.01% of residents live in urban areas, with a growth rate of 4.63%. In 1998, the urban population was 320,397; by 2017, it increased to 63,728, with an annual growth rate of 3.68%. Based on calculations, the current urban population is approximately 763,529. The 2017 census maps indicate that the total urban area of Jamrud is 48.10 sq. km.

Furthermore, the draft master plan of urban center Landi Kotal has been prepared and is currently at the stage of final approval. The boundaries of urban centers Jamrud and Landi Kotal are shown in the map below.

Map 1: Boundary of Urban Centers Jamrud and Landi Kotal



Source: Consultants, 2024

1.2 Introduction of the Region

1.2.1 Background

Khyber Pakhtunkhwa, Pakistan's northwestern province, is divided into thirty-four districts, with Peshawar as its capital and most populous city. In 2018, the province's administrative landscape significantly changed when the Federally Administered Tribal Areas (FATA) were merged into Khyber Pakhtunkhwa under the 25th amendment. These areas were then integrated into the nearby existing divisions.

Historically, the province was organized into larger administrative units called divisions. The Peshawar Division, once dissolved, has since been re-established. Before Pakistan's independence, the region was divided into just two divisions, with the Peshawar Division covering a larger area than it does today. Over time, districts were promoted to divisional status, shaping the current administrative structure. The Peshawar Division includes five districts: Peshawar, Charsadda, Nowshera, Khyber, and Mohmand.

1.2.2 The Administrative Structure of the Region

Khyber Pakhtunkhwa (KP) Province operates under a hierarchical administrative structure, subordinate to the federal government. At the apex of provincial governance is the Chief Minister, elected by the Provincial Assembly. The Chief Minister heads the executive branch and is assisted by a cabinet of ministers overseeing various departments.

The bureaucratic machinery is led by the Chief Secretary, who coordinates and supervises departmental activities. The Additional Chief Secretary heads the Planning & Development Department, reporting directly to the Chief Secretary. A tiered structure of Additional Secretaries, Deputy Secretaries, Section Officers, and other staff supports the departments. Additionally, various attached departments and autonomous bodies operate under the provincial government.

The province is divided into 38 districts, each with its administrative hierarchy. Local government is overseen by the Secretary of the Local Council Board, under the purview of the Local Government Establishment and Rural Development Department. This department is responsible for administration, planning, and development at the local level. Its structure includes five key sections: Planning & Development, Estate, Administration/Establishment, Finance, and Local Governance. An Additional Secretary heads the Litigation, Monitoring & Evaluation, and Smart City wings. The Deputy Secretary for Administration and Establishment oversees municipal administration across KP, including 7 Regional Municipal Officers (RMOs) and 93 Tehsil Municipal Officers (TMOs).

The land use regulations governing development in Pakistan, including national and provincial laws, acts, and policies, are implemented by the local government department and development authorities.

1.3 Legal & Policy Framework (Federal, Provincial, Local)

1.3.1 Existing Legal Framework

1.3.1.1 The North-West Frontier Province Urban Planning Ordinance, 1978

The North-West Frontier Province Urban Planning Ordinance of 1978 was enacted to establish a comprehensive urban planning system for the province. Its primary goals are to integrate physical planning with economic and social planning at all levels of government and to establish an institutional framework for the effective implementation of these plans. Ordinance makes the Provincial Urban Development Board (Board) as the primary governing body. The Board is responsible for formulating and implementing urban development policies, coordinating with federal and local planning agencies, and ensuring proper consideration of economic and social planning factors.

Established by the Board with government approval, detailed planning and implementation are mandated in specific local areas under Section 15. The Board defines the boundaries of these local areas as per Section 15(2). Additionally, the Board has the authority to delegate all or any of its functions related to the local area to the Local Area Authority (LAA), as specified in Section 16.

The functions of LAAs are comprehensive and include engaging in a continuous planning process that outlines land development, public facilities, housing, open spaces, and more. They are also responsible for conducting studies, making projections, and analyzing existing conditions under Section 17(3). Furthermore, LAAs are tasked with implementing approved plans, which require the necessary resources and powers, as stated in Section 17(4). They must prepare documents like Local Area Plans (LAPs) and others as needed, according to Section 17(5), and follow directions from the Board under Section 17(6).

Local Area Plans (LAPs) are defined by the LAA with titles approved by the Board, as outlined in Section 18(1). These plans include written summaries of findings, recommendations, and proposed plans. They also specify territorial and time dimensions, subject matter, and the level of detail required. Moreover, LAPs identify provisions to be included in Land Development Regulations or adhered to by government agencies, as noted in Section 18(4).

Land Development Regulations (LDRs) can be adopted by LAAs if authorized by the Board, as outlined in Section 21. These regulations govern various aspects of land development within the local area, as specified in Sections 31(1) and (2).

The implementation of the approved plans is a key responsibility of LAAs, who must carry out this task directly or through other government agencies, as stated in Section 22. The Board has the authority to modify delegation terms, dissolve LAAs, or merge them with other planning agencies, according to Section 23. Once local area development is complete, the Board can dissolve the LAA and transfer the area to a local council, as outlined in Section 24.

The ordinance outlines the procedures for land acquisition for urban planning purposes. The process begins with the identification of required land, where the Board identifies the necessary land and publishes a notification in the official gazette. Authorized officers are then allowed to survey, mark boundaries, and assess land suitability, with compensation provided

for any damage caused during this process. Compensation is determined based on factors such as market value, damages, and relocation expenses, while excluding factors like urgency or potential land value increases due to the project.

1.3.1.2 North-West Frontier Province Local Government Ordinance, 2001

In line with the objectives of decentralization and devolution of power, the *North-West Frontier Province Local Government Ordinance, 2001* (the "NWFP LGO 2001") was promulgated under the Devolution Plan 2001 to restructure the local government system in the then North-West Frontier Province, now Khyber Pakhtunkhwa. The Ordinance aimed to devolve political, administrative, and financial authority to the district, tehsil, and union levels, thereby strengthening grassroots governance and improving service delivery.

The NWFP LGO 2001 applied to the entire province, excluding cantonment areas and any other areas notified by the government. The Ordinance defined key institutional terms such as district, tehsil, union, local government, and local council, and established a **three-tier local government structure** comprising District Governments, Tehsil Municipal Administrations (TMAs), and Union Administrations. Each tier was assigned specific functions and responsibilities to ensure administrative decentralization and local participation in governance.

Under the Ordinance, a **District Government** was established in each district, headed by a directly elected *Nazim*, with executive authority supported by the District Coordination Officer and district line departments. The District Government was responsible for overall district-level planning, coordination, and management of devolved sectors, including education, health, infrastructure, and spatial planning. The District Nazim provided leadership for district development, approved development strategies, and coordinated with provincial departments.

At the tehsil level, the Ordinance established **Tehsil Municipal Administrations (TMAs)**, headed by a Tehsil Nazim. TMAs were assigned municipal and regulatory functions, including land use control, building regulations, water supply, sanitation, solid waste management, local roads, markets, and spatial planning. The TMAs were responsible for preparing tehsil-level development plans and managing municipal services in both urban and rural settlements within their jurisdiction, subject to provincial policies.

The **Union Administration**, headed by a Union Nazim, functioned as the lowest tier of local government. Union Councils were responsible for identifying local development needs, maintaining communal infrastructure, assisting in data collection, monitoring service delivery, and facilitating community participation. They also played a role in dispute resolution, registration of vital events, and implementation of small-scale development schemes.

The NWFP LGO 2001 also established **elected councils** at each tier—District Council, Tehsil Council, and Union Council—which exercised legislative and oversight functions. These councils approved budgets, development plans, local taxes, fees, and bylaws, and held the respective Nazims accountable for administrative and financial performance through committees and council proceedings.

Although the NWFP LGO 2001 introduced an extensive framework for devolution and local-level planning, its implementation faced challenges related to administrative capacity, fiscal dependence on the province, and limited continuity. The Ordinance remained in force until it was repealed and replaced by subsequent local government legislation, including the *Khyber Pakhtunkhwa Local Government Act, 2012* and later the *Khyber Pakhtunkhwa Local Government Act, 2013*. Nevertheless, the NWFP LGO 2001 remains a foundational legal instrument that shaped the evolution of local governance and planning institutions in Khyber Pakhtunkhwa.

1.3.1.3 The Khyber Pakhtunkhwa Establishment of District Development Advisory Committees Act, 1989

With a District Development Advisory Committee for each district, the KP Establishment of District Development Advisory Committees Act, 1989 was established to provide appropriate planning and oversight of local-level development operations throughout the province. The heads of any district-level Attached Departments, the District Nazim, the City District Nazim, the Tehsil Nazim/Town Nazim, and any other elected representatives that the Government may designate as co-opted members comprise the Committees, in addition to all the members of the Provincial Assembly from that District. Voting rights are not granted to co-opted members.

1.3.1.4 The Khyber Pakhtunkhwa Local Government Act, 2013

In accordance with Article 140A of the Constitution of the Islamic Republic of Pakistan, 1973 (the "Constitution"), which mandates the establishment of local government systems (in all provinces) and the devolution of political, administrative, and financial responsibility authority to the elected representatives of such local governments, the province's local government system has been reorganized and consolidated thanks to the Khyber Pakhtunkhwa Local Government Act, 2013 (the "LGA").

The Khyber Pakhtunkhwa Local Government Act, 2013, applies throughout the entire Khyber Pakhtunkhwa Province, excluding designated cantonments and any other areas excluded by official government notification. The Act defines key terms like district, local government, local council (including Tehsil, Village, and Neighborhood Councils), and tehsil. It establishes local areas for the formation of local governments, including villages, neighborhoods, and later additions like tehsils. Finally, the Act outlines the structure of local governments, which will consist of City Local Governments, Tehsil Local Governments, Village Councils, and Neighborhood Councils.

The Khyber Pakhtunkhwa Local Government Act, 2013 establishes a Tehsil Local Government (TLG) in each tehsil. Each TLG has a directly elected Chairman with executive authority and a Tehsil Local Administration for support. The Chairman is responsible for ensuring the TLG functions according to the Act and oversees a range of duties. These include providing vision and leadership for the tehsil's development, formulating development strategies, and coordinating with the District Administration. The TLG itself manages devolved government

departments within the tehsil, following general government policies. They are accountable to both the public and the provincial government for improving governance and service delivery within their devolved authority. The Chairman has a wide range of powers to fulfill these responsibilities. They can propose budgets and development plans, oversee implementation of devolved functions, and regulate markets and services within the tehsil. Additionally, the Chairman monitors government officials, coordinates with village and neighborhood councils, and represents the TLG in official capacities.

The Khyber Pakhtunkhwa Local Government Act, 2013 also establishes a Tehsil Council in each tehsil. The council's composition is detailed in Part-I of the Eleventh Schedule of the Act. This council plays an important oversight role by approving taxes, fines, and bylaws proposed by the Chairman. Additionally, they have final say on the annual budget and development plans for the Tehsil Local Government. To ensure an effective delivery service, the council elects Standing Committees to oversee various aspects of TLG's operations. These committees cover areas like municipal offices, devolved functions, finances, accounts, and ensuring smooth council proceedings and ethical conduct amongst members. Finally, the Tehsil Council reviews report from the Accounts Committee and performance reports from the Chairman, holding them accountable for their actions.

The Khyber Pakhtunkhwa Local Government Act, 2013 establishes Village Councils in rural areas and Neighborhood Councils in urban areas. After their boundaries are finalized by the Election Commission, the government officially forms these councils. Both types of councils play a crucial role in local development and service delivery.

Their shared responsibilities include implementing and monitoring village-level development projects (for Village Councils), handling village sanitation (Village Councils only), identifying local development needs, registering vital events, approving annual budgets and development plans, organizing local sports and cultural events, and overseeing watch and ward programs. Village Councils additionally organize cattle fairs and shows.

Furthermore, both councils play a vital role in monitoring service providers like education, health, agriculture, and sanitation. They achieve this through a dedicated Monitoring Committee that reports to the Tehsil Local Government. Data collection on social indicators is another important function. The councils also collaborate with the Tehsil Local Government by assisting with surveys, data collection, and selecting locations for public facilities. Finally, they can be assigned additional tasks by the government or the Tehsil Local Government. The Khyber Pakhtunkhwa Local Government Act, 2013, outlines the process for delimiting village and neighborhood councils within the province.

- **Number of Councils:** The total number of councils per district is specified in the Ninth Schedule of the Act.
- **Delimitation Authority:** The Election Commission of Pakistan is responsible for delimiting village and neighborhood councils.
- **Village Council Areas:** A village council covers one or more muaziaat (land revenue units) or census villages.

- **Neighborhood Council Areas:** In urban areas, a neighborhood council covers whole census blocks or a combination of blocks and muaziaat.
- **Delimitation Considerations:** Delimitation considers factors like population distribution, geographic compactness, existing administrative boundaries, communication facilities, public convenience, and ensuring homogeneity in council creation.
- **Population Range:** The population range for councils within a district is 5,000 to 15,000 based on the latest official census data. If the official census results are not available, provisional results from the 2017 national population census can be used for delimitation.

1.3.1.5 Khyber Pakhtunkhwa Planning and Development Guidelines for Local Governments 2015

The Planning and Development (P&D) Guidelines 2015 for the devolved tiers of local governments in Khyber Pakhtunkhwa (KP) were developed to operationalize the provisions of the Local Government Act (LGA) 2013. These guidelines provide a structured approach for the planning, execution, and monitoring of development projects at the district, tehsil, and village/neighborhood levels. The guidelines underscore the importance of decentralized and participatory planning to ensure that development initiatives are responsive to the specific needs of local communities. It advocates for a decentralized planning system where local governments have the authority and responsibility to plan and execute development projects. This approach aims to bring decision-making closer to the community level, promoting more effective and context-sensitive interventions.

Local governments are required to prepare a Medium-Term District Development Plan (DDP) and an Annual Development Program (ADP). The DDP outlines the strategic development priorities for a multi-year period, while the ADP details the specific projects and budget allocations for each fiscal year. The planning cycle is designed to ensure alignment between the medium-term and annual plans, facilitating continuity and coherence in development efforts.

A key feature of the guidelines is the emphasis on inclusive and evidence-based planning. Local governments must conduct thorough needs assessments, involving extensive data collection and stakeholder consultations to identify service delivery gaps and prioritize projects. Special attention is given to engaging marginalized groups, including women, minorities, and the disabled, to ensure that development interventions are equitable and address the needs of all community members.

The guidelines specify the allocation of development funds across various sectors, such as education, health, infrastructure, and water supply. There are also earmarked funds for gender-responsive projects, youth, and marginalized groups. This structured allocation is intended to ensure that critical areas receive adequate funding and that development efforts are balanced and comprehensive.

The guidelines outline clear procedures for project identification, approval, and implementation, with an emphasis on transparency and accountability. Various committees at the district, tehsil, and village/neighborhood levels are responsible for overseeing these processes. Furthermore, monitoring and evaluation mechanisms are established to track project progress, assess outcomes, and ensure the proper utilization of funds. Recognizing the need for effective implementation, the guidelines highlight the importance of capacity building for local government officials. This includes training on technical aspects of project planning, financial management, and community engagement.

The P&D Guidelines 2015 for devolved local governments in KP represent a significant step towards achieving a decentralized and participatory development planning framework. The guidelines are comprehensive, detailing every aspect of the planning, execution, and monitoring process. The Khyber Pakhtunkhwa Urban Areas Development Authorities Act, 2020.

The Khyber Pakhtunkhwa Urban Areas Development Authorities Act of 2020 represents a significant step towards the regulated and sustainable development of urban centers within the province. The legislation establishes a framework for the creation and operation of Urban Areas Development Authorities, empowering them to play a pivotal role in shaping the future of the province's cities.

The primary objective of the Act is to enhance the quality of life for urban residents. It seeks to achieve this by promoting planned and sustainable urban growth. To this end, the Act grants Urban Development Authorities broad powers to formulate and implement comprehensive land use plans and zoning regulations. These authorities are also entrusted with the responsibility of developing and maintaining essential urban infrastructure, including transportation networks, water supply, and sanitation systems.

One of the notable features of the Act is its provision for granting autonomous status to specific development authorities. This decentralization approach empowers local authorities to make decisions tailored to the unique needs and challenges of their respective areas. The Kohat Development Authority is a prime example of this, serving as a model for other potential autonomous development authorities.

To ensure alignment with broader development objectives, the Act establishes an Urban Development Authority's Board. This body oversees the approval of development schemes and can initiate modifications as needed.

While the Act presents a promising framework for urban development, its successful implementation hinges on several factors. Effective coordination and monitoring mechanisms are essential to ensure that the authorities operate efficiently and harmoniously. Moreover, fostering meaningful public participation in decision-making is crucial for creating inclusive and responsive urban environments. Adequate financial resources are also indispensable for the development and maintenance of necessary infrastructure.

The Khyber Pakhtunkhwa Urban Areas Development Authorities Act of 2020 offers a solid foundation for urban transformation. By empowering local authorities, promoting

sustainable practices, and emphasizing the importance of public engagement, the Act has the potential to significantly improve the lives of urban residents in the province. However, its full potential can only be realized through effective implementation, ongoing evaluation, and adaptation to emerging challenges and opportunities.

1.3.1.6 Khyber Pakhtunkhwa Land Use and Building Control Act, 2019

The *Khyber Pakhtunkhwa Land Use and Building Control Act, 2019* provides the legal framework for regulating land use, urban development, and building construction across the province. Its primary objective is to ensure planned, safe, and sustainable urban growth, while controlling unauthorized construction and unplanned settlement expansion.

The Act applies throughout the province in **notified urban areas, towns, and cities**, excluding cantonments unless specifically notified by the government. It defines key terms such as land use, development, building, zoning, planning authority, and local authority. The Act also establishes the legal basis for preparation, approval, and enforcement of land use plans, zoning schemes, and building regulations at provincial and local levels.

Under the Act, designated **Local Authorities**, including City Local Governments, Tehsil Local Governments, Development Authorities, and other notified agencies, are empowered to regulate land use and building activities within their jurisdiction. Their responsibilities include approving land use plans, granting building permissions, regulating changes in land use, enforcing zoning compliance, and overseeing all construction activity to ensure conformity with approved plans.

The Act mandates the preparation of **zoning and land use plans**, classifying areas into residential, commercial, industrial, institutional, mixed-use, and other designated zones. Any land subdivision, change of land use, or building construction requires prior approval from the relevant authority according to the rules and standards set forth in the Act.

It also outlines **building control provisions**, including plot coverage, building height, structural safety, setbacks, parking, access, and provision of essential services. Local Authorities are authorized to inspect buildings, issue notices, impose penalties, seal unauthorized constructions, and order demolition of structures violating approved plans.

To ensure effective implementation, the Act provides mechanisms for appeals, penalties, and enforcement, ensuring accountability of developers and landowners. The provincial government is empowered to issue detailed rules, regulations, and guidelines to operationalize the Act and adapt it to local needs.

The *Khyber Pakhtunkhwa Land Use and Building Control Act, 2019* thus serves as a **key legal instrument** for guiding orderly urban development, promoting efficient land utilization, regulating housing density and vertical expansion, and supporting sustainable urban planning across the province.

1.3.1.7 Khyber Pakhtunkhwa Land Acquisition Rules, 2020

The KP Land Acquisition Rules, 2020 are a comprehensive framework governing land acquisition in Khyber Pakhtunkhwa, Pakistan, published by the Board of Revenue and available on their official website. These rules outline the procedures for land acquisition,

including the determination and payment of compensation. Their primary objective is to establish a clear and transparent process that ensures fairness and equity for all parties involved, particularly by providing adequate compensation to landowners whose properties are acquired for public purposes. The rules detail a step-by-step procedure for land acquisition, clarify the criteria and methodology for determining compensation, and establish a mechanism for timely payment to eligible landowners. Additionally, they designate the role of a Land Acquisition Collector, responsible for the effective implementation of these regulations. However, the enforcement and monitoring of these rules can present challenges, necessitating robust mechanisms to address non-compliance. Ensuring local compliance and raising awareness among stakeholders may also be difficult, especially when resources for monitoring and corrective actions are limited. Furthermore, the policy may require periodic updates to remain aligned with evolving local development needs and changing circumstances.

1.3.1.8 Khyber Pakhtunkhwa Local Government (Private Housing Schemes Management and Regulation) Rules 2021

The KP Local Government (Private Housing Schemes Management and Regulation) Rules 2021 are designed to oversee the management and regulation of private housing schemes in Khyber Pakhtunkhwa, Pakistan. Promulgated by the Government of Khyber Pakhtunkhwa under Section 112 of the Khyber Pakhtunkhwa Local Government Act, 2013, these rules establish a regulatory framework aimed at ensuring that private housing schemes are developed in a sustainable and planned manner while protecting the rights of all stakeholders involved. They promote transparency and accountability in the management of these schemes. The rules provide a structured mechanism for overseeing private housing projects, ensuring compliance with established guidelines and standards in planning, execution, and ongoing management.

They also prioritize community interests by encouraging the development of inclusive and safe housing schemes with well-planned infrastructure. Additionally, the rules establish transparent processes for the approval, monitoring, and management of private housing schemes, thereby enhancing accountability and trust among stakeholders while promoting the integration of environmental considerations and sustainable practices. However, the enforcement of these rules presents challenges, including the complexity of effective monitoring and the need for robust mechanisms to address non-compliance. Ensuring local-level compliance and raising awareness among stakeholders can be difficult, especially given the limited resources available for monitoring and corrective actions. Furthermore, the policy may require periodic updates to adapt to evolving local development needs and changing circumstances.

1.3.1.9 Khyber Pakhtunkhwa Urban Policy 2022-2030

The Khyber Pakhtunkhwa (KP) Urban Policy (2022-2030) is a comprehensive blueprint designed to steer the growth and management of the province's urban areas. It acknowledges

the province's diverse urban landscape by categorizing cities based on population and administrative factors, recognizing the unique challenges and opportunities presented by the Northern, Central, and Southern regions. This zonal differentiation allows for flexible and tailored strategies while maintaining a unified policy framework.

At its core, the policy envisions cities as engines of social and economic progress, aiming to create inclusive and prosperous urban spaces. It emphasizes adaptability, inclusivity, and collaboration as guiding principles. The policy seeks to create cities that are responsive to changing needs, where all residents feel valued and empowered, and where government, the private sector, and civil society work together towards shared goals.

To achieve this vision, the policy outlines three primary objectives: fostering sustainable cities, promoting social mobility and livability, and driving youth-focused economic development. Sustainable cities are envisioned as balanced ecosystems where economic growth coexists with environmental protection and social well-being. The policy emphasizes green spaces, clean air, and efficient resource management as crucial elements of this vision.

Social mobility and livability are central to creating inclusive and equitable cities. The policy aims to improve the quality of life for all residents, particularly vulnerable groups such as women, children, and people with disabilities. By enhancing access to essential services, creating inclusive public spaces, and fostering a sense of community, the policy seeks to build vibrant and resilient urban environments.

Recognizing the potential of young people, the policy places a strong emphasis on youth-focused economic development. By creating an environment that supports entrepreneurship, job creation, and skill development, the policy aims to empower young people to contribute to the province's economic growth and innovation.

Beyond these primary objectives, the policy integrates gender equality, technology, and sustainability into all aspects of urban development. By mainstreaming these cross-cutting themes, the policy aims to create cities that are just, efficient, and resilient.

A significant aspect of the policy is the introduction of Strategic City Management Plans (SCMPs). These plans are to be developed for each city on a rolling three-year basis, prioritizing local interventions and sustainable solutions in various sectors including urban governance, land use, mobility, urban design, local economic development, environmental sustainability, financial stability, and communication. The development of SCMPs involves a participatory process of public engagement, ensuring that the plans are user-friendly and reflect the community's needs. Additionally, the SCMPs include a disaster risk management response and coordination mechanism.

The policy also includes several annexures providing additional guidelines and frameworks. Annexure 1 lists the cities and tehsils by zone, while Annexure 2 details the implementation framework for the policy, emphasizing the need for periodic reviews and updates. Annexure 3 presents a linkages matrix that connects the goals, indicators, and policy clauses. Annexure 4 provides guidelines for the preparation of SCMPs, and Annexures 5 and 6 offer public space

design and community participation guidelines, respectively. Finally, Annexure 7 includes an urban sector diagnostic to inform policy decisions.

The KP Urban Policy (2022-2030) aims to create a balanced and inclusive urban development framework that addresses the diverse needs of the province. It seeks to promote sustainability, enhance social mobility, and drive economic development through comprehensive planning, public participation, and the use of technology. The policy's success will depend on effective implementation, continuous adaptation, and genuine engagement with the communities it serves.

1.3.1.10 Merged District's Annual Development Plan 2022-23

The Merged Areas Development Plan 2022-23 for Khyber Pakhtunkhwa is a detailed and comprehensive framework aimed at integrating the formerly Federally Administered Tribal Areas (FATA), and now Merged Districts, into the province. The document addresses various sectors, including agriculture, education, health, infrastructure, governance, and social welfare, each with specific projects, financial allocations, and expected impacts. The agricultural sector is a significant focus, with projects aimed at enhancing productivity through modern farming techniques, establishing soil and water testing labs, promoting indigenous crops, and developing fisheries. These initiatives aim to create a sustainable agricultural framework that supports local economies and food security.

In education, the plan includes scholarships to encourage higher education and numerous projects for constructing and rehabilitating schools in remote areas, addressing the literacy gap, and promoting education accessibility. The health sector focuses on improving healthcare infrastructure, expanding essential medical services, and combating prevalent diseases such as tuberculosis and hepatitis. Key initiatives include constructing new hospitals, upgrading existing facilities, and enhancing maternal and child health services, which are critical for improving the overall health standards of the population.

Infrastructure development is a cornerstone of the plan, with significant projects aimed at improving road connectivity, water supply, and energy infrastructure. This includes the construction and upgrading of roads to enhance connectivity within the merged areas and with the rest of KP, and the implementation of new water supply schemes to ensure access to clean drinking water. These projects are designed to facilitate economic activities, improve living standards, and create a robust infrastructure framework that supports sustainable urban development.

Governance and social welfare projects within the plan focus on strengthening local governance institutions and providing social safety nets for vulnerable populations. Initiatives for capacity building aim to improve service delivery, while social welfare programs provide financial assistance and skill development opportunities, fostering social cohesion and supporting economic mobility. The urban planning components emphasize creating sustainable and resilient urban environments by integrating economic, social, and environmental considerations. Projects aim to develop urban areas through infrastructure improvements, enhanced public services, and the promotion of economic activities, while

sustainable practices such as efficient water management and renewable energy projects are highlighted.

The document also stresses the importance of community engagement in the planning process, ensuring that development meets local needs and preferences. Financial allocations are detailed, highlighting the investment required for each sector and the sources of funding, which include a mix of local and foreign resources. Effective implementation mechanisms are crucial, and the plan discusses coordination among various government departments and stakeholders to ensure smooth execution.

However, potential challenges and issues may affect the successful implementation of the plan. These include the capacity for effective implementation, requiring robust administrative capabilities, resource allocation, and coordination. Establishing strong monitoring and evaluation mechanisms is essential to track progress and address bottlenecks promptly. Ensuring the long-term sustainability of projects, especially in infrastructure and agriculture, requires continuous support and maintenance. Security concerns, given the region's history of conflict, could also pose significant challenges to implementing development projects.

1.4 Context & Rationale for Land Use Planning

Historical planning of Master Plans of Cities/Towns in Khyber Pakhtunkhwa involved drawing plans in isolation from their hinterland, which was a piecemeal and isolated procedure, and consequently did not yield results. Recognizing the situation, the Provincial Government has rightly opted to adopt an integrated and holistic Land Use Planning approach for the development of all parts of the province. The Land Use Plan will serve as a policy document meant for the integrated, coordinated, systematic planning and uniform spread of development activities. It also aims to generate employment for the rural and suburban populations, thereby reducing rural-urban migration. It would help establish a hierarchy of settlements and the development of satellite, intermediate, secondary, and industrial towns as focal points for the future, catering to rural areas and small towns.

The plan will focus on creating, inducing, and facilitating sustainable development, optimizing land and other physical resource use, enhancing provincial income, increasing overall activity, and ensuring a balanced distribution of infrastructure and services. The Land Use Plan must serve as a guide for all the Provincial Government, Urban Policy Unit, District Governments, and TMAs to run integrated as well as coherent development programs.

1.5 Study Area Profile

1.5.1 Regional History

Prior to formal colonial administration, the region was characterized by a decentralized tribal policy. Pashtun tribes, such as the Afridi and Shinwari, constituted the predominant socio-political units. These tribes adhered to a customary legal framework, Pashtunwali, which regulated social relations, property rights, and conflict resolution. The absence of a centralized authority fostered a degree of autonomy and resilience among these communities, though it also rendered them vulnerable to external pressures and incursions.

The 19th century witnessed a profound transformation of the region with the expansion of British imperial interests. The Khyber Pass emerged as a critical strategic asset for securing British India's northwestern frontier. Consequently, the British implemented a system of indirect rule, establishing the Khyber Agency as a buffer zone between colonial territory and the turbulent tribal areas. This administrative construction aimed to balance the imperatives of colonial control with the preservation of tribal autonomy; a strategy known as the 'frontier policy'.

The Khyber Pass, a formidable geographical feature, served as a conduit for trade, migration, and cultural exchange. However, its strategic importance also made it a contested space. The region experienced recurrent armed conflicts between British forces and Pashtun tribes, as exemplified by the Pashtun Rebellion of 1897. These conflicts were often rooted in resistance to colonial encroachment on tribal sovereignty and resource exploitation.

The partition of the Indian subcontinent in 1947 resulted in the incorporation of the Khyber Agency into the newly formed Pakistan. The region remained under the administrative purview of the Federally Administered Tribal Areas (FATA), operating under the controversial Frontier Crimes Regulations (FCR). This legal framework, a colonial relic, granted extensive powers to political agents, marginalizing tribal institutions and hindering socio-economic development.

The post-independence period was marked by a complex interplay of internal and external factors. The Cold War, the Soviet invasion of Afghanistan, and the subsequent rise of Islamist militancy had profound repercussions for the region. Khyber District became increasingly porous, facilitating cross-border movement of people, arms, and ideologies. This, coupled with the complex tribal dynamics and the absence of effective governance, created a fertile ground for insurgency and extremism.

The merger of FATA into Khyber Pakhtunkhwa province in 2018 represented a significant political and administrative reform. This process aimed to mainstream the region, extend the writ of the state, and accelerate development. However, the challenges of integrating a historically marginalized and conflict-ridden region into the mainstream are formidable. Issues of governance, security, and economic development remain complex and multifaceted.

1.5.2 District Study Profile

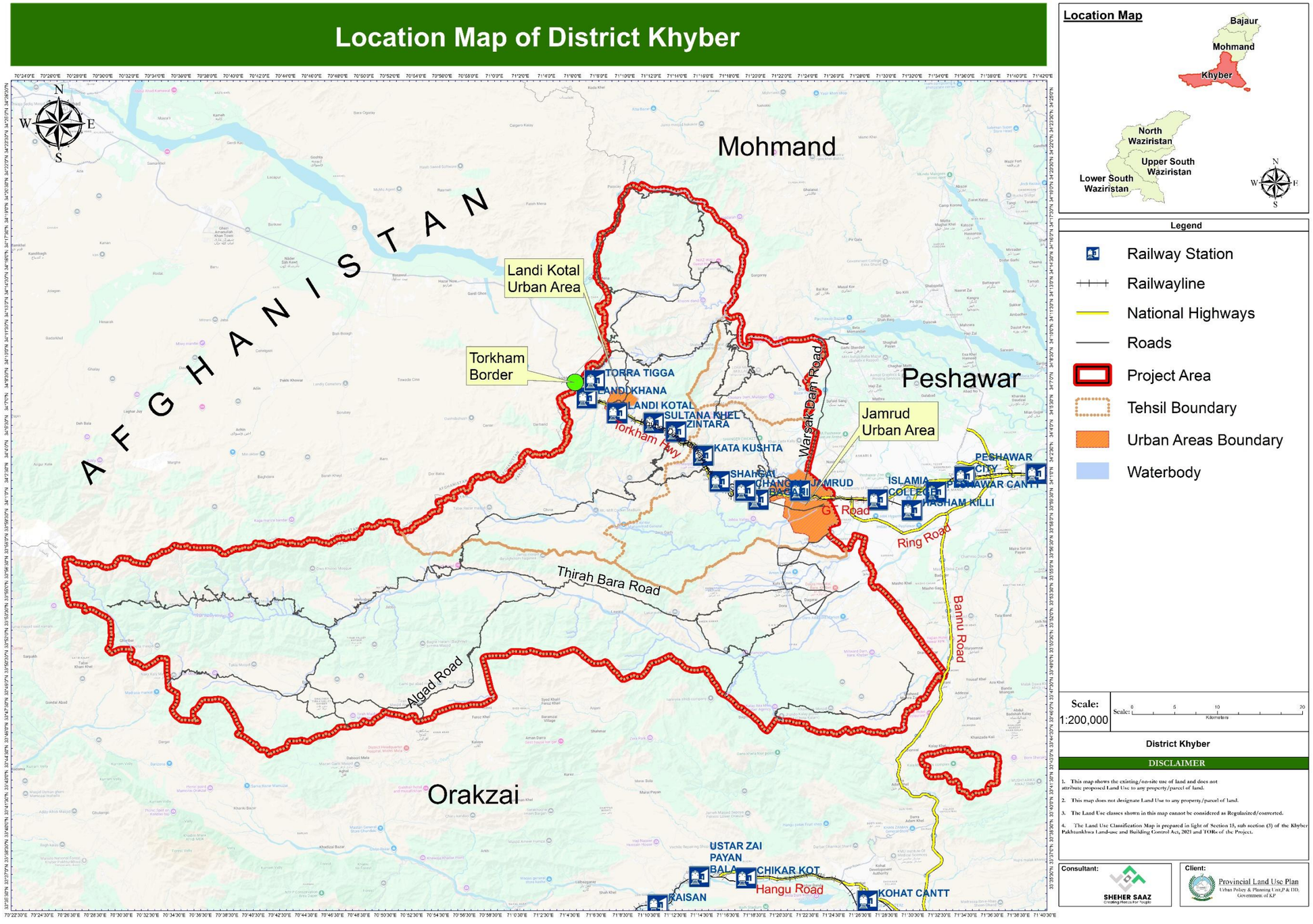
Formerly a part of the Federally Administered Tribal Areas, Khyber District is now integral to Khyber Pakhtunkhwa Province. Situated within the Peshawar Division, it spans an area of 2,576 square kilometers and is home to a population exceeding 1,146,267, with Pashto as the predominant language. The district's administrative framework is divided into four tehsils: Bara, Jamrud, Landi Kotal, and Mula Gori. A hierarchical governance structure operates, with Deputy Commissioners overseeing the district and Assistant Commissioners managing tehsils, complemented by Village and Neighborhood Councils. Renowned for its historical and strategic importance, Khyber District is synonymous with the iconic Khyber Pass, a centuries-old conduit for trade, migration, and conquest. The district's rich cultural tapestry is woven

from diverse tribes, including Afridi, Shinwari, Mulagori, and Shalmani. Its allure extends to tourists drawn to landmarks like Bab-e-Khyber, Ali Masjid Fort, and the Khyber Train Safari.

1.5.3 Geographical Location

Khyber District is strategically positioned in northwestern Pakistan, sharing a border with Afghanistan and encompassing the historical Khyber Pass. Situated between latitudes 33.5° to 34.1° North and longitudes 71.2° to 71.7° East, the district's rugged terrain is characterized by mountains, hills, and valleys. To the east lies Peshawar District, to the north Mohmand District, to the south Kurram District, and to the southwest Orakzai District. The Khyber Pass, a vital trade and invasion route, traverses the western border with Afghanistan. Khyber District benefits from its proximity to Peshawar, the provincial capital, a significant economic and administrative hub for the region.

Map 2: Location Map of the Project Area



1.5.4 Physical Characteristics

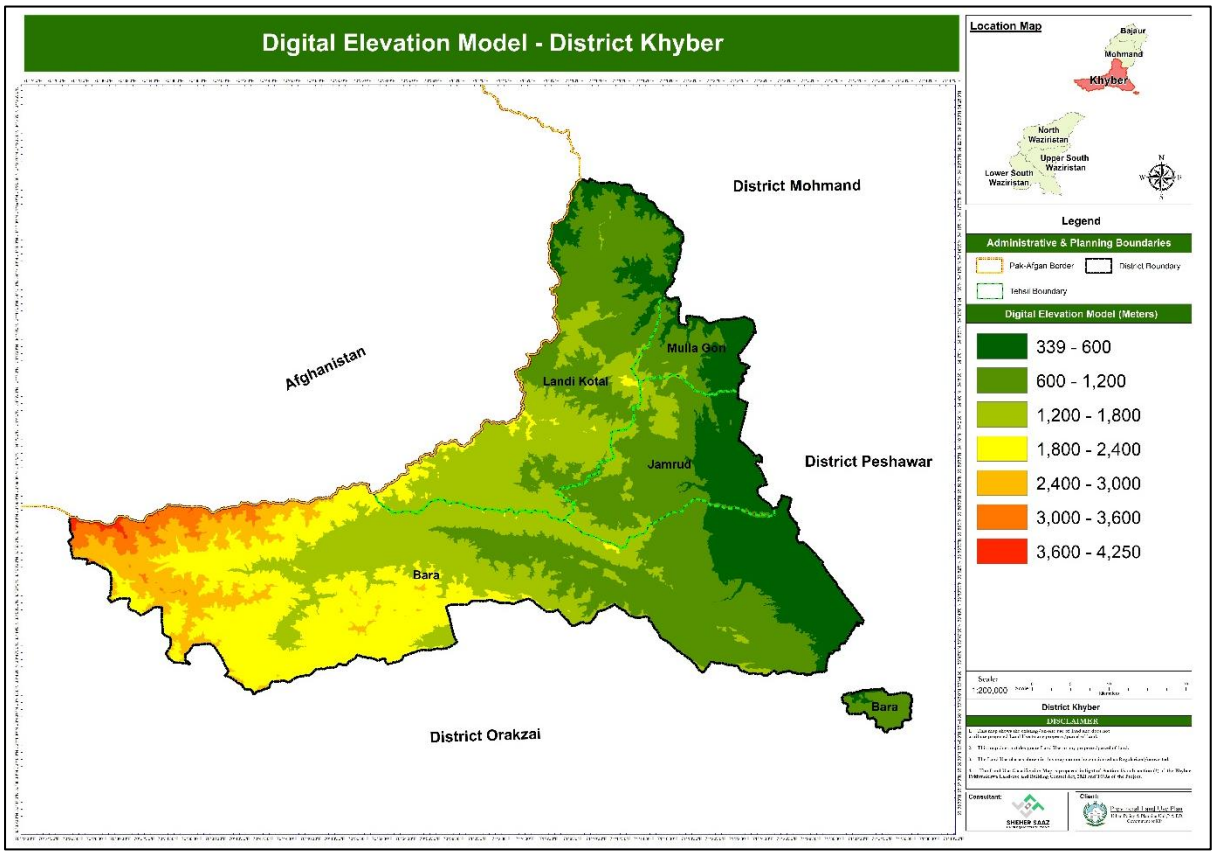
1.5.4.1 Topography (Elevation)

Khyber District is characterized by a precipitous and rugged terrain, dominated by the formidable Spin Ghar mountain range, a sub-range of the Hindu Kush. This mountainous topography is dissected by a dense network of fluvial landforms, including the Bara River and its tributaries, resulting in a highly articulated and dissected landscape.

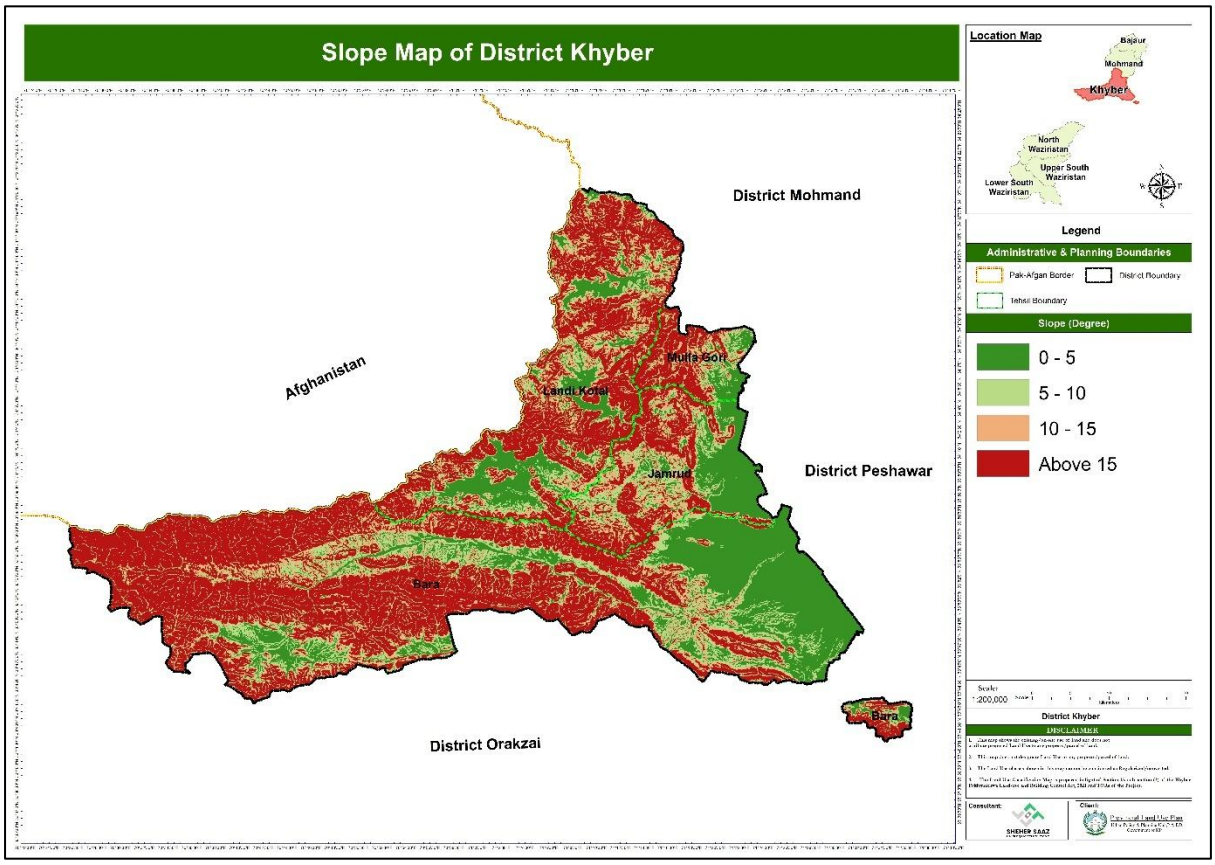
The district's position at the tectonic convergence of the South Asian and Central Asian plates has engendered a complex geological structure and a pronounced susceptibility to seismic hazards. The Khyber Pass represents a significant geomorphic feature and a crucial transportation corridor, as well as a geopolitical boundary.

From a spatial planning perspective, the district's topography presents both challenges and opportunities. The steep slopes and rugged terrain impose constraints on development density and infrastructure, necessitating site-specific engineering solutions. Conversely, the district's natural attributes offer potential for eco-tourism and conservation initiatives. The district's strategic location at a regional crossroads presents opportunities for borderland development and economic cooperation.

Map 3: Existing Digital Elevation Model Map - District Khyber



Map 4: Slope Map - District Khyber

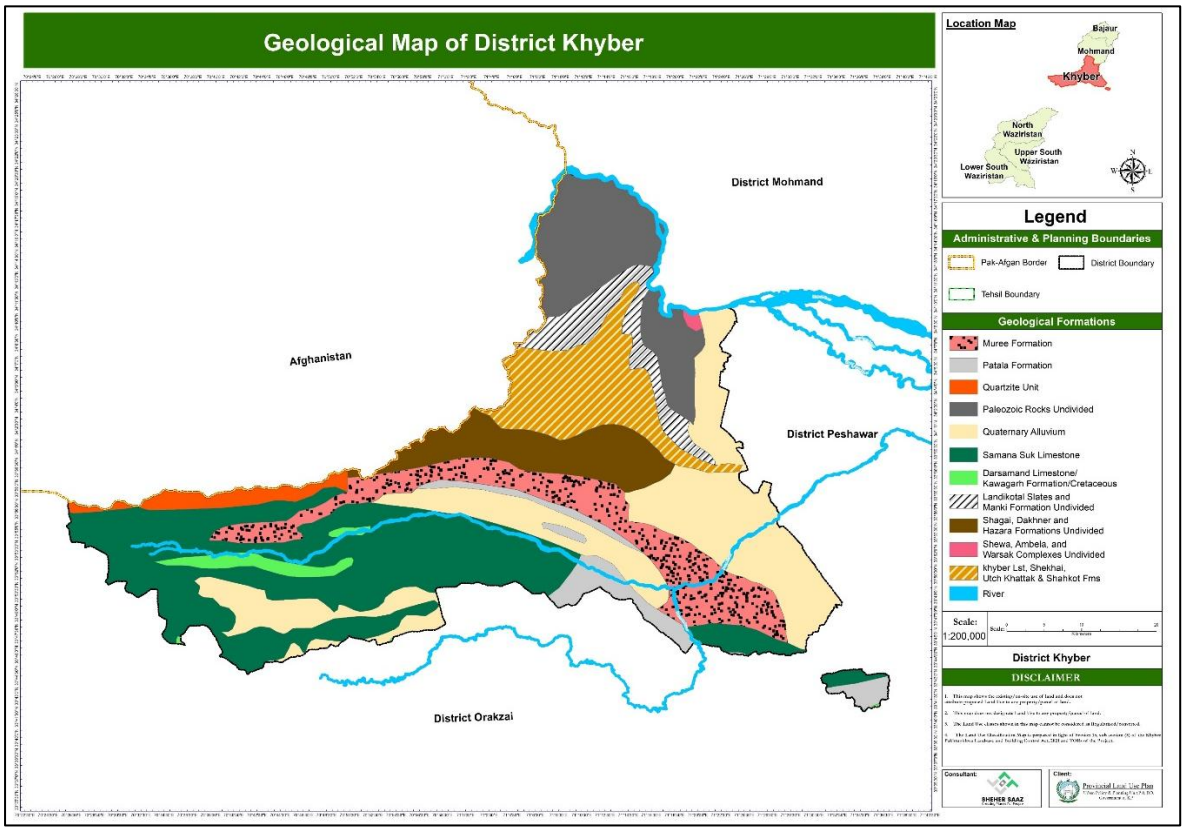


1.5.4.2 Geology

Khyber District, located in northern Pakistan and bordering Afghanistan, spans 2,576 km² with a population of nearly 987,000. Its rugged, hilly terrain includes valleys (Rajgal, Maidan, Bara, Bazaar) and plains (Khajuri, Bara), while major rivers such as Bara, Chora, and Kabul drain into the Peshawar Valley. Forests cover only 8.22% of the area. Strategically important, Khyber serves as one of Pakistan's busiest trade routes, with potential for a Free Trade Zone, olive cultivation, and revival of the Khyber Safari train to promote tourism.

Geologically, the district lies at the junction of the Northwest Himalayan fold-thrust belt and the Himalayan Crystalline Nappe, forming part of the Khyber-Hazara Metasedimentary Fold and Thrust Belt. This belt consists of Precambrian to early Mesozoic sediments (slates, phyllites, quartzite, marbles) intruded by mafic dykes, sills, and granitic rocks like the Ambela pluton and Warsak granite. The region is marked by tight folds and multiple thrust faults, reflecting significant tectonic activity.

Map 5: Existing Geological Map - District Khyber



1.5.4.3 Climate

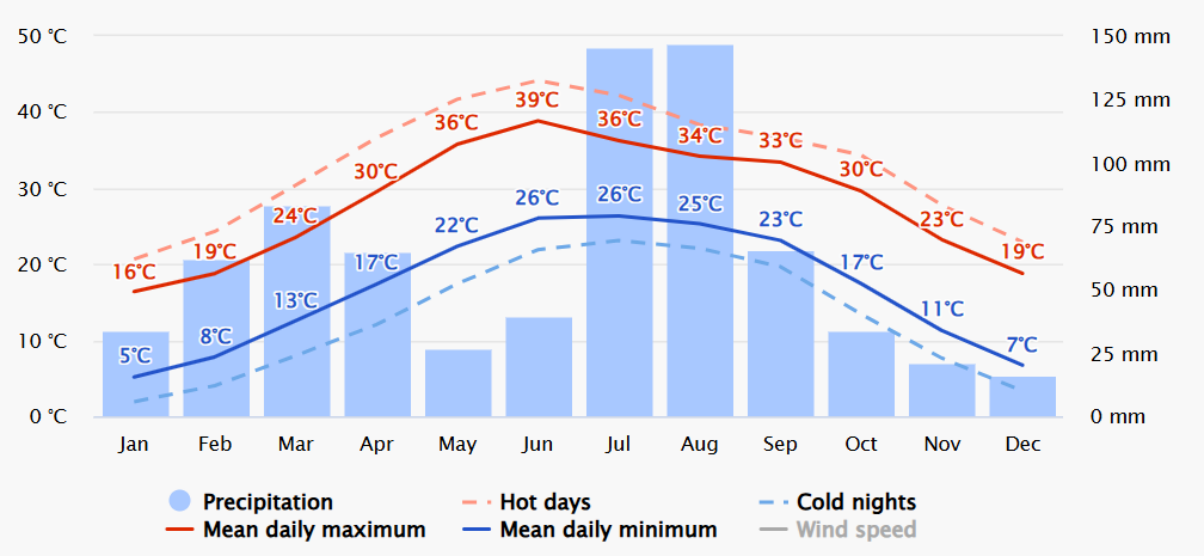
The climate of Khyber District, now part of Khyber Pakhtunkhwa province in Pakistan, is characterized by its diversity, influenced by the region's varying topography and geographical features. The district experiences a mix of continental and subtropical climates, resulting in distinct seasons throughout the year. Here is a short note on the climate of Khyber District:

- **Summers (April to September):** Khyber District experiences a hot and dry climate during the summer, with daytime temperatures typically ranging from 30°C to 40°C. The heat is most intense in June and July, especially in low-lying areas and valleys
- **Monsoon Season (July to September):** Khyber District receives the majority of its annual rainfall during the monsoon season, which typically lasts from July to September. The monsoon brings relief from the scorching heat and contributes to the region's agriculture. However, heavy downpours during this period can also lead to flash floods and landslides, especially in the mountainous areas.
- **Winters (October to March):** The winter season in Khyber District is relatively mild, with temperatures dropping to cooler levels. In the higher elevations and mountainous areas, temperatures can dip below freezing, resulting in snowfall. However, in the lower valleys, winters are generally pleasant, with daytime temperatures ranging from 10 to 20 degrees Celsius (50 to 68 degrees Fahrenheit).

- **Spring and Autumn:** Spring and autumn are transitional seasons in Khyber District, with moderate temperatures and pleasant weather. These seasons are considered the best time to visit the region, as the weather is neither too hot nor too cold, making it ideal for outdoor activities and tourism.
- **Diverse Microclimates:** Due to the district's varied topography, Khyber District exhibits diverse microclimates. The climate can differ significantly between the valleys and the mountainous areas, with variations in temperature, rainfall, and humidity levels.

The chart below shows the typical yearly climate pattern for the area. Temperatures rise steadily from January, peaking in June–July with very hot days (around 39–40°C) and warm nights. After August, temperatures gradually drop toward winter. Rainfall is highest in July and August, showing a strong monsoon season, while the rest of the year is relatively dry. The coldest months are December–January, when nights drop to around 5–7°C. Overall, the chart highlights a hot summer, a wet monsoon, and a cool dry winter.
The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for khyber. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years. Monthly precipitations above 150mm are mostly wet, below 30mm mostly dry.

Figure 2: Climate Data of Khyber District

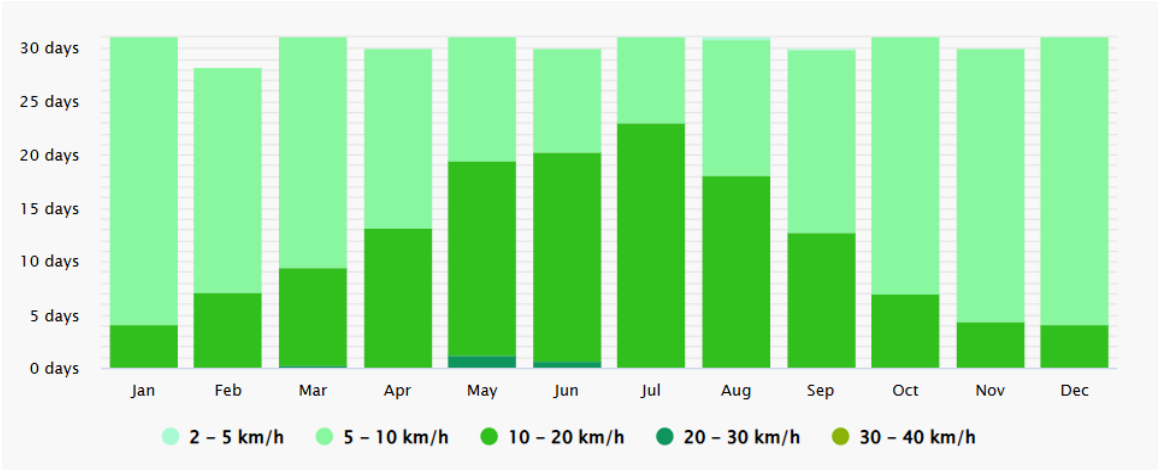


Source: meteoblue.com

This chart represents the number of days each month experiences different wind-speed ranges. Light winds (2–10 km/h) dominate throughout the year, especially in winter months. Moderate winds (10–20 km/h) increase in spring and peak in May–August, while stronger winds (20–30 km/h) occur mainly in early summer, with July showing the highest frequency.

Very strong winds (30–40 km/h) are rare and appear briefly around May. Overall, wind activity intensifies in summer and remains mild during the rest of the year.

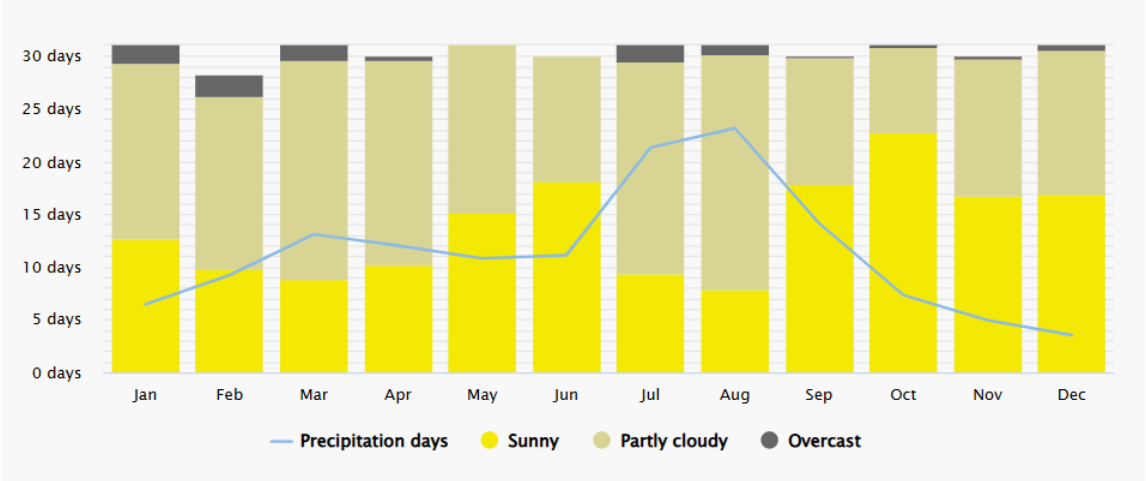
Figure 3: Average Wind speed - District Khyber



Source: meteoblue.com

In District Khyber, the weather is defined by a distinct rainy season in late summer, with **July and August** being the wettest and cloudiest months; during this time, it rains frequently (over 20 days a month), and partly cloudy skies dominate. In contrast, the autumn and early winter months are much drier and clearer. **October** stands out as the sunniest month of the year with over 20 clear days, while **November and December** see the least amount of rainfall. throughout the rest of the year, "partly cloudy" weather is the most common condition, while heavy overcast days are quite rare and mostly occur in winter.

Figure 4: Cloudy, sunny, and precipitation days

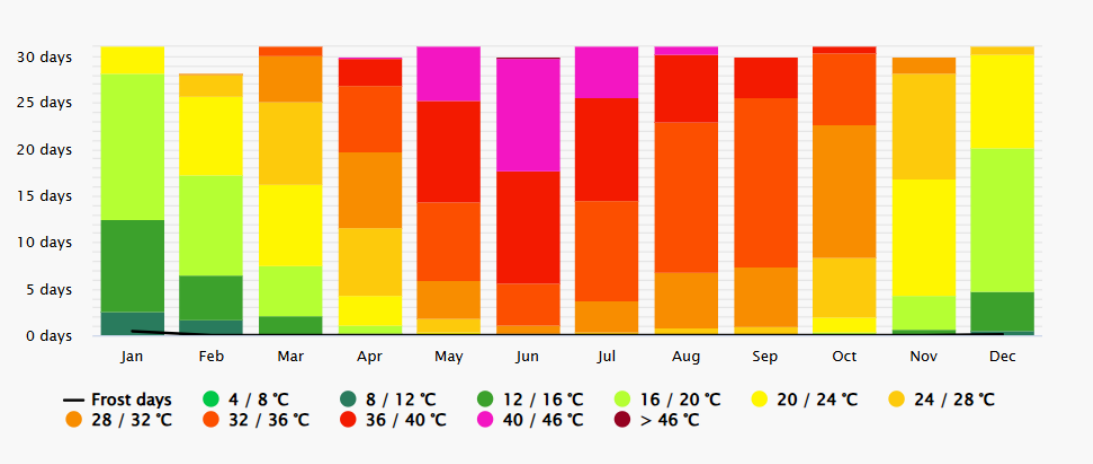


Source: meteoblue.com

The temperature in District Khyber varies drastically between extreme summer heat and mild winters. **June** is the hottest month of the year, with a significant number of days reaching scorching temperatures between **40°C and 46°C** (shown in pink). The heat remains intense

throughout May, July, and August, where most days stay very hot. In contrast, **January and December** are the coolest months, characterized by mild daytime temperatures usually between **12°C and 20°C**, though slight frost is possible. The months of **November and March** offer the most moderate, comfortable transition weather between the two extremes.

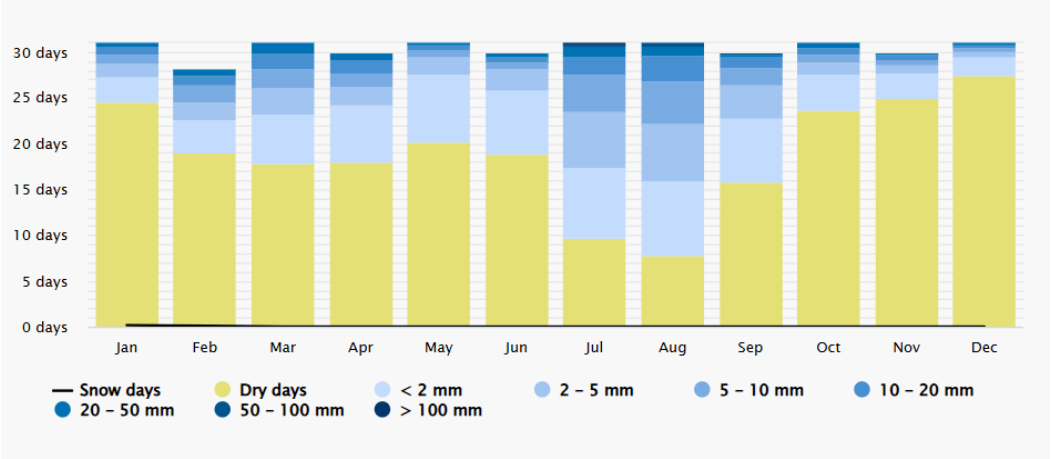
Figure 5: Maximum temperatures in Khyber



Source: meteoblue.com

The rainfall in District Khyber is concentrated heavily during the late summer, making August the wettest month, with the fewest dry days and the highest number of days featuring heavy to extreme rainfall (dark blue segments). July and March also contribute significantly to the total rainfall, featuring moderate to heavy rain. Conversely, the months of November and December are the driest, typically seeing over 25 dry days each. Throughout the rest of the year, light precipitation (less than 2 mm) is the most common form of rain, while days with snow are virtually non-existent.

Figure 6: Precipitation amounts analysis in khyber



Source: meteoblue.com

The wind rose chart for District Khyber clearly shows that the prevailing wind comes overwhelmingly from the West (W). This Westerly wind is the most frequent direction by far, as indicated by the long, wide spoke. Although these winds are frequent, they are generally light to moderate in speed, mostly falling within the 2 to 20 km/h range. Winds from all other directions, such as the North or the South, occur much less often and contribute very little to the overall wind pattern.

Figure 7: Wind Rose in khyber



Source: meteoblue.com

1.5.4.3.1 Climate Change

The Earth's climate has historically changed over long periods due to various natural factors such as changes in the Sun's strength, the Earth's orbital shape and tilt, continental positions, and atmospheric composition. However, there is now compelling evidence that greenhouse gas (GHG) emissions from human activities are significantly raising the Earth's temperature and altering the climate. Projections indicate that these emissions will continue to rise in the coming decades, leading to a substantial increase in global temperatures. This poses profound risks to both the natural environment and human society worldwide.

Climatic variations are crucial for the development and survival of natural ecosystems and human societies. However, climate change introduces additional stress on these natural systems. It is one of the major challenges of the 21st century, adversely affecting sustainable development, livelihoods, health, shelters, and, in some cases, human lives.

A study by Helvetas Pakistan, in cooperation with Swiss Development and Cooperation (SDC), identifies Khyber Pakhtunkhwa (KP) as a region divided into nine agro-ecological zones based on climate, rainfall, temperature, altitude, soil, and topography. This zonal distribution is used to conveniently identify potential future impacts from external forces such as climate change. KP, and specifically District Khyber, is highly vulnerable to the negative impacts of climate change.

According to the National Disaster Management Plan (NDMP) 2012, District Khyber faces various climate hazards, each with different levels of risk:

Table 1: Natural Hazards Vulnerability Assessment

District	Flood Risk	Landslide Risk	Earthquake Risk	Cyclone Risk	Drought Risk	GLOF Risk
Khyber	3	4	3	1	2	1
Legend	**5 (Very High)**	**4 (High)**	**3 (Medium)**	**2 (Low)**	**1 (Very Low)**	

Source: National Disaster Management Plan - 2012

These hazards require careful consideration and should be addressed through simulation modelling and projections to mitigate their potential impact effectively. Proactive measures and robust planning are essential to enhance the resilience of District Khyber to these climate hazards and ensure sustainable development in the face of climate change.

1.5.4.3.2 Recommended Plan of Action

District Khyber, with its mountainous regions, fertile valley areas, and dense natural forests, is further exposed to climate change and global warming effects. Uncontrolled urbanization in such towns as Landi Kotal, Jamrud, and Bara, alongside the excessive depletion of natural resources, has increased environmental degradation at a faster pace. Increased temperatures, unpredictable rainfall, and recurring droughts are already impacting the region's agriculture, water resources, and forest conditions, thus posing a threat to biodiversity and local livelihoods.

Considering Khyber's strategic ecological value and socio-economic reliance on natural resources, it is imperative to increase the district's climate shock resilience, contain anthropogenic emissions of carbon, and enhance sustainable land and resource use practices. The below suggested action plan provides focused strategies to tackle these pressing environmental issues in the context of District Khyber specifically.

1.5.4.3.3 Climate Resilience and Pollution Elimination

- **Promote Low Carbon Footprints:** Advance area planning to enable and encourage low carbon footprints for residents through denser housing forms. Balance this with consideration for low carbon construction materials, such as sustainably sourced wood framing or mass timber.
- **Flexible Building Use:** Encourage the reuse and flexible use of buildings to reduce the need for demolition and minimize waste.
- **Circular Economy Initiatives:** Identify spaces on both public and private properties to enable neighbourhood and city-scale materials management, supporting a circular economy, zero waste initiatives, and local job production.
- **Whole Systems Land Use Planning:** Establish a 'whole systems' approach to land use planning, including watershed scale planning, to protect, restore, and maintain key ecological features and areas.
- **Environmental Setbacks:** Establish appropriate environmental setbacks to limit development around important water bodies.
- **Sensitive Zones Protection:** Designate land use and permit requirements for ecologically sensitive zones to protect and enhance ecological functions.
- **Urban Soil Protection:** Protect urban soil to support the urban forest and hydrological cycle.
- **Natural Areas Management:** Ensure that all types of natural areas have management plans and conservation guidelines, developed and implemented in collaboration with cultural norms.
- **Expand Urban Forest:** Increase the urban forest and expand the blue-green network to enhance biodiversity and climate resilience.
- **Enhance Biodiversity:** Identify new and enhance existing biodiversity hotspots and corridors and promote environmental regeneration areas.
- **Urban Forest Health:** Retain and grow a healthy and resilient urban forest using city tools such as zoning, servicing, and subdivision bylaws, and upgraded street designs to provide more space for permeability, quality soil, and increased tree canopy.

1.5.4.3.4 Greening of Cities

Urbanization in in District Khyber, especially in Landi Kotal, Jamrud, and new urban settlements of Bara, has led to the widespread destruction of natural cover, which has been replaced by concrete structures. This change has exacerbated the urban heat island effect, lowered air quality, and decreased the availability of public green spaces. Considering the semi-arid nature of the region, its vulnerable ecosystems, and the socio-economic dependency of the population on natural resources, an overarching and context-oriented greening approach is imperative.

1.5.4.3.4.1 Annual Tree Plantation Plan

To enhance the green infrastructure in District Khyber, an Annual Tree Plantation Plan should be developed for urban and peri-urban areas. This comprehensive plan will identify suitable sites across all four urban centers of the district, specifying the proposed number of trees to be planted at each location. It will focus on native species, detailing their ecological and health benefits, and ensuring the availability of these plants. Additionally, the plan will include a robust monitoring mechanism to guarantee the sustainability of the plantation efforts, ensuring that planted trees are nurtured and maintained for long-term success. This initiative aims to create greener urban environments, improve air quality, and provide recreational and health benefits to the community.

1.5.4.3.4.2 Multifunctional Urban Green Spaces

Ensure that urban green spaces serve multiple functions by utilizing all available vacant lands and urban infrastructure (housing schemes, schools, colleges, universities, public buildings, etc.) for education, recreation, relaxation, health benefits, enhanced air quality, noise reduction, and long-term climate benefits.

1.5.4.3.4.3 Parks Management Plan

To enhance the recreational spaces and green infrastructure in District Khyber, a comprehensive Parks Management Plan should be developed. This plan will focus on improving existing parks and establishing new ones in the main urban centers of the district. Key components will include robust tree plantation initiatives, aiming to increase green cover and improve air quality. Regular monitoring by the Environmental Protection Agency (EPA) will be integral, particularly for projects that require Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) in urban and peri-urban areas, ensuring compliance with environmental standards and fostering sustainable development.

1.5.4.3.4.4 Forest Fire Management Plan

The Forest Fire Management Plan must be developed as a priority to protect and preserve the district's forested areas. This plan will address the critical need for preventive measures, early detection systems, and effective response strategies to mitigate the risk of forest fires. By safeguarding the district's forests, the plan will contribute to the overall ecological health, maintain biodiversity, and support the livelihoods of local communities dependent on these natural resources.

1.5.4.4 Hydrology and Surface Water Resource

The primary water resource in the Khyber District is surface water, including floodwater and minor perennial streams, which are predominantly used for agriculture and account for over

90% of the total water supply. Groundwater is scarce and has been extensively extracted for multiple purposes, leading to a rapid decline in the water table[1].

Despite its high potential for farming, spate irrigation has received minimal investment in the Khyber District. There has been a lack of significant efforts to develop sustainable spate irrigation systems, which could help recharge groundwater and mitigate the impact of floods. As a result, flash floods continue to damage infrastructure and agriculture in the region.

1.5.4.4.1 Ground Water

Ground water is the main source of drinking water, and it is also used for irrigation. Around 42% of the households in the Khyber District use open wells and hand pumps for their drinking. The average depth to the water table was noticed to be 117 feet in Khyber District. Due to the uncontrolled abstraction of ground water resources, the water table in this area is lowering very rapidly. Overuse of water has caused many existing waters supply schemes to stop functioning in Khyber District. Due to the lowering of the water table, people could not afford to bore at their houses, therefore, the wells are dug at one or two places in a village, and all the community shares these wells.

The northwestern border areas of Pakistan have been facing regional instability and poor governance that have caused the ecological crisis. The ecological changes have resulted in reduced recharge to aquifers and the drying up of many springs, streams, and perennial water courses. Thus, groundwater as the major source of water in most areas. Without any alternate source of water for domestic purposes, the abstraction rate of ground water is increasing. If 42% of the households use ground water for drinking as mentioned above, this means that if not all of these households but still a major portion of them would be using ground water for domestic uses as well. Also, around 11% of the total cultivated areas, which is 2697 hectares, depend on ground water for irrigation.

1.5.4.4.2 Surface Water

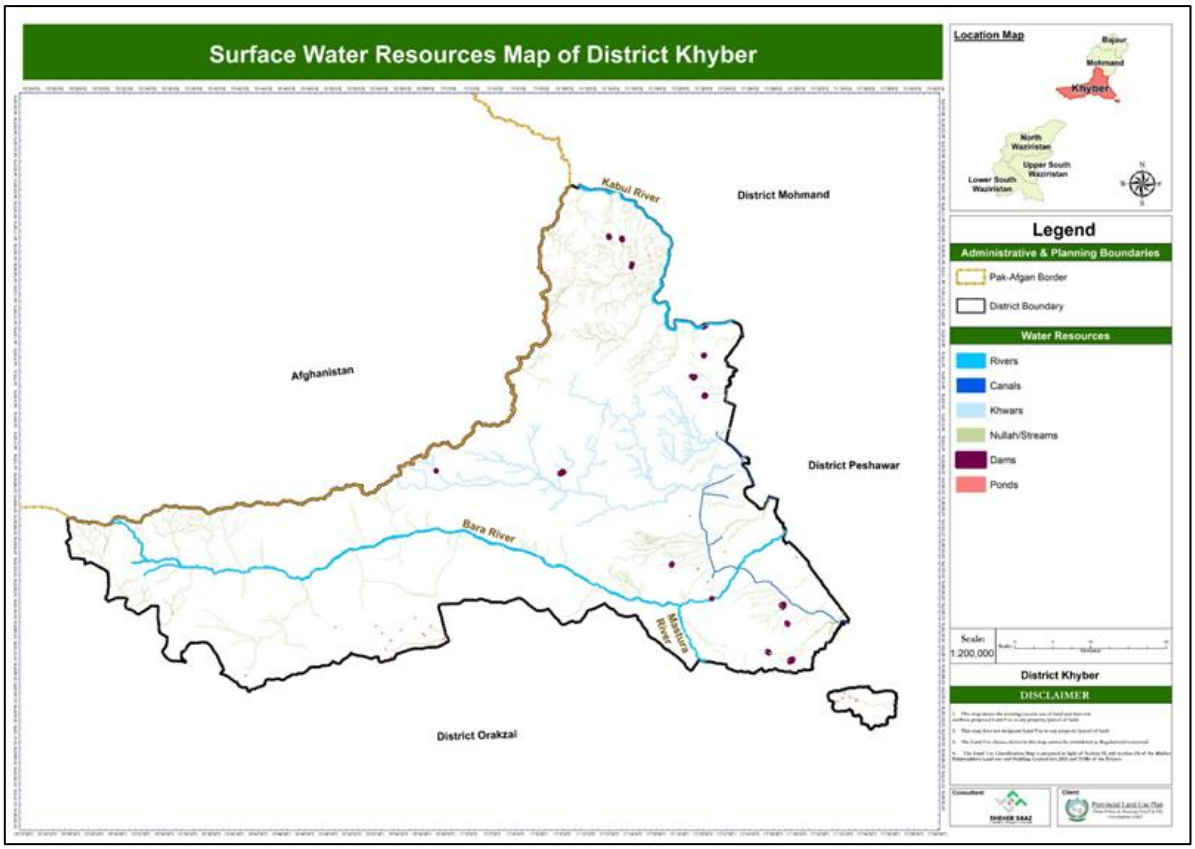
Bara River, which flows in the southern part of the Khyber District, is the main source of irrigation for the cultivated land in the area. Another stream that passes through Jamrud is Jabba Khawar. This stream is the second largest source for irrigation of the cultivated lands in Jamrud Tehsil.

The Bara River Canal, which originates from the Bara River, also provides water for irrigation in the Khyber District. The total length of this canal is 2,680 meters and it has a discharge rate of 276 cusecs10. Out of the total cultivated area of 24,518 hectares in the Khyber District, an area of 9,050 hectares (36.91 %) is irrigated from these sources of surface water.

[1] Technical Studies of Water Resources in FATA, IUCN Pakistan, SDC and FATA Environment Cell, https://pcrwr.gov.pk/wp-content/uploads/2020/Water-Management-Reports/FATA-water-studies.pdf

The total surface water available in Khyber District is 802.5 million cubic meters. Less than 50% (385.3 million cubic meters) is used for irrigation, while most of the water (417 million cubic meters) flows out of the district and drains into the Kabul River.

Map 6: Surface Water Map - District Khyber



2 CHAPTER II: POPULATION

2.1 Introduction

Demography, the scientific investigation of population characteristics, forms the basis for creating urban environments that are both sustainable and equitable. It provides invaluable data for informed decision-making by exploring the complexities of population size, age structure, income distribution, and household composition.

The analysis of age distribution allows for the strategic allocation of resources. Cities with many young adults require a strong emphasis on educational facilities and recreational amenities, while cities with a growing senior population need to prioritize accessible housing and healthcare infrastructure. Demographic data serves as the fundamental basis for evidence-based planning in these situations.

Moreover, demographic analysis promotes a mutually beneficial interaction across different planning areas. Demographic data shows that densely populated places with strong public transit networks can motivate people to use public transportation instead of private vehicles. This shift can help reduce air pollution and support environmental sustainability. Moreover, comprehending population growth patterns enables preemptive strategizing for water infrastructure, such as optimizing distribution networks and implementing sustainable measures like rainwater collecting or greywater recycling.

Demographic data is essential for attaining both inclusive and sustainable development. Demographic analysis enables planners to identify and address disparities in access to resources such as healthcare, education, and transportation infrastructure across different geographical areas. This study helps promote fair and balanced development across all socio-economic levels. Moreover, demographic trends serve as a prognostic instrument. Proactive infrastructure planning can ensure the city remains adaptive and caters to the growing demands of its citizens by predicting population expansion or shifts in age structure.

2.2 Existing Demographic Profile

2.2.1 Urban/Rural Distribution of Population from 1951 to 2023

The 2023 census places the total population of Khyber District at 1,146,267. However, detailed breakdowns by age, sex, and geographic distribution are currently unavailable.[2] Table below provides an analysis of the intercensal growth rates in Khyber District from 1951 to 2023, revealing a dynamic demographic landscape.

The earliest period, 1951-1961, establishes a baseline growth rate of 3.3%.[3] This initial growth likely reflects natural population increase, influenced by factors such as improved healthcare and post-colonial socio-economic changes. The following decade, 1961-1972, exhibits a

[2] Census of 2023, Bureau of Statistics Pakistan
[3] Census of 1998, Bureau of Statistics Pakistan

decline in growth, reaching 2.0%. The following census period of 1972-1981 presents an anomaly with a negative growth rate of -3.4%. This sharp decline could be attributed to increased emigration due to political unrest, law and order or security situation, natural disasters, or economic hardships. Alternatively, methodological discrepancies in data collection between censuses cannot be entirely ruled out.

The subsequent period, 1981-1998, marks a return to sharp growth, at a significantly higher rate of 3.9%. The population in 1998 jumped 547,360 people from 284,000 people in 1981. This suggests a potential stabilization of the population after the previous decade's decline, indicative of improved living conditions leading to renewed natural increase or the return of migrants who had previously left the district. The second-to-last census period, 1998-2017, represents a 16.2% increase from 547,360 people in 1998 to 984,246 individuals enumerated in the 2017 census. The 2017 data further indicated a sex ratio of 51.26% male, 48.73% female, and a negligible 0.01% transgender population.[4] The average annual growth rate between 1998 and 2017 was 3.14%, while the rate between 2017 and 2023 dipped to 2.58%, representing a decrease of 0.56%.

There has been a general reduction in the average size of households, from 9.9 in 1998 to 6.87 in 2023 Table below which points towards a reduction in family sizes and fertility levels. Expanded access to education and health has promoted increased awareness and use of family planning measures and substantial out-migration, especially among the working-age group in search of employment opportunities elsewhere, has slowed the natural growth momentum. These combined forces represent a demographic transition in the district from high growth typical of traditional rural populations to more stabilized population dynamics.

Khyber District encompasses a total land area of 2,576 km², resulting in a current population density of 445 individuals per km^2. This represents a significant increase from the 2017 density of 382 people per km² and the 1998 density of 212 people per km². The data regarding average household size is available only for the last three censuses and has shown a decline, dropping from 9.9 in 1998 to 8.49 in 2017 and then to 6.87 according to the 2023 census.

Table 2: General Demographic Statistics of Khyber District and Growth Trend

Khyber District – Area: 2,576 km^2							
Year	*Population*	*Population Increase*	*Average Growth Rate (%)*	*Increase/ Decrease (+/-)*	*Average Household Size*	*Increase/ Decrease (+/-)*	*Population Density (km^2)*
1951	217,000		-	-			84
1961	301,000	84,000	3.3	-			117
1972	378,000	77,000	2.0	-1.3			147
1981	284,000	-94,000	-3.4	-1.4			110
1998	547,360	263,360	3.9	0.5	9.9	-	212

[4] Census of 2017, Bureau of Statistics Pakistan

2017	984,246	436,886	3.14	-0.76	8.49	-1.41	382
2023	1,146,267	162,021	2.58	-0.56	6.87	-1.62	445

Source: Census Report of 1998, 2017 and 2023, Pakistan Bureau of Statistics

The analysis of the 2017 census, at the district level, reveals that the bulk of the population resides in rural regions, with rural residents making up 90.1% (886,789 people) and urban residents accounting for 9.9% (97,457 people). In 1998, the rural population was recorded as 492,367, while the urban population was recorded as 54,363. Notably, these figures correspond to the present distribution of 90.1% for rural population and 9.9% for urban population. The rural population in the entire district experienced an average growth rate of 3.14% from 1998 to 2017, slightly higher than the average growth rate of the urban population, a rate of 3.11%. The average household size in rural parts of the entire district is 8.55, whereas in urban areas it is 7.99, indicating a similar trend.

2.2.2 Tehsil Wise Population Distribution

Khyber District is divided into four tehsils. Among them, Bara and Mulla Gori Tehsils are predominantly rural, while Jamrud and Landi Kotal Tehsils have a mix of urban and rural populations. The district's urban population is the combined total of the urban populations in Jamrud and Landi Kotal. Table below provides a detailed comparative analysis of the four tehsils within the Khyber District, highlighting their respective land areas, demographic statistics as of 2017, average household sizes, and annual population growth rates from 1998 to 2017, alongside their populations recorded in 1998.

Bara: Spanning an extensive area of 1,430 km^2, Bara is the largest tehsil in the Khyber District in terms of area as well as population. In 2017, it recorded a population of 443,449 individuals, entirely rural. The gender distribution included 224,995 males, 218,433 females, and 21 individuals identified as transgender, resulting in a sex ratio of 103 males per 100 females. Comparatively, the population in 1998 was 286,184, with 148,177 males and 138,007 females. The average annual growth rate of Bara's population as recorded in 2017 was 2.33%, a significant decrease from the 4.11% noted in the 1998 census. Despite the deceleration in growth rate, the population increased by 35% over the 19-year period. Additionally, there was a notable reduction in the average household size, which decreased from 9.7 individuals per household in 1998 to 8.28 in 2017. This trend indicates a shift towards smaller household units over the period analyzed.

Landi Kotal: As the second-largest tehsil in the Khyber District, Landi Kotal encompasses an area of 679 km^2. In 2017, its population stood at 273,052, with an urban proportion of 12.35%, equating to 33,729 urban inhabitants and 239,323 rural inhabitants. In 1998, the total population was 144,714, with an urbanization rate of 15.4%, indicating a slight decline in the rate of urbanization over the 19-year period. The male population in 2017 was 141,939, compared to 76,055 in 1998, while the female population was 131,088 in 2017, up from 68,659 in 1998. The average annual population growth rate showed a marginal decrease,

from 3.47% in 1998 to 3.39% in 2017. Furthermore, the rural population growth rate in 2017 was 3.59%, surpassing the urban population growth rate of 2.19%. The average household size in Landi Kotal experienced a decline, from 10.2 individuals per household in 1998 to 8.91 in 2017. Within the tehsil, rural areas had a higher average household size (9.08) compared to urban areas (7.86), reflecting differing household dynamics between rural and urban settings.

Jamrud Tehsil: Jamrud emerges as the second most populous tehsil, boasting a substantial population of 227,557 individuals as per the 2017 census and covers the area of 311 km^2. It exhibits a remarkable degree of urbanization, with a staggering 28.01% of its residents classified as dwelling in urban centers. This translates to a significant urban population of 63,728, solidifying Jamrud's position as the most urbanized tehsil in the district. The remaining 163,829 inhabitants reside in rural areas. Jamrud's population has exhibited a noteworthy upward trend. Compared to 1998, it has witnessed a substantial increase from 96,188 people. Even in 1998, Jamrud stood out for its high urbanization rate of 33.3%. This trend continues, with the 2017 census revealing the highest average growth rate of 4.63% among all four tehsils. This growth is further reflected in the population density, which has skyrocketed to a staggering 731.69 people per km^2 in 2017, compared to 309 people per km^2 in 1998. This dramatic surge signifies a remarkable rise in urbanization within Jamrud's boundaries.

Mulla Gori Tehsil: In stark contrast, Mulla Gori presents a completely different demographic profile. It holds the distinction of being the smallest tehsil in terms of both areas (spanning only 156 km^2) and population (comprising just 40,188 residents in 2017). After Bara tehsil, Mulla Gori also lacks any urban population, making it the second tehsil in the district with this characteristic. Despite this, the population has grown steadily, rising from 19,644 in 1998. The average growth rate, however, is lower than Jamrud's at 3.83%. The population density in Mulla Gori is also significantly lower at 257.62 people per km^2. The average household size in Mulla Gori is slightly higher than Jamrud, with 9.41 people per household recorded in 2017.

Table 3: Urban/Rural Comparison of Demographic Statistics of All Tehsils – Khyber District

Indicator	Tehsils of District Khyber			
	Bara	Landi Kotal	Jamrud	Mulla Gori
Area (sq.km)	1,430	679	311	156
Population 1998	286,184	144,714	96,188	19,644
Population 2017	443,449*	273,052	227,557	40,188
Population 2017 (Rural)	443,449	239,323	163,829	40,188
Population 2017 (Urban)	-	33,729	63,728	-
Population 2023	548,084	312,313	243,290	42,580
Growth Rate 1998 (%)	4.18	3.47	-	-
Growth Rate 2017 (%)	2.33	3.39	4.63*	3.83
Growth Rate 2017 (%) (Rural)	2.33	3.59	5.05*	3.83

Indicator	Tehsils of District Khyber			
	Bara	Landi Kotal	Jamrud	Mulla Gori
Growth Rate 2017 (%) (Urban)	-	2.19	3.68*	-
Growth Rate 2023 (%)	3.6	2.27	1.12	0.97
Average Household Size 1998	9.7	10.2	10.1	10
Average Household Size 2017	8.28	8.91	8.31	9.41*
Average Household Size 2017 (Rural)	8.28	9.08*	8.41	9.41
Average Household Size 2017 (Urban)	-	7.86	8.05	-
Average Household Size 2023	7.1	6.5	6.5	7.1
Pop Density 1998 (per sq.km)	200.1	213.1	309.3	125.9
Pop Density 2017 (per sq.km)	310	402.1	731.69*	257.6
Pop Density 2023 (per sq.km)	383.28	679.00	782.28	272.95

*Highest
Lowest

Source: Census Report of 1998, 2017 and 2023, Pakistan Bureau of Statistics

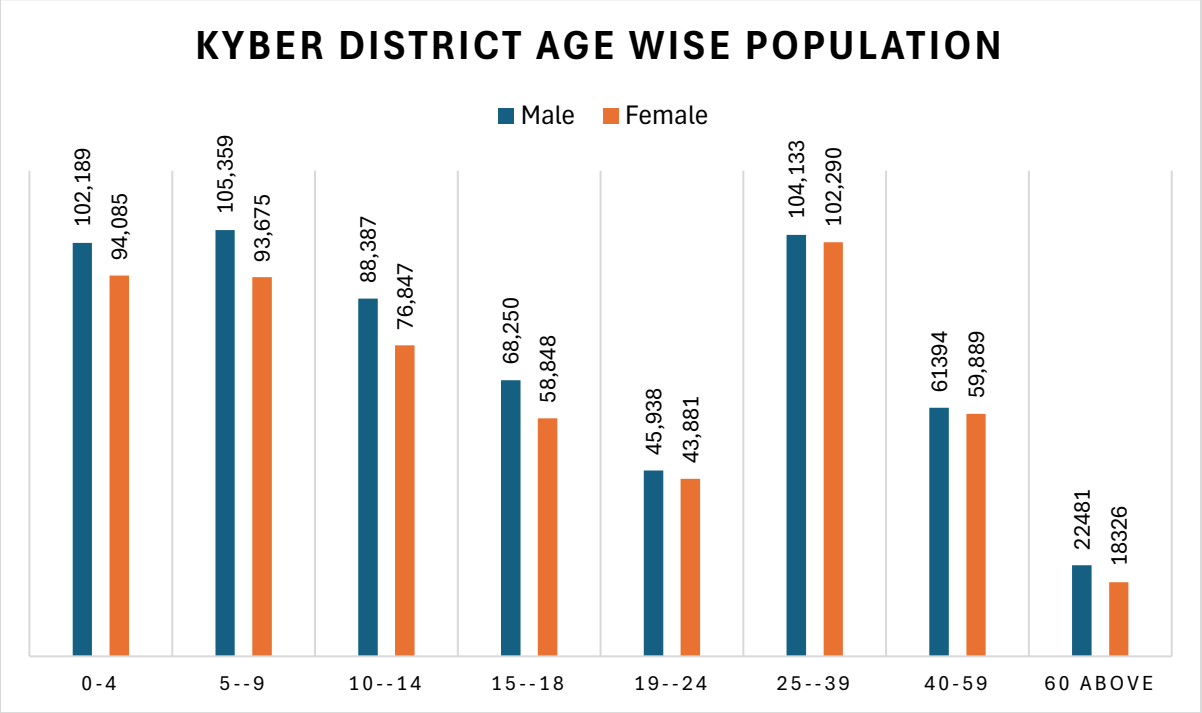
2.2.3 Population Distribution by Age & Gender

Dividing the population by age helps us understand social structure and plan services effectively. Each group represents a key stage in human development and has distinct needs. Infants (1 month–4 years) are in early childhood, needing health, nutrition, and care. Ages 5–9 and 10–14 cover primary and middle school years, requiring education services and child development support. Ages 15–19 represent high school students, often transitioning into vocational training or early jobs.

The population composition of Khyber District shows a fairly balanced distribution between males (598,131) and females (547,841), bringing the total to 1,145,972. The largest age group is 25–39 years, with over 206,000 individuals, indicating a strong working-age base. Children aged 0–4 and 5–9 also represent a significant share of the population, pointing to high birth rates and a predominantly young demographic.

Adolescents and youth (10–24 years) form a substantial portion of the population, underlining the need for focused investments in education, skills development, and employment opportunities. The elderly (60+) make up a smaller segment, reflecting a low aging trend. Overall, Khyber District has a youthful population profile, which presents both opportunities and challenges for future development planning.

Figure 8: Population by Gender – Khyber District



Source: Census Report of 2023, Pakistan Bureau of Statistics

2.2.4 Population Distribution in District

Khyber District is administratively divided into four tehsils, each carrying its own significance. Landi Kotal and Jamrud are already established as key urban and commercial hubs due to their strategic locations and historical importance. However, a major concern lies in Bara Tehsil, which accommodates the largest share of the district's population yet lacks a well-developed urban center to cater to the growing socio-economic needs of its residents.

This absence of an organized urban nucleus limits access to essential services, markets, and recreational facilities for most of the population. In contrast, Mulla Gori Tehsil has the smallest population. This scattered settlement pattern poses additional challenges for service delivery, infrastructure development, and economic integration. Overall, while Landi Kotal and Jamrud are progressing as urbanized centers, addressing the urban gap in Bara is critical for balanced development across Khyber District.

Table 4: Percentage of Division Population

Area	*Pop. 2023*	*Percentage of District Population*
Bara Tehsil	548,084	48%
Landi Kotal Tehsil	312,313	27%
Jamrud Tehsil	243,290	21%
Mulla Gori Tehsil	42,580	4%
Khyber District	1,146,267	100%

Source: Pakistan Bureau of Statistics (PBS) Census 2023

2.3 Migration

Migration in Khyber District occurs mainly due to economic, social, and family-related reasons, and understanding these trends is crucial for district planning because migration directly affects population distribution, demand for services, labor availability, and urbanization patterns. Migration to Khyber is shaped more by family and livelihood factors than by education or professional opportunities. These patterns are particularly important for district planning, as they highlight the need for stronger economic development, educational facilities, and urban services within Khyber to reduce outmigration and better manage rural-to-urban transitions

Table 5: Indicator and Reason for Migration in Khyber

Indicators	Total	Rural	Urban
Population 2023	1,146,267	1,051,404	94,578
Migration	12,424	9,196	3,228
Intra Provisional Migration	5,330	3,830	1,500
Inter Provisional Migration	420	301	119
Migration from Abroad	6,674	5,065	1,609
Reason for Migration			
Job/ Business	1,643	1,172	471
Education	70	39	31
Marriage	782	463	319
With Family	5,673	4,710	963
Back to Home	56	55	1
Other	4200	2,757	1,443

Source: Pakistan Bureau of Statistics (PBS) Census 2023

2.4 Density Pattern

Population density in Khyber District has been gradually increasing, reflecting steady growth in settlement pressure across the area. In 2017, density stood at 1.5 persons per acre, rising to 1.8 by 2023, and is projected to reach 3.1 persons per acre by 2045. This growth indicates a doubling of population pressure within less than three decades.

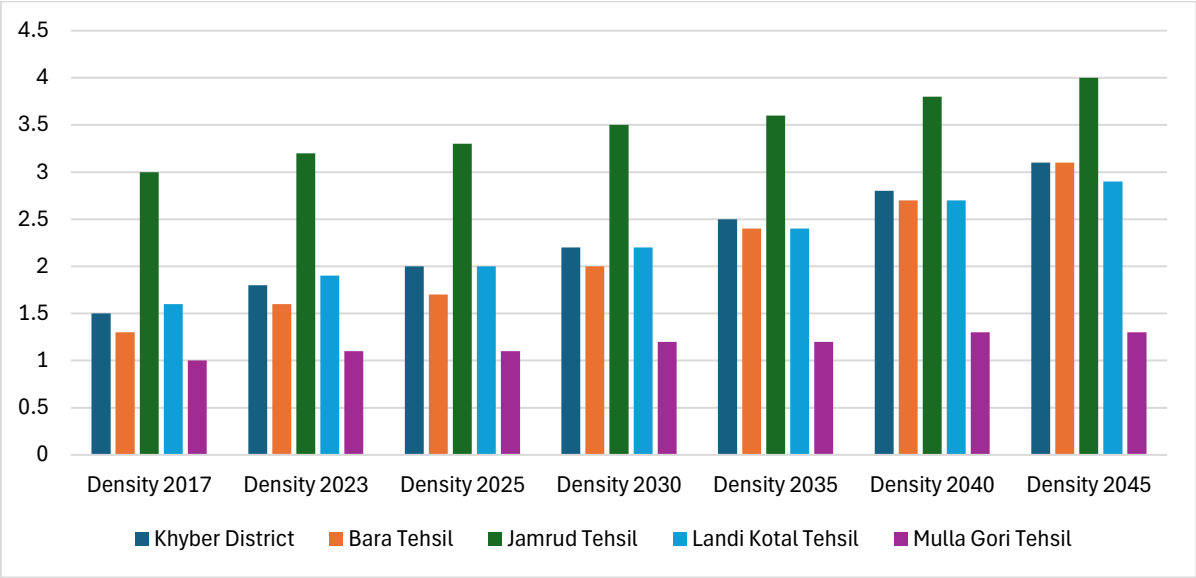
At the tehsil level, Bara Tehsil demonstrates the fastest growth in density, moving from 1.3 in 2017 to a projected 3.1 persons per acre in 2045. This sharp rise highlights Bara as a priority area for urban planning and service delivery. Jamrud Tehsil already has the highest density, starting from 3.0 in 2017 and reaching 4.0 by 2045, reflecting its established role as a trade and service hub with limited land availability. Landi Kotal Tehsil shows a moderate but steady increase, from 1.6 in 2017 to 2.9 by 2045, consistent with its role as a border settlement and emerging urban center. Mulla Gori Tehsil has the lowest density across all years, rising only marginally from 1.0 to 1.3, which reflects its small population base and limited settlement expansion. Overall, density trends point toward increasing pressure on land and resources, with Bara and Jamrud requiring immediate focus for infrastructure, services, and urban management, while Landi Kotal is likely to grow steadily and Mulla Gori will remain relatively low-density.

Table 6: Population Density

District/ Tehsil	Area (Sq.km)	Area (Acres)	Density 2017	Density 2023	Density 2025	Density 2030	Density 2035	Density 2040	Density 2045
Khyber District	2,576	636544	1.5	1.8	2.0	2.2	2.5	2.8	3.1
Bara Tehsil	1,430	353361	1.3	1.6	1.7	2.0	2.4	2.7	3.1
Jamrud Tehsil	311	76849.8	3.0	3.2	3.3	3.5	3.6	3.8	4.0
Landi Kotal Tehsil	679	167785	1.6	1.9	2.0	2.2	2.4	2.7	2.9
Mulla Gori Tehsil	156	38548.4	1.0	1.1	1.1	1.2	1.2	1.3	1.3

Source: Derived by the Consultant 2025

Figure 9: Population Density - District Khyber



2.5 Population Projection

2.5.1 Khyber District

The population of Khyber District is increasing steadily across all tehsils, which brings both challenges and opportunities. A growing population means higher demand for housing, schools, healthcare, jobs, and basic services, making proper planning essential to avoid shortages. At the same time, it also expands the labor force and creates new opportunities for trade, markets, and economic activities if resources are managed well.

Within the district, Bara Tehsil shows the fastest growth, placing pressure on land, water, and services but also offering potential for economic development. Jamrud is growing more slowly, which makes service delivery easier but still requires steady investment in education, health, and infrastructure.

Landi Kotal, being a border tehsil, will see population growth drive more cross-border trade and economic activity, while Mulla Gori, though smaller, still needs attention to basic facilities to prevent migration toward larger tehsils. Together, these trends highlight the importance of tailored planning in each tehsil to meet future needs.

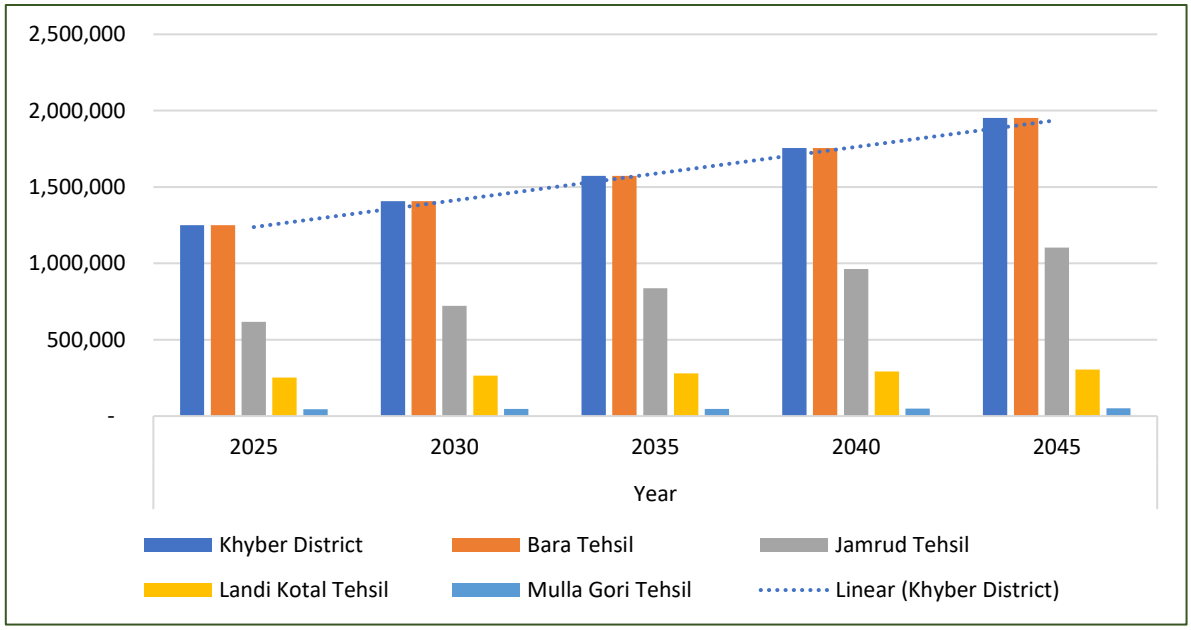
Table 7: Population Projection Tehsil Wise

Average Population Projection Khyber District (Tehsil-Wise)						
Area	**Method**	**2025**	**2030**	**2035**	**2040**	**2045**
Khyber District	Arithmetic	1200274	1335292	1470309	1605327	1740344
	Geometric	1206177	1370013	1556102	1767468	2007544
	Average	**1203226**	**1352652**	**1513206**	**1686397**	**1873944**
Tehsil-wise Projections						

Bara Tehsil	Arithmetic	582962	670158	757354	844550	931746
	Geometric	587771	698795	828754	980536	1157430
	Average	**585367**	**684477**	**793054**	**912543**	**1044588**
Jamrud Tehsil	Arithmetic	248534	261645	274756	287867	300978
	Geometric	248615	261984	275396	288802	302161
	Average	**248575**	**261815**	**275076**	**288335**	**301569**
Landi Kotal Tehsil	Arithmetic	325400	358118	390835	423553	456270
	Geometric	348333	387543	430122	476256	526137
	Average	**325400**	**372830**	**410478**	**449904**	**491204**
Mulla Gori Tehsil	Arithmetic	43377	45371	47364	49357	51351
	Geometric	43381	45371	47336	49268	51160
	Average	**43379**	**45371**	**47350**	**49312**	**51255**

Source: Derived by the Consultant 2025

Figure 10: Tehsil - wise Population Projection



2.5.2 Potential Urban Centers and Settlements

The projected population shows that all NC/VCs across Khyber District will experience substantial population and density growth between 2025 and 2045. In Bara Tehsil, Bara increases from 219,044 people (density 11.82) in 2025 to 403,394 people (density 21.77) in 2045, while Tirah grows from 12,434 (16.33) to 22,807 (29.96), indicating rising settlement pressure even in smaller valleys. Jamrud Urban Centre expands rapidly, from 160,422 (12.35) to 311,984 (24.02), showing accelerated urbanization, and Ali Masjid becomes one of the densest areas, rising from 14,215 (26.14) to 26,088 (47.97) by 2045. In Landi Kotal Tehsil, Bazar Zakha Khel-5 increases from 9,009 (16.79) to 15,278 (28.48), while the Landi Kotal Urban Centre grows from 152,213 (23.81) to 269,203 (42.12), reflecting strong population concentration in the main town. Mulla Gori Tehsil shows moderate growth, with Mulla Gori

rising from 15,718 (8.64) to 26,966 (14.82), maintaining the lowest density in the district, whereas Tatara increases from 4,364 (19.04) to 6,816 (29.74).

Figure 11: Projected population for potential urban centers

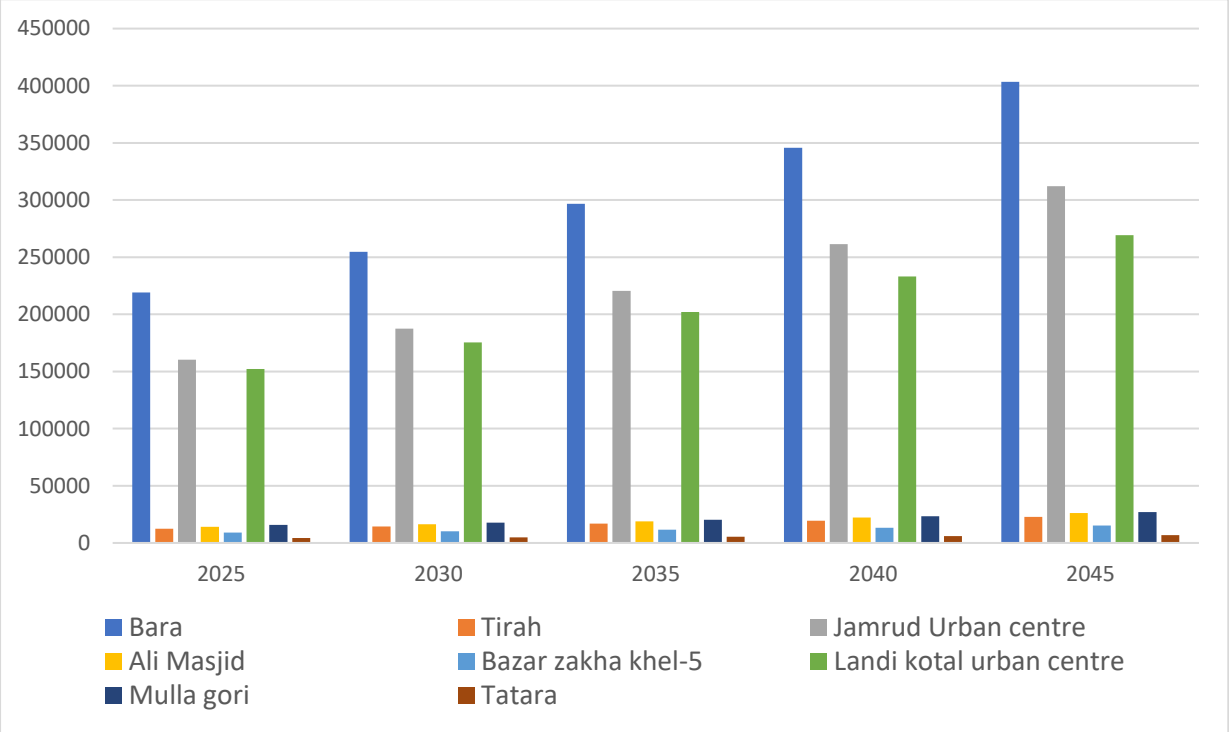
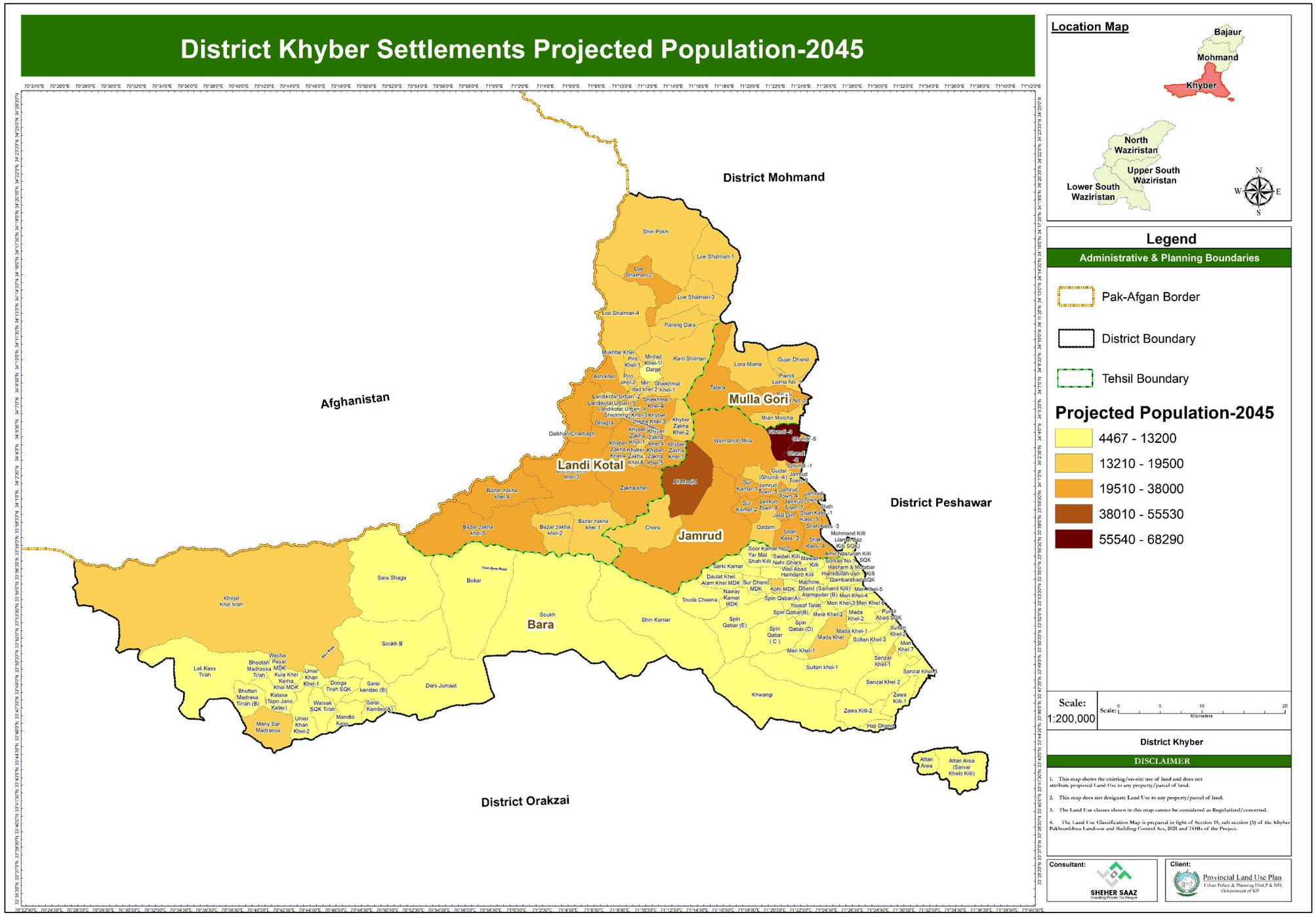


Table 8: Projected population for potential urban centers

Tehsil	NC-VC	2025		2030		2035		2040		2045	
		Population 2025	Density	Population 2030	Density	Population 2035	Density	Population 2040	Density	Population 2045	Density
Bara	Bara	219044	11.82	254796	13.75	296675	16.01	345777	18.66	403394	21.77
	Tirah	12434	16.33	14449	18.98	16807	22.08	19569	25.71	22807	29.96
Jamrud	Jamrud Urban centre	160422	12.35	187394	14.43	220539	16.98	261415	20.13	311984	24.02
	Ali Masjid	14215	26.14	16357	30.07	18967	34.87	22161	40.75	26088	47.97
Landi Kotal	Bazar zakha khel-5	9009	16.79	10270	19.14	11715	21.84	13374	24.93	15278	28.48
	Landi kotal urban centre	152213	23.81	175327	27.43	202109	31.62	233165	36.48	269203	42.12
Mulla Gori	Mulla gori	15718	8.64	17816	9.79	20297	11.15	23238	12.77	26966	14.82
	Tatara	4364	19.04	4843	21.13	5400	23.56	6051	26.41	6816	29.74

Map 7: Population Projection 2045



3 CHAPTER III: ANALYSIS OF EXISITING LAND USE DISTRIBUTION

3.1 District Khyber Land Use Distribution

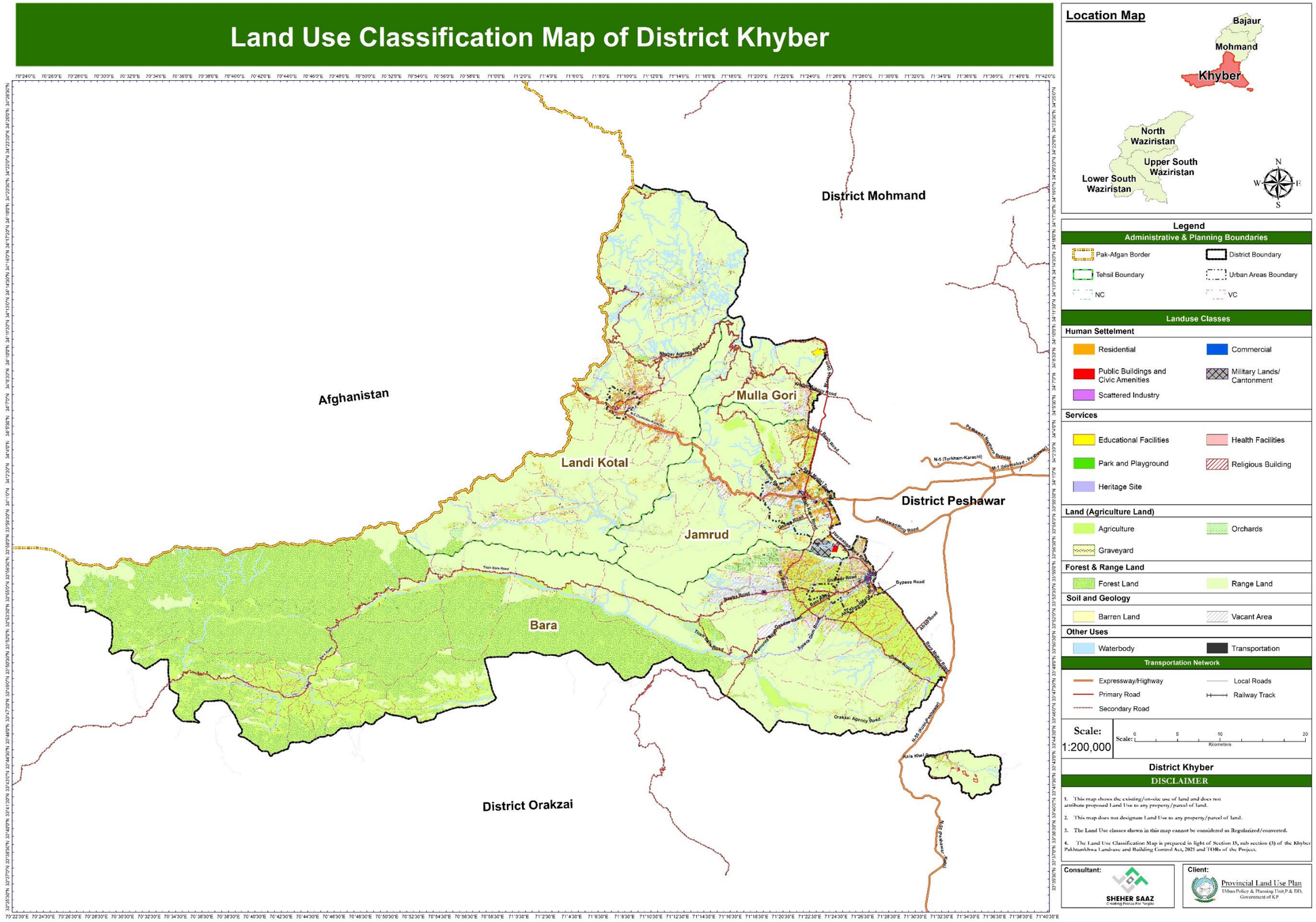
District Khyber covers a total area of 704,192.62 acres, with rangelands (368,376 acres) and forest land (195,144 acres) dominating the landscape. Agriculture (72,159 acres) and orchards (2,167 acres) also play a vital role in supporting local livelihoods.

Urban and built-up areas, including residential (20,067 acres), commercial (757 acres), and industrial (361 acres) zones, are relatively limited in comparison. Public infrastructure such as education facilities (663 acres), health services (116 acres), and transportation networks (6,327 acres) further contribute to the district's socio-economic development. Other notable land uses include vacant land (20,791 acres), military cantonments (1,440 acres), and mining areas (140 acres). Water resources, comprising waterbodies (13,879 acres) and water tanks (30 acres), remain crucial for the district's sustainability.

Table 9: Existing Land use Division of Khyber District

Land use	Area (Acres)	Percentage %
Residential	20877.41	2.97%
Commercial	758.04	0.11%
Agriculture	69317.76	9.85%
Education Facilities	683.25	0.10%
Health Facilities	116.47	0.02%
Graveyard	311.23	0.04%
Park and Playground	204.29	0.03%
Public Buildings and Civic Amenities	339.23	0.05%
Religious Building	124.54	0.02%
Range Land	378938.82	53.82%
Scattered Industry	376.21	0.05%
Transportation	6373.47	0.91%
Heritage Site	10.03	0.00%
Orchards	2183.52	0.31%
Vacant Area	10493.76	1.49%
Barren Land	889.94	0.13%
Forest Land	196208.34	27.87%
Military Lands/Cantonment	1723.89	0.24%
Minning Area	140.08	0.02%
Waterbody	13982.50	1.99%
Total	704052.77	100.00%

Map 8: Existing Land use Map - District Khyber



3.2 Tehsil-wise Land Use Classification

3.2.1 Tehsil Landi Kotal

Landi Kotal Tehsil spans a total area of 182,681 acres, with rangelands (161,919 acres) overwhelmingly dominating the landscape, indicating its rugged terrain and grazing potential. Residential areas (5,083 acres) and commercial zones (187 acres) support the local population and economic activities.

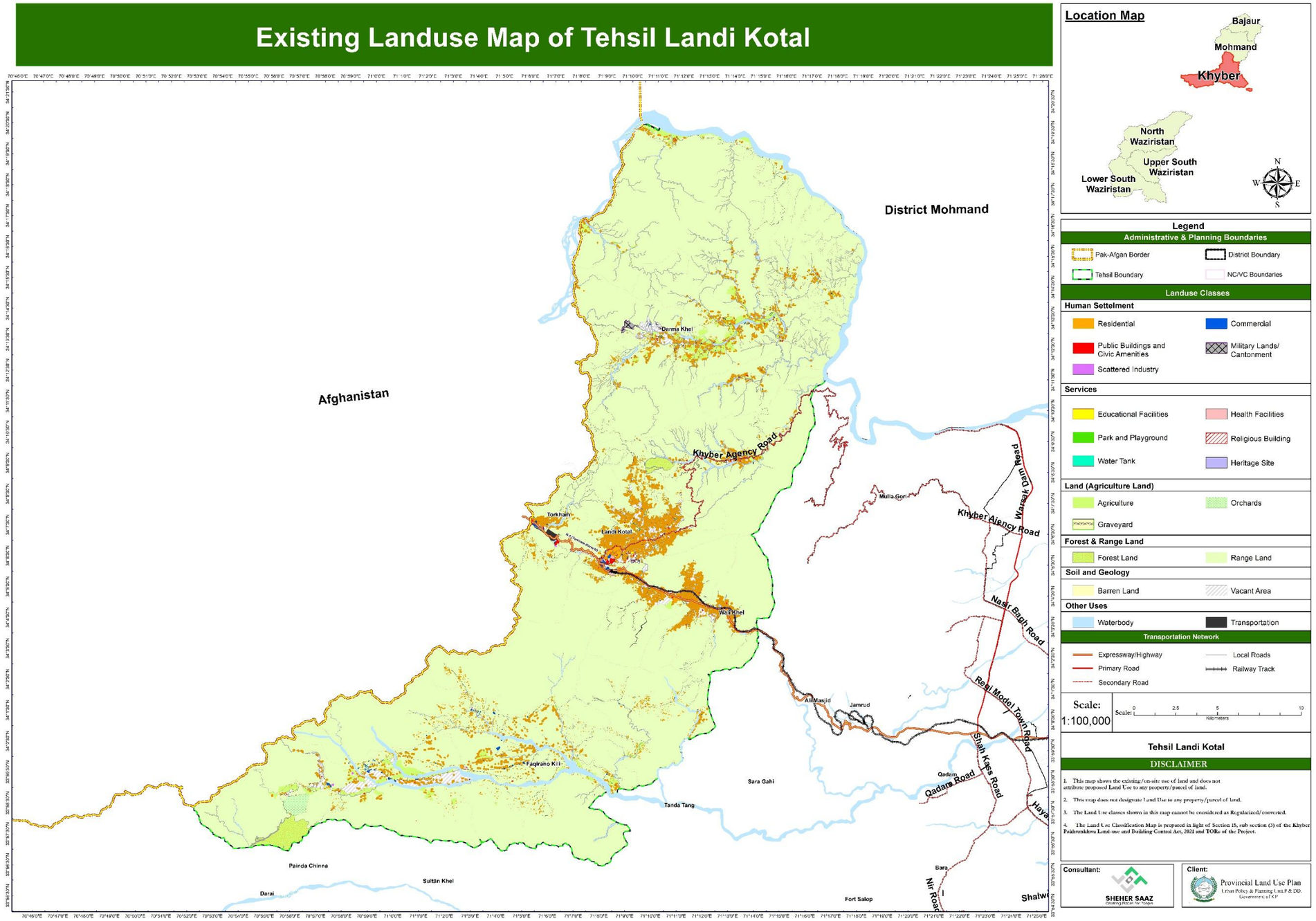
Agriculture covers 2,722 acres, supplemented by orchards (359 acres), reflecting a modest role in local livelihoods. Forests (1,128 acres) contribute to environmental sustainability, while waterbodies (4,592 acres) are a significant feature.

Civic infrastructure includes education (120 acres), health (52 acres), and public buildings (48 acres), ensuring basic services. Military lands (80 acres), heritage sites (3 acres), and religious buildings (13 acres) highlight the area's strategic and cultural importance. With vacant land (4,457 acres) and transportation networks (1,773 acres), Landi Kotal holds potential for future urban and economic expansion, while maintaining its predominantly natural and pastoral landscape

Table 10: Land use Classification of Landi Kotal

Land use	Area (acres)	Percentage %
Agriculture	2721.70161	1.5
Barren Land	16.072661	0.008
Commercial	187.436286	0.10
Education Facilities	119.859918	0.07
Forest Land	1127.761461	0.62
Graveyard	63.026735	0.03
Health Facilities	51.717827	0.03
Heritage Site	2.926715	0
Military Lands/Cantonment	80.499521	0.04
Orchards	358.632635	0.20
Park and Playground	50.806885	0.03
Public Buildings and Civic Amenities	48.033278	0.03
Range Land	161919.2427	88.63
Religious Building	12.847525	0
Residential	5083.117655	2.78
Scattered Industry	14.625998	0.008
Transportation	1773.218198	0.97
Vacant Area	4457.476303	2.44
Water Tank	0.133756	0
Waterbody	4592.486334	2.51
Total Area	182681.624	100

Map 9: Land use Map - Tehsil Landi Kotal



3.2.2 Tehsil Jamrud

Jamrud Tehsil covers a total area of 58,621 acres, with rangelands (45,514 acres) dominating the landscape, highlighting its natural terrain and grazing potential. Residential areas (3,552 acres) and commercial zones (138 acres) indicate moderate urbanization and economic activity.

Agriculture plays a limited role with 1,581 acres, supplemented by orchards (31 acres). The presence of military lands/cantonments (1,248 acres) reflects strategic importance, while education (97 acres), health (16 acres), and public buildings (161 acres) support civic services.

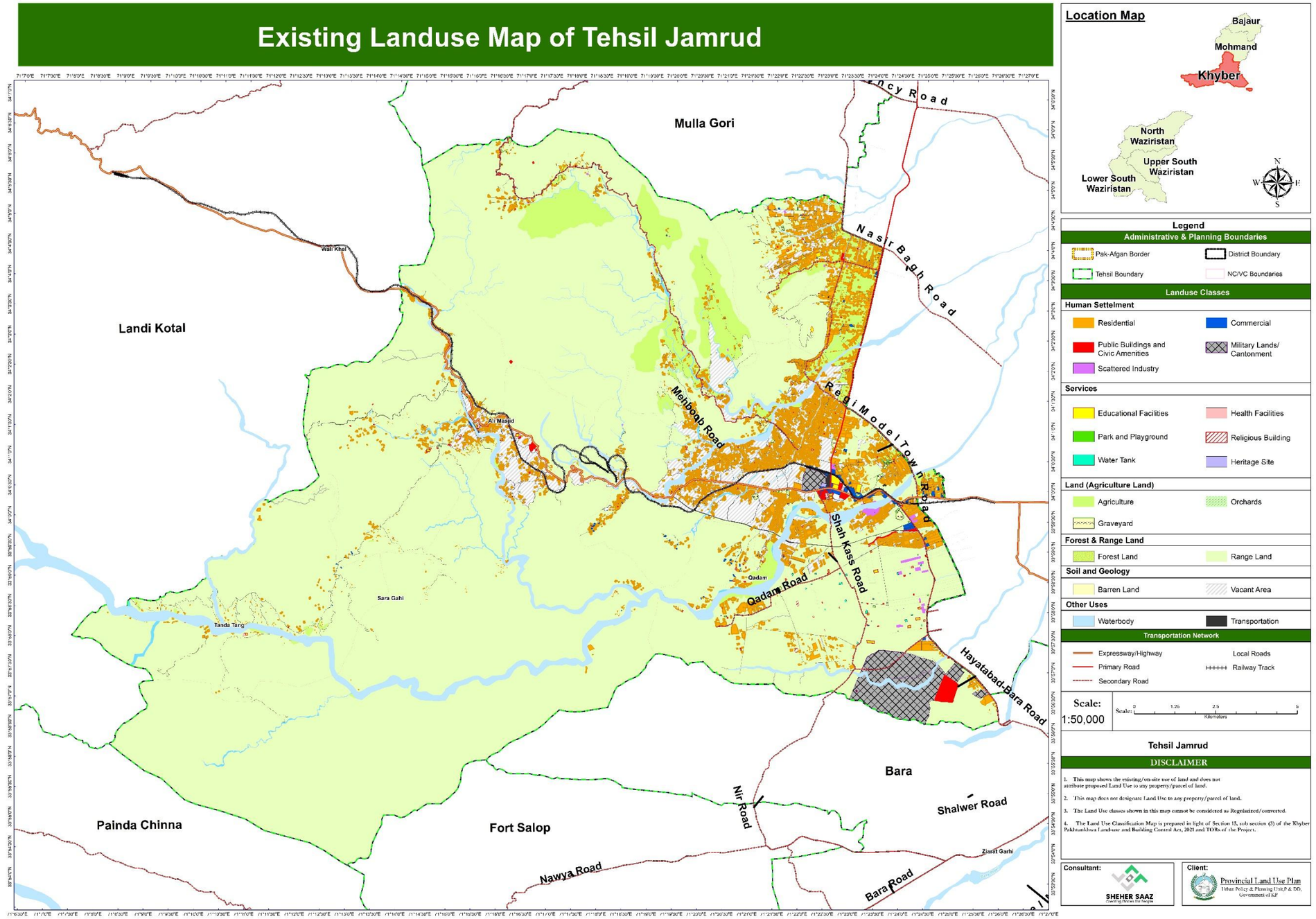
Jamrud also features heritage sites (4 acres), religious buildings (24 acres), and parks (16 acres), showcasing cultural and recreational spaces. Waterbodies (1,388 acres) and vacant land (3,852 acres) provide future development opportunities.

Overall, Jamrud exhibits a mixed-use landscape, where rangelands dominate, while residential, commercial, and civic infrastructure support local communities. The area has potential for controlled urban expansion and economic diversification.

Table 11: Land use Classification of Jamrud Tehsil

Land use	Area (acres)	Percentage %
Agriculture	1580.972707	2.70
Commercial	137.721771	0.23
Education Facilities	97.395921	0.17
Graveyard	88.37035	0.15
Health Facilities	16.462117	0.03
Heritage Site	4.308358	0.01
Military Lands/Cantonment	1248.308725	2.13
Orchards	30.906505	0.05
Park and Playground	16.277063	0.03
Public Buildings and Civic Amenities	161.08012	0.27
Range Land	45514.82113	77.64
Religious Building	24.467215	0.04
Residential	3552.029967	6.06
Scattered Industry	84.086977	0.14
Transportation	809.541681	1.38
Vacant Area	3851.967172	6.57
Water Tank	15.603841	0.03
Waterbody	1387.623679	2.37
Total Area	58621.9453	**100.00**

Map 10: Land use Map - Tehsil Jamrud



3.2.3 Tehsil Bara

Bara Tehsil spans a total area of 102,326 acres, with rangelands (58,589 acres) and agriculture (24,101 acres) dominating the landscape. These land types indicate the tehsil's strong reliance on livestock grazing and farming as primary economic activities.

Urbanization is evident with residential areas (7,281 acres) and commercial zones (302 acres), alongside essential infrastructure such as education (82 acres), health facilities (33 acres), and transportation networks (1,532 acres).

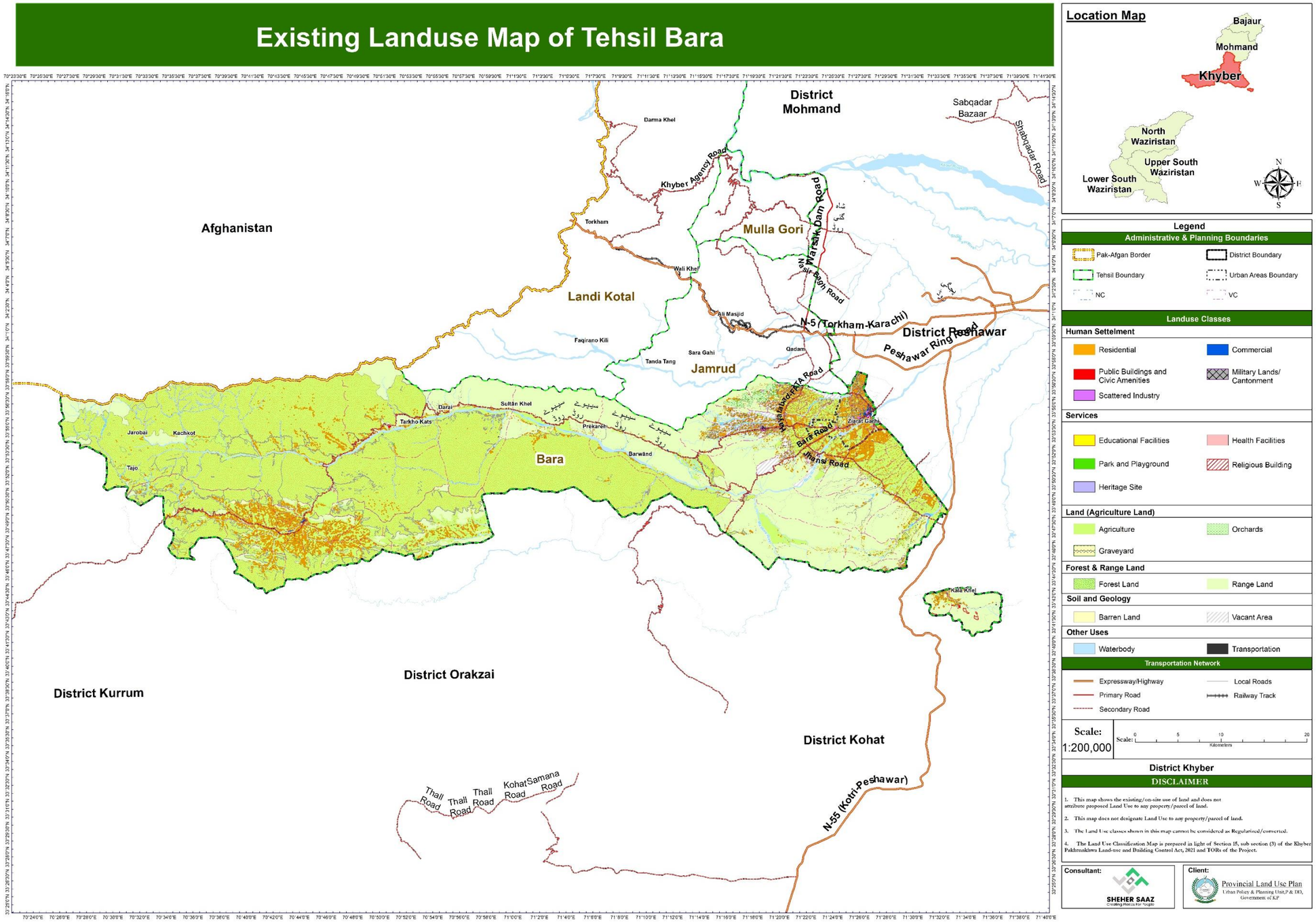
Natural features include forests (289 acres), waterbodies (1,120 acres), and orchards (1,570 acres), supporting biodiversity and water conservation. Additionally, vacant land (6,774 acres) and barren land (2 acres) present opportunities for future development.

Special-use land includes military cantonments (31 acres), mining areas (140 acres), religious sites (41 acres), and heritage sites (17 acres), highlighting diverse land functions.

Table 12: Land use Classification of Bara Tehsil

Land use	Area (acres)	Percentage %
Agriculture	24101.94747	23.55
Barren Land	1.941493	0.00
Commercial	302.588274	0.30
Education Facilities	82.660093	0.08
Forest Land	288.695413	0.28
Graveyard	69.032903	0.07
Health Facilities	33.86125	0.03
Heritage Site	16.763068	0.02
Military Lands/Cantonment	31.344135	0.03
Mining Area	140.163094	0.14
Orchards	1569.870829	1.53
Park and Playground	92.090037	0.09
Public Buildings and Civic Amenities	29.668412	0.03
Range Land	58589.06705	57.26
Religious Building	41.086282	0.04
Residential	7281.332663	7.12
Scattered Industry	216.103227	0.21
Transportation	1532.923354	1.50
Vacant Area	6774.224288	6.62
Water Tank	9.944875	0.01
Waterbody	1120.717317	1.10
Total Area	102326.0255	100.00

Map 11: Land use Map - Tehsil Bara



3.2.4 Tehsil Mulla Gori

Mula Gori Tehsil covers a total area of 45,608 acres, with rangelands (38,084 acres) making up most of the landscape, highlighting the region's natural and grazing potential. Agriculture (2,642 acres) and orchards (24 acres) indicate limited but vital farming activities.

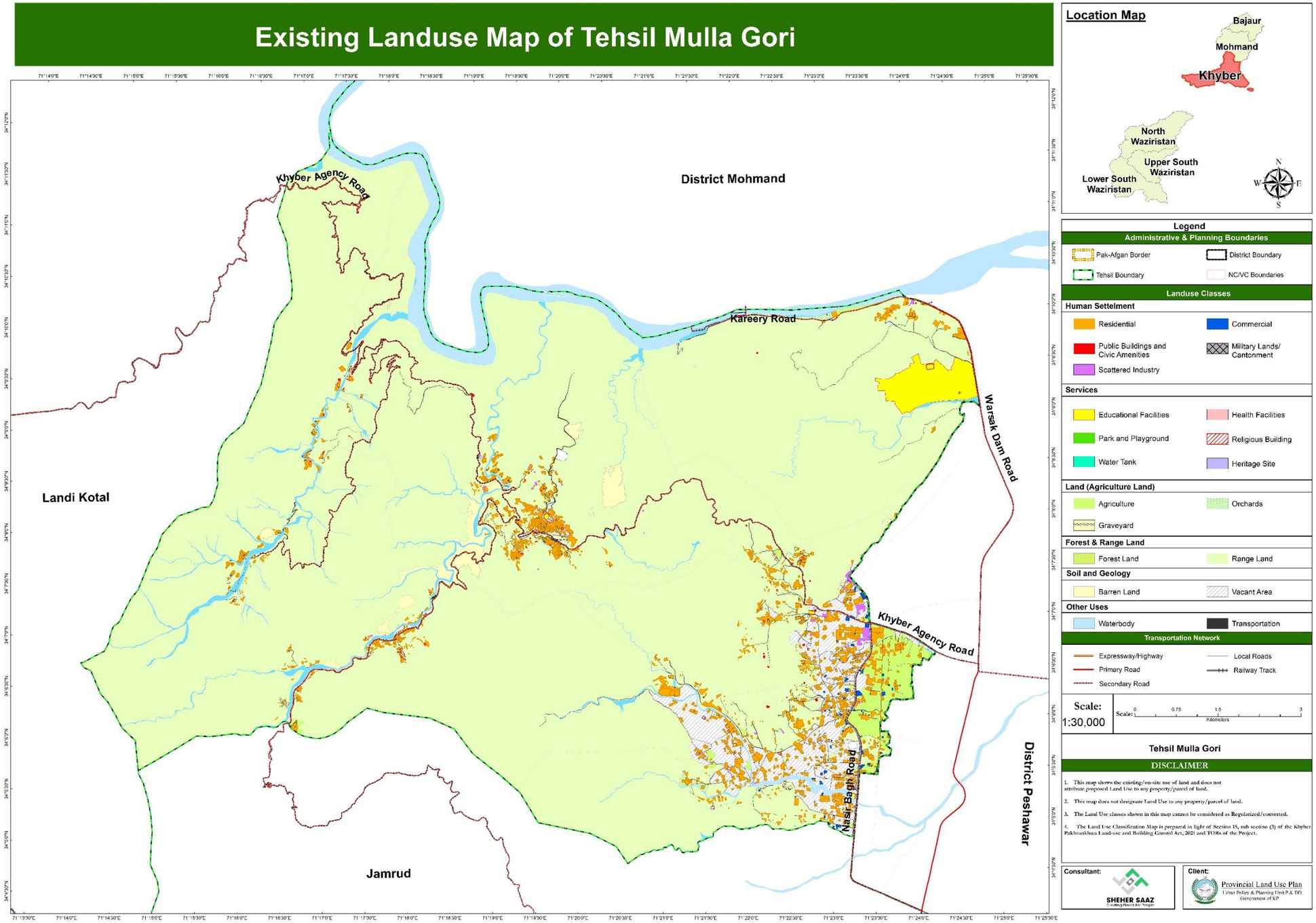
The residential area (1,203 acres) is relatively small, with commercial zones (30 acres) and scattered industry (32 acres) supporting economic activity. Waterbodies (1,192 acres) play an essential role in the local ecosystem and water availability.

Civic infrastructure includes education facilities (313 acres), health services (8 acres), and public buildings (7 acres), ensuring basic public services. Religious buildings (11 acres), graveyards (17 acres), and parks (18 acres) contribute to the social and cultural fabric of the area. With vacant land (1,290 acres) and transportation networks (471 acres), Mula Gori has potential for controlled development, while its predominantly natural landscape remains a defining feature.

Table 13: Land use Classification of Mula Gori

Land use	Area (acres)	Percentage %
Agriculture	2641.800684	5.79
Barren Land	264.205224	0.58
Commercial	30.411772	0.07
Education Facilities	313.033574	0.69
Graveyard	16.575897	0.04
Health Facilities	8.379926	0.02
Orchards	23.528233	0.05
Park and Playground	17.791465	0.04
Public Buildings and Civic Amenities	7.383602	0.02
Range Land	38084.33262	83.50
Religious Building	11.328839	0.02
Residential	1203.362462	2.64
Scattered Industry	32.465895	0.07
Transportation	470.563808	1.03
Vacant Area	1290.048892	2.83
Water Tank	0.289179	0.00
Waterbody	1192.219379	2.61
Total Area	45607.72145	100.00

Map 12: Land use Map - Tehsil Mulla Gori



3.3 Urban Centres

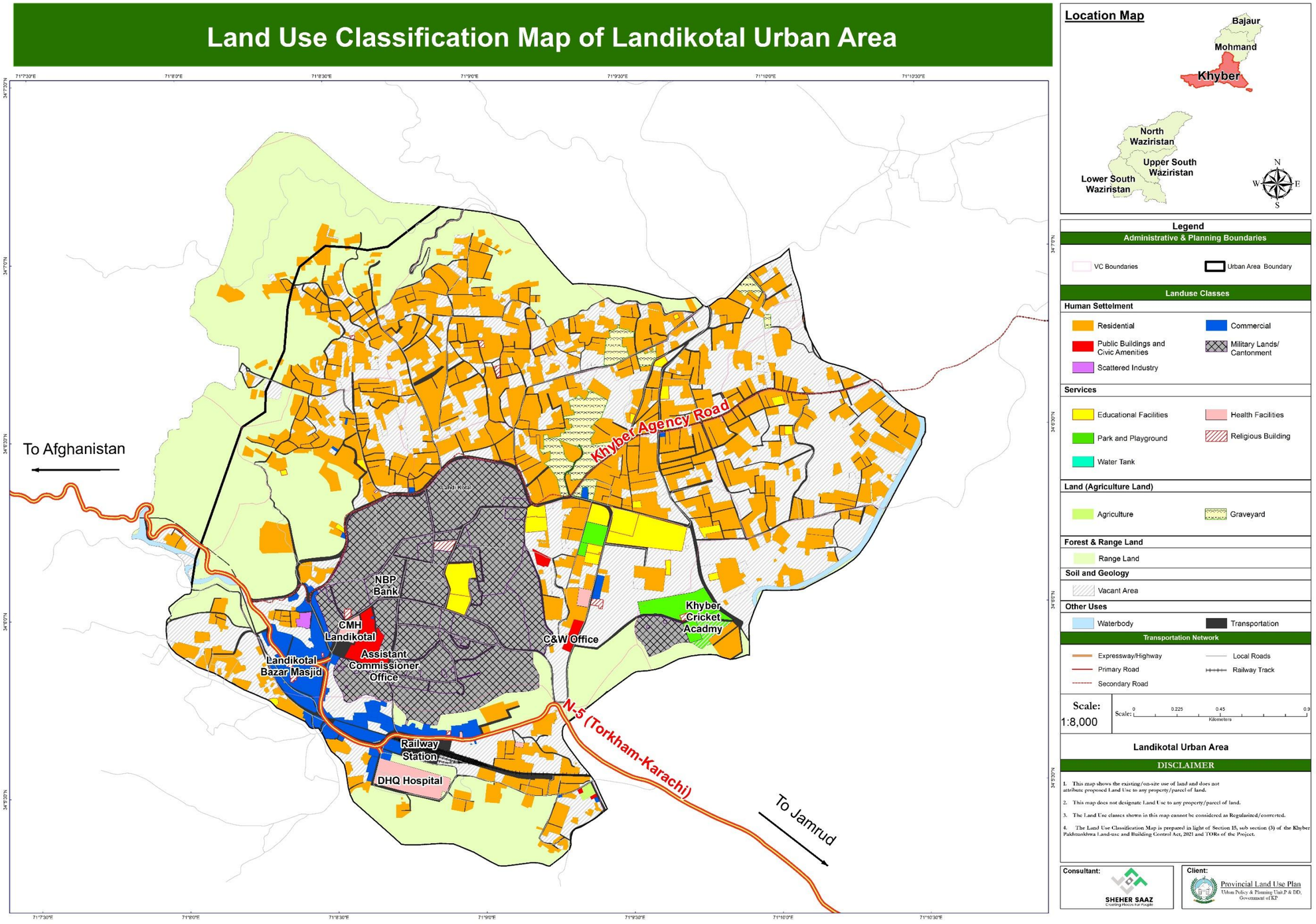
3.3.1 Landi Kotal

The land-use distribution shows that the total area of 6,392 acres is dominated by Range Land, which covers the largest share at 36.24% (2,316 acres), followed by a significant portion of Vacant Area, accounting for 25.91% (1,656 acres). Residential use forms the next major category, occupying 23.29% (1,488 acres), indicating a sizeable settled population. In contrast, commercial activities cover only 0.95% (61 acres) and scattered industry is almost negligible at 0.02% (1.29 acres), showing very limited economic or industrial land use. Public amenities such as education facilities (0.81%), health facilities (0.27%), and public buildings (0.20%) occupy relatively small areas, suggesting a shortage of dedicated institutional infrastructure. Religious buildings (0.12%), parks/playgrounds (0.31%), and agriculture (0.06%) also represent very minor proportions. Military land makes up 4.14% (265 acres), while transportation infrastructure such as roads occupies 5.90% (377 acres). Waterbodies account for 0.57% (37 acres), and the graveyard area stands at 1.21% (78 acres).

Table 14: Existing Land use distribution of Landi Kotal

Land use	Area (Acres)	Percentage %
Residential	1488.623	23.29%
Commercial	60.626	0.95%
Scattered Industry	1.294	0.02%
Public Buildings and Civic Amenities	12.501	0.20%
Education Facilities	51.478	0.81%
Health Facilities	17.457	0.27%
Religious Building	7.801	0.12%
Park and Playground	19.867	0.31%
Agriculture	4.072	0.06%
Graveyard	77.598	1.21%
Military Lands/Cantonment	264.851	4.14%
Range Land	2316.346	36.24%
Transportation	376.914	5.90%
Vacant Area	1656.059	25.91%
Waterbody	36.520	0.57%
Total	6392.008	100.00%

Map 13: Land use Classification Landi Kotal Urban Area



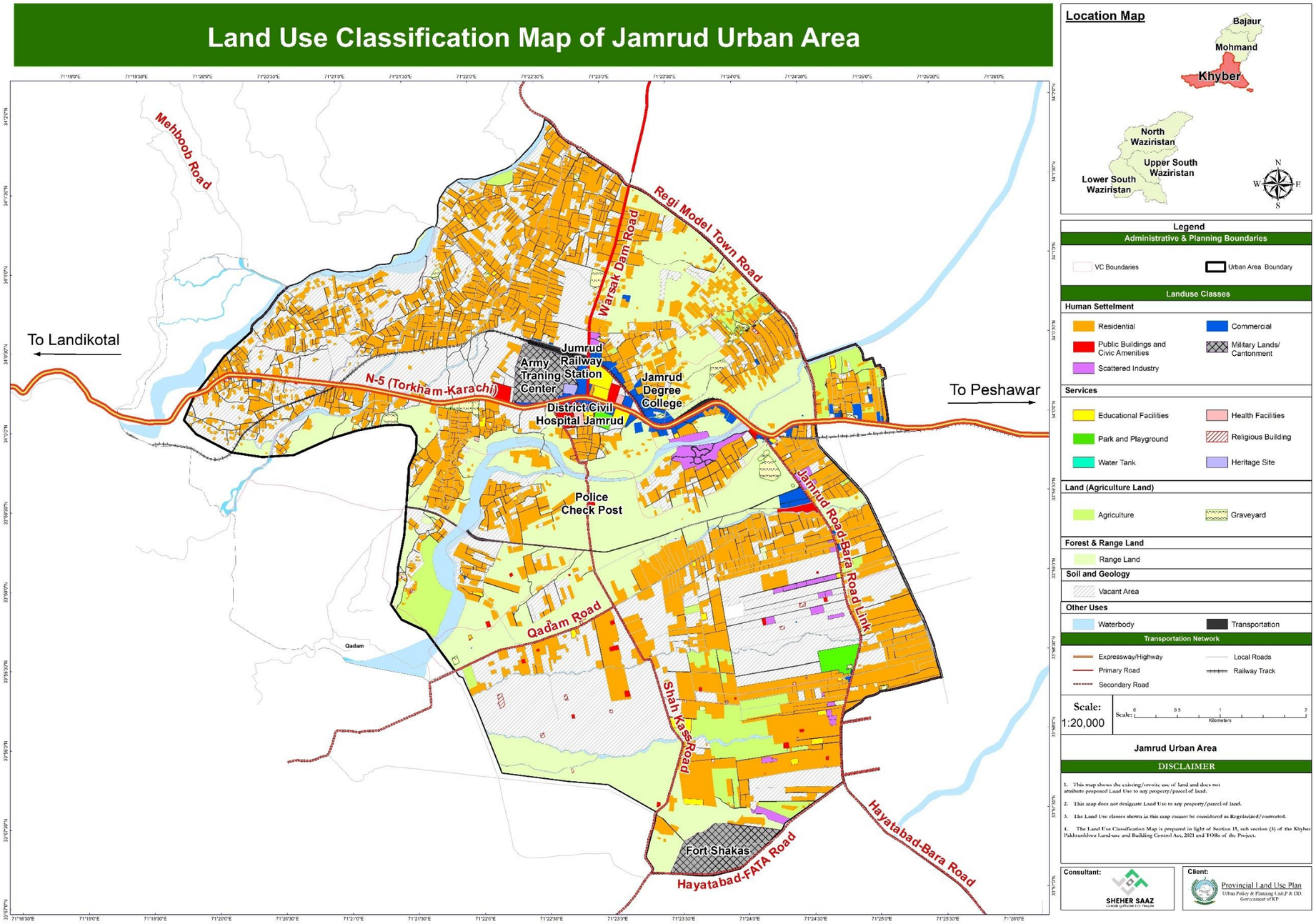
3.3.2 Jamrud

The land-use breakdown for the total 12,989 acres shows that the area is primarily dominated by Range Land, which accounts for the largest share at 35.53% (4,614 acres). This is followed by a substantial proportion of Vacant Area, covering 22.54% (2,927 acres), indicating large tracts available for future development or currently unused. Residential land forms the next major category at 24.84% (3,226 acres), reflecting a significant settled population within the area. In contrast, land allocated to commercial activities remains limited at 1.06% (138 acres), and scattered industry is also small at 0.71% (93 acres), suggesting modest economic and industrial activity. Public and community facilities, including public buildings (0.41%), education facilities (0.68%), health facilities (0.07%), and religious buildings (0.14%), occupy relatively small portions, indicating limited institutional infrastructure. Recreational spaces such as parks and playgrounds cover only 0.29%, while graveyards (0.52%) and heritage sites (0.03%) represent minor land uses. Military land accounts for 1.72% (224 acres), and transportation infrastructure occupies 4.70% (610 acres), reflecting network connectivity across the region. Meanwhile, agriculture (3.31%), orchards (0.07%), and waterbodies (3.38%) collectively show a modest presence of productive and natural landscapes.

Table 15: Existing Land use distribution of Jamrud

Land use	Area (Acres)	Percentage %
Residential	3226.939	24.84%
Commercial	138.241	1.06%
Scattered Industry	92.553	0.71%
Public Buildings and Civic Amenities	53.526	0.41%
Education Facilities	87.943	0.68%
Health Facilities	8.942	0.07%
Religious Building	18.105	0.14%
Park and Playground	37.788	0.29%
Graveyard	67.201	0.52%
Heritage Site	4.307	0.03%
Military Lands/Cantonment	223.682	1.72%
Orchards	8.964	0.07%
Range Land	4614.463	35.53%
Transportation	610.355	4.70%
Vacant Area	2927.275	22.54%
Agriculture	430.233	3.31%
Waterbody	438.531	3.38%
Total	12989.049	100.00%

Map 14: Land use Classification Map of Jamrud Urban Area



3.4 Potential Urban Centers

3.4.1 Bara

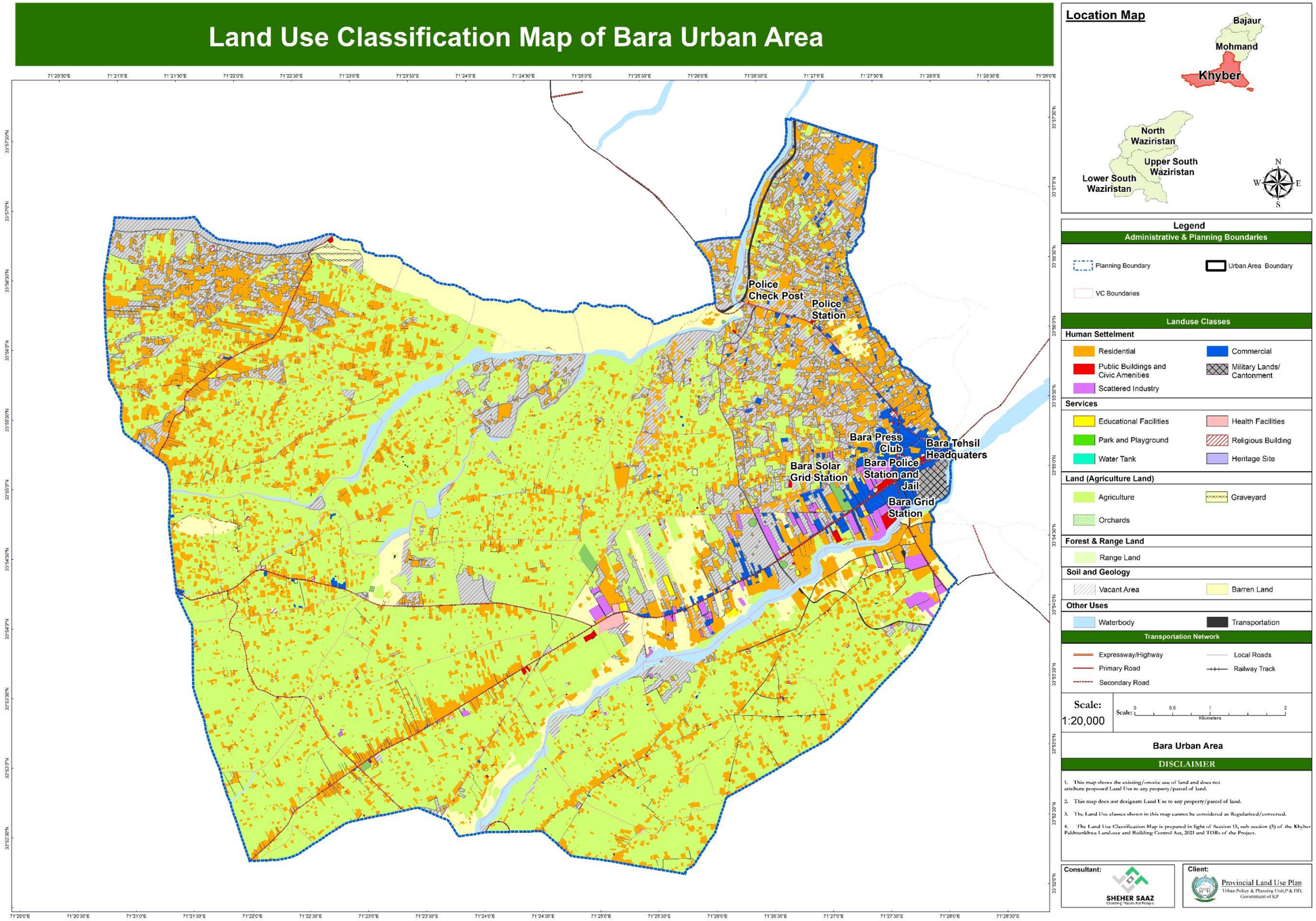
The land-use distribution of Bara (urban area) for the 18,525.91 acres shows that the landscape is overwhelmingly dominated by Agriculture, which occupies nearly half of the total area at 49.71% (9,209 acres). This indicates that the region is primarily an agrarian zone with extensive cultivation. The second-largest category is Residential land, covering 21.14% (3,917 acres), reflecting a significant settled population. Vacant areas also form a notable portion at 12.52% (2,320 acres), suggesting land available for expansion or currently unused. Range land accounts for 6.02% (1,114 acres), showing the presence of open, undeveloped terrain. Transportation infrastructure occupies 4.32% (801 acres), illustrating established road networks across the area.

Commercial and industrial uses remain relatively limited, with commercial land at only 1.44% (267 acres) and scattered industry at 0.88% (163 acres), indicating modest economic activity. Institutional and community services including public buildings (0.15%), education facilities (0.30%), health facilities (0.13%), religious buildings (0.15%), and parks/playgrounds (0.17%) each occupy less than 1% of the land, pointing to a shortage of civic and social infrastructure relative to population size. Other minor categories include graveyards (0.26%), military lands (0.28%), orchards (0.07%), and barren land (0.01%). Waterbodies represent 2.45% (454 acres), contributing to the area's natural environmental features.

Table 16: Existing Land use distribution of Bara

Land use	Area (Acres)	Percentage %
Residential	3917.16	21.14%
Commercial	266.79	1.44%
Scattered Industry	162.81	0.88%
Public Buildings and Civic Amenities	27.58	0.15%
Barren Land	1.94	0.01%
Religious Building	28.14	0.15%
Education Facilities	54.69	0.30%
Health Facilities	24.23	0.13%
Park and Playground	31.62	0.17%
Graveyard	47.98	0.26%
Military Lands/Cantonment	52.25	0.28%
Orchards	12.44	0.07%
Range Land	1114.38	6.02%
Transportation	800.64	4.32%
Vacant Area	2320.14	12.52%
Agriculture	9209.01	49.71%
Waterbody	454.11	2.45%
Total	18525.91	100.00%

Map 15: Land Use classification of Bara Potential Urban Center



3.4.2 Mullagori

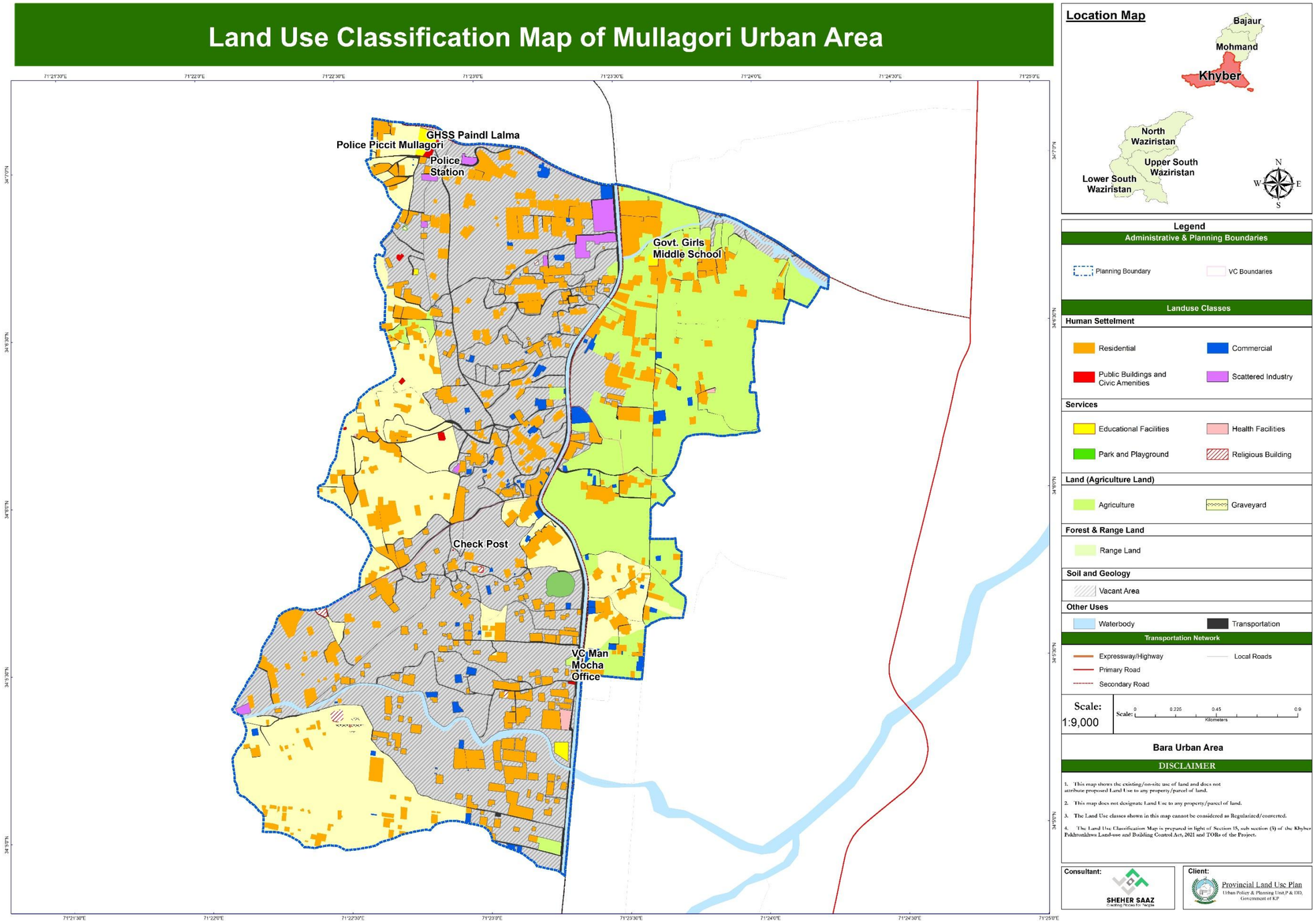
The land-use distribution for the 1,651.46 acres shows that Vacant Area forms the largest share at 40.80% (673.85 acres), indicating a significant amount of undeveloped or unused land with potential for future expansion. Agriculture is the second-largest category, covering 19.32% (318.99 acres), reflecting a moderate presence of cultivated land in the area. Residential land accounts for 17.10% (282.38 acres), showing a settled population but at a relatively small scale compared to agricultural and vacant land. Range land occupies 13.37% (220.74 acres), representing open, undeveloped terrain that supports natural or grazing activities.

Commercial and industrial uses are minimal, with commercial land at 1.22% (20.16 acres) and scattered industry at just 0.70% (11.64 acres), indicating limited economic and industrial activity. Public and community facilities including public buildings (0.11%), education facilities (0.35%), health facilities (0.11%), religious buildings (0.11%), graveyards (0.12%), and parks/playgrounds (0.28%) each occupy very small proportions of the total area, reflecting a clear shortage of civic and social infrastructure. Transportation land accounts for 4.90% (80.97 acres), representing the area's road networks, while waterbodies cover 1.50% (24.84 acres).

Table 17: Existing Land use distribution of Mullagori

Land use	Area (Acres)	Percentage %
Residential	282.38	17.10%
Commercial	20.16	1.22%
Scattered Industry	11.64	0.70%
Public Buildings and Civic Amenities	1.84	0.11%
Education Facilities	5.85	0.35%
Health Facilities	1.83	0.11%
Religious Building	1.74	0.11%
Graveyard	2.01	0.12%
Park and Playground	4.62	0.28%
Range Land	220.74	13.37%
Transportation	80.97	4.90%
Vacant Area	673.85	40.80%
Agriculture	318.99	19.32%
Waterbody	24.84	1.50%
Total	1651.46	100.00%

Map 16: Land use Classification Map of Mullagori Potential Urban Area



3.5 Potential Urban Settlements/Areas

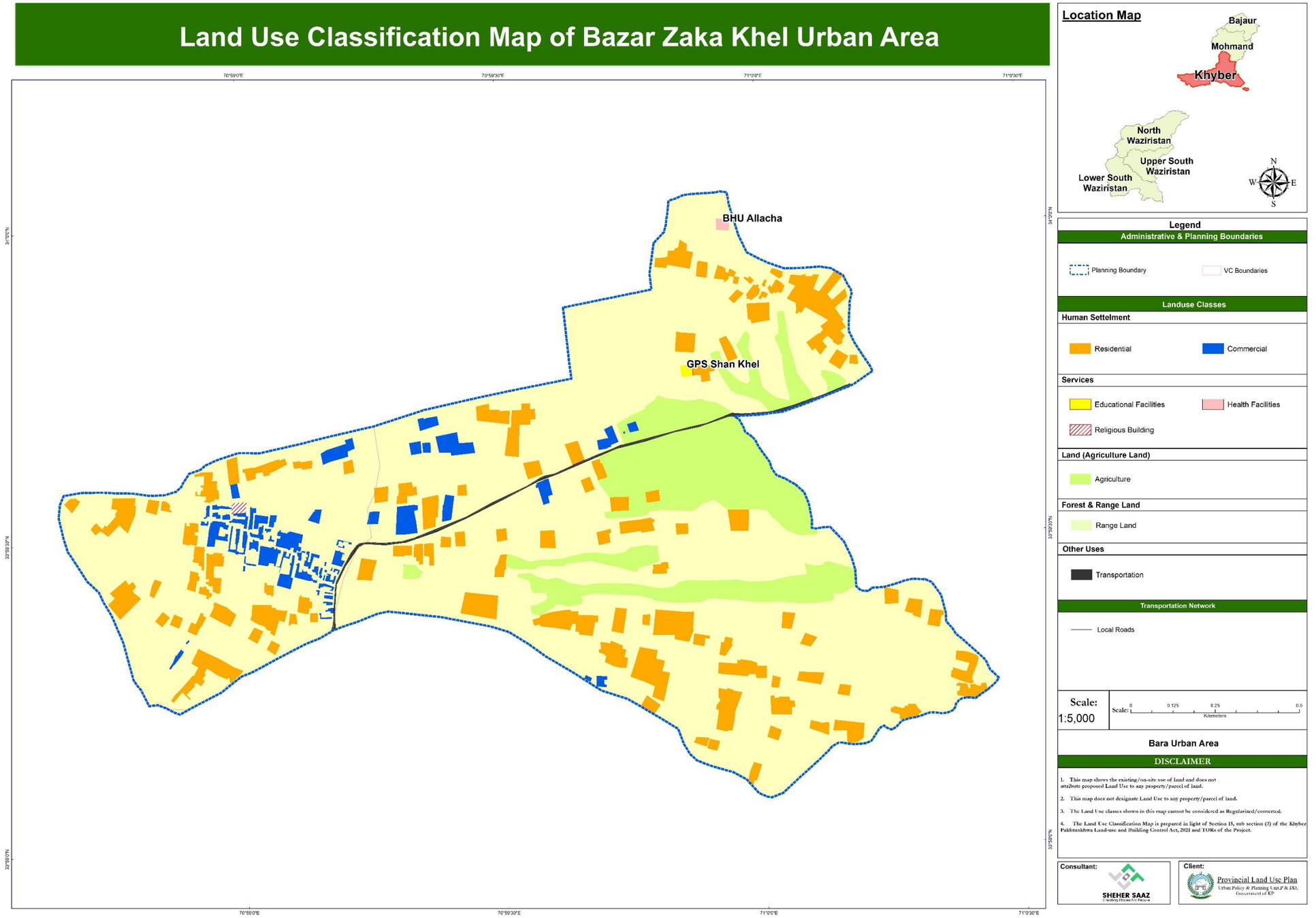
3.5.1 Bazar zakha khel-5 (Landi kotal Tehsil)

The land-use distribution for the 536.63 acres shows that the area is overwhelmingly dominated by Range Land, which accounts for 71.83% (385.47 acres) indicating a landscape largely characterized by open, undeveloped, or grazing land. Residential use forms 12.76% (68.46 acres), suggesting a small but established settlement. Agriculture covers 11.59% (62.22 acres), reflecting limited but present cultivation within the area.

Commercial land occupies 2.99% (16.03 acres), showing minor economic activity, while institutional and community uses including education facilities (0.06%), health facilities (0.07%), and religious buildings (0.07%) each take up very small portions, indicating a scarcity of social infrastructure. Transportation land accounts for only 0.63% (3.40 acres), representing minimal road or mobility infrastructure.

Land use	Area (Acres)	Percentage %
Agriculture	62.22	11.59%
Commercial	16.03	2.99%
Education Facilities	0.32	0.06%
Health Facilities	0.35	0.07%
Range Land	385.47	71.83%
Religious Building	0.37	0.07%
Residential	68.46	12.76%
Transportation	3.40	0.63%
Total	536.63	100.00%

Map 17: Land use Classification Map of Bazar zakha khel-5 Potential Urban Area



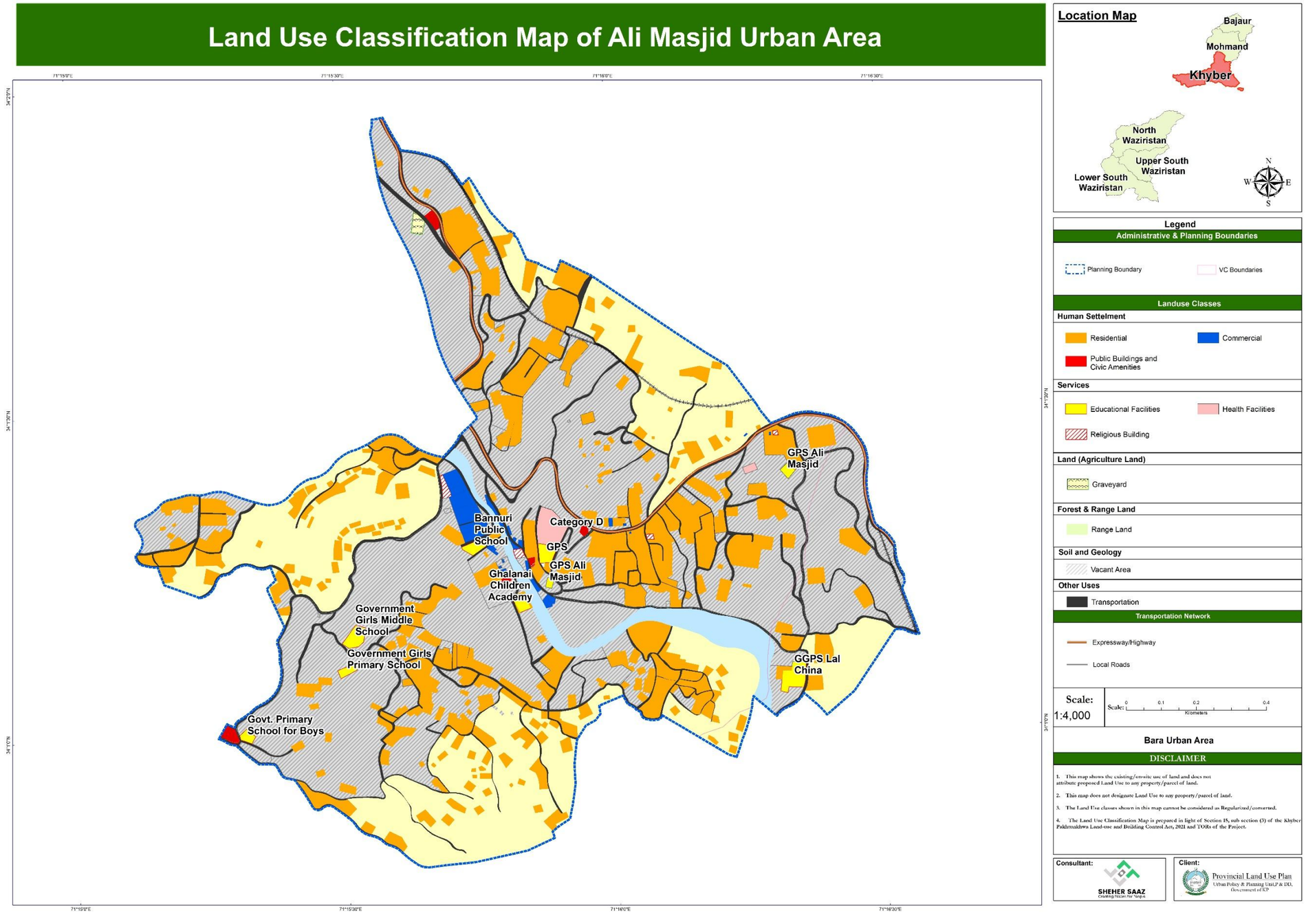
3.5.2 Ali Masjid (Jamrud Tehsil)

The land-use distribution for Ali Masjid (Jamrud Tehsil, District Khyber) shows a total area of 543.85 acres, dominated primarily by Vacant Area, which constitutes 44.44% (241.70 acres). This indicates that almost half of the settlement remains undeveloped or underutilized, offering significant potential for planned growth and future infrastructure development. The second-largest category is Range Land, covering 23.31% (126.77 acres), reflecting the presence of open, natural, or semi-developed terrain around the settlement.

Residential land makes up 19.51% (106.13 acres), showing a moderate-sized population cluster within the area. In contrast, economic activity remains limited, with commercial land accounting for only 0.83% (4.51 acres). Institutional facilities including education (0.75%), health (0.36%), public buildings (0.18%), and religious structures (0.11%) each occupy very small portions of the land, indicating a shortage of essential services relative to settlement size. Transportation land accounts for 8.07% (43.91 acres), showing a noticeable share allocated to roads and mobility networks, while waterbodies cover 2.35% (12.79 acres).

Land use	Area (Acres)	Percentage %
Residential	106.130	19.51%
Commercial	4.506	0.83%
Education Facilities	4.099	0.75%
Graveyard	0.424	0.08%
Health Facilities	1.955	0.36%
Public Buildings and Civic Amenities	0.983	0.18%
Religious Building	0.595	0.11%
Range Land	126.765	23.31%
Transportation	43.907	8.07%
Vacant Area	241.699	44.44%
Waterbody	12.790	2.35%
Total	543.853	100.00%

Map 18: Land Use Classification of Ali Masjid Potential Urban Area



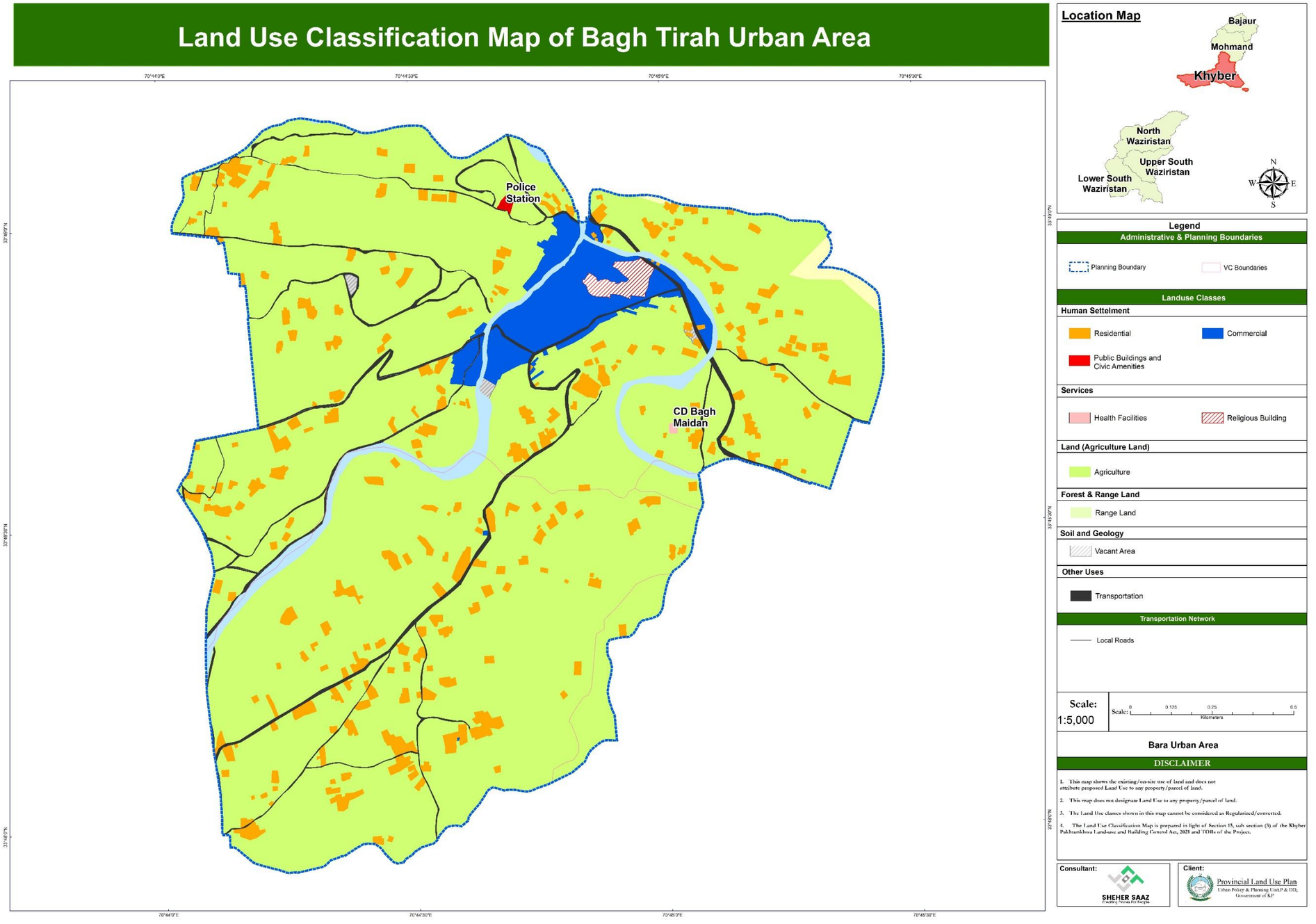
3.5.3 Tirah (Bara Tehsil)

The land-use distribution for Tirah (Tehsil Bara), covering a total of 801.39 acres, is overwhelmingly dominated by Agriculture, which accounts for 84% (673.16 acres). This indicates that Tirah is primarily an agrarian landscape, with most of its land dedicated to farming and cultivation. Residential use is limited to 6.07% (48.64 acres), showing that the settlement footprint is relatively small compared to its vast agricultural land. Commercial activity occupies 4.04% (32.39 acres), suggesting modest local trade and market functions within the area.

Other land uses appear minimal: transportation accounts for 3.06% (24.53 acres), reflecting essential but limited road infrastructure, while range land represents only 0.57% (4.56 acres). Institutional and community facilities including health (0.03%), public buildings (0.05%), and vacant areas (0.13%) cover very small proportions, pointing to a shortage of civic services and administrative infrastructure. Waterbodies, at 2.05% (16.44 acres), provide natural resources and environmental value to the region.

Land use	Area (Acres)	Percentage %
Residential	48.641	6.07%
Commercial	32.393	4.04%
Health Facilities	0.228	0.03%
Public Buildings and Civic Amenities	0.382	0.05%
Range Land	4.561	0.57%
Transportation	24.534	3.06%
Vacant Area	1.055	0.13%
Agriculture	673.157	84.00%
Waterbody	16.441	2.05%
Total	801.393	100.00%

Map 19: Land Use Classification of Tirah Potential Urban Area



3.5.4 Tatara (Mulla gori Tehsil)

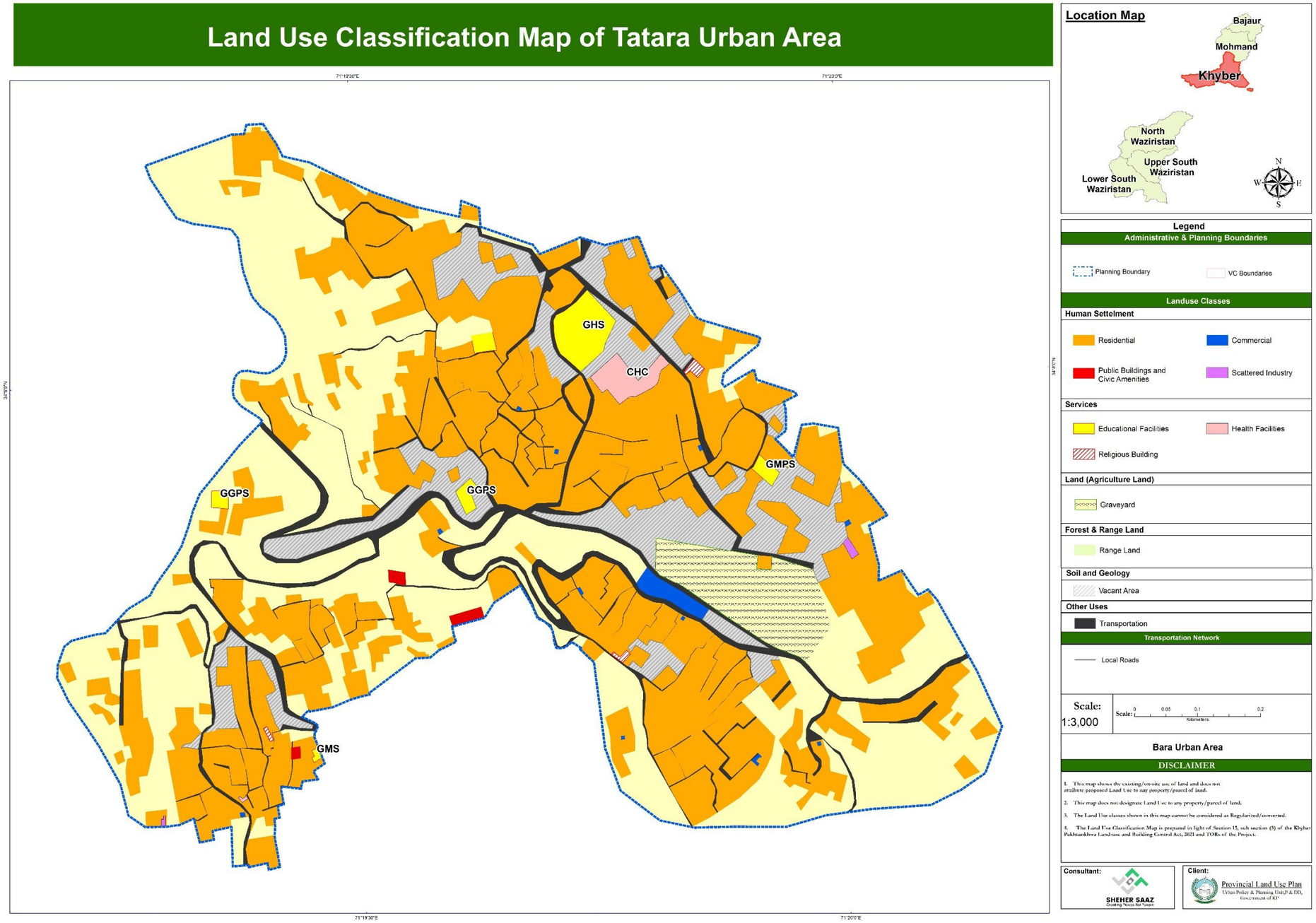
The existing land use of Tatara reflects a predominantly residential and rural character, with residential areas occupying 98.702 acres, which is the largest single category at 43.07% of the total land. This indicates that the settlement is primarily a living area with concentrated housing. The second largest land type is range land, covering 79.384 acres (34.64%), which suggests that a significant portion of the area is used for grazing, agriculture, or open natural landscapes, highlighting the semi-rural nature of the region.

Vacant areas account for 20.850 acres (9.10%), showing potential space for future development or community expansion. Transportation infrastructure, including roads and pathways, occupies 17.386 acres (7.59%), providing necessary connectivity within the settlement and to surrounding areas. Graveyards take up 7.048 acres (3.08%), reflecting cultural and religious land use, while education facilities cover 2.919 acres (1.27%), and health facilities occupy 1.195 acres (0.52%), indicating the presence of essential public services but on a relatively small scale.

Other minor land uses include commercial areas (0.906 acres, 0.40%), public buildings and civic amenities (0.453 acres, 0.20%), religious buildings (0.210 acres, 0.09%), and scattered industry (0.116 acres, 0.05%), which show limited economic and institutional activities.

Land use	Area (Acres)	Percentage %
Commercial	0.906	0.40%
Education Facilities	2.919	1.27%
Graveyard	7.048	3.08%
Health Facilities	1.195	0.52%
Public Buildings and Civic Amenities	0.453	0.20%
Range Land	79.384	34.64%
Religious Building	0.210	0.09%
Residential	98.702	43.07%
Scattered Industry	0.116	0.05%
Transportation	17.386	7.59%
Vacant Area	20.850	9.10%
Total	229.169	100.00%

Map 20: Land Use Classification of Tatara Potential Urban Area



4 CHAPTER IV: URBANIZATION AND HIERARCHY OF HUMAN SETTLEMENTS

4.1 Urbanization

Urbanization refers to the systematic transformation of rural areas into urbanized regions, driven by economic development and industrialization. Demographically, it refers to the shift of populations from rural to urban settings over time. This process predominantly leads to the formation and expansion of towns and cities as more people start living and working in central urban areas. Over the past fifty years, many developing countries have experienced rapid urbanization, resulting in a high concentration of urban populations in large cities. Urbanization is not just a modern occurrence but a significant and historical shift in human social structures on a global scale, where rural cultures are rapidly being replaced by urban ones.

Urbanization has both positive and negative impacts. On the positive side, it drives economic development and improves education. However, it also strains existing social services and infrastructure. For example, a sudden population increase can lead to housing shortages, resulting in the development of slums. To address urbanization, long-term planning for cities and towns is crucial. This planning should include considerations for housing, infrastructure, employment, and social services to manage urban growth effectively. Such planning is essential for creating attractive, affordable, sustainable, and well-serviced communities with access to job opportunities.

4.1.1 Urbanization of District Khyber

District Khyber has gone through a dramatic demographic shift over the last four decades. In 1981, its population was just under 380,000, but by 1990 it had already crossed the half-million mark (513,000). The upward trend continued into the 21st century, with the population reaching just over 1 million by 2017, and further increasing to 1.15 million in 2023. This doubling in less than thirty years reflects the combined effect of a high natural growth rate and steady in-migration from surrounding rural areas.

Despite this rapid rise, the district is still overwhelmingly rural. As of 2023, over 92% of residents live in rural areas, while the urban share is just 8% (94,707 people). However, the pace of change within the two recognized towns, Jamrud and Landi Kotal is striking. Jamrud's population has more than doubled since 1998, and today it has around 56,600 residents. If current trends continue, it is projected to cross the one-million threshold by 2045, effectively transforming into a major secondary city. Landi Kotal has grown more moderately, from about 22,000 people in 1998 to nearly 38,000 in 2023, but projections still suggest that it could exceed half a million residents within two decades.

At the sub-district level, Bara Tehsil is by far the largest, with almost 550,000 residents, nearly half of the district's total population. Landi Kotal and Jamrud follow, with 312,000 and 243,000 people respectively, while Mulla Gori remains sparsely populated at around 43,000. The settlement pattern shows how people continue to cluster along transport corridors and fertile valleys, particularly around routes connecting to Peshawar.

4.1.2 Growth Direction

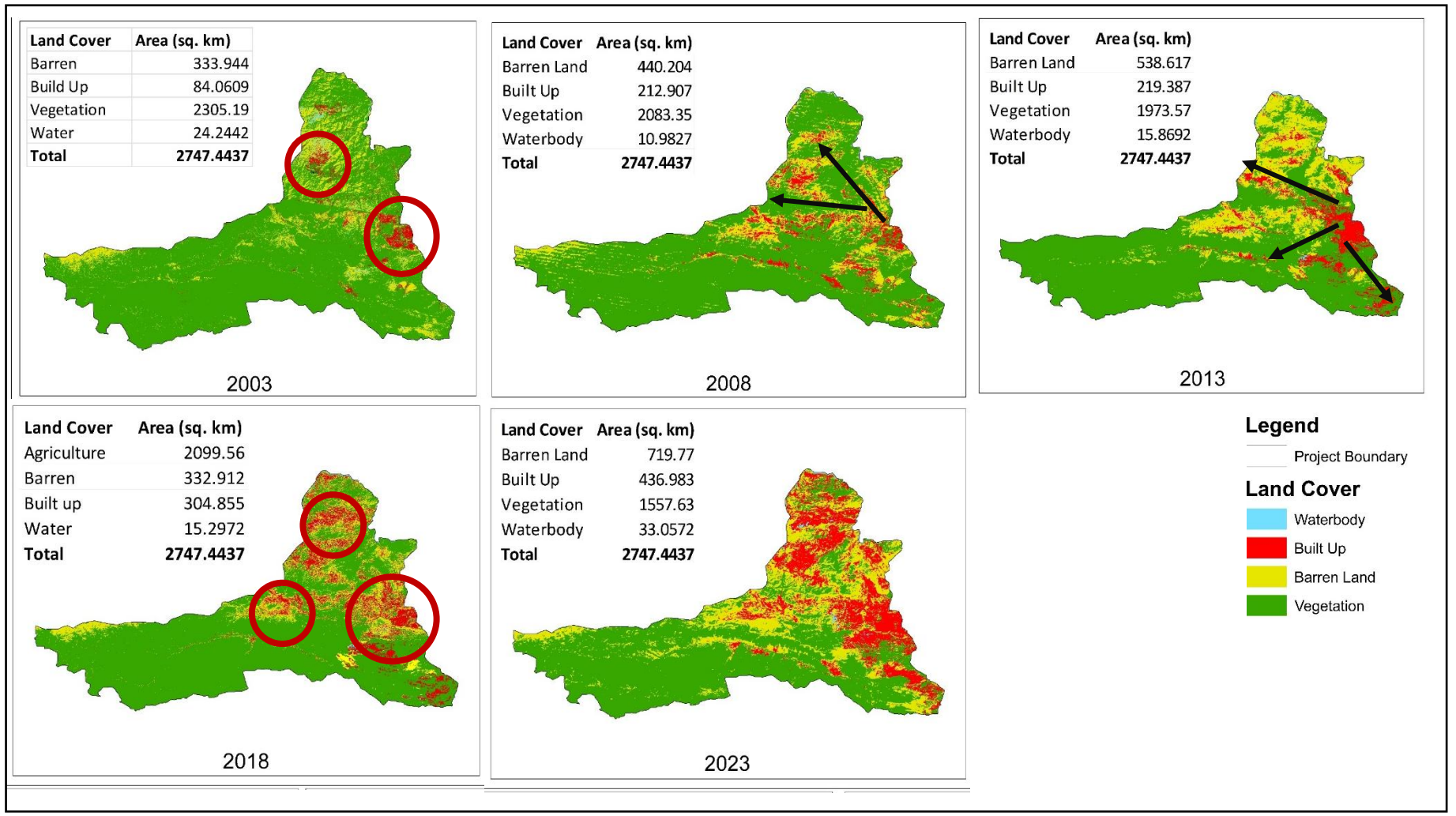
Over the last two decades, District Khyber has experienced a significant transformation in its land cover and settlement pattern. The built-up area has expanded rapidly, increasing from around 84 sq. km in 2003 to nearly 437 sq. km in 2023. This expansion is not uniform but is shaped by the district's geography, its transport corridors, and the strong urban influence of Peshawar. The most visible direction of growth is eastward and northeastward toward Peshawar, while another strong axis of expansion follows the Peshawar–Torkham Highway (N-5) in a linear, corridor-based form. In contrast, the rugged northern and western areas of the district show limited change due to topographical constraints.

This growth has come with a notable shift in land use. Vegetation and agricultural land have declined by almost one-third, while barren land has more than doubled. Much of the new urban area has been developed on former cultivated or vegetated land, showing a gradual transition from vegetation to barren land and then to built-up. The plains in the east and central valleys of the district are under the greatest development pressure, whereas the higher hill ranges remain relatively stable.

Tehsil-wise Growth Trends

- Bara Tehsil has witnessed the largest expansion of built-up land, mainly in the eastward and northeastward direction. Its settlements are spreading into the plains that directly connect with Peshawar, creating a visible continuity of urban development between the two areas.
- Jamrud Tehsil shows a linear growth pattern, concentrated along the Peshawar–Torkham Highway. Expansion is strongest on the eastern side toward Peshawar, while westward growth is observed along the valley floors. The built-up footprint follows the road corridor closely.
- Landi Kotal Tehsil has expanded in a more radial form around its central settlement, with development stretching along the valley and the highway. Growth has extended east toward Jamrud and west toward Torkham, although it remains more moderate compared to Bara and Jamrud.
- Mulla Gori Tehsil remains the least urbanized, with only scattered settlement expansion. Growth is localized near fertile valleys and accessible points, while much of the land still remains barren or under vegetation cover.

Map 21: Growth Trend Map - District Khyber



4.1.3 Drivers of Urbanization

Urbanization in Khyber District is driven by a combination of factors that include natural population increase, proximity to Peshawar District, and the strategic importance of the region. One of the primary drivers of urbanization in Khyber District is the natural population increase. High birth rates and declining mortality rates contribute to a growing population, which in turn fuels the expansion of urban areas. As the population grows, there is an increased demand for housing, infrastructure, and services, leading to the development of urban settlements.

Proximity to Peshawar District, particularly tehsils such as Jamrud and Landi Kotal, plays a significant role in the urbanization process. Peshawar, being the provincial capital and a major urban center, exerts a strong economic and social influence on the surrounding areas. Khyber District benefits from its proximity to Peshawar by gaining access to better employment opportunities, educational institutions, healthcare facilities, and markets. This proximity encourages migration from rural areas within Khyber District to urban centers near Peshawar, contributing to the urbanization trend.

Additionally, the strategic location of Khyber District, which includes key border areas and trade routes, enhances its importance as an urbanizing region. The district serves as a vital link between Pakistan and Afghanistan, facilitating trade and commerce. The development of infrastructure such as roads and trade facilities further accelerates urban growth by attracting businesses and investments. The economic opportunities generated by these activities not only draw in local populations but also attract migrants from other regions, thereby increasing urbanization.

4.1.4 Settlements to be Urbanized by 2045

Several settlements in District Khyber are projected to reach urban scale by 2045 due to rapid population growth. Based on demographic and functional analysis, 19 rural settlements will have populations exceeding 30,000, qualifying them for urban status. These include:

- **Jamrud Tehsil**: Ghundi-3, Ghundi-2, Ali Masjid, Ghundi-5, Shah Kass-2
- **Landi Kotal Tehsil**: Khyber Zakha Khel-4, Dalkhad/Charbagh, Bazar Zakha Khel-4 & 5
- **Bara Tehsil**: Sanzal Khel-1, Khojal Khel Tirah, Kohi MDK, Mada Khel
- **Mulla Gori Tehsil**: Paindi Lalma No. 2, Tatara

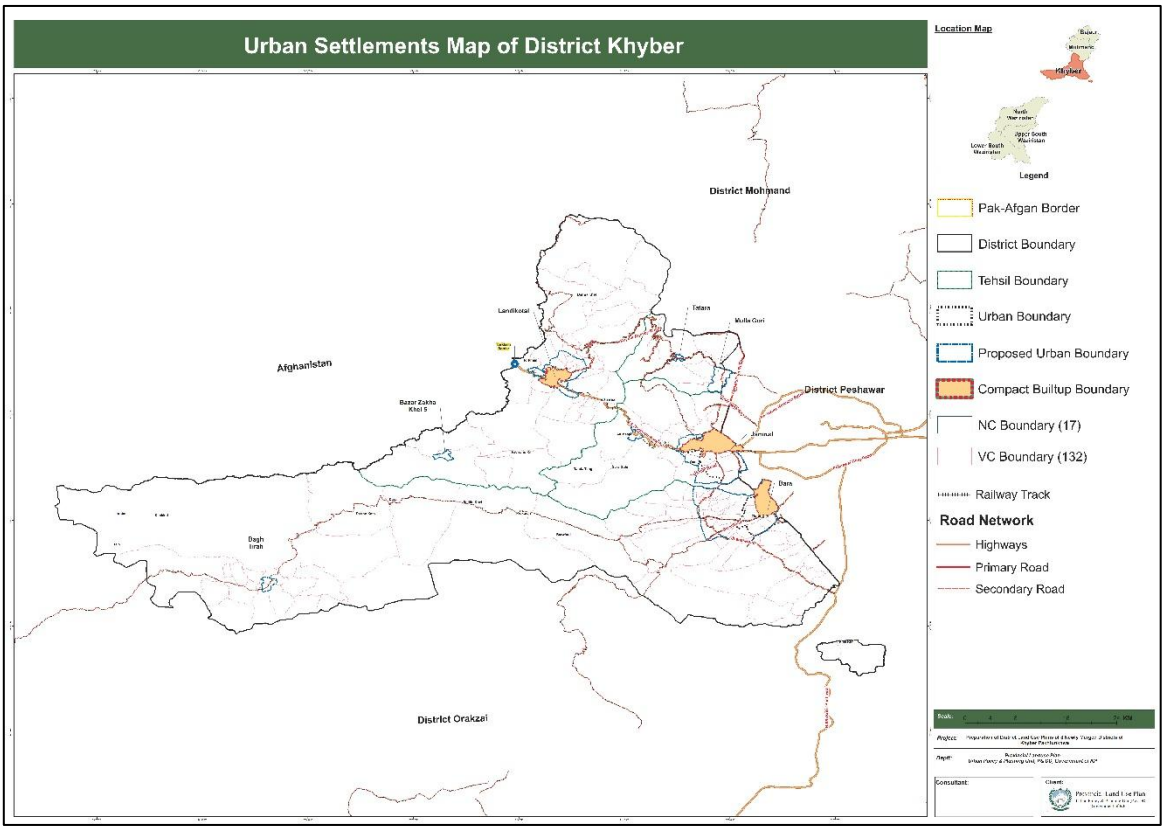
These areas show growing urban functions and should be prioritized for basic services, infrastructure, and inclusion in urban development plans. The table and the map below show the village councils which need to be urbanized by 2045.

Table 18: Identified Potential Urban Settlements based on Population

Sr. No.	Tehsil	Existing Hierarchy	Settlement Name	Settlement by Type	Population 2045
1	Landi Kotal	Rural area	Bazar zakha khel-5	Small City	15278
		Urban area	Landi kotal urban centre	Small City	269203
2	Jamrud	Urban area	Jamrud Urban centre	Small City	311984
		Rural area	Ali Masjid	Small City	26088
3	Bara	Rural area	Bara	Small City	403394
		Rural area	Tirah	Small City	22807
4	Mulla Gori	Rural area	Mulla gori	Small City	26966
		Rural area	Tatara	Small City	6816

Source: Devised by Consultant

Map 22: Compact and Proposed Urban Boundaries



4.2 Hierarchy of Settlements

4.2.1 Objectives of Hierarchy of Settlements

The overall objective of establishing hierarchy of settlements is to describe and understand the existing structure of the network of settlements (urban centers and small settlements) in

Khyber as a key consideration in the formulation of development strategies and projects. Structure is determined by the functions and roles of the settlements.
Major objectives of the Settlement Hierarchy are as below:

- Accommodate and promote the development of linkages and infrastructure servicing of these settlements.
- Accommodate and promote proper planning and sustainable development in their environs.
- Promote the role of these Settlements as economic, social and cultural centers for the surrounding areas.
- Promote growth in smaller areas to allow for balanced and coordinated development throughout Khyber District.
- Promote linkages between larger and smaller towns in order to distribute the resulting influence throughout the region.
- Promote the strengthening of Settlements/Towns as employment and service centers and as attractive residential centers.

4.2.2 Hierarchy of Human Settlements and Urban Planning

Since there are only two identified urban settlements in Khyber District, there is a need to identify criteria by which rural settlements can be categorized by hierarchy. Since there is no universally agreed-upon standard for these thresholds to establish a relevant settlement hierarchy, the consultant has developed criteria based on indicators of human settlements including population, density, administrative status, and infrastructure development as these indicators are essential for urban planning and resource allocation:

- **Population & its Density**
- **Administrative Status of Settlement**
- **Education Facilities**
- **Health Facility**
- **Access Roads**

These indicators have been assigned weight based on the outcome of the analysis of spatial and non-spatial data, best practices, professional judgment, and the importance of the criteria identified. The criteria for the hierarchy of human settlements are shown below:

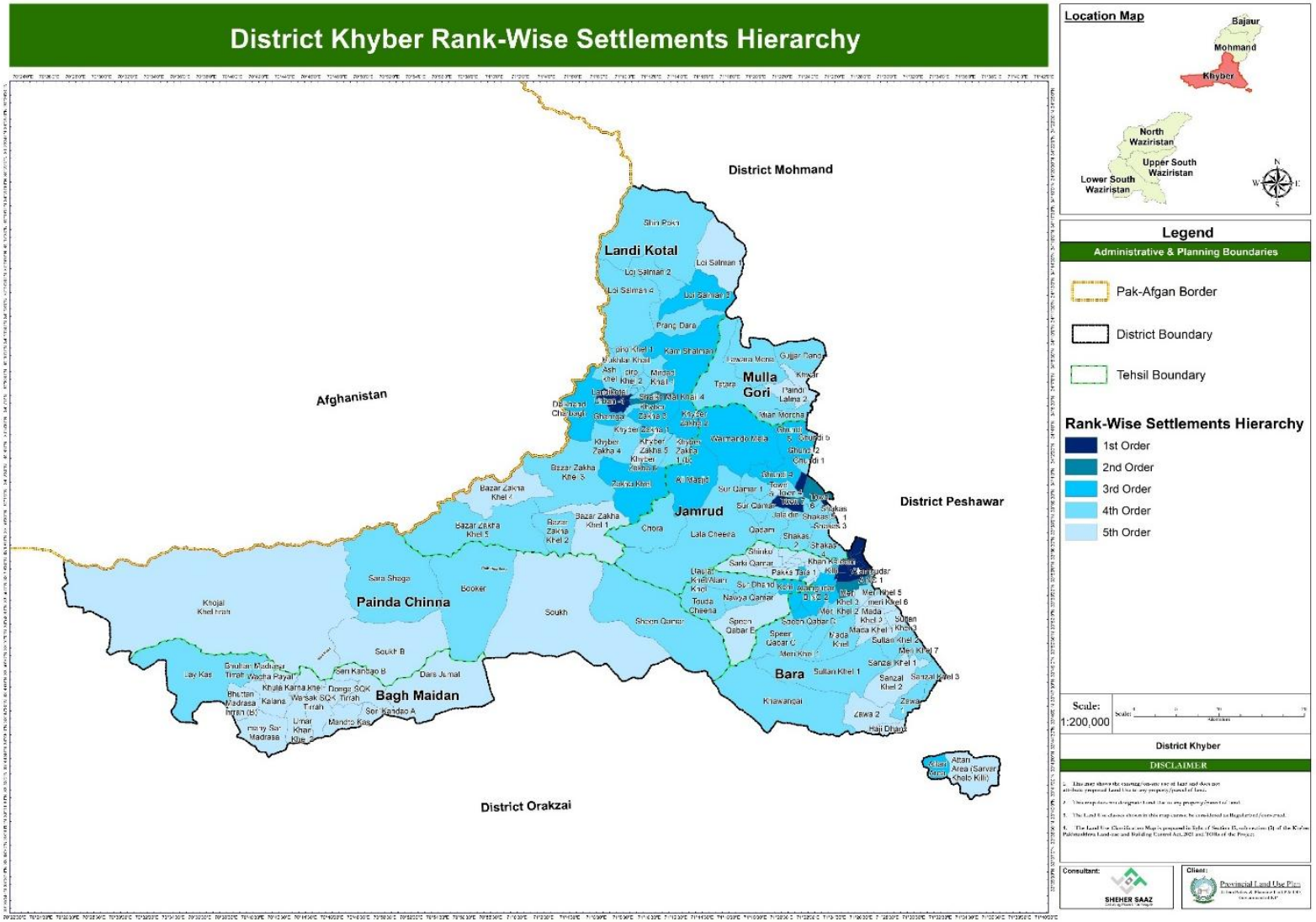
Table 19: Key Indicators of Human Settlements in Khyber District

Indicator	
Population	• Every 10000 population = 1.0
Density	• 0-5000 = Low Density = 0.5 • 5001-10001 = Medium Density = 1.0 • 10002-15002= High Density = 1.5 • >15003 = Very High Density = 2.0
Administrative Status of Settlement	• District Headquarter = 2.0 • Tehsil Headquarter = 1.5 • Village Council = 0.5 • Cantonment = 0.0
Education Facilities	• No Education Facility = 0.0 • Every 1 Primary School = 0.15 • Every 1 Middle School = 0.25 • Every 1 High School = 0.5 • Every 1 Higher Secondary School/Inter College = 1.0 • Every 1 Degree College = 1.5 • Every 1 University = 2.0
Health Facility	• No Health Facility = 0.0 • Every 1 Dispensary = 0.25 • Every 1 Basic Health Unit = 0.5 • Every 1 Rural Health Centre = 1.0 • Every 1 Other Health Centre = 1.5 • Every 1 Hospital = 2.0
Access Roads	• Metaled Road = 2.0 • Unmetalled road = 1.0 • Inaccessible = 0.0

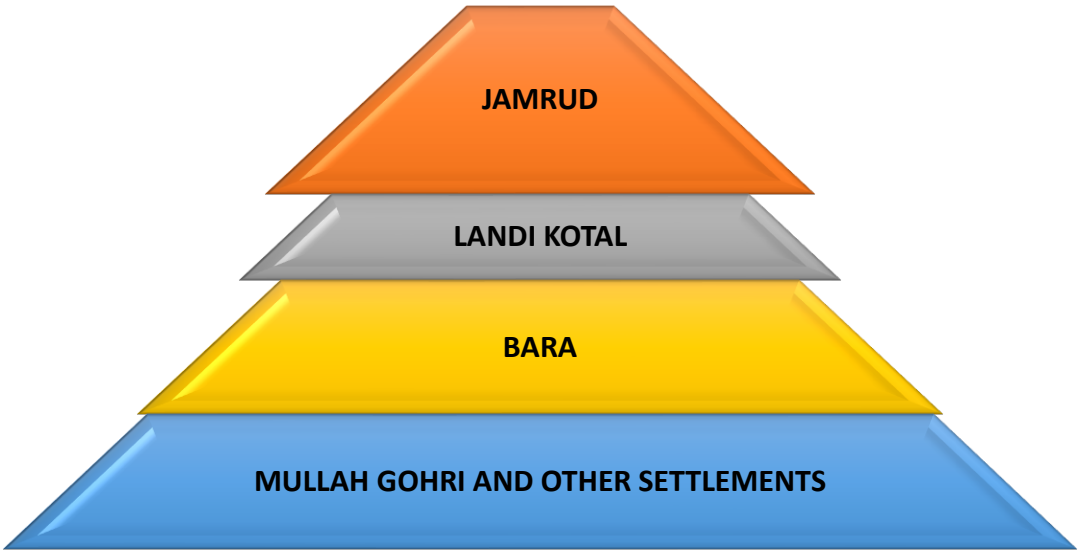
Source: Devised by Consultant, 2024

According to the availability of services and other factors mentioned above, the Khyber district's settlement hierarchy is split into five categories: first order, second order, third order, fourth order, and fifth order.

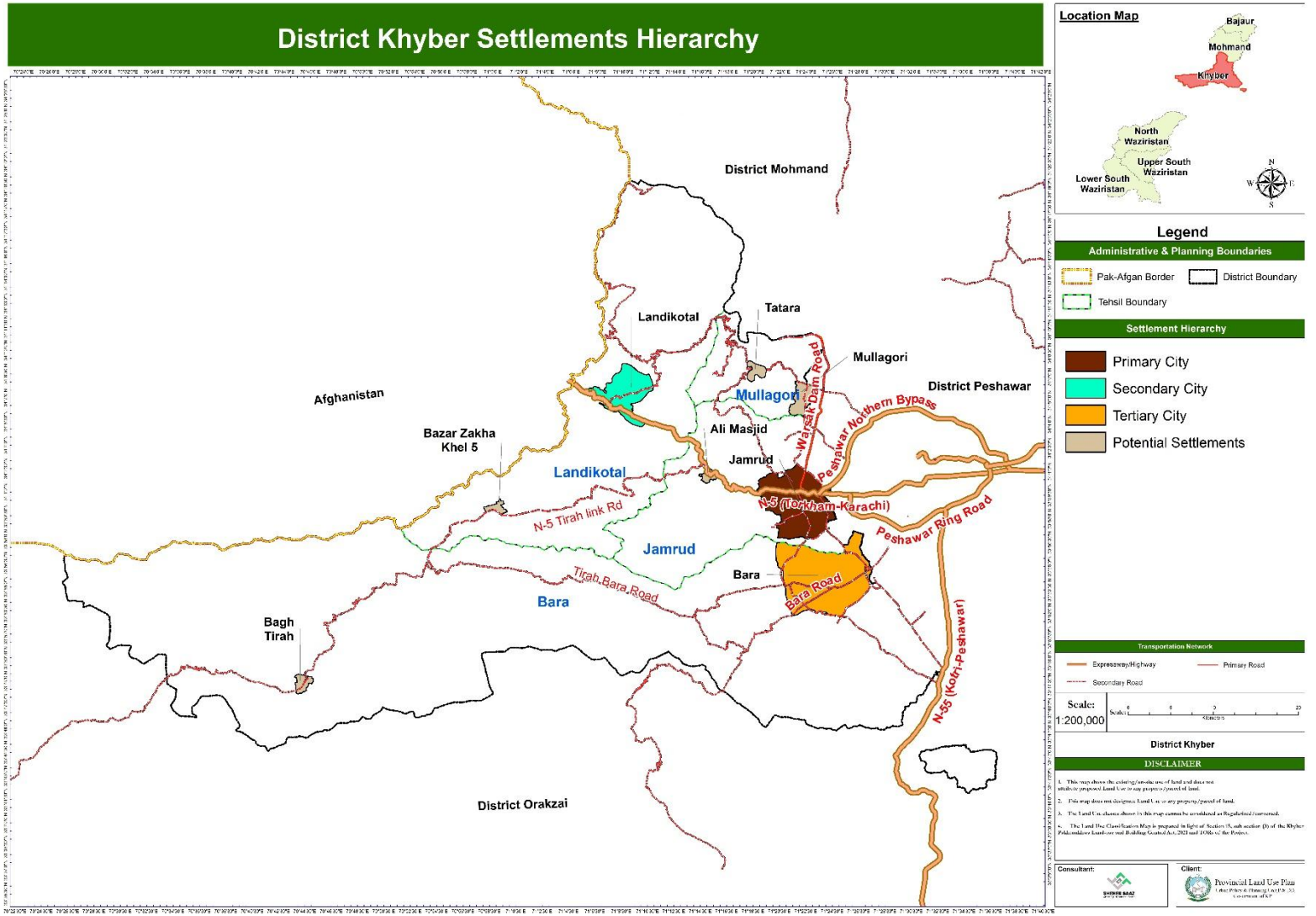
Map 23: Rank-Wise Settlements Hierarchy



The settlement hierarchy of Khyber District reveals Jamrud as the most dominant urban center, followed by Landi Kotal, with Bara and Mulla Gori positioned at lower levels in the hierarchy. Population analysis shows that Jamrud has grown from 32,039 in 1998 to 63,728 in 2017, recording an annual growth rate of 3.68%, while Landi Kotal increased from 22,324 to 33,729 in the same period with a growth rate of 2.19%. The Rank-Size Rule confirms that the district broadly follows a predictable urban distribution, although Jamrud's actual population exceeds the expected figure, showing its stronger urban pull. Similarly, the Primacy Index of 1.89 indicates that Jamrud is almost twice the size of Landi Kotal, emphasizing its concentration of population and services. In terms of spatial function, Jamrud operates as the primary central place, offering intermediate-level services and attracting migration due to its proximity to Peshawar, while Landi Kotal functions as a secondary hub providing high-order services to surrounding rural areas. Bara performs at a tertiary level with basic services, whereas Mulla Gori and smaller villages remain at the lowest tier with minimal services. Overall, this structure highlights a clear dominance of Jamrud in both demographic and functional terms, supported by its location and connectivity, while Landi Kotal maintains a complementary but smaller role in the district's settlement system.



Map 24: Hierarchical Structure of Settlements in Khyber District



5 CHAPTER V: LAND SUITABILITY AND MULTI-CRITERIA ANALYSIS

5.1 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:

$$Multi\ Criteria\ Analysis = w\ x\ C\ x\ r$$

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's suitability is the aptness of a given type of land for a defined use i.e., residential, or commercial. 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 12: 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

5.2 Land Suitability Analysis (LSA) for Land uses

The criteria for the Land Suitability Assessment (LSA) of various land uses, residential, agricultural, commercial, and industrial, are developed based on extensive consultations with the client. These discussions help identify key factors such as land characteristics, environmental sustainability, infrastructure availability, and community needs, ensuring that each land use is appropriately allocated. The details of all land-uses are given below:

5.2.1 LSA Criteria for Residential

The residential criteria are made by using factors and constraints of planning development. The important factor is the proximal of land to primary and secondary roads, planned residential, water bodies and land cover. The table below shows the selected criteria for residential.

Table 20: Factors and Criteria of Residential

S. No	Parameters	Weights	Influence

		Classes (Meters) (Degree)	1 = Not Suitable 2 = Moderate 3 = Most Suitable	
1	Primary Roads	11 - 50	1	15
		51 - 1400	2	
		1401 - 2800	3	
		Above 2801	2	
2	Secondary Roads	11 - 50	1	20
		51 - 1500	3	
		1501 - 2900	3	
		Above 2901	2	
3	Planned Residential	0 - 400	3	15
		401 - 800	3	
		801 - 1600	2	
		Above 1601	1	
4	Waterbodies	0 - 50	1	20
		51 - 500	2	
		501 - 1200	3	
		Above 1201	3	
5	Land Cover	Built-Up	1	10
		Vacant	3	
		Agriculture	2	
6	Slope	0-9 Degree	3	20
		10-15	2	
		Above 15 degree	1	

Source: Developed by Consultants

5.2.2 LSA Criteria for Commercial

The commercial criteria are made by using factors and constraints of planning development. The important factor is the proximal of land to Primary and Secondary Roads, Existing Commercial Bazaar and Land Cover.

Table 21: Factors and Criteria for Commercial

S. No	Parameters	Classes (Meters) (Degree)	Weights 1 = Least Suitable 2 = Moderate 3 = Most Suitable	Influence
1	**Primary Roads**	11 - 70	3	20
		71 - 800	2	
		801 - 1600	1	
		Above 1600	1	

2	**Secondary Roads**	20 - 80	3	30
		81 - 900	2	
		901 - 1800	1	
		Above 1800	1	
3	**Existing Commercial Bazar**	0 - 600	3	20
		601 - 1200	2	
		1201 - 1800	2	
		Above 1800	1	
4	**Land Cover**	Built-Up	1	10
		Vacant	3	
		Agriculture	2	
5	Slope	0-9 Degree	3	
		10-15	2	
		Above 15 degree	1	

Source: Developed by Consultants

5.2.3 LSA Criteria for Industry

The Industrial criteria have been made by using factors of planning development. The important factor is the proximal of land to road, community facilities and parks and playgrounds. For the Land cover, the built-up area is least suitable, vegetation is moderately suitable and vacant is highly suitable.

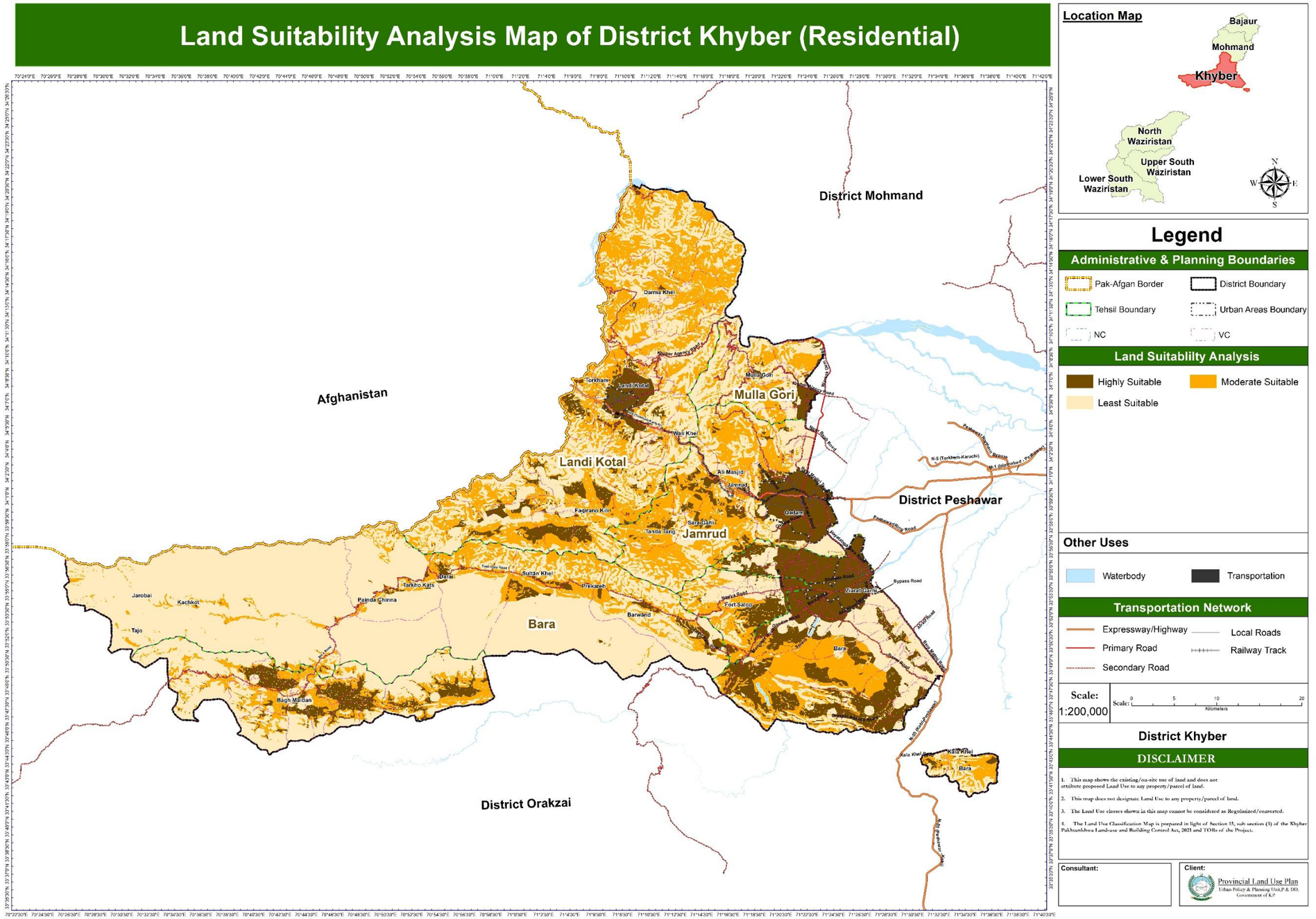
Table 22: LSA Criteria for Industry

S. No	Parameters	Classes (Meters) (Degree)	Weights 1 = Least Suitable 2 = Moderate 3 = Most Suitable	Influence
1	Primary Roads	11 - 700	3	10
		701 - 1400	2	
		1401 - 2100	1	
		Above 2100	1	
2	Secondary Roads	6 - 650	3	20
		551 - 1200	2	
		1201 - 1650	2	
		Above 1650	1	
3	Waterbodies	0 - 50	1	25
		51 - 500	2	

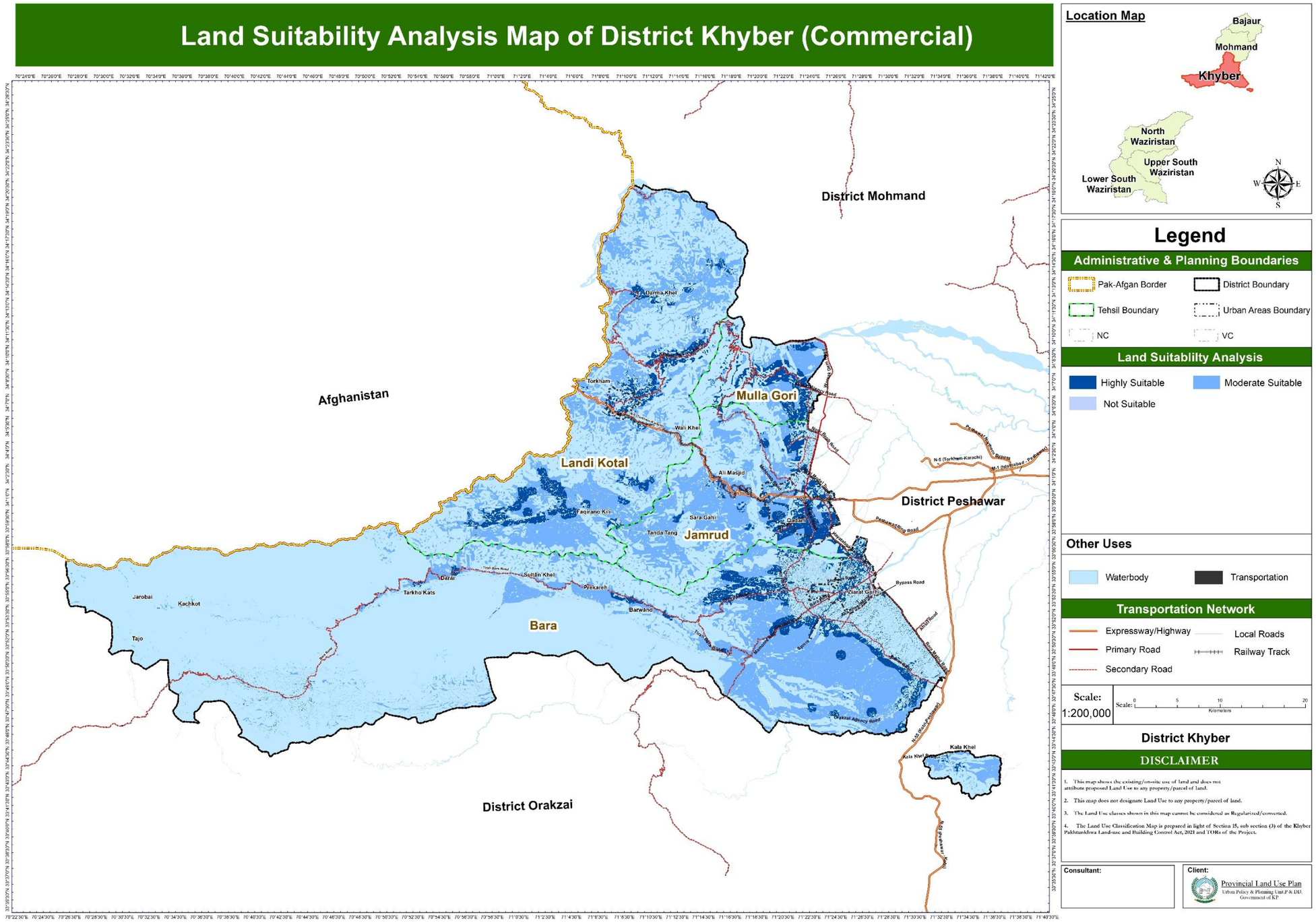
		501 - 1200	3	
		Above 1200	3	
4	Existing Industrial Block	0 - 500	1	20
		501 - 1000	2	
		1001 - 1500	3	
		Above 1500	3	
5	Land Cover	Built-Up	1	10
		Vacant	3	
		Agriculture	2	

Source: Developed by Consultants

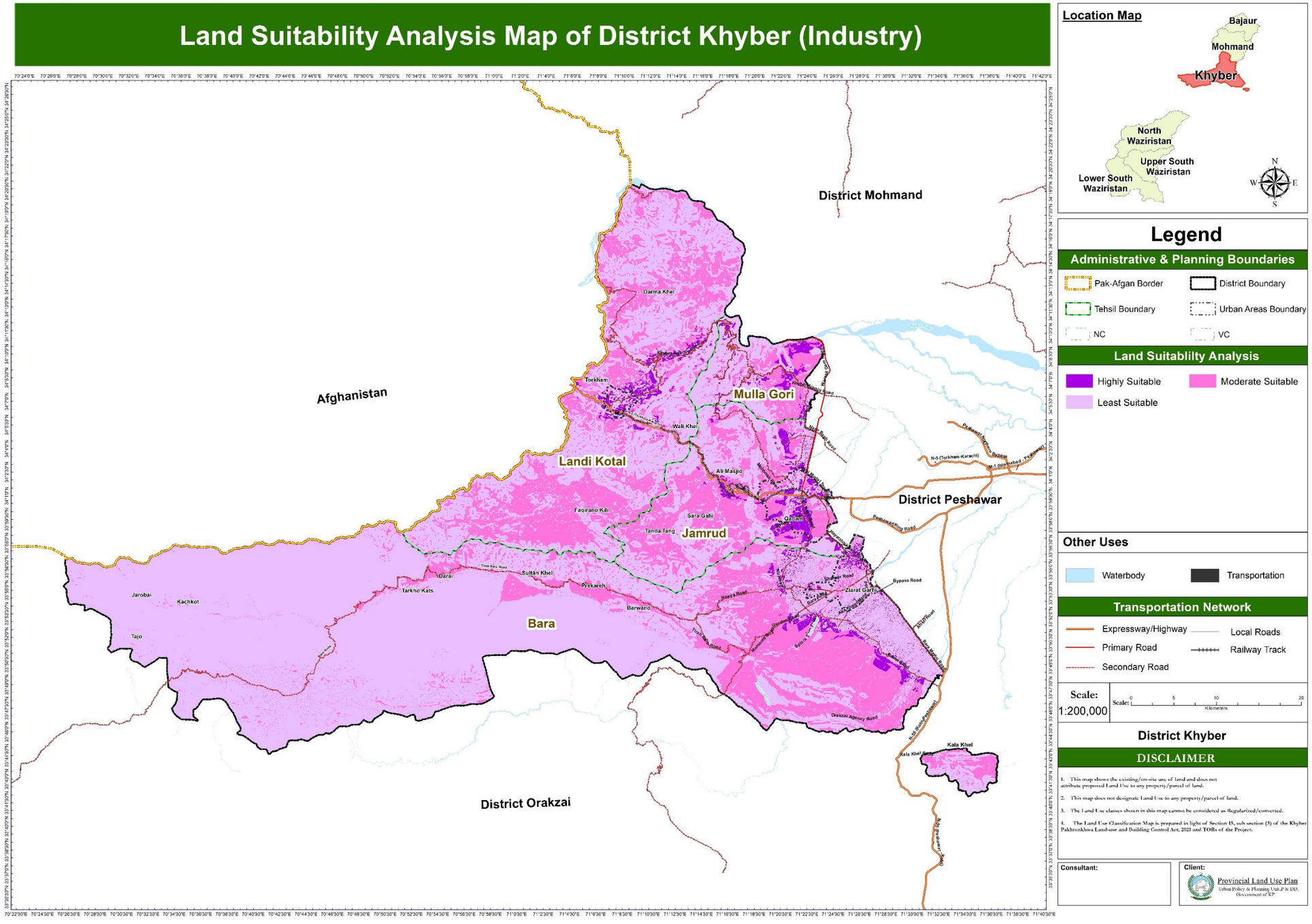
Map 25: Land Suitability Analysis of Residential Land Use



Map 26: Land Suitability Analysis Commercial



Map 27: Land Suitability Analysis for Industry



6 CHAPTER VI: SECTORAL STUDIES AND PROPOSALS

6.1 RESIDENTIAL/HOUSING

6.1.1 Existing Housing Stock

Khyber district has experienced significant transformations in recent years, especially in the domain of housing. The housing sector in Khyber District is characterized by a mix of rural and semi-urban settlements, reflecting the region's transition from traditional tribal governance to more structured administrative frameworks.

The housing structures range from traditional mud houses to more modern brick and concrete constructions, indicative of the gradual shift towards urbanization. This transition is propelled by various factors, including the changing of administrative setup, population growth, internal migration, and economic opportunities, aimed at improving living conditions. Despite these advancements, the housing sector in Khyber District faces several challenges. These include inadequate infrastructure, limited access to basic services such as water and sanitation, and the impact of natural disasters and conflict. Additionally, socio-cultural factors play a crucial role in shaping housing preferences and practices, with extended family systems often necessitating larger living spaces.

As per the census report of 2017, the total population of 984,246 people in Khyber District was accommodated in 111,715 housing units, as against the population of 546,730 people enumerated in 54,416 housing units in the year 1998.

Table 23: Tehsil Wise Details of Housing Units – Khyber District

Administrative Unit	Housing Units	
	1998	2017
Khyber Agency	**54,416**	**111,715**
Rural	43,364	99,888
Urban	5,526	11,827
Bara Tehsil	**29,222**	**51,886**
Rural	29,222	51,886
Urban	-	-
Jamrud Tehsil	**5,848**	**26,362**
Rural	2,432	18,742
Urban	3,416	7,620
Landi Kotal Tehsil	**11,870**	**29,430**
Rural	9,760	25,223
Urban	2,110	4,207

Administrative Unit	Housing Units	
	1998	2017
Mulla Gori Tehsil	**1,950**	**4,037**
Rural	1,950	4,037
Urban	-	-

Source: Census Report of 2017, Pakistan Bureau of Statistics

Focusing on tehsils within Khyber Agency, Bara Tehsil experienced an increase in housing units from 29,222 in 1998 to 51,886 in 2017, a growth of 77.5%. Given that all these units are categorized as rural, this growth reflects extensive rural development. In Jamrud Tehsil, housing units saw an extraordinary increase from 5,848 in 1998 to 26,362 in 2017, a growth of 350.7%. The rural housing units in Jamrud surged from 2,432 to 18,742, a remarkable 670.8% increase, indicating substantial rural development. Urban housing units in Jamrud also increased significantly, from 3,416 to 7,620, a 123.1% rise, reflecting urbanization alongside rural expansion.

Landi Kotal Tehsil also saw significant growth in housing units, increasing from 11,870 in 1998 to 29,430 in 2017, a 147.9% increase. Rural housing units in Landi Kotal rose from 9,760 to 25,223, a 158.4% increase, showing significant rural growth. Urban housing units grew from 2,110 to 4,207, marking a 99.3% increase, indicating steady urban growth. Mulla Gori Tehsil, although smaller, experienced a notable increase in housing units from 1,950 in 1998 to 4,037 in 2017, a 107.1% increase, all of which are rural. This growth underscores the development in the rural area of Mulla Gori.

The following table shows the trends observed in Kacha (temporary), Semi-Pucca (semi-permanent), and Pucca (permanent) housing based on the 1998 and 2017 census.

Table 24: Tehsil-Wise Types of Housing Units – Khyber District

Administrative Unit	1998				2017			
	Total	Kacha	Semi-Pucca	Pucca	Total	Kacha	Semi-Pucca	Pucca
Khyber Agency	**54,416**	**25,902**	**1,618**	**26,896**	**111,715**	**29,234**	**38,402**	**44,079**
Rural	48,890	22,322	1,408	25,160	99,888	24,273	35,472	40,143
Urban	5,526	3,580	210	1,736	11,827	4,961	2,930	3,936
Bara Tehsil	**29,222**	**11,760**	**845**	**16,617**	**51,886**	**21,701**	**17,230**	**12,955**
Rural	29,222	11,760	845	16,617	51,886	21,701	17,230	12,955
Urban	-	-	-	-	-	-	-	-
Jamrud Tehsil	**9,264**	**6,277**	**291**	**2,696**	**26,362**	**12,664**	**7,574**	**6,124**
Rural	5,848	4,027	126	1,695	18,742	8,531	6,088	4,123
Urban	3,416	2,250	165	1,001	7,620	4,133	1,486	2,001
Landi Kotal Tehsil	**13,980**	**7,344**	**428**	**6,208**	**29,430**	**8,921**	**12,425**	**8,084**

Administrative Unit	1998				2017			
	Total	Kacha	Semi-Pucca	Pucca	Total	Kacha	Semi-Pucca	Pucca
Rural	11,870	6,014	383	5,473	25,223	8,093	10,981	6,149
Urban	2,110	1,330	45	735	4,207	828	1,444	1,935
Mullagori Tehsil	**1,950**	**521**	**54**	**1,375**	**4,037**	**1,818**	**1,173**	**1,046**
Rural	1,950	521	54	1,375	4,037	1,818	1,173	1,046
Urban	-	-	-	-	-	-	-	-

Source: Census Report of 2017, Pakistan Bureau of Statistics

6.1.1.1 Household Size

In 2017, the average household size at the Khyber Agency was 8.49. By 2023, this number had decreased to 6.8, indicating a reduction of approximately 19.9%. This decline suggests a trend towards smaller family units, which may be attributed to socio-economic factors such as improved family planning, economic pressures, or cultural shifts.

In the light of different administrative units within Khyber district, the highest household size can be observed in Mullagori tehsil, with an average household size of 9.41, followed closely by Landi Kotal tehsil, with 8.91 people per household in 2017. The trend within these tehsils followed a non-traditional trend; settlements with a higher urban proportion have a higher household size. However, a different trend has been observed based on the 2023 census. The Jamrud tehsil has the highest urban proportion, but its household size is comparatively less than that of the district average and other tehsils. The table below depicts different administrative units with respect to their urban proportion and average household size:

Table 25: Comparison of Average Household Size – Khyber District

Administrative Unit	Census 2017		Census 2023	
	Urban Proportion	Average Household Size	Urban Proportion	Average Household Size
Khyber District	9.90	8.49	8.26	6.8
Bara Tehsil	-	8.28	-	7.1
Jamrud Tehsil	28.01	8.31	23.28	6.5
Landi Kotal Tehsil	12.35	8.91	12.19	6.5
Mullagori Tehsil	-	9.41	-	7.1

Source: Census Report of 2023, Pakistan Bureau of Statistics

There is a noticeable decrease in the urban proportion in both Jamrud and Landi Kotal Tehsils from 2017 to 2023.

- **Jamrud Tehsil**: Urban proportion decreased from 28.01% t0 23.28%
- **Landi Kotal Tehsil**: Urban proportion decreased from 12.35% to 12.19%

This decline could indicate a relative stagnation or slower pace of urbanization in these areas compared to the overall growth rate of the population.

Between 2017 and 2023, all tehsils of Khyber District experienced a notable decline in average household size, reflecting broader socio-economic shifts towards smaller family units. In Bara, household size fell by 17.8% (8.28 to 6.8), while Jamrud and Landi Kotal recorded sharper reductions of 21.7% (8.31 to 6.5) and 27% (8.91 to 6.5) respectively, indicating significant demographic change. Mulagori also saw a decline from 9.41 to 7.1 (24.5%), though the reduction was relatively less pronounced compared to Jamrud and Landi Kotal. Overall, the trend underscores a district-wide move towards smaller family structures.

6.1.2 Existing Housing Schemes Public and Private

Several housing initiatives, both public and private, are shaping the future residential landscape of Khyber District.

Scheme/Initiative	***Type & Developer***	***Location***	***Features***	***Current Status***
Naya Pakistan Housing Programme (NPHP)	Federal Govt. Initiative	Jamrud, Bara, Landi Kotal	Subsidized housing for low/middle-income families; Instalment-based (5–20 years); basic infrastructure	Survey & land identification underway
KP Housing Authority (KPHA) Schemes	Provincial Govt. Initiative	Near Peshawar-Khyber Economic Corridor	Low-cost housing, including for TDPs; possible private collaboration	In planning phase under NMDs Development Plan
Land Allocation for TDPs	Govt. Rehabilitation Housing	Bara, Jamrud & conflict-affected areas	Free/subsidized plots for displaced families; basic infrastructure provided	Ongoing resettlement projects under FDMA
Al-Falah Housing Scheme	Private – Local Investors	Near Jamrud Bypass Road	Residential & commercial plots (5 Marla–1 Kanal); gated community; basic amenities	Development in progress; plots available for sale

Scheme/Initiative	*Type & Developer*	*Location*	*Features*	*Current Status*
Shahbaz Heights	Private – Bara-based developers	Bara Tehsil	Affordable plots; focus on security & modern infrastructure	Registration open; development ongoing
Khyber Economic Zone Residencia	PEZDA + Private Partners	Near Darra Adam Khel Road	Planned housing for industrial workers/investors; linked to CPEC	Planning phase
Khyber Model Town	Private – Peshawar developers	Near Landi Kotal or Jamrud	Modern township with schools, hospitals & markets; high-security zone	Land acquisition underway; not yet launched

6.1.3 Housing Shortage/Backlog

The main aspects that need to be considered for assessing housing backlog include population, household size and the current housing stock. The overall required number of houses in Khyber district was calculated by dividing the current population with the household size of 8.49 as per 2017 census. The difference between the number of houses required and the existing housing stock gives the current housing backlog which turns out to be 168,569 units in the year 2023.

The projected population for the year 2023 shows an increase of 1,146,267 people in five years. This constant increase results in increasing demand for housing units. The total requirement as per current population and household size of Khyber District turns out to be 6,935 units till 2023 as mentioned below.

Table 26: Housing Backlog - Khyber District

Year	Population	Household Size	Required Housing Units	Existing Housing Units	Backlogs	Replacement Demand	Total Requirement
2017	984,246	8.49	115,930	111,715	4,215	-	4,215
2023	1,146,267	6.80	168,569	166,805	1,764	5,171	6,935

Source: Census Report of 2017, Pakistan Bureau of Statistics

6.1.4 Additional Housing Demand (2025-2045)

6.1.4.1 Urban Centre

6.1.4.1.1 Landi Kotal and Jamrud

The projected population growth in both Landi Kotal and Jamrud urban centres indicates a substantial rise in housing demand over the coming decades. For Landi Kotal, the population is expected to increase from 152,213 in 2025 to 269,203, reflecting a steady upward trend. With an assumed average household size of 6.5 persons, the estimated housing requirement for the year 2042 reaches approximately 23,417 housing units, rising to 41,416 units when considering the extended population scenario.

Similarly, Jamrud urban centre shows a strong population increase, with numbers rising from 160,422 in 2025 to 311,984. Applying the same household size assumption of 6.5 persons, the projected need for housing by 2042 is estimated at 24,680 units, increasing further to 47,997.5 units under the higher population projection.

Table 27: Additional Housing Demand in Urban centers (Current 2025 and Future 2045)

Landi Kotal Urban Centre		
Projected Population	***2025***	***2045***
	152,213	269,203
Household Size from 2025 till 2045	6.50	6.5
Future Requirements Housing Units for 2042	23,417	41,416
Jamrud Urban Centre		
Projected Population	***2025***	***2045***
	160,422	311,984
Household Size from 2025 till 2045	6.50	6.5
Future Requirements Housing Units for 2042	24,680	47,997.5

6.1.4.2 Potential Urban Centre

6.1.4.2.1 Bara and Mullagori

The population outlook for Bara and Mullagori indicates notable future housing pressure as both areas transition into emerging urban centres. In Bara, the projected population grows from 219,044 in 2025 to 403,394, signalling a strong upward trajectory. With an average household size of 7.1 persons projected through 2045, the estimated housing need reaches 30,851 units for 2042, increasing further to approximately 56,816 units under the higher population scenario.

Mullagori, though smaller in scale, follows a similar trend. Its population is expected to rise from 15,718 in 2025 to 26,966, resulting in a required 2,214 housing units by 2042. When considering the extended population estimate, the need increases to about 3,798 units.

Table 28: Additional Housing Demand in Potential urban centers (Current 2025 and Future 2045)

Bara Potential Urban Centre		
Projected Population	***2025***	***2045***
	219,044	403,394
Household Size from 2025 till 2045	7.10	7.1
Future Requirements Housing Units for 2042	30,851	56,816
Mullagori Potential Urban Centre		
Projected Population	***2025***	***2045***
	15,718	26,966
Household Size from 2025 till 2045	7.10	7.1
Future Requirements Housing Units for 2042	2,214	3,798.0

6.1.4.3 Potential Urban Settlements / Areas

The potential settlements across Jamrud, Landi Kotal, Bara, and Mulla Gori show a consistent pattern of population growth that will translate into increased housing needs over the next two decades.

In Jamrud (Ali Masjid), the population is projected to rise from 14,215 in 2025 to 26,088, indicating a steady expansion of the settlement. With an average household size of 6.5 persons, the estimated housing requirement for 2042 is around 2,187 units, increasing to approximately 4,014 units under the extended projection.

For Landi Kotal (Bazar Zakha Khel-5), the population increases from 9,009 in 2025 to 15,278. Applying the same household size assumption, the settlement will require roughly 1,386 housing units by 2042, rising to 2,350.5 units with the higher population estimate.

In Bara (Tirah), the projected population grows from 12,434 in 2025 to 22,807, with a household size of 7.1 persons. This results in an estimated need for 1,751 units in 2042, which further rises to 3,212 units based on the extended projection.

Finally, Mulla Gori (Tatara Area) remains the smallest among the four but still shows growth, increasing from 4,364 in 2025 to 6,816. With a household size of 7.1 persons, the settlement's housing demand is estimated at 615 units for 2042, increasing to 960 units under the higher projection.

Table 29: Additional Housing Demand in Potential Settlements/areas (Current 2025 and Future 2045)

Jamrud (Ali Masjid) Potential Settlement		
Projected Population	***2025***	***2045***
	14,215	26,088
Household Size from 2025 till 2045	6.50	6.5
Future Requirements Housing Units for *2045*	2,187	4,014
Landi Kotal (Bazar Zakha Khel-5) Potential Settlement		
Projected Population	***2025***	***2045***
	9,009	15,278
Household Size from 2025 till 2045	6.50	6.5
Future Requirements Housing Units for *2045*	1,386	2,350.5
Bara (Tirah) Potential Settlement		
Projected Population	***2025***	***2045***
	12,434	22,807
Household Size from 2025 till 2045	7.10	7.1
Future Requirements Housing Units for *2045*	1,751	3,212
Mulla Gori (Area Tatara) Potential Settlement		
Projected Population	***2025***	***2045***
	4,364	6,816
Household Size from 2025 till 2045	7.10	7.1
Future Requirements Housing Units for *2045*	615	960.0

6.1.5 Future Area Requirement (2045)

The selection of housing typologies is derived from HIS and GIS-based ground assessment, which confirms that the majority of residential plots fall within the ranges of up to 10 Marla, 10–20 Marla, 1–2 Kanal, and 2 Kanal and above across Khyber. These plot sizes reflect prevailing settlement patterns and household preferences. Using HIS household data and tehsil-level household size, the projected population was translated into category-wise housing demand.

6.1.5.1 Urban Centre

6.1.5.1.1 Landi Kotal

The housing typology has been derived from a GIS-based on-ground assessment of existing housing plot sizes and development patterns. Based on this analysis, residential areas have been categorized into Infill, Short-Term, Medium-Term, and Long-Term development zones, with percentage allocations assigned to each typology to reflect realistic land consumption

For a projected population of ***269,203,*** a total of ***41,416*** housing units is required. These units are allocated across the proposed zones, resulting in a cumulative residential land requirement of 6,341.81 acres, which increases to 9,512.72 acres after accounting for internal roads, community facilities, open spaces, and other allied uses.

Infill residential areas, representing high-density development, are planned with G+3 to G+4 storey buildings to efficiently accommodate population within limited land availability. Short-term residential zones are proposed at medium-to-high density with 2–3 storeys, while medium-term residential areas follow a medium-to-low density pattern with predominantly two-storey development. Long-term residential zones are planned as low-density areas, characterized by single-storey or low-rise housing.

Table 30: Future area requirement for housing - LandiKotal

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
Up to 10 Marla	**Infill Residential**	15%	40380	6212	62123.77	388.27	194.14	582.41
10-20 Marla	**Short Term Residential Zone**	30%	80761	12425	186371.31	1164.82	582.41	1747.23
1-2 Kanal	**Medium Term Residential Zone**	35%	94221	14496	434866.38	2717.92	1358.96	4076.88
More than 2 Kanal	**Long Term Residential Zone**	20%	53841	8283	331326.77	2070.80	1035.40	3106.19
Total		**100%**	**269203**	**41416**	**1014688**	**6341.81**	**3170.91**	**9512.72**

6.1.5.1.2 Jamrud

For Jamrud, the proposed residential framework is based on the distribution of the projected population of 311,984 across three residential typologies: Infill Residential (15%), Medium-Term Residential (35%), and Long-Term Residential (50%). The Infill Residential Zone, covering 449.98 acres, utilizes vacant and underutilized land within the existing urban area to accommodate 7,200 housing units, enabling efficient population absorption in high-density areas. The Medium-Term Residential Zone spans 2,099.90 acres, accommodating 16,799 housing units, while the Long-Term Residential Zone occupies 5,999.70 acres to provide for 23,999 units, supporting lower-density and future phased expansion.

An additional 50% of the total residential area has been allocated for allied uses, including roads, educational and healthcare facilities, commercial and mixed-use spaces, and open areas, ensuring that the residential zones are fully functional and support population needs. This phased and density-responsive approach allows the proposed residential footprint to effectively accommodate future population growth, optimize land use, and provide a structured basis for long-term urban development in Jamrud.

Table 31: Future area requirement for housing - Jamrud

Proposed Plot Size	*Proposed Zones*	*Percentage*	*Population*	*Req. Housing Units*	*Area Required (Marla)*	*Area into Acres*	*Area Required for Allied Uses*	*Total Area Required*
Up to 10 Marla	**Infill Residential**	15%	46798	7200	71996.31	449.98	224.99	674.97
10-20 Marla	**Medium Term Residential Zone**	35%	109194	16799	335982.77	2099.90	1049.95	3149.84
1-2 Kanal	**Long Term Residential Zone**	50%	155992	23999	959950.77	5999.70	2999.85	8999.55
		100%	**311984**	**47998**	**1367930**	**8549.58**	**4274.79**	**12824.36**

6.1.5.2 Potential Urban Centre

6.1.5.2.1 Bara

- **Residential**

For Bara, the proposed residential framework is based on the projected population of 403,394, distributed across four residential typologies: Vertical Housing (10%), Short-Term Residential (25%), Medium-Term Residential (45%), and Long-Term Residential (20%). The Vertical Housing zone covers 355.10 acres and is intended for high-density development on vacant or underutilized land, accommodating 5,682 housing units through G+3 to G+4 storey buildings to optimize population absorption.

The Short-Term Residential Zone, spanning 1,331.63 acres, provides space for 14,204 units, while the Medium-Term Residential Zone occupies 4,793.86 acres, accommodating 25,567 units. The Long-Term Residential Zone, with 2,840.81 acres, supports 11,363 units in a lower-density, low-rise pattern.

Table 32: Future area requirement for housing - Bara

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
0-10 Marla	**Vertical Housing**	**10%**	40339	5682	56816.06	355.10	177.55	532.65

10-20 Marla	**Short Term Residential Zone**	**25%**	100849	14204	213060.21	1331.63	665.81	1997.44
1-2 Kanal	**Medium Term Residential Zone**	**45%**	181527	25567	767016.76	4793.86	2396.93	7190.79
More than 2 Kanal	**Long Term Residential Zone**	**20%**	80679	11363	454528.45	2840.81	1420.40	4261.21
		100%	**403394**	56816	**1491421**	**9321.40**	**4660.70**	**13982.10**

6.1.5.2.2 Mullagori

The proposed residential framework for Mullagori is structured around a mix of infill, short-term, medium-term, and long-term residential zones, based on observed plot sizes and settlement patterns. With a projected population of 26,966 and a housing demand of 3,595 units, the total land requirement is estimated at 884.82 acres, inclusive of allied uses.

The Infill Residential Zone (33.71 acres) targets compact development within vacant and underutilized land pockets to address immediate housing needs. Short-Term Residential Zones (126.40 acres) support medium-density development for near-term growth, while the Medium-Term Residential Zone forms the largest share (455.05 acres), accommodating the bulk of future population through planned, phased expansion. The Long-Term Residential Zone (269.66 acres) allows low-density development and safeguards land for long-range growth.

Table 33: Future area requirement for housing - Mullagori

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
0-10 Marla	**Infill Residential Zone**	**10%**	2697	360	3595.47	22.47	11.24	33.71
10-20 Marla	**Short Term Residential Zone**	**25%**	6742	899	13483.00	84.27	42.13	126.40
1-2 Kanal	**Medium Term Residential Zone**	**45%**	12135	1618	48538.80	303.37	151.68	455.05
More than 2 Kanal	**Long Term Residential Zone**	**20%**	5393	719	28763.73	179.77	89.89	269.66
		100%	**26966**	3595	**94381**	**589.88**	**294.94**	**884.82**

6.1.5.3 Potential Urban Settlements / Areas

6.1.5.3.1 Ali Masjid

For Ali Masjid, the future residential framework is based on the projected population of 26,088, distributed across three residential typologies: Short-Term Residential (10–20 Marla, 25%), Medium-Term Residential (1–2 Kanal, 35%), and Long-Term Residential (more than 2 Kanal, 40%). The Short-Term Residential Zone, covering 65.75 acres, is designed to accommodate 701 housing units, providing medium- to high-density development suitable for near-term expansion. The Medium-Term Residential Zone spans 184.09 acres, supporting 982 housing units, while the Long-Term Residential Zone occupies 280.52 acres to provide 1,122 units in a lower-density, low-rise pattern for phased growth.
To enhance land-use efficiency, vertical development (G+3 to G+4 storeys) is proposed in higher-density zones, allowing the population to be accommodated within limited land. Additionally, 50% of the total area is allocated for allied uses, including roads, educational and healthcare facilities, commercial and mixed-use spaces, and open areas

Table 34: Future area requirement for housing - Ali Masjid

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
10-20 Marla	**Short Term Residential Zone**	**25%**	6522	701	10519.35	65.75	32.87	98.62
1-2 Kanal	**Medium Term Residential Zone**	**35%**	9131	982	29454.19	184.09	92.04	276.13
More than 2 Kanal	**Long Term Residential Zone**	**40%**	10435	1122	44882.58	280.52	140.26	420.77
		100%	**26088**	2805	**84856**	**530.35**	**265.18**	**795.53**

6.1.5.3.2 Bazar Zakha Khel-5

For Bazar Zakha Khel, the future residential framework is based on a projected population of 26,088, entirely accommodated within the Infill Residential Zone with an average plot size of 1–2 Kanal (30 Marla). This zone covers 603.89 acres, accommodating 3,221 housing units.

To optimize population absorption in this relatively high-density area, vertical development (G+3 to G+4 storeys) is proposed, allowing more households to be accommodated within limited land. In addition, 50% of the total area is allocated for allied uses, including roads, educational and healthcare facilities, commercial and mixed-use spaces, and open areas.

Table 35: Future area requirement for housing - Bazar Zakha

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
1-2 Kanal	**Infill Residential Zone**	**100%**	26088	3221	96622.22	603.89	301.94	905.83

6.1.5.3.3 Tirah

For Tirah, the future residential framework is based on a projected population of 22,807, distributed across three residential typologies: Short-Term Residential (10–20 Marla, 25%), Medium-Term Residential (1–2 Kanal, 40%), and Long-Term Residential (more than 2 Kanal, 35%). The Short-Term Residential Zone, covering 73.23 acres, accommodates 781 housing units with medium-density development. The Medium-Term Residential Zone spans 234.32 acres, supporting 1,250 units, while the Long-Term Residential Zone occupies 273.38 acres to provide 1,094 units in a low-density, low-rise pattern suitable for phased expansion.

Table 36: Future area requirement for housing – Tirah

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
10-20 Marla	**Short Term Residential Zone**	**25%**	5702	781	11716.16	73.23	36.61	109.84
1-2 Kanal	**Medium Term Residential Zone**	**40%**	9123	1250	37491.70	234.32	117.16	351.49
More than 2 Kanal	**Long Term Residential Zone**	**35%**	7983	1094	43740.32	273.38	136.69	410.07
		100%	**22807**	3124	**92948**	**580.93**	**290.46**	**871.39**

6.1.5.3.4 Tatara

For Tatara, the future residential framework is based on a projected population of 6,816, distributed across three residential typologies: Short-Term Residential (10–20 Marla, 25%), Medium-Term Residential (1–2 Kanal, 40%), and Long-Term Residential (more than 2 Kanal, 35%). The Short-Term Residential Zone, covering 16.98 acres, accommodates 181 housing

units, providing medium-density development suitable for immediate growth. The Medium-Term Residential Zone spans 54.33 acres, supporting 290 housing units, while the Long-Term Residential Zone occupies 63.38 acres to provide 254 units in a lower-density, low-rise pattern.

To optimize land use in higher-density areas, vertical development (G+3 to G+4 storeys) is proposed, enabling more households to be accommodated within limited land. In addition, 50% of the total area is allocated for allied uses, including roads, educational and healthcare facilities, commercial and mixed-use spaces, and open areas.

Table 37: Future area requirement for housing - Tatara

Proposed Plot Size	*Proposed Zones*	Percentage	Population	Req. Housing Units	Area Required (Marla)	Area into Acres	Area Required for Allied Uses	Total Area Required
10-20 Marla	**Short Term Residential Zone**	**25%**	1704	181	2716.26	16.98	8.49	25.46
1-2 Kanal	**Medium Term Residential Zone**	**40%**	2726	290	8692.03	54.33	27.16	81.49
More than 2 Kanal	**Long Term Residential Zone**	**35%**	2386	254	10140.70	63.38	31.69	95.07
		100%	**6816**	724	**21549**	**134.68**	**67.34**	**202.02**

6.1.6 In-fill Development

Infill development has been proposed as a key component of the District Khyber Land Use Plan to ensure that growth within urban boundaries is efficiently managed before outward expansion occurs. The strategy focuses on utilizing vacant parcels and underused land within the established built-up areas of major towns, particularly Jamrud and Landi Kotal, where such interventions align with the directions of their approved master plans.
The core principle of this approach is to consolidate existing urban footprints, reduce pressure on agricultural and environmentally sensitive lands, and promote a compact urban form. Vacant lands and fragmented parcels within the built-up areas have been earmarked for residential development, complemented by provision for allied uses such as internal roads, open spaces, and community facilities.

To make optimal use of available land, the plan encourages vertical development through G+2 housing typologies in selected infill areas. This approach not only increases land-use efficiency but also improves housing affordability and reduces infrastructure costs per

household. By concentrating growth within already-serviced areas, infill development supports better access to utilities and social services while preventing unregulated sprawl.
The proposed infill areas are distributed across Jamrud, Landi Kotal, Mulla Gori, and Tatara tehsils, with the highest concentration in Jamrud and Landi Kotal due to their role as primary and secondary urban centers. These areas, once developed, will accommodate a significant share of future urban housing demand, bridging the gap between current settlement capacity and newly designated residential zones. The designated infill areas include:

- **Jamrud:** 2,283 acres of vacant and underutilized land within the established urban fabric are proposed for infill residential use.
- **Landi Kotal:** 607 acres are allocated for infill development, reinforcing the town's role as an administrative and commercial hub while absorbing additional population within the planned boundary.
- **Mulla Gori:** 0.7 acres have been designated for infill housing development, focusing on compact clusters within the tehsil's central settlement area.
- **Tatara:** 85 acres are proposed for infill residential development, targeting underutilized land within the existing settlement pattern.

6.1.6.1 Technical Analysis and Planning Implications

The designated infill development areas, covering approximately **3,975.7 acres** across Jamrud, Landi Kotal, Mulla Gori, and Tatara, represent a highly significant land resource for future housing provision. Under compact development models and G+2 vertical housing typologies, this land has the theoretical potential to accommodate well above the district's projected additional housing demand to 2045. In quantitative terms, the infill resource base alone is sufficient not only to meet requirements but also to create a surplus capacity that functions as a strategic buffer and enhances market flexibility.
The primary implication of this analysis is the transformative impact of vertical development. By permitting multiple housing units on a single residential plot, the district can achieve substantial land-efficiency gains without encroaching upon agricultural or environmentally sensitive areas. This supports consolidation of urban footprints and helps contain unregulated sprawl, preserving productive land and reducing the ecological footprint of urban expansion.
From a spatial perspective, Jamrud and Landi Kotal emerge as the key absorption nodes. Their combined share of the infill potential positions them to meet both immediate urban requirements and a significant proportion of near-urban housing demand. Concentrating capacity within established urban centres creates opportunities to redirect growth pressures away from rural and peri-urban areas, safeguarding agricultural land while lowering per-household infrastructure delivery costs.
However, realizing this capacity requires enabling infrastructure and services. Water supply, sewerage, power, solid waste management, and road access must be expanded and upgraded

in parallel with infill development. Vertical housing models further necessitate specialized infrastructure considerations, such as storm water management, fire safety standards, and structural stability measures. Without these provisions, the theoretical capacity will remain underutilized.

Market behaviour and socio-cultural dynamics are equally decisive. Not all parcels will be redeveloped immediately; household preferences for single-family compounds, financial limitations, and developer interest in small-lot redevelopment will influence uptake. Targeted incentives, phased roll-out, and facilitation mechanisms such as concessional financing, technical assistance for G+2 construction, and conditional relaxation of floor area ratios will be critical to encourage landowners and private sector participation.

6.1.7 Proposed Locations for New Housing Areas (Residential Zones)

The future housing demand of District Khyber cannot be absorbed solely through infill development. In addition to the identified infill parcels, new residential zones have been delineated across the district to accommodate population growth up to 2045. These areas are strategically located within established urban centers and in potential Village Councils earmarked for urbanization under the settlement hierarchy framework. The proposed zoning approach follows a phased development strategy short, medium, and long term to align land release with actual demand and infrastructure expansion.

6.1.7.1 Urban Center

The proposed expansion and reclassification of residential land in Landi Kotal and Jamrud urban centres are based on both existing land-use patterns and projected population growth, ensuring that future development is strategically planned and efficiently managed.

In Landi Kotal, the existing residential area of 1,488.62 acres has been supplemented with 607.23 acres of infill residential development to optimize the use of underutilized urban parcels. Additionally, the plan designates areas for short-term (634.88 acres), medium-term (1,213.51 acres), and long-term (1,736.92 acres) residential development, along with a dedicated residential zone of 223.36 acres. The total proposed residential area of 4,415.90 acres accommodates anticipated housing demand while ensuring a structured, phased expansion of the town. This approach consolidates growth within the existing urban footprint, reduces pressure on surrounding agricultural and environmentally sensitive lands, and supports compact, well-serviced neighborhoods.

Similarly, in Jamrud, the existing residential area of 3,226.94 acres is complemented by 2,283.88 acres of infill development and additional allocations for medium-term (710.47 acres) and long-term (406.51 acres) residential expansion, alongside a residential zone of

401.33 acres. The total proposed residential area of 3,802.19 acres reflects a balance between accommodating future population growth and preserving open and agricultural spaces. By integrating infill development with phased residential zones, the plan encourages efficient land use, promotes vertical housing options where appropriate, and aligns with approved master plan directives.

Table 38: Existing and Proposed Residential/Housing in Urban Centre

Existing Land Uses	Existing Area/Acre	Proposed	Proposed Area/Acre	Total Proposed
Landi Kotal Urban Centre				
Residential	1488.62	Infill Residential	607.23	4415.90
		Residential Zone	223.36	
		Short Term Residential Zone	634.88	
		Medium Term Residential Zone	1213.51	
		Long Term Residential Zone	1736.92	
Jamrud Urban Centre				
Residential	3226.94	Infill Residential	2283.88	3802.19
		Residential Zone	401.33	
		Medium Term Residential Zone	710.47	
		Long Term Residential Zone	406.51	

6.1.7.2 Potential Urban Centre

The proposed residential land-use plan for Bara and Mullagori potential urban centres is designed to accommodate projected population growth while promoting efficient, phased, and sustainable urban expansion.

In Bara, the existing residential area of 3,917.16 acres is complemented with additional allocations for short-term (3,366.88 acres), medium-term (6,007.16 acres), and long-term (2,034.26 acres) residential development, along with 1,213.11 acres designated for vertical housing. The total proposed residential area of 12,621.40 acres ensures that Bara can meet future housing demand while encouraging a mix of horizontal and vertical development. This phased approach consolidates growth within the emerging urban footprint, optimizes land-use efficiency, and reduces pressure on surrounding agricultural and environmentally sensitive lands.

In Mullagori, the existing residential area of 282.38 acres is augmented with 248.29 acres of short-term, 250.43 acres of medium-term, and 383.39 acres of long-term residential zones, alongside 0.71 acres of infill development. The total proposed residential area of 882.82 acres

provides sufficient capacity to accommodate future population growth while maintaining a compact urban form.

Table 39: Existing and Proposed Residential/Housing in Potential Urban Centre

Existing Land Uses	Existing Area/Acre	Proposed	Proposed Area/Acre	Total Proposed
Bara Potential Urban Centre				
Residential	3917.16	Short Term Residential Zone	3366.88	12621.40
		Medium Term Residential Zone	6007.16	
		Long Term Residential Zone	2034.26	
		Vertical Housing	1213.11	
Mullagori Potential Urban Centre				
Residential	282.38	Short Term Residential Zone	248.29	882.82
		Medium Term Residential Zone	250.43	
		Long Term Residential Zone	383.39	
		Infill Residential	0.71	

6.1.7.3 Potential Settlements/Areas

The proposed residential land allocations for the potential settlements of Ali Masjid, Bazar Zakha Khel-5, Tatara, and Tirah have been designed to accommodate projected population growth in a phased and structured manner while promoting efficient use of available land.

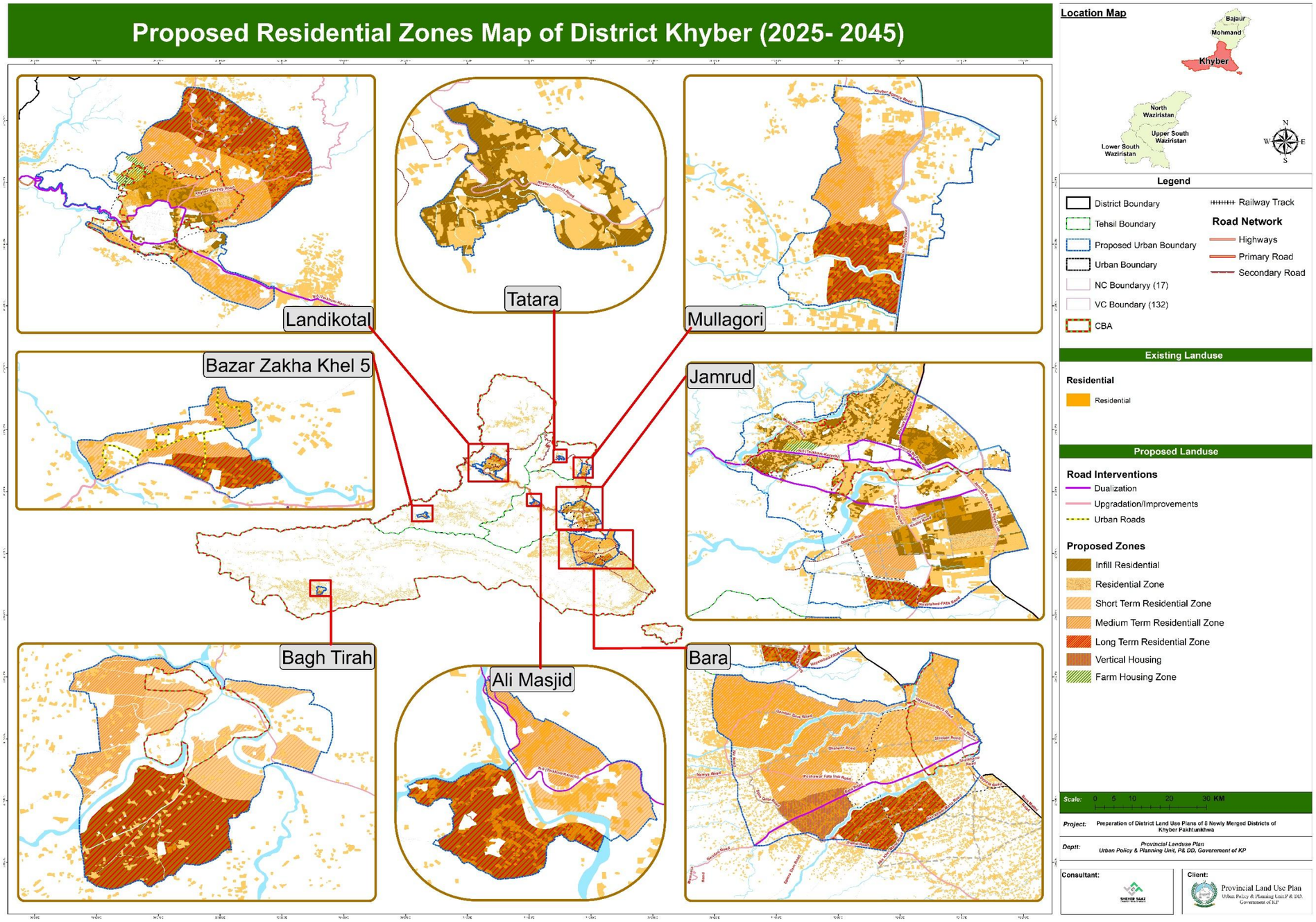
In Ali Masjid, the existing residential area of 106.13 acres is expanded with 94.73 acres of short-term, 109.36 acres of medium-term, and 221.06 acres of long-term residential zones, bringing the total proposed residential area to 425.14 acres. This phased approach ensures the settlement can meet future housing needs while maintaining a compact urban footprint.

For Bazar Zakha Khel-5, the existing 68.46 acres is complemented by 84.74 acres of infill residential development, resulting in a total proposed residential area of 153.21 acres. This prioritizes the use of underutilized parcels within the existing settlement, optimizing land efficiency. In Tatara, the current 98.82 acres of residential land is supplemented with 83.75 acres of short-term, 171.20 acres of medium-term, and 135.28 acres of long-term residential zones, totaling 489.06 acres. Finally, Tirah's existing 48.64 acres of residential land is proposed to expand with 141.05 acres of short-term, 105.61 acres of medium-term, and 237.89 acres of long-term residential zones, totaling 636.32 acres.

Table 40: Existing and Proposed Residential/Housing in Potential Settlements

Existing Land Uses	Existing Area/Acre	Proposed	Proposed Area/Acre	Total Proposed
Ali Masjid Potential Settlement				
Residential	106.13	Short Term Residential Zone	94.73	425.14
		Medium Term Residential Zone	109.36	
		Long Term Residential Zone	221.06	
Bazar Zakha Khel 5 Potential Settlement				
Residential	68.46	Infill Residential	84.742763	153.21
Tatara Potential Settlement				
Residential	98.82	Short Term Residential Zone	83.75	489.06
		Medium Term Residential Zone	171.20	
		Long Term Residential Zone	135.28	
Tirah Potential Settlement				
Residential	48.64	Short Term Residential Zone	141.05	636.32
		Medium Term Residential Zone	105.61	
		Long Term Residential Zone	237.89	

Map 28: Proposed Residential Development - District Khyber



6.2 TRADE AND COMMERCE

6.2.1 Current Commercial Area Gap

Currently, commercial activity in Khyber District is scattered and largely undeveloped, with the main concentrations located in Bara and Jamrud. This pattern is influenced by the proximity of these areas to Hayatabad, a major urban center of Peshawar District. Furthermore, the commercial significance of the district is expected to increase due to the proposed Khyber Pakhtunkhwa Economic Corridor (KPEC), which will enhance trade and connectivity in the region.

Though Landi Kotal serves as the District Headquarters in the area and has sufficient commercial activity, its commercial area needs to be developed to serve as the district headquarters.

6.2.2 Proposed Locations for New Commercial Areas and Mixed Land Use Zones

Internationally, the allocation of commercial land is generally determined in terms of floor space per capita or as a percentage of total urban land use, rather than a fixed acreage per population. For example, in the United States, commercial land typically accounts for 5–10% of total urban land, with retail floor space ranging between 20–40 square feet per person (around 2–3.7 m² per capita). In the United Kingdom, benchmarks usually fall between 2–3 m² per person, guided by a "town center first" policy that prioritizes compact, service-oriented growth. Similarly, UN-Habitat and World Bank guidelines suggest that commercial and business uses together should occupy 5–7% of urban land, which translates to about 1.5–2.5 m² per capita. In South Asia, India's URDPFI Guidelines (2015) recommend around 0.8–1.2 acres per 1,000 people, or 0.15–0.25 m² of commercial space per person at different planning levels, which aligns closely with international averages but adjusts for higher densities.

In contrast, Pakistan follows the planning standard of 1 acre per 1,000 people (≈4 m² per capita) as defined in the National Reference Manual (NRM) of Planning Standards. This ratio is relatively higher than international averages, but it reflects the low- to medium-density settlement pattern in Pakistan, where commercial activity is plot-based, spread across bazaars, and rarely concentrated in multi-story retail complexes. The higher allocation ensures sufficient land for wholesale markets, truck terminals, and service-related commercial activities that are spatially more land-intensive than in compact, high-rise urban models. It also provides flexibility for future expansion of economic activity, recognizing that Pakistan's urban centers often evolve organically with scattered, mixed-use growth rather than tightly zoned systems. On this Basis, the commercial total area from the Khyber district was calculated

Table 41: Required Total Commercial of Khyber District

Commercial Area Requirement (Till-2045) Using NRM Standard				
Name	**Total Population 2045**	**Existing Area/Acre**	**Area Required 2045/Acre**	**Standard**
Jamrud	311984	138.24	311.98	1-Acre for 1000 Population
Landi Kotal	269203	60.62	269.20	
Bara	403394	266.78	403.39	
Mullagori	26966	20.16	26.97	
Ali Masjid	26088	4.50	26.09	
Tatara	6816	0.90	6.82	
Bazar Zakha Khel-5	15278	16.03	15.28	
Bagh (Tirah) Valley	22807	32.39	22.81	

Source: Developed by Consultant, 2024

6.2.3 Analysis of LSA of Commercial Area

After calculating the required total area, it is important to see which land is suitable for the provision of a Commercial area. To perform LSA, it is essential to develop a set of criteria that help identify the areas of importance.

6.2.4 Proposed Commercial Areas

According to the National Reference Manual (NRM) guidelines for sustainable urban planning, a minimum of 1 acre of commercial land must be allocated for every 1,000 persons in the population to ensure adequate provision of retail, services, and economic activity centers. Based on this standardized ratio and the projected demographic profiles of the respective tehsils, tailored commercial area proposals have been developed to meet local needs while promoting balanced urban growth. The following table outlines the proposed commercial land allocations for each tehsil, reflecting population-driven requirements, accessibility, and integration with residential and industrial zones to foster vibrant, self-sufficient local economies.

Table 42: Total Commercial Area Proposed in Each Settlement- Khyber District

Name	Type of Commercial Activity	Proposed Area/Acre
Jamrud	Gem City	31.18
	CBD	5.75
	Commercial Zone	94.34
	Grain Market	3.20
	Linear Commercial	194.96
	Pak Afghan Trade Center	469.95
	Trade and Logistics Hub	264.66
Landi Kotal	Commercial Zone	107.15
	Linear Commercial	129.04
	Grain Market	11.17
	CBD	1.91
Bara	Commercial Zone	746.83
	Grain Market	41.09
Mullagori	Commercial Zone	12.23
Ali Masjid	Commercial Zone	10.35
	Linear Commercial	21.33
Tatara	Commercial Zone	45.06
Bazar Zakhakhel-5	Commercial Zone	5.81
Bagh Tirah Valley	Commercial Zone	11.13

6.2.4.1 Bara Urban Centre

Bara Urban Center has been identified as the most suitable location for a designated commercial zone in Khyber District due to its available land, strategic location, and strong connectivity to Peshawar.

The proposed Commercial Zone, covering 746.83 acres, will serve as the district's primary hub for trade, wholesale markets, retail complexes, and industrial distribution. A dedicated Grain Market of 41.09 acres is included to support agricultural trade. The zone will also establish

direct economic links with the Jamrud Dry Port, enhancing regional trade potential, attracting investment, and promoting overall economic growth in the district.

The proposed Commercial Zone in Bara Urban will boost economic activity by establishing a central hub for trade, industry, and agriculture. The Grain Market will support farmers and traders, while connectivity to the Jamrud Dry Port will enhance regional trade. The zone will generate employment, attract investment, and stimulate urban development, creating a thriving economic ecosystem in the area.

6.2.4.2 Jamrud Urban Centre

Jamrud Urban Center is designed as a key economic hub, leveraging its strategic location along the Pak–Afghan border. The proposed zoning framework organises economic activities into dedicated clusters, preventing dispersed and unplanned development. A Central Business District (CBD) covering approximately 5.75 acres and a 94.34-acre Commercial Zone anchor the urban core, while Linear Commercial areas follow major transport corridors to support roadside businesses across roughly 194.96 acres. Additionally, a Grain Market (3.20 acres) promotes value addition in local agriculture.

The plan also incorporates specialized KPEC-designed economic zones: Gem City (31.18 acres), the Pak–Afghan Trade Center (469.95 acres), and the Trade & Logistics Hub (264.66 acres), to strengthen regional trade potential and support organised commercial operations. Gem City concentrates on value-added gemstone activities, the Pak–Afghan Trade Center facilitates regulated cross-border commerce, and the Trade & Logistics Hub improves goods movement through modern warehousing and freight services.

6.2.4.3 Mullagori Urban Centre

Mullagori is a settlement with a relatively small population and limited future commercial potential. However, to meet the area's long-term needs, it is proposed that a dedicated commercial market of approximately 12.23 acres be established. This market would primarily serve local demand while also supporting the supply of products from nearby industries.

6.2.4.4 Landi Kotal Urban Centre

Although the district headquarters benefits from its proximity to the Afghan border, its distance from major settlements, limited infrastructure, and low level of urban development reduce its potential to serve as a central commercial hub.

In contrast, the proposed commercial land-use plan for Landi Kotal Urban strategically allocates zones to organise economic activities and support future urban growth. The Central Business District (CBD), spanning 1.91 acres, will function as the commercial centre, accommodating higher-end retail, business services, and administrative functions. Surrounding this centre, a 107.15-acre Commercial Zone provides space for general retail and community-focused commercial activities. To manage trade and roadside commerce along

major transportation corridors, 129.04 acres have been designated as Linear Commercial areas, ensuring accessibility whilst preventing unplanned ribbon development.

Furthermore, an 11.17-acre Grain Market provides a dedicated and organised space for agricultural trade and storage. Collectively, these commercial areas enhance land management, broaden trade opportunities, improve mobility, and steer Landi Kotal's development into a well-structured and economically vibrant regional trade gateway.

6.2.4.5 Ali Masjid (Potential Settlement)

Ali Masjid has been recognised as a prospective settlement area due to its strategic position along the main corridor connecting key urban centres within the district. It demonstrates significant growth potential, supported by improved accessibility and increased traffic along the corridor.

Planned development will ensure the provision of essential services and facilities, supporting the needs and well-being of the local population.

The proposed land use for Ali Masjid includes designated commercial zones of 10.35 acres in the central areas and linear commercial development covering 21.33 acres along the main corridor. These zones are intended to support local businesses, roadside amenities, and services for both residents and corridor traffic.

6.2.4.6 Tatara (Potential Settlement)

Tatara's strategic location, accessible transport links, and development potential make it a logical choice for a new settlement. Its development will support the broader urban hierarchy, promote balanced regional growth, and provide vital services to both residents and corridor users. Its proximity to Mullagori also allows Tatara to benefit from existing services and infrastructure while acting as a complementary growth node.

The proposed land use for Tatara includes designated commercial zones covering 45.06 acres in the central areas. These zones are planned to support local businesses, provide roadside amenities, and deliver essential services to both residents and travelers along the corridor.

6.2.4.7 Bazar Zakhakhel-5 (Potential Settlement)

Bazar Zakhakhel, near Landi Kotal, is strategically located along an important transport route, offering significant development potential. Its growth will enhance the regional urban structure, encourage balanced expansion, and deliver vital services to both residents and travellers alike.

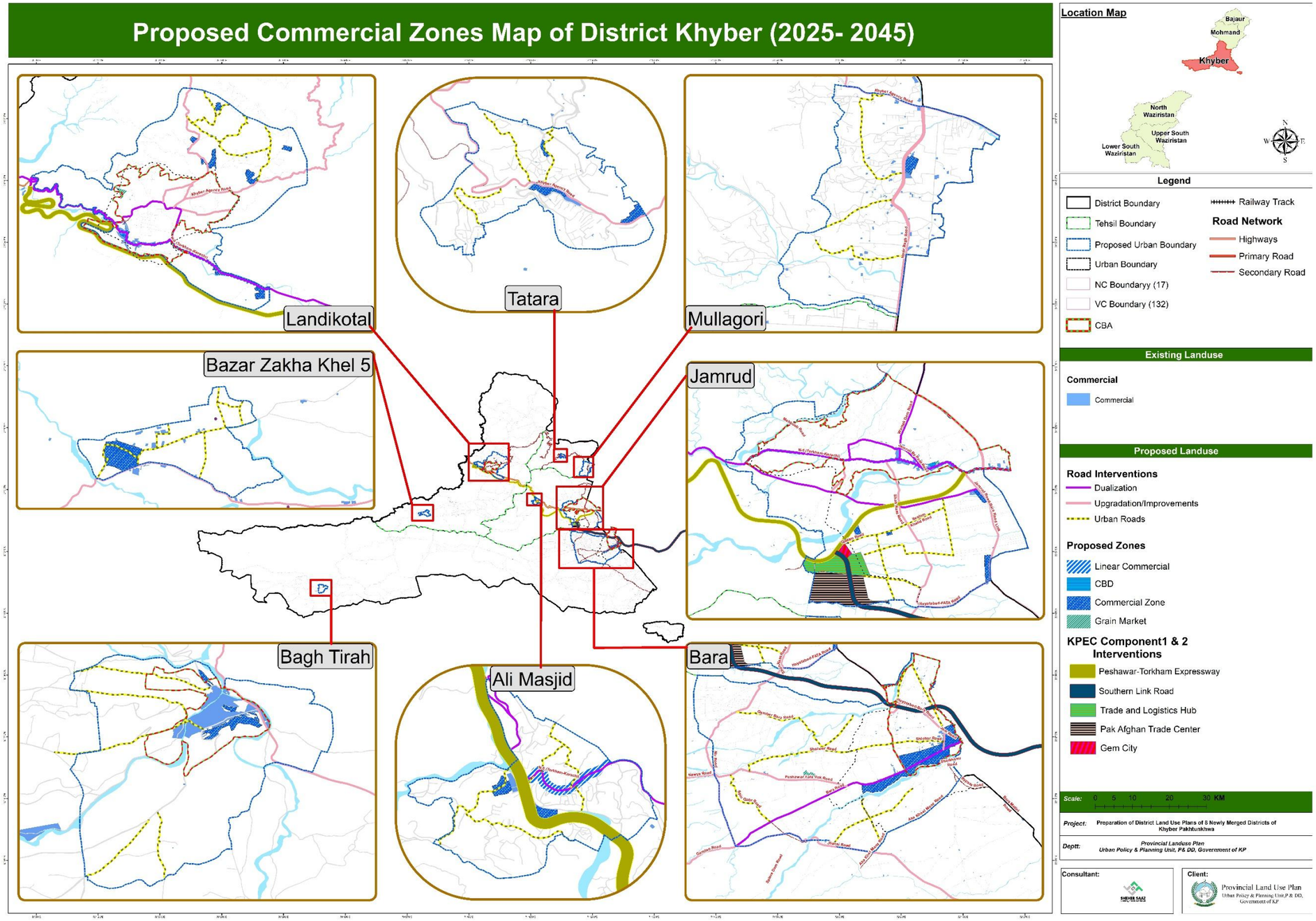
At the core of Bazar Zakhakhel, 5.81 acres are designated for commercial use. These zones will host local enterprises and roadside amenities, serving both residents and corridor users

6.2.4.8 Bagh Tirah Valley (Potential Settlement)

Bagh Tirah Valley, situated in Bara Tehsil, commands a strategic position along a vital transport corridor, making it an area ripe for structured development. Its location not only connects surrounding communities but also positions the valley as a potential catalyst for regional growth, offering essential services to residents and travellers alike.

Within this emerging landscape, Bagh Tirah Valley is set to become a key commercial node, with 11.13 acres earmarked for businesses and roadside amenities. These spaces will foster local entrepreneurship, serve corridor users, and anchor economic activity in the valley.

Map 29: Proposed Commercial Map of District Kyber



6.2.5 Future Strategies, Constraints, and Recommendations

The future development is divided into three phases so that development can be controlled and refined.

6.2.5.1 Short Term

The building by laws of KPK needs to be put in immediate action according to which certain road width will be standardized and will help in traffic inflow and is one of the major Short Term Development Project.

Table 43: Commercial Regularisations for the major road

S.No	Types	Name of Road	Setback and Height building	Commercial Buffer	TOD Buffer
1	Type A	Ring road	Setback=50 feet (Mandatory) Height of building = 100 feet OR The setback=60 feet (Optional) Height of building = 160 feet	Approx. 250 Feet	----
2	**Type-B**	Major Arterial Roads	Setback=25 feet (Mandatory) Height of building=80 feet OR The setback = 30 feet (Optional) Height of building = 120 feet	Approx. 250 Feet	Approx. 650 Feet (except Nasir Bagh Road)
3	**Type-C**	All canals, patrolling, and other roads,	(ROW + Setback) *1.5		

Type A Roads (e.g., N-5)

- Commercial Development Buffer:250 feet on both sides
- Mandatory Setback: 50 feet

- Maximum Building Height: 100 feet
- Incentive for Increased Setback: If the setback is increased to 60 feet (optional), the building height can be extended to 160 feet.
- Objective: Encourages greater setbacks to promote vertical development while maintaining urban aesthetics and smooth traffic flow.

Type B Roads (e.g., Bara Road, Warsak Dam Road etc.)

- Commercial Development Buffer: 250 feet on both sides
- Mandatory Setback: 25 feet
- Maximum Building Height: 80 feet
- Incentive for Increased Setback: If the setback is increased to 30 feet (optional), the building height can go up to 120 feet.
- Objective: Ensures a balance between urban density and road functionality by maintaining clear sightlines and preventing congestion along these major corridors.

Type C Roads (e.g., Link Road)

- Building Height Formula: (Right of Way (ROW) + Setback) * 1.5

Objective: Links permissible building height directly to ROW and setback, ensuring proportional vertical development. This regulation accommodates the unique characteristics of canal-side roads, maintaining a balance between commercial activity, environmental considerations, and spatial planning. Adhering to the Jamrud Master Plan is essential, as it will facilitate the establishment of the district's first major linear commercial development while significantly enhancing local GDP growth.

6.2.5.2 Medium Term

A pivotal medium-term intervention entails the development of the Bara Tehsil Commercial Zone to reinforce the operational capacity of the Jamrud Tehsil Dry Port. Jamrud's terrain, constrained by its mountainous geography and limited flat land, necessitates this strategic shift, allowing Bara Tehsil to handle most downstream activities. This includes retail distribution for industrial outputs from adjacent sectors like textiles and cement (valued at PKR 50 billion annually in Khyber District exports) and serving as a logistics hub for value-added assembly of goods imported from Peshawar District, thereby streamlining supply chains and catalyzing a projected 15-20% uplift in local industrial throughput over the next 3-5 years.

6.2.5.3 Long Term

Over the long term, the development of Mulla Gori and the Commercial Market in Landi Kotal will be essential to support sustained economic growth in the district. The commercial market in Landi Kotal requires targeted development, considering its strategic location and role as the district headquarters. Key priorities include enhanced accessibility infrastructure, with greater attention to road networks and connectivity, as improved infrastructure will enable the market to serve a larger consumer base effectively. Development in Mulla Gori should proceed in a phased manner, contingent on industrial progress. Industries in Mulla Gori must first reach full development and operational status. Only then should the 4-acre commercial zone be developed, aligning with emerging demand.

6.3 INDUSTRIAL ZONES

6.3.1 Heavy, Medium, and Light Industrial Zones/Small Industries Estates

The industrial landscape of District Khyber demonstrates a diverse composition ranging from small-scale traditional units to large industrial establishments, reflecting both the historical strengths and the evolving industrial base of the region. According to the updated figures for 2023-24[5], the district accommodates a total of 335 registered industrial units, of which 248 are currently operational while 87 units stand closed due to a variety of constraints such as energy shortages, market access issues, and security-related challenges.

Table 44: Registered Industrial Units – District Khyber

District	2021-2022			2022-2023			2023-2024		
Khyber	Total	Running Unit	Closed Unit	Total	Running Unit	Closed Unit	Total	Running Unit	Closed Unit
	331	308	23	332	244	88	335	248	87

Source: Development Statistics KPK, 2025

6.3.1.1 Heavy Industries

District Khyber's heavy industrial base remains limited but holds significance for local employment and economic activity. The most prominent large-scale industries are the Bara Ghee Mills and two cigarette factories, One More Cigarette Factory and Tatara Cigarette Factory, located in Bara Tehsil. These three units collectively employ around 800 workers, positioning them as the backbone of the district's large industrial employment. Additionally, steel furnace units operating in areas like Shahkas and Jamal Khel contribute to the heavy industry profile by supplying construction material across Khyber Pakhtunkhwa and beyond.

[5] Development Statistics KPK, 2025

6.3.1.2 Medium Industries

The medium-scale sector is dominated by the silk power loom industry, which has historically been concentrated in Bara. Presently, around 39 power looms are operational, employing nearly 6,000 workers. Each loom employs, on average, more than 150 workers, thereby placing them in the medium industry category despite their traditional roots in textile processing. Apart from textiles, a few marble processing and cutting units located in Bara and Mullagori also fall within this category, supporting both domestic and export markets. These medium-scale industries not only provide substantial employment but also form the connective layer between small cottage industries and the limited heavy industries in the district.

6.3.1.3 Light and Small Industries

Small and cottage industries represent the most widespread industrial activities in District Khyber, both in number and geographical spread. Traditional silk processing units in Alam Gudar, Bara, are classified as cottage industries, providing livelihoods for local households through home-based or small workshop production. Stone-crushing units, particularly concentrated in Landi Kotal and Jamrud, are also classified as light industries due to their limited employment base and low-to-moderate investment levels. In addition, brick kilns, food processing units, and marble finishing workshops across the district form a critical component of the small industries landscape. Collectively, these units provide flexible employment opportunities, absorb surplus labor, and serve local market needs.

6.3.1.4 Existing Industrial Zones and Estates

Despite the presence of a sizable number of industries, no formally designated industrial estates currently exist in District Khyber. Industrial activity has largely developed in an unplanned manner along major corridors such as Jamrud Road and within Bara Tehsil. The absence of dedicated industrial estates has constrained the growth potential of both heavy and small-scale industries, resulting in issues of land-use conflict, inadequate infrastructure, and environmental stress. There is strong justification for the establishment of Small Industries Estates in Bara and Jamrud, with zoning for heavy industries such as steel furnaces and marble units, and separate clusters for light and cottage industries such as textiles, food processing, and handicrafts. Planned estates would not only enhance productivity and environmental compliance but also reduce the closure rate of units, which in 2023-24 accounted for over 25% of the district's total registered industries.

In summary, District Khyber's industrial sector is characterized by a mix of traditional small-scale industries, medium-scale textile and marble units, and a handful of heavy industries, all contributing to the local economy. However, without structured zoning and industrial estate development, the sector remains underutilized. Establishing designated Heavy, Medium, and Light Industrial Zones along with Small Industries Estates is essential for harnessing the district's industrial potential, reducing closures, and ensuring sustainable growth.

6.3.2 Number of Industries by Types, Units, and Employment

6.3.2.1 Industries by Types and Units

The industrial base of District Khyber is heavily dominated by the marble sector, with 211 units making up about 85 percent of all active industries. This reflects the district's rich mineral resources but also shows a strong dependence on a single sector. Supporting activities include stone crushers and grinding or crushing plants with 16 units in total, further highlighting the focus on construction materials.

Other industries are present in smaller numbers. Agro-based units include two flour mills and one ghee or edible oil mill, which are limited compared to the scale of local agriculture. There are also four ice factories and one LPG plant that mainly serve local demand. Light manufacturing includes two foam units, three plastic units, three paper units, and one cotton cloth unit. In terms of heavy industry, four steel units provide construction material but remain small in scale.

Overall, the industrial structure is concentrated in marble and stone, while Agro-processing and light manufacturing remain underdeveloped. This imbalance points to both strength in natural resources and vulnerability to market fluctuations, making diversification and the establishment of planned industrial estates essential for sustainable growth.

Table 45: Industries by Type and Units – District Khyber

Sr. No	Type of Industry	Number of Units
1	Cotton Cloth	1
2	Flour Mills	2
3	Foam	2
4	Ghee / Edible Oil	1
5	Grinding/Crushing	8
6	Ice Factory	4
7	LPG Plant	1
8	Marble Factory	211
9	Paper	3
10	Plastic Industry	3
11	Steel Industry	4
12	Stone Crushers/Crush Plants	8
Total Industry Units		**248**

Source: Development Statistics KPK, 2025

6.3.2.2 Employment in Industrial Sector

The employment situation in Khyber District presents a stark contrast between urban and rural areas. The overall labor force participation rate appears relatively high at 48.2%. A substantial 81.7% of the employed population in Khyber District is engaged in informal economic activities. This figure is even higher in rural areas (84.7%) compared to urban areas (58.5%), indicating a pronounced reliance on informal livelihoods in the district. The formal

sector employs only 18.3% of the total workforce, with a significant urban bias. While the urban formal employment rate of 41.5% is relatively higher, it still indicates a substantial gap in formal job opportunities.

Despite the overall dominance of the informal sector, the industry sector contributes to overall employment of the district, accounting for 27.2% of the total employed population. However, the distribution of industrial jobs between urban and rural areas is relatively balanced. The table below provides information about employment in industries.

This underscores the critical challenges faced by Khyber District in terms of job creation, formalization, and poverty reduction. The heavy reliance on the informal sector implies vulnerabilities to economic shocks and limited social protection for workers. To address these issues, concerted efforts are required to promote formal employment opportunities, particularly in the industrial sector, while simultaneously strengthening the informal economy through capacity building and skill development programs. Additionally, policies aimed at improving the business environment and attracting investments can play a pivotal role in fostering job creation and economic growth in the district.

Table 46: Employment Statistics by Industry Sector – Khyber District

Indicator	Total	Urban	Rural
Population Over 18 Years of Age (person)	421,055	44,491	376,564
Labor Force (person)	202,000	19,500	182,500
Employed People (person)	183,800	16,900	166,900
Unemployment Rate (%)	9	13.4	8.5
Employment by Industry (%)	27.2	25.1	27.4
Activity Status (Formal) (%)	18.3	41.5	15.3
Activity Status (Informal) (%)	81.7	58.5	84.7

Source: Labor Force Statistics Survey, 2020-21

6.3.3 Existing & Future Industrial Programs

Khyber District is undergoing a period of development with several initiatives aimed at boosting its economy and improving the livelihood of its residents.

One of the key projects is the establishment of a ***Small Industrial Estate in Bara***, estimated at a cost of 558.9 million rupees. Although this project received a minimal allocation of 0.002 million rupees in the 2023-24 fiscal year, no funds have been earmarked in the subsequent year's budget. In parallel, the provincial government has identified the Industrial Park Bara Khyber located at Tandai Sepah, Bara, where land acquisition is currently in process. The site spans 125 acres and holds strategic significance due to its proximity to Afghanistan and trade routes with Central Asian Republics.

Similarly, the ***Industrial Park Jamrud Khyber***, located at Teddy Bazar, has completed its feasibility study. This site, covering 87 acres, has also been highlighted as important for cross-border trade and regional connectivity. Together, the Bara and Jamrud industrial parks represent critical future nodes for industrial expansion, though they currently await concrete budgetary allocations for implementation.

To enhance the skill base of the local population, the Accelerated Skill Development Program for Merged Areas has been initiated. With a total cost of 700 million rupees, this program secured an allocation of 50 million rupees in the 2024-25 budget. Additionally, recognizing the importance of technical education, the government has launched a project to improve the infrastructure of existing technical institutes in the merged areas, with an estimated cost of 210 million rupees and an allocation of 100 million rupees for 2024-25.

Although there are currently no tax-free zones in Khyber District, a feasibility study for a Pak-Afghan Economic Zone is underway. With a projected cost of 10 million rupees, it too received only 0.002 million rupees in the 2023-24 budget.

While these initiatives highlight the government's intent to strengthen both industrial and human capital, disparities in allocations remain evident. The industrial estate projects in Bara and Jamrud, despite their potential to create jobs and enhance cross-border trade, have been sidelined in funding priorities. In contrast, skill development and technical institute upgrades have received more substantial financial support, indicating a stronger immediate focus on building human capital rather than accelerating physical industrial infrastructure.

6.3.4 Current Industrial Area Gap

The current industrial area gap in District Khyber has been calculated as follows:

Table 47: Current Industrial Area Gap – Khyber District

Urban & Rural Population	1,146,267
Industrial Labor Force @5%	57313.35
Industrial Area Required (@40 Worker Per Acre)	1432.83
Current Area Under Industries	361.39
Industrial Area Deficiency 1071.44	1071.44

Source: Calculated by Consultant, 2025

It is evident from the above calculations that the district is currently facing an industrial land deficit of 1,071 acres. This significant shortfall highlights the urgent need for expansion through the establishment of new industrial estates and zones. Unless this deficiency is addressed alongside future industrial land requirements, the district will face increasing constraints on industrial growth, job creation, and economic diversification.

6.3.5 Future Industrial Area Requirement

The future industrial area requirement for District Khyber has been projected on the basis of additional population growth and labor force participation. For the short-term plan period (2025–2030), the district is expected to add 1,067,436 people to its population. Applying a participation rate of 5 percent, this translates into an estimated 53,372 industrial workers, which would require an industrial area of about 1,334 acres.

In the long-term period (2031-2045), the additional population is projected at 1,984,947 persons, creating an industrial labor force of approximately 99,247 workers. Based on the standard of 50 workers per acre, the industrial area required for this phase comes to about 2,481 acres.

Overall, for the entire 2025-2045 plan period, the cumulative additional population is estimated at 3,052,383, generating an industrial labor force of 152,619 workers. To accommodate this, District Khyber will require a total of nearly 3,815 acres of industrial land. This projection clearly indicates a substantial demand for new industrial estates and planned zoning to ensure that industrial growth keeps pace with demographic and economic expansion in the district.

Table 48: Future Industrial Area Requirements – Khyber District

Parameters	Short-Term Plan (2025-2030)	Long Term-Term Plan (2031-2045)	Total (2025-2045)
Additional Population	1067436	1984947	**3052383**
Industrial Labor Force (@5%)[6]	53371.8	99247.35	**152619.15**
Industrial Area Required (acres)	1334.295	2481.18375	**3815.47875**

Source: Calculated by Consultant, 2025

The urban areas of District Khyber are projected to experience an additional population of 27,087 persons during the short-term plan period (2025–2030). Applying a 5 percent participation rate, this demographic growth is expected to generate an industrial labor force of 1,354 individuals, which will require approximately 33.9 acres of industrial area to support associated industrial activities and employment needs.

In the long-term plan period (2031–2045), the urban population is anticipated to grow by a further 196,886 persons, leading to an expansion of the industrial labor force by 9,844 individuals. To accommodate this workforce, an additional 246.1 acres of industrial land will be required.

Taken together, the total projected urban population increase between 2025 and 2045 amounts to 223,973 persons, which corresponds to an increase in the industrial labor force by 11,199 individuals. To meet this demand, nearly 280 acres of industrial land will need to be allocated over the entire plan period. These figures clearly highlight the importance of timely planning and the establishment of dedicated urban industrial estates to ensure that industrial growth can keep pace with population expansion and urbanization.

6.3.6 Proposed Locations for New Industrial Areas

6.3.6.1 Proposed Industrial Zones

To identify the need for an industrial area, the area is calculated through an individual recommended NRM standard according to the population. It includes two steps:

[6] @ 5% participation rate; Source: Pakistan Bureau of Statistics, Govt. of Pakistan, Labor Force Statistics 2008- 2009, Table 21 (www.pbs.gov.pk). Labor force participation rate given here is 7.46% for population of 10 years & above. Averaging it over the gross population, the participation rate comes out to be around 5%.

Industrial Demand = (Pn * Labour Force)/ Person per Acre
Where;
Pn = Population
Industrial Labor Force = 5%
Person per Acre = 40
According to this, we have the following requirements:

Table 49: Industrial Requirement for Urban Settlements

Area	Requirement
Jamrud	297
Landi Kotal	335.21
Bara	341.44
Mulla Gori	22.07
Bagh (Tirah Valley)	19.10

Source: District Khyber Proposed Land Use Plan, 2025

The proposed industrial and trade-related land allocations for Khyber District reflect a strategic approach to stimulate economic growth across its tehsils by leveraging their geographic advantages and sectoral strengths. In Bara, a substantial 668.87 acres has been earmarked as an Industrial Zone, recognizing its potential to accommodate large-scale industries and support employment generation. Jamrud has been allocated 365.93 acres for an Industrial Zone along with an additional 160.59 acres for an Industrial Park, positioning it as a major hub for manufacturing and value-addition activities due to its proximity to major transportation corridors. In Mullagori, 113.97 acres are proposed for an Industrial Zone, targeting small- to medium-scale industrial activities while utilizing available land without disturbing its sensitive ecological setting. Landi Kotal includes an 87.69-acre Industrial Zone and a significant 415.67-acre Trade Integrated Transit Zone, capitalizing on its strategic location along the Pak-Afghan trade route to facilitate logistics, warehousing, and cross-border commerce. Collectively, these proposals account for a total of 1,841.73 acres of industrial and trade-oriented development across Khyber District, demonstrating a consolidated effort to position the district as a regional industrial and trade gateway.

Table 50: Proposed Industrial Zones – Urban Settlements

Tehsil	Proposal	Area in acres
Jamrud	Industrial Park	160.59
	Industrial Zone	365.93
Landi Kotal	Industrial Zone	87.69
	Trade Integrated Transit Zone	415.76
Bara	Industrial Zone	668.87

Mullagori	Industrial Zone	113.97
Bagh Tirah Valley	Industrial Zone	28.92
Khyber District		1841.73

Source: District Khyber Proposed Land Use Plan, 2025

An industrial park is a smaller, planned, self-contained development typically covering 50 to 500 acres designed and managed by a single entity to host light to medium industries such as manufacturing, assembly, and warehousing. It features fully integrated shared infrastructure, including roads, utilities, security, and sometimes amenities like offices or cafeterias, with strict zoning, aesthetic, and environmental standards, often located near urban centers for easy access.

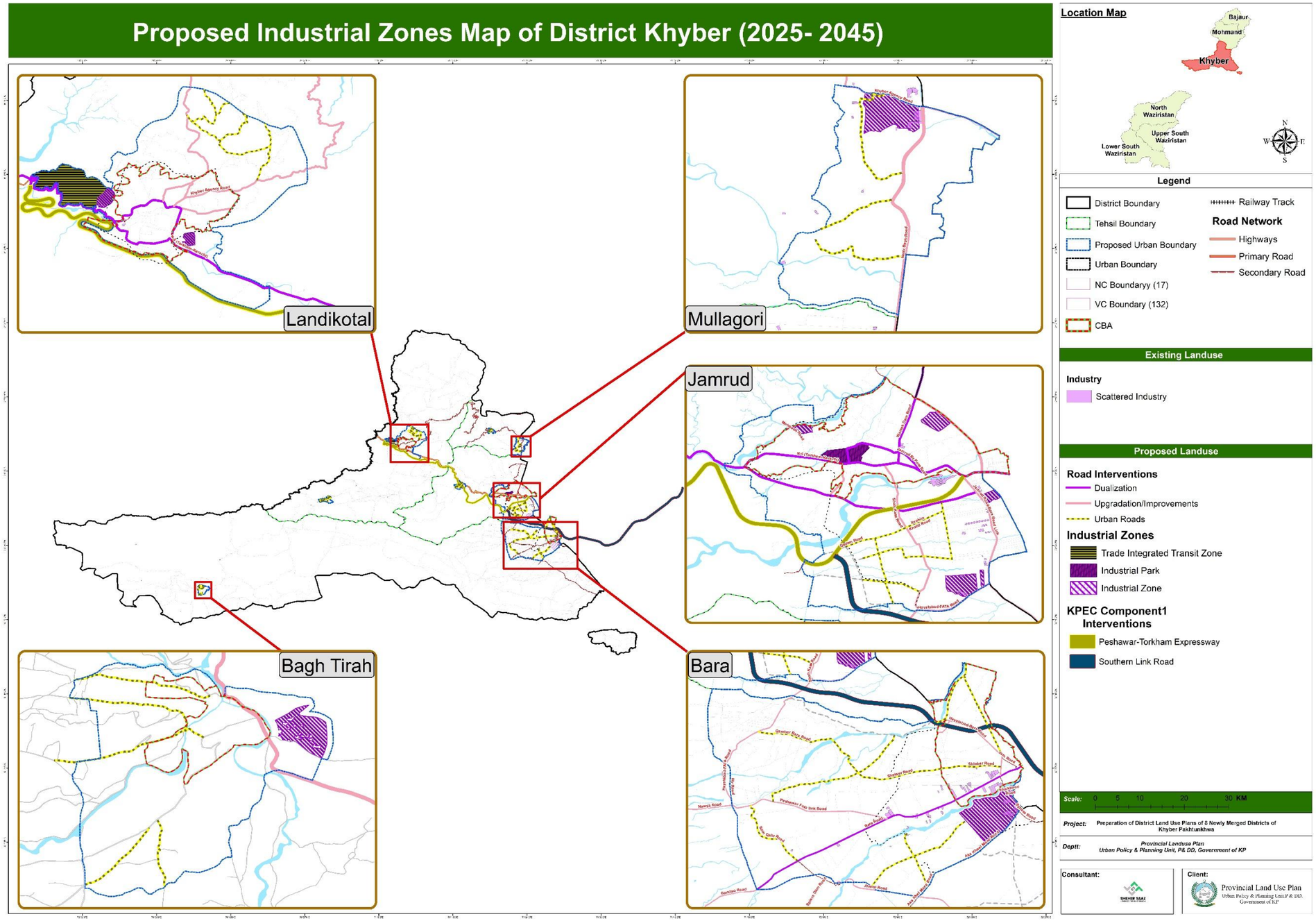
In contrast, an industrial zone is a much larger area, often spanning hundreds or thousands of acres, designated by government authorities to accommodate heavy industries like steel, chemicals, or petrochemicals, with more flexible regulations and basic infrastructure that companies may need to add. While industrial parks emphasize synergy, cleanliness, and investment appeal in a campus-like setting, industrial zones prioritize large-scale production, economic impact, and logistical efficiency, typically situated in peripheral or coastal regions with access to ports and railways. Essentially, a park is a curated, efficient industrial community, whereas a zone is a broad, functional space for high-capacity operations.

A trade integrated transit zone refers to a specialized economic area, often a variant or enhanced form of a free trade zone (FTZ) or transit zone, designed to facilitate seamless international trade through integrated multimodal transportation systems (such as sea, rail, and road networks) and logistics hubs. These zones are typically located near ports or borders, allowing goods to be imported, stored, processed, manufactured, or transshipped without immediate customs duties, tariffs, or bureaucratic delays until they enter the domestic market or are re-exported, thereby reducing costs and enhancing supply chain efficiency. For instance, they serve as gateways for landlocked countries or regions with limited port access, promoting competitiveness by deferring duties on inputs for exports and attracting foreign investment through streamlined regulations and infrastructure synergies.

A designated industrial park is given in Jamrud, while seeing the closeness of Landi Kotal to Afghanistan, a designated trade integrated transit zone is proposed to be developed. While each tehsil is separately given industrial zone for better economic development.

Although locations such as Tatara, Ali Masjid, and Bazar Zaka Khel have been identified as potential sites, their geographic conditions and proximity to already designated industrial areas within the tehsil do not justify establishing separate industrial zones within their individual planning boundaries.

Map 30: Proposed Industrial Zones



6.4 SOCIAL INFRASTRUCTURE

6.4.1 Educational Facilities

6.4.1.1 Existing Educational Institutions

The literacy rate in District Khyber is 38.45%, which highlights the persistent challenges in the education sector. The district has a broad base of schools, with most concentrated at the primary level. There are 592 primary schools with 1,194 teachers serving 105,633 students, which translates into a student–teacher ratio of 88:1. This shows significant overcrowding at the foundation stage.

At the middle level, there are 85 schools with 18,706 students and 402 teachers, giving a ratio of 47:1. The situation improves slightly at the high school level, where 51 schools serve 5,409 students with 588 teachers, resulting in a ratio of 9:1. However, this unusually low ratio reflects the smaller number of students progressing to higher levels rather than better resource allocation. At the college/higher secondary level, only 6 institutions exist, accommodating 976 students with 152 teachers, giving a ratio of 6:1, again indicating minimal enrollment rather than abundant teaching staff.

In addition, 6 primary and 2 middle schools are non-functional, which further reduces access in some areas. The imbalance across levels is evident: while primary schools are widespread, opportunities diminish rapidly at middle, high, and college levels. This weakens the educational pipeline and contributes to dropouts after the primary stage.

6.4.1.2 Accessibility Analysis

Accessibility to educational institutions is assessed through two approaches: walkability distance and driving distance. For walkability, different speeds are considered based on age groups, since younger children and older students have varying mobility levels. For primary school students, a speed of 3.5 km/h is used, which corresponds to an effective walking range of 600–800 m[7]. For secondary and high school students, a standard adult speed of 5.0 km/h is applied, giving a reasonable walking range of 800 m–1 km[8]. These buffers represent the maximum distance students can realistically cover on foot without difficulty.

In contrast, for **vehicular accessibility**, a speed of **30 km/h** is assumed to reflect the mixed road conditions common in urban and peri-urban areas of Khyber District[9]. At this speed, a **10-minute travel time translates to a service radius of approximately 6 km**, which represents the effective catchment of schools when accessed by vehicles.

The walkable distance shows that many areas cannot access public educational institutes, however, if driving distance is used almost entire study area can access the available public educational institutes. This does not change the fact that with respect to the population, the

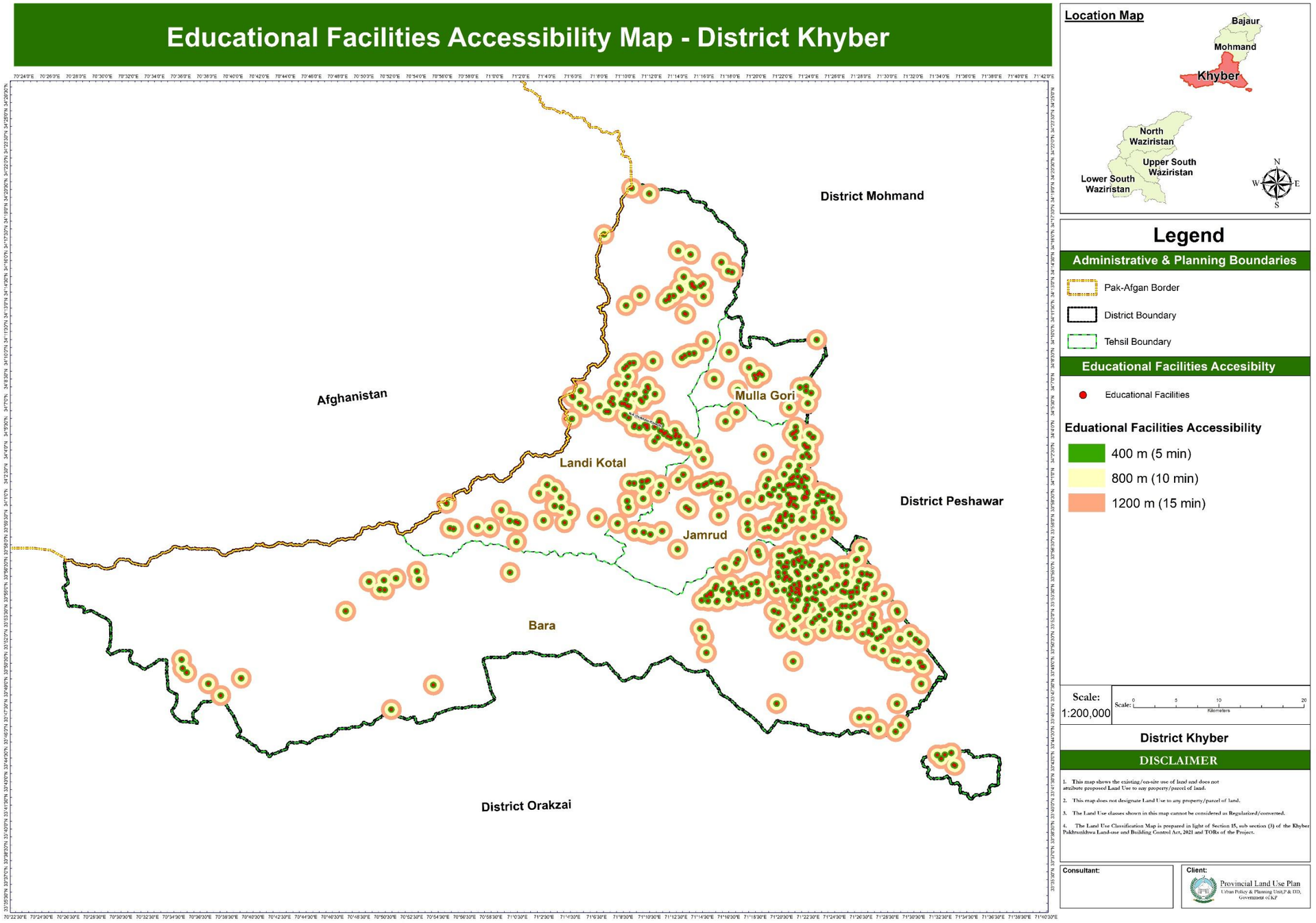
[7] Millward, H., Spinney, J., & Scott, D. (2012). Active-transport walking behavior: destinations, durations, distances. Journal of Transport Geography, 28, 101–110. https://doi.org/10.1016/j.jtrangeo.2012.11.012

[8] Riazi, N. A., & Faulkner, G. (2018). Children's independent mobility. In Elsevier eBooks (pp. 77–91). https://doi.org/10.1016/b978-0-12-811931-0.00005-3

[9] Verma, V. R., & Dash, U. (2020). Geographical accessibility and spatial coverage modelling of public health care network in rural and remote India. PLoS ONE, 15(10), e0239326. https://doi.org/10.1371/journal.pone.0239326

number of schools are quite low, and more are required in the next twenty years. The following maps show accessibility of public educational institutions with respect to walkability and driving. The analysis indicates that while the majority of settlements have access to educational facilities, certain areas remain underserved with limited accessibility.

Map 31: Existing Educational Facilities Accessibility – District Khyber



6.4.1.3 National and International Education Policies and Planning Standards

6.4.1.3.1 National Standards

- ***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 51: 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
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

Sr. No.	Educational Institution Type	Location Guidelines
4	Degree College	Large City
5	University	Metropolitan City Area

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

- **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 52: 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 • Minimum total: 175 boys / 140 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)
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.

6.4.1.3.2 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 53: International Education Policies and Planning standards[101112]

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
	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

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

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

6.4.1.4 Educational Future Requirement

6.4.1.4.1 District

To ensure adequate educational infrastructure for the growing population, a future requirement assessment was conducted using population projections and standard benchmarks defined in the National Reference Manual (NRM). These standards specify that one primary school is required for every 7,500 people, one middle school for every 17,000 people, and one high school for every 74,000 people. Additionally, one college is recommended for every 170,000 to 400,000 people, with a mid-range benchmark of one college per 250,000 population applied for this analysis.

Based on the projected increase in population from 1.2 million in 2025 to 1.87 million by 2045, the district will require a considerable expansion of its educational facilities. The assessment indicates a need for 89 new primary schools, 39 additional middle schools, and 9 new high schools to accommodate the future demand. Furthermore, 4 additional colleges will be required to ensure higher education accessibility in line with demographic growth.

Table 54: Future Educational Facilities Requirement

Facility	Current Requirement (2025)				Future Requirement (2025-2045)			NRM Standard
	Existing Facilities (numbers)	Population 2025	Current requirement	Current Gap (2025)	Population 2045	Increase in Population	Future Requirement (2025-2045)	
Primary	592	1203136	160	0	1,872,301	669,165	89	1 for 7500
Middle	85		71	0			39	1 for 17000
High	51		16	0			9	1 for 74000
College	6		7	1			4	1 for 170,000 - 400,000

Source: Calculated by Consultant based on the population projection of the district and NRM Standards

Note: *These facility requirements are calculated based on population projections and national-level planning standards. Actual needs may vary due to factors such as the spatial distribution of the population, literacy trends, migration, and access barriers.*

In total, the period 2025–2045 will necessitate the establishment of 141 new educational institutions across all levels, ensuring that the district's educational infrastructure remains aligned with both population growth and national planning standards.

6.4.1.4.2 Urban Centre, Potential Urban Centre and Potential Settlement

The assessment of educational facilities across urban and potential urban centres in the district highlights the current capacity and projected future needs based on population growth by 2045. The analysis covers primary, middle, high schools, and colleges, providing a clear basis for planning new infrastructure.

In Landi Kotal (Urban Centre), the projected population of 269,203 in 2045 will require 36 primary schools, 16 middle schools, 4 high schools, and 2 colleges, up from the current requirements of 20, 9, 2, and 1 respectively. Similarly, Jamrud Urban Centre will need 42 primary, 18 middle, 4 high schools, and 2 colleges for its future population of 311,984, almost double the current requirements.

For potential urban centres, Bara will see the largest educational demand, requiring 54 primary, 24 middle, 5 high schools, and 2 colleges for a projected population of 403,394, while Mullagori will need only 4 primary and 2 middle schools, with no high school or college requirement due to its smaller population.

In potential urban settlements, the demand is smaller but still significant. Ali Masjid will require 3 primary and 2 middle schools; Bazar Zakha Khel-5 will need 2 primary and 1 middle school; Tatara will require only 1 primary school, and Tirah will need 3 primary and 1 middle school. High schools and colleges are not required in these smaller settlements at this stage.

Table 55: Future Education requirement of Urban Centre, Potential Urban Centre and Potential Settlement

Educational Facilities		***Pop 2025***	***Current Requirements***	***Existing Gap***	***Pop 2045***	***Future Requirement 2045***	***Total Requirement (2025-2045)***
URBAN CENTRE							
Landi Kotal (Urban)							
Primary	29	152213	20	0	269,203	36	36
Middle	1		9	8		16	24
High	2		2	0		4	4
College	3		1	0		2	2

Jamrud (Urban)							
Primary	58	160422	21	0	311,984	42	42
Middle	6		9	3		18	22
High	5		2	0		4	4
College	5		1	0		2	2
POTENTIAL URBAN CENTRE							
Bara (Potential Urban Centers)							
Primary	84	219044	29	0	403,394	54	54
Middle	11		13	2		24	26
High	7		3	0		5	5
College	5		1	0		2	2
Mullagori (Potential Urban Centers)							
Primary	1	15718	2	1	26,966	4	5
Middle	2		1	0		2	2
High	1		0	0		0	0
College	0		0	0		0	0
POTENTIAL URBAN SETTLEMENTS							
Ali Masjid (Potential Urban Settlements)							
Primary	6	14215	2	0	26,088	3	3
Middle	1		1	0		2	2
High	0		0	0		0	0
College	0		0	0		0	0
Bazar Zakha Khel-5 (Potential Urban Settlements)							
Primary	1	9009	1	0	15,278	2	2
Middle	0		1	1		1	1
High	0		0	0		0	0
College	0		0	0		0	0
Tatara (Potential Urban Settlements)							
Primary	3	4364	1	0	6,816	1	1
Middle	1		0	0		0	1
High	1		0	0		0	0
College	0		0	0		0	0
Tirah (Potential Urban Settlements)							
Primary	0	12433	2	2	22,807	3	5
Middle	0		1	1		1	2
High	1		0	0		0	0
College	0		0	0		0	0

Source: Calculated by Consultants

6.4.1.5 Proposed Future Educational Institutions

Educational facilities proposed under this master plan are an integral part of the broader institutionalization and economic development strategies. These facilities are expected to significantly improve literacy rates, which in turn will contribute to enhanced economic growth and overall social development.

6.4.1.5.1 Rationale for Proposed Educational Facilities

Demography, connectivity, and environmental factors critically influence spatial policy decisions, particularly when identifying the best locations for public services to promote accessibility, efficiency, and equity. When setting up new education facilities, important factors to consider are their proximity to flood zones, earthquake zones, and issues related to air and water quality, among other influential elements.

6.4.1.6 Proposed Educational Zone

To accommodate future educational needs and ensure accessibility across major urban and potential urban centers of Khyber District, specific land areas have been designated for Educational Zones. These zones are planned to provide space for schools, colleges, training centers, and other educational facilities based on population growth and projected demand by 2045.
To accommodate future educational needs and ensure accessibility across major urban and potential urban centers of Khyber District, specific land areas have been designated as Educational Zones. These zones are intended to provide space for schools, colleges, training centers, and other educational facilities, with allocations determined based on population growth and projected demand by 2045.

In urban centres, Landi Kotal currently has 51.48 acres of educational land, which is proposed to expand to 84.12 acres to meet future demand. Similarly, Jamrud will see its educational area increase from 87.94 acres to 113.96 acres, ensuring adequate provision for primary, middle, high schools, and colleges.

For potential urban centres, Bara will experience a significant increase, from 54.69 acres to 282.31 acres, reflecting its projected population growth and status as a major urban hub. Mullagori will see a more modest increase, from 5.85 acres to 9.40 acres.

In potential settlements, the proposed educational land varies according to population and existing provision. Ali Masjid is slightly reduced from 4.10 acres to 3.78 acres, while Tatara expands from 2.92 acres to 6.81 acres. Bazar Zakhakhel increases from 0.32 acres to 2.02 acres, and Bagh Tirah, which currently has no designated educational land, is allocated 11.12 acres for future development.

Table 56: Proposed educational zones

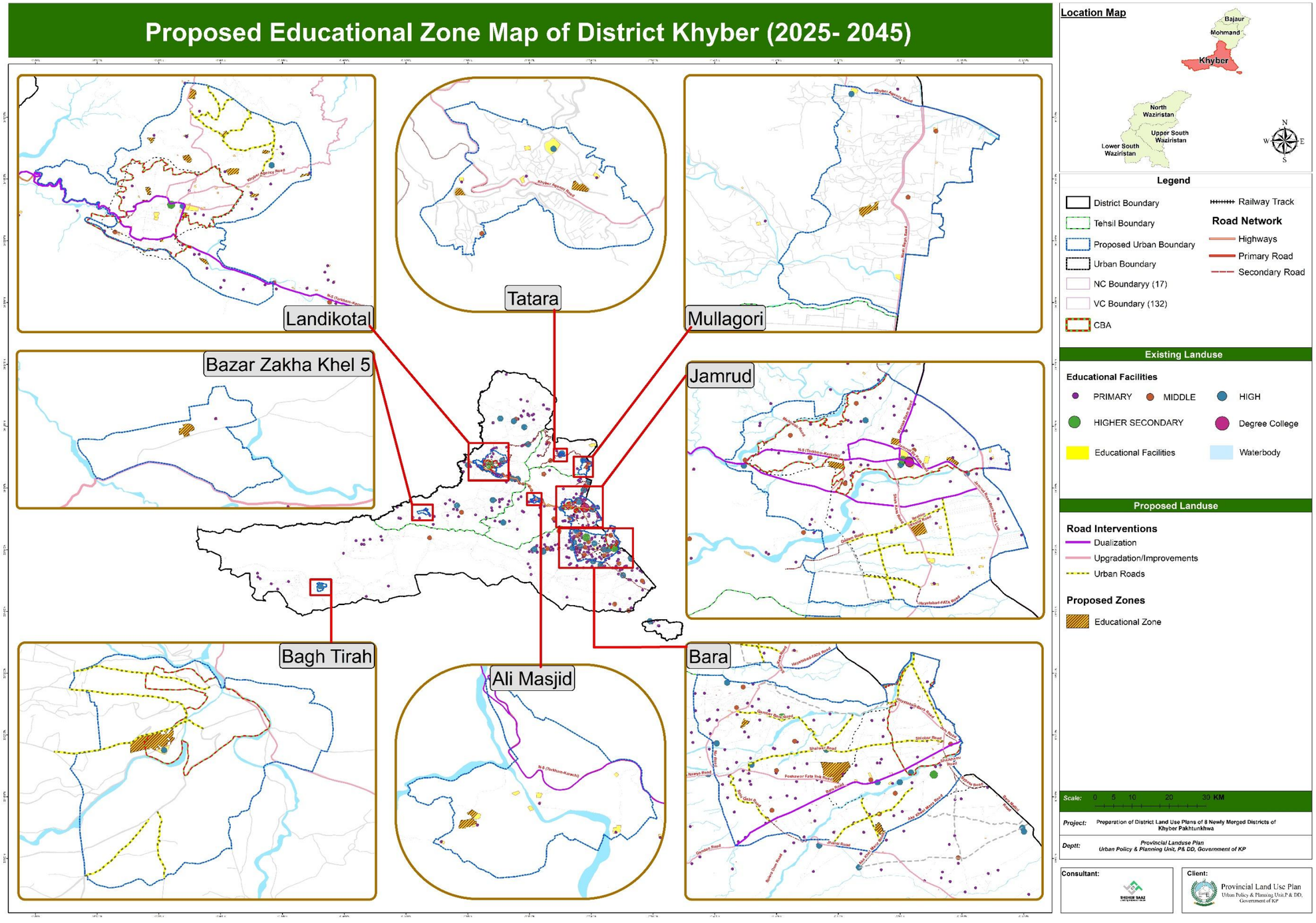
Urban centre/Settlements	*Existing Education*	*Proposed Educational Zones*	*Total Education (Existing and Proposed)*
Urban Centre			
Landikotal	51.48	84.12	135.60

Jamrud	87.94	113.96	201.90
Potential Urban Centre			
Bara	54.69	282.31	337.00
Mullagori	5.85	9.40	15.25
Potential Settlement			
Ali Masjid	4.10	3.78	7.9
Tatara	2.92	6.81	9.7
Bazar Zakhakhel	0.323766	2.024455	2.3
Bagh Tirah	0	11.116982	11.1

Implementation Approach

1. **Upgrading Existing Institutions:** Schools and colleges within these zones will be modernized with improved classrooms, laboratories, libraries, and other essential facilities.
2. **New Educational Facilities:** Construction of new institutions will be prioritized based on demand, ensuring efficient use of resources.
3. **Integration of Vocational and Technical Training:** Educational Zones will include vocational training centers to provide students with diverse career pathways.
4. **Community and Private Sector Engagement:** Collaboration with local communities, NGOs, and private educational providers will enhance capacity and quality.
5. **Accessibility Measures:** Transport links and pedestrian infrastructure will ensure students from surrounding areas can access educational facilities conveniently.

Map 32: Proposed Educational Facilities Map – District Khyber



6.4.1.7 Zoning Regulations for Educational Zone

Permitted Uses	*Permitted on appeal uses (Permissible)*	*Prohibited Uses*
• General Education Universities • Educational and Research Institutions • IT and media institutes • Offices of Social and Cultural Organizations • Public Utilities and Buildings • Taxi Stands, Bus Halts • Approved Parking Provisions • Day Cares • Research centers and Vocational training centers • Libraries	• Staff residences (teaching and non-teaching, employees) • Separate Male and Female Hostels • Athletic, Gymnasium sports facilities, fitness centers, or indoor spot facilities. • Banks and ATM • Food courts • Religious Institutions • Petrol and gas filling Station • Memorials and Monuments • Community facilities (Parks and Playgrounds)	• Other than permitted and permissible

6.4.1.8 Recommendations

- Substantial investment is needed to construct additional classrooms and other essential rooms in girls' schools at all educational levels to bridge the infrastructure gap and ensure equitable access to education.
- Rehabilitation and functionalization of non-functional schools should be prioritized to maximize the use of existing resources. Increasing budget allocations for education and ensuring the effective utilization of funds are crucial for infrastructure development and maintenance.
- Recruitment and training of qualified teaching staff must be emphasized to improve the teacher-student ratio and enhance the quality of education.

- Additionally, providing basic facilities such as clean drinking water, sanitation, and electricity in all schools will create a more conducive learning environment.
- Community awareness programs should be implemented to emphasize the importance of education, particularly for girls, and to address socio-cultural barriers that hinder female enrollment.

6.4.2 Health Facilities

6.4.2.1 Existing Health Institutions

The healthcare infrastructure in the district is limited in both capacity and coverage. At present, the available facilities include 12 Basic Health Units (BHUs), 2 Rural Health Centers (RHCs), 2 Mother and Child Health (MCH) Centers, 28 dispensaries, and 5 public hospitals, collectively offering a total of 516 hospital beds. A few private clinics and dispensaries supplement these. Despite this network, the existing facilities remain insufficient to meet the healthcare needs of a rapidly growing population.

The doctor-to-population ratio falls significantly below the minimum threshold of 1.11 doctors per 1,000 population (as per WHO/SDG standards), reflecting both an overall shortage of health professionals and an uneven distribution of doctors across rural and urban areas. The limited availability of nurses further aggravates this gap, Lady Health Visitors (LHVs), and midwives, which undermines the quality of preventive, promotive, and curative healthcare delivery.

Regarding disease prevalence, the District Health Information System (DHIS) lists Malaria, Tuberculosis (TB-DOTS), Hepatitis, Diarrhoea, Acute Respiratory Infections (ARI), and COVID-19 as major recurring illnesses. Seasonal health issues such as fever, flu, and chest infections are common, while non-communicable diseases (NCDs) like diabetes and hypertension are gradually increasing. Less frequent but urgent cases include heart attacks, kidney stones, and cancer, highlighting the dual challenge of infectious and chronic diseases.

6.4.2.2 Accessibility Analysis

Accessibility to health services is also determined by both walking distance and vehicular travel time. For walkability, international health geography standards often assume a 3.5–5.0 km/h walking speed depending on age and physical capacity[13]. A 1 km buffer (12–15 minutes walking) is generally considered a reasonable access threshold for primary health services in rural and peri-urban settings, especially for vulnerable groups such as women, children, and the elderly.

For vehicular accessibility, a speed of **30 km/h** is applied, consistent with mixed road conditions (urban, peri-urban, and rural link roads) common in Khyber District. At this speed, a **30-minute travel time** corresponds to an effective **catchment radius of 15 km[14]**, which aligns with global benchmarks for essential health service coverage. This threshold reflects the maximum distance patients can reasonably travel to reach first-level health care without

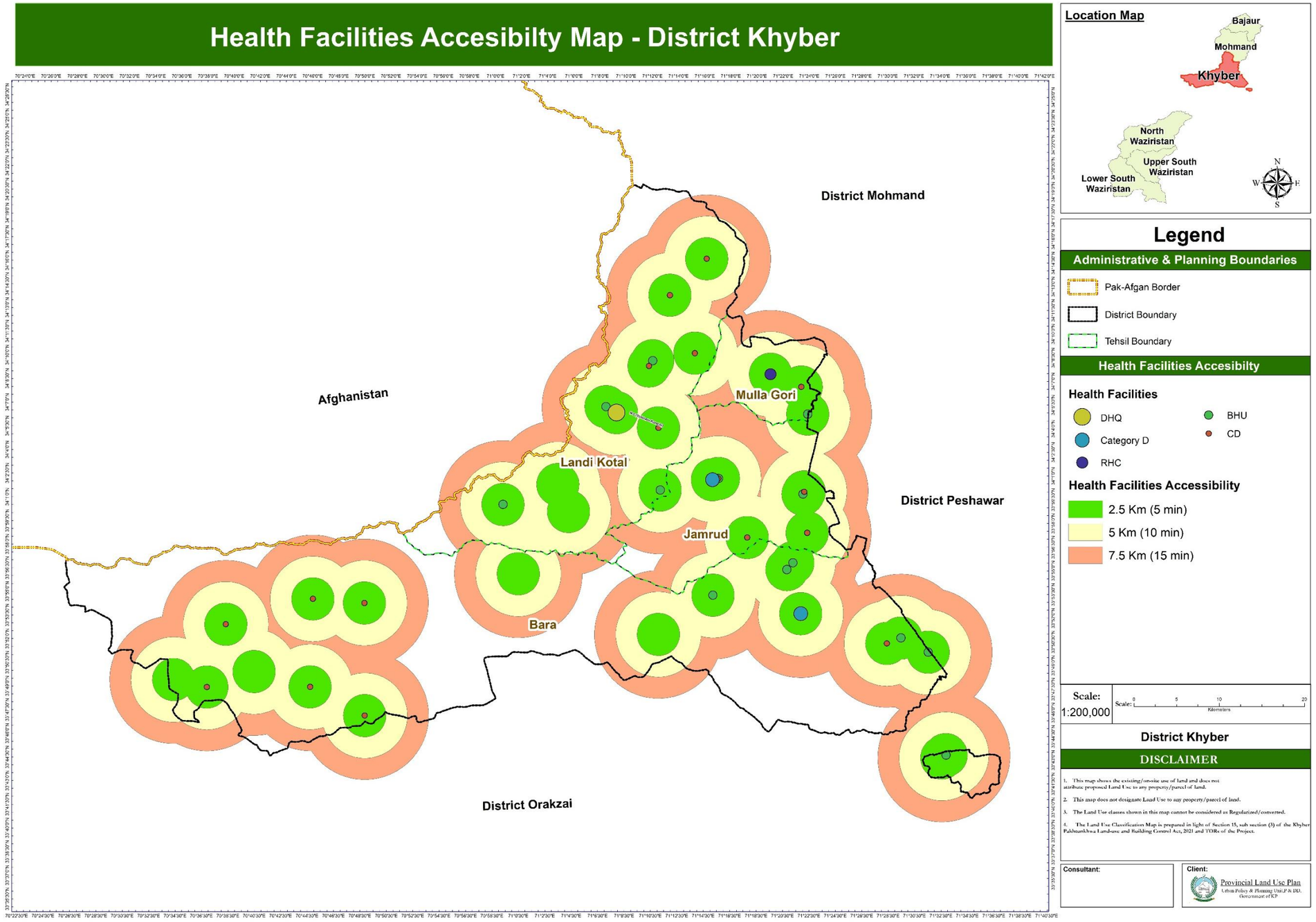
[13] WHO (2019). *Primary health care on the road to universal health coverage: 2019 monitoring report.* Geneva: World Health Organization. https://iris.who.int/server/api/core/bitstreams/c9e2c0c0-cfad-4e6c-9982-68d4f9ffe365/content

[14] Millward, H., Spinney, J., & Scott, D. (2012). Active-transport walking behavior: destinations, durations, distances. Journal of Transport Geography, 28, 101–110. https://doi.org/10.1016/j.jtrangeo.2012.11.012

facing major delays. The walkable distance shows that many areas cannot access public health facilities, however, if driving distance is used almost entire study area can access the available public health facilities. This does not change the fact that with respect to the population, the number of schools are quite low, and more are required in the next twenty years.

The analysis indicates that while the majority of settlements have access to health facilities, certain areas remain underserved with limited accessibility. To address this imbalance, proposed Health zones have been designed to meet the calculated requirements and ensure that facilities are more equitably distributed and easily accessible to the community.

Map 33: Existing Health Facilities Accessibility – District Khyber



6.4.2.3 Requirements Criteria

6.4.2.3.1 National Standards

- **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 57: 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)

- **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 58: Proposed Criteria for Establishment of BHU and Up-gradation to RHC[15]

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	Educational Facilities	Basic educational facilities in the area	At least **one College or Higher Secondary School** in the vicinity
8	Distance from Nearest Health Facility	**7 – 10 km** from another BHU or higher-level facility	**25 – 35 km** from nearest RHC or Civil Hospital
9	Postal Facility	Not applicable	**Post Office** required

[15] Source: Secondary Data collected from Department

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 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 59: Healthcare Facility Types and Services – Khyber Pakhtunkhwa

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 &	Upgradation of BHUs for 24/7 delivery care is being implemented in Khyber

			child health- Requires adequate infrastructure, human resources, equipment & supplies	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 • Clinical, logistical, managerial support to linked BHUs, LHWs, MCH Centres, Dispensaries- Laboratory & X-ray services- Medico-legal, basic surgical, dental, ambulance services	Typically links 5–8 BHUs for referral; private sector equivalents exist in urban areas; ambulance services under Rescue 1122
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

6.4.2.3.2 Requirement

6.4.2.3.2.1 District

By the year 2045, the health infrastructure will need significant expansion to meet the demands of a growing population of 1,872,301. The requirement for Basic Health Units (BHUs) will rise to 67, compared to only 12 existing units at present, creating a substantial gap. Similarly, the number of Rural Health Centers (RHCs) will need to increase from the current 2 to at least 9 to ensure adequate service delivery. Maternal and Child Health (MCH) centers will also face increased demand, with the requirement reaching 9 centers by 2045, whereas only, 2 exist currently.

Dispensaries, essential providers of basic healthcare, will need to increase from their current number to 45 units. In terms of public hospitals, however, the situation is comparatively favorable, as the existing 5 hospitals already exceed the projected requirement of 1 hospital by 2045. Nevertheless, the most critical concern lies in hospital bed capacity; while only 516 beds are currently available, the projected requirement by 2045 is 2,007 beds, indicating a severe shortage that must be addressed to strengthen the overall health system.

Table 60: Future Requirement of Health Facilities in District Khyber

Facility	Current Requirement (2025)				Future Requirement (2025-2045)			NRM Standard
	Existing Facilities (numbers)	Population 2025	Current requirement	Current Gap (2025)	Population 2045	Increase in Population	Total Requirement (2025-2045)	
BHU	12	1203136	120	108	1,872,301	669,165	67	1 for 10000
RHC	2		16	14			9	1 for 73000
MCH	2		16				9	1 for 75000
Dispensary	28		80	52			45	1 for 15000
Public Hospitals	5		2	-3			1	Criteria of THQ (1 hospital for 0.5 to 1 million)
Bed in all Facilities	516		3609	3093			2007	3 for 1000 people

Source: Calculated by Consultants

6.4.2.3.2.2 Potential Urban Centers and Settlements

The assessment of health facilities in the urban centers of District Khyber, including Landi Kotal (Urban), Jamrud (Urban), Bara (Urban), Mullagori (Urban), and Jamrud (Ali Masjid), highlights a mixed situation where limited infrastructure is in place, but future population growth will require proportional expansion. Despite being more accessible than rural regions, these urban areas still face significant gaps in primary and secondary healthcare facilities when measured against NRM Standards.

To ensure equitable access to primary and secondary healthcare services across Khyber District, the future healthcare requirements have been projected for both urban centers and potential urban settlements based on population growth from 2025 to 2045. The analysis includes Basic Health Units (BHUs), Rural Health Centers (RHCs), Maternal and Child Health (MCH) facilities, dispensaries/clinics, public hospitals, and bed capacity.

Urban Centers:

- Landi Kotal's population is expected to grow from 152,213 to 269,203, increasing the need from 15 BHUs to 27 BHUs, 2 RHCs to 4, 2 MCHs to 4, 10 dispensaries to 18, and establishing 1 public hospital, while bed capacity rises from 457 to 808.

- Jamrud's population will increase from 160,422 to 311,984, requiring 31 BHUs, 4 RHCs, 4 MCHs, 21 dispensaries, 1 public hospital, and bed capacity expansion from 481 to 936.

- Bara will grow from 219,044 to 403,394, necessitating 40 BHUs, 6 RHCs, 5 MCHs, 27 dispensaries/clinics, 1 public hospital, and beds increasing from 657 to 1,210.

- Mullagori's urban population increase from 15,718 to 26,966 requires 3 BHUs, 2 dispensaries, and bed capacity rising from 47 to 81, while RHCs, MCHs, and public hospitals remain unrequired.

Potential Urban Settlements:

- Jamrud (Ali Masjid): population grows from 14,215 to 26,088, requiring 3 BHUs, 2 dispensaries, and beds increasing from 43 to 78.

- Landi Kotal (Bazar Zakha Khel-5): population grows from 9,009 to 15,278, requiring 2 BHUs, 1 dispensary, and beds increasing from 27 to 46.

- Mulla Gori (Area Tatara): population grows from 4,364 to 6,816, requiring 1 BHU, with bed capacity rising from 13 to 20; other facilities remain unrequired.

- Bara (Area Tirah): population grows from 12,434 to 22,807, requiring 2 BHUs, 2 dispensaries, and beds increasing from 37 to 68.

Table 61: Required Health Facilities

Tehsil / Urban Area	*Facility*	*Existing Facilities*	*Pop 2025*	*Current Req*	*Current Gap*	*Pop 2045*	*Future Req (2025-2045)*
Landi Kotal (Urban)	BHU	0	152,213	15	15	269,203	27
	RHC	0		2	2		4
	MCH	2		2	0		4
	Dispensary	2		10	8		18
	Public Hospitals	1		0	N/A		1
	Beds			457	457		808
Jamrud (Urban)	BHU	0	160,422	16	16	311,984	31
	RHC	0		2	2		4
	MCH	0		2	2		4
	Dispensary	2		11	9		21
	Public Hospitals	3		0	N/A		1

	Beds			481	481		936
Bara (Urban)	BHU	4	219,044	22	18	403,394	40
	RHC	0		3	3		6
	MCH	1		3	2		5
	Dispensary/Clinic	4		15	11		27
	Public Hospitals	3		0	N/A		1
	Beds			657	657		1210
Mullagori (Urban)	BHU	1	15,718	2	1	26,966	3
	RHC	0		0	0		0
	MCH	0		0	0		0
	Dispensary	0		1	1		2
	Public Hospitals	1		0	N/A		0
	Beds			47	47		81
Jamrud (Ali Masjid)	BHU	0	14,215	1	1	26,088	3
	RHC	0		0	0		0
	MCH	0		0	0		0
	Dispensary/Clinic	1		1	0		2
	Public Hospitals	1		0	N/A		0
	Beds			43	43		78
Landi Kotal (Bazar Zakha Khel-5)	BHU	1	9,009	1	0	15,278	2
	RHC	0		0	0		0
	MCH	0		0	0		0
	Dispensary	0		1	1		1
	Public Hospitals	0		0	0		0
	Beds			27	27		46
Mulla Gori (Area Tatara)	BHU	0	4364	0	0	6816	1
	RHC	0		0	0		0
	MCH	1		0	N/A		0
	Dispensary	0		0	0		0
	Public Hospitals	0		0	0		0
	Bed in all Facilities			13	13		20
Bara (Area Tirah)	BHU	0	12434	1	1	22807	2
	RHC	0		0	0		0
	MCH	0		0	0		0
	Dispensary	1		1	0		2
	Public Hospitals	0		0	0		0
	Bed in all Facilities			37	37		68

6.4.2.4 Proposed Future Health Institutional Zone

To meet future healthcare needs and ensure accessibility across urban centers, potential urban centers, and settlements, specific land areas have been designated as **Health Care Zones**. These zones are planned to accommodate hospitals, clinics, specialized medical facilities, and allied health infrastructure, aligned with projected population growth and service demand.

In **urban centres**, **Landi Kotal**'s existing healthcare land of **17.46 acres** is proposed to expand to **88.66 acres for Health Care Zones** and an additional **51.60 acres for Regional Health Care Zones**, reflecting its role as a primary urban hub. **Jamrud**'s healthcare land increases from **8.94 acres** to **66.46 acres**, ensuring adequate provision for both primary and specialized health services.

For **potential urban centres**, **Bara** is proposed to expand from **24.23 acres** to **188.77 acres**, while **Mullagori** increases from **1.83 acres** to **8.45 acres**, reflecting their projected population growth and urbanization potential.

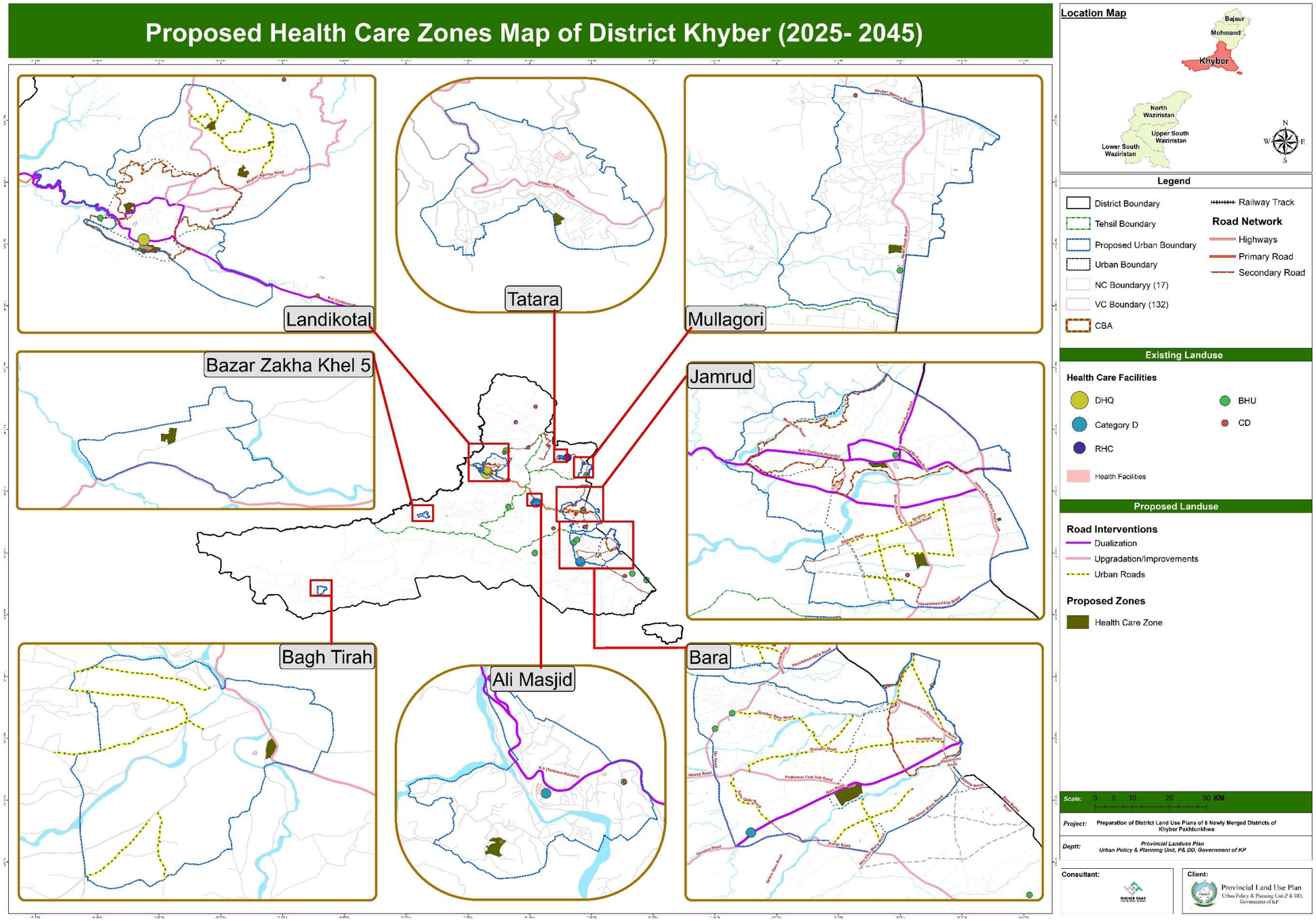
In **potential settlements**, **Ali Masjid** will expand from **1.95 acres** to **5.25 acres**, **Tatara** from **1.20 acres** to **8.45 acres**, **Bazar Zakhakhel** from **0.35 acres** to **1.09 acres**, and **Bagh Tirah** from **0.23 acres** to **3.01 acres**. These allocations ensure that even smaller settlements are served by appropriately scaled health facilities.

The proposed Health Care Zones are strategically planned to improve access to medical services, enhance service delivery efficiency, and accommodate future population growth while supporting sustainable urban development. By integrating these zones within the broader land-use framework, the district can optimize health infrastructure, reduce travel times, and improve overall community well-being.

Table 62: Proposed Health Care Zones in Potential Urban Centers/ Settlements

Urban center/Settlements	*Existing*	*Proposed Zones*	
Urban Centre			
Landi Kotal	17.46	Health Care Zone	88.66
		Regional Health Care Zone	51.60
Jamrud	8.94	Health Care Zone	66.46
Potential Urban Centre			
Bara	24.23	Health Care Zone	188.77
Mullagori	1.83		8.45
Potential Settlement			
Ali Masjid	1.95	Health Care Zone	5.25
Tatara	1.20		8.45
Bazar Zakhakhel	0.34		1.09
Bagh Tirah	0.22		3.01

Map 34: Proposed Health Facilities Map – District Khyber



6.4.2.5 Zoning Regulations for Health Zone

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

6.4.3 Public/Civic Amenities Zone

To address these gaps, a proposed Civic / Public Amenities Zone has been earmarked across the district. This expansion represents a nearly threefold increase over the existing allocation and has been strategically located to ensure maximum accessibility for the public.
The proposed zone is envisioned as a consolidated hub for essential civic and administrative functions, accommodating Government and Semi-Government offices such as the District Secretariat, Town Hall, and other core public institutions. By bringing together dispersed administrative buildings into one designated zone, the initiative seeks to:

- Streamline public services through improved coordination and proximity of offices.
- Enhance accessibility for residents by centralizing key administrative functions.
- Improve operational efficiency through modern, purpose-built facilities.
- Support future governance needs as the district grows in size and complexity.

In urban centres, Landi Kotal's existing civic land of 20.30 acres is proposed to be refined to 3.54 acres, focusing on strategically located civic amenities within the urban core. Jamrud will expand its civic zone from 71.00 acres to 124.66 acres, reflecting the town's growing administrative and commercial functions. For potential urban centres, Bara sees a substantial increase from 55.71 acres to 646.74 acres, supporting its anticipated growth and status as a major urban hub, while Mullagori expands from 3.58 acres to 8.76 acres, aligning with projected population growth. In potential settlements, land allocations for civic and public amenities are scaled to community size and growth potential: Ali Masjid increases from 1.58 acres to 5.99 acres, Tatara from 0.66 acres to 7.51 acres, Bazar Zakhakhel from 0.37 acres to 2.00 acres, and Bagh Tirah from 0.38 acres to 8.09 acres.

This planned relocation and consolidation of civic functions into a unified Civic Amenities Zone will not only improve administrative performance but also align with the broader vision of creating a more organized, accessible, and citizen-friendly governance structure for District Khyber.

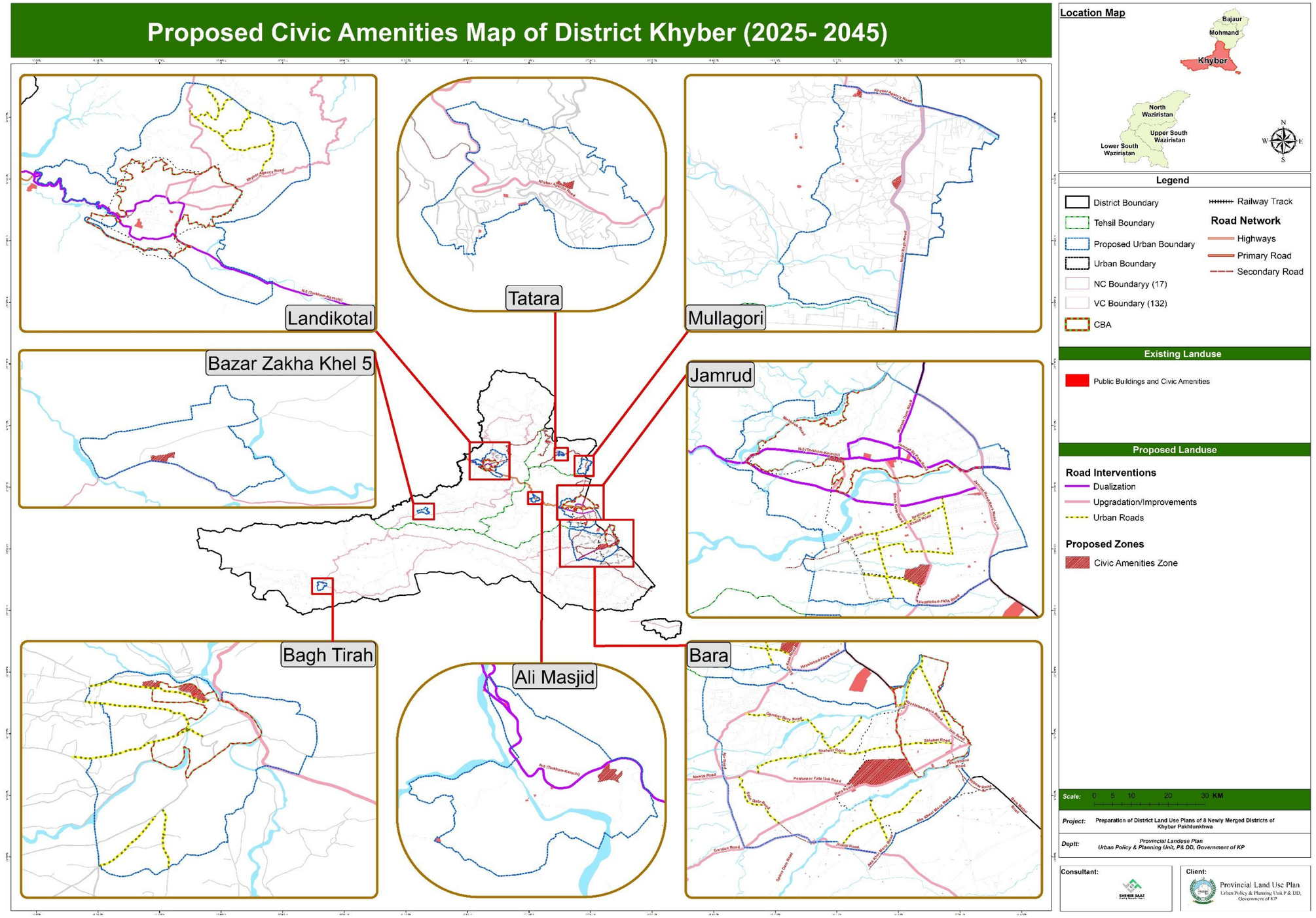
Urban center/Settlements	***Existing***	***Proposed Zones***
Urban Centre		
Landi Kotal	20.30	3.54
Jamrud	71.00	124.66
Potential Urban Centre		
Bara	55.71	646.74
Mullagori	3.58	8.76
Potential Settlement		
Ali Masjid	1.58	5.99
Tatara	0.66	7.51

Bazar Zakhakhel	0.37	2.0
Bagh Tirah	0.38	8.09

6.4.3.1 Zoning Regulations for Public/Civic Amenities Zone

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Government or semi-government offices (District Secretariat, Town Hall etc.)	Hotel or Motel	Other than permitted and permissible
Social welfare institution such as community centre, art gallery, museum and auditorium	Guest house	
Local and zonal municipal office	Athletic club, gymnasium, fitness centre or indoor sport facility	
Police station, fire station or post office	Research and development centres	
Shelter home		
Pannahgahh		
Convention centre		

Map 35: Proposed Public/Civic Amenities Zones



6.4.4 Graveyards

6.4.4.1 Existing Graveyards

Graveyards in District Khyber are distributed across all major towns and tribal areas, yet they face significant challenges of space, management, and infrastructure. Public graveyards, located in Bara, Jamrud, and Landi Kotal, are generally managed by local councils, the Auqaf Department, or community committees, but most suffer from overcrowding and encroachments. For example, the Jamrud Central Graveyard, situated in Jamrud Bazaar, has limited capacity remaining and is only partially maintained. At the same time, the Shahkas Graveyard near Bara is heavily overcrowded, forcing communities to seek burial space outside its boundaries. The Landi Kotal Graveyard, although centrally located in the town, lacks proper infrastructure, including boundary walls, drainage, and pathways, making it vulnerable to pressure from expansion and unmanaged growth.

Alongside these, a large number of community and tribal graveyards exist, owned and maintained by families or clans, which hold cultural and ancestral significance. Notable examples include the Afridi tribal graveyards in Jamrud and Landi Kotal, as well as the Malagori tribal graveyard located in the hilly terrain of Jamrud. These graveyards are family-managed but lack formal record-keeping, making long-term capacity management challenging. Historical sites such as the Old Afridi Graveyard near the Jamrud Fort reflect both their heritage value and the pressure from urban expansion.

6.4.4.2 National Standards and Future Requirements for New Graveyards

District Khyber's health and mortality profile emphasizes the need for graveyards. The under-five mortality rate is 31 per 1,000 live births, and neonatal mortality is 20 per 1,000, both contributing to a considerable number of child and infant burials. Limited skilled birth attendance (69%) and low antenatal care coverage (27.7%) add to maternal and infant deaths. Although immunization coverage is high (98%), healthcare remains limited. These gaps maintain a significant mortality burden, making the provision of sufficient burial capacity a crucial planning priority. 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.

6.4.4.2.1 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.

Table 63: Proposed Graveyard (Size and Dimensions)

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

6.4.4.2.2 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.

Table 64: Proposed Parameters for Graveyard

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.

6.4.4.3 Proposed Graveyards

As of 2025, the total area of existing graveyards in District Khyber is estimated at 276.24 acres, distributed across different tehsils and settlements. While these existing burial grounds cater to current population needs, they are approaching capacity in several locations due to rapid

population growth, urban expansion, and limited land availability for future extensions. Many existing graveyards are also constrained by topography, proximity to settlements, and inadequate management, creating challenges for sustainable use in the long term.

To address these emerging pressures, additional has been proposed for new graveyard sites across the district. These proposed areas have been identified based on population projections, settlement expansion trends, and accessibility considerations to ensure that each tehsil and major urban center has adequate burial space for at least the next two decades. The allocation also aligns with urban planning standards that promote designated, well-managed, and environmentally sustainable graveyard zones to prevent encroachment and sanitation issues.
In urban centres, Landi Kotal's existing graveyard area of 77.60 acres is proposed to be rationalized to 46.23 acres, optimizing the location and accessibility of burial spaces. Jamrud will see an expansion from 67.20 acres to 169.90 acres, reflecting its larger population and future demand.

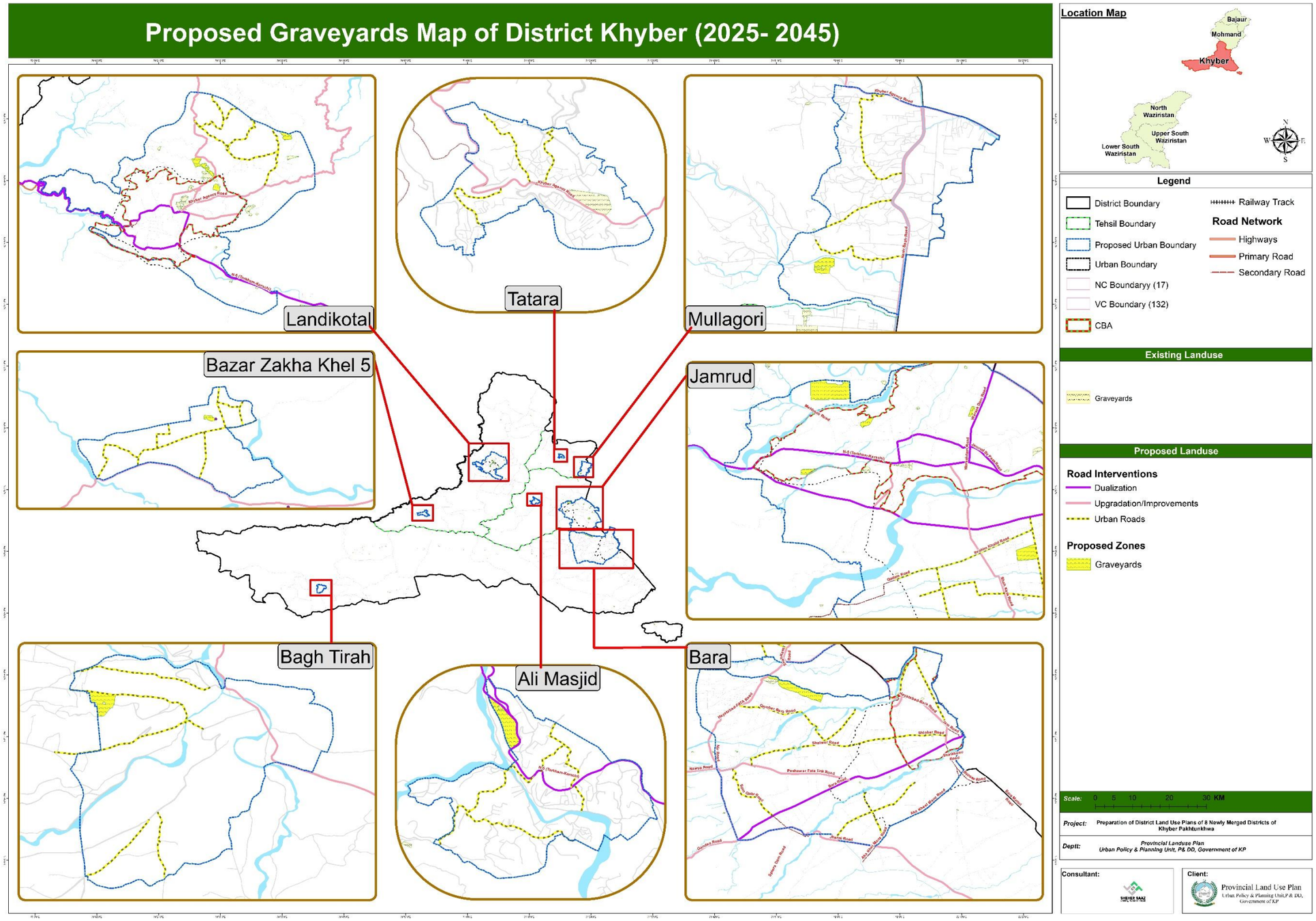
For potential urban centres, Bara increases its graveyard allocation from 47.98 acres to 187.50 acres, while Mullagori expands from 2.01 acres to 17.45 acres, ensuring sufficient capacity for long-term use.

In potential settlements, smaller allocations are provided based on population and expected growth: Ali Masjid from 0.42 acres to 12.95 acres, Tatara from 7.05 acres to 2.28 acres, Bazar Zakhakhel newly allocated 2.28 acres, and Bagh Tirah newly allocated 8.07 acres.

Urban center/Settlements	***Existing (acers)***	***Proposed Zones acers***
Urban Centre		
Landikotal	77.60	46.23
Jamrud	67.20	169.90
Potential Urban Centre		
Bara	47.98	187.50
Mullagori	2.01	17.45
Potential Settlement		
Ali Masjid	0.42	12.95
Tatara	7.05	2.28
Bazar Zakhakhel	No	2.28
Bagh Tirah	No	8.07

Source: Devised by Consultant

Map 36: Proposed Graveyards – District Khyber



Guidelines for the Proposed Graveyards

According to the Khyber Pakhtunkhwa Urban Policy 2022–30, the responsibility of defining Land Use, Building Control, and Zoning Regulations lies with the Khyber Pakhtunkhwa Land Use and Building Control Authority. Under the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021, the Authority specifies the concepts of permitted and permissible land uses. Permissible land uses may be granted approval by the District Planning and Design Committee, subject to the payment of the prescribed fee. However, detailed planning standards and development guidelines are yet to be formally established. In this context, the consultant has reviewed both national and international case studies and formulated development guidelines tailored to the study area. These guidelines shall remain applicable until the Building Control Authority officially notifies any Land Use Classification Rules enforceable across Khyber Pakhtunkhwa. The proposed development guidelines for graveyard sites are as follows:

Table 65: Rules and Guidelines for Proposed Graveyards

Permitted Uses	Allied Permissible Uses	Prohibited Uses
• Administration buildings • Religious buildings • Mosques • Clinics/dispensaries • Local shopping areas • Retail stores (e.g., flower shops, horticulture, convenience stores) • Petrol pumps, Gas filling stations • Parking facilities	• Residential for graveyard workers/caretakers • Shops • Zoological garden • Botanical garden • Bird sanctuary	• Heavy, large, and extensive industries (noxious, obnoxious) • Hazardous industries • Warehousing, storage godowns of perishables, hazardous, inflammable goods • Sewage treatment plant/disposal work • Water treatment plant • Solid waste dumping yards • Research laboratories treating contagious diseases

6.5 RECREATIONAL ZONES & TOURISM

6.5.1 Tourist Site

Following are the major tourist sites in Khyber District.

Table 66: Tourist Sites of Significance in Khyber

Tourism Site	Description / Significance
Khyber Pass	World-famous mountain pass linking Pakistan and Afghanistan; historically part of the Silk Road and a strategic trade and invasion route for centuries.
Torkham Border	A major border crossing point between Pakistan and Afghanistan, it is vibrant with cross-border trade and cultural exchange.
Ali Masjid	A historic mosque and site of an old British-era fort, located at the narrowest point of the Khyber Pass.
Shagai Fort	A British-built fort (1927) was used for controlling tribal areas, offering panoramic views of the surrounding valleys.
Landi Kotal	A scenic town in the Khyber Pass region, known for its bazaar, tribal culture, and proximity to Afghanistan.
Michni Checkpost	A high-altitude vantage point near the border, offering sweeping views of Afghanistan and the Khyber Pass terrain.
Jamrud Fort	Historic fort at the entrance of Khyber Pass, dating back to the Sikh period (1836); key control point in colonial times.
Shalman Valley	Picturesque valley with orchards, streams, and terraced fields, offering natural beauty and local hospitality.
Khyber Steam Safari Route	Historic railway line (now partially functional for tourism), passing through tunnels and bridges of the Khyber Pass.

6.5.2 Major Constraint in Tourism

One of the major constraints to tourism development in District Khyber is the lack of recreational facilities and limited support for local tourism. Within urban areas, the absence of dedicated entertainment options is particularly noticeable. While playgrounds are present, there are no specialized venues for family recreation such as **J**oyland in Lahore, which caters to both children and adults. Similarly, the absence of theaters, cinemas, and other cultural attractions reduces opportunities for local tourism and leisure activities. This lack of entertainment infrastructure not only limits the recreational choices for residents but also discourages visitors, ultimately weakening the district's tourism potential and its contribution to the local economy.

The district also suffers from weak promotion and marketing, as its cultural heritage, scenic landscapes, and traditional crafts remain under-advertised compared to other destinations. Furthermore, the absence of tourist-friendly amenities such as rest areas, information

centers, signage, and guided services reduces visitors' comfort and satisfaction. Institutional support is also lacking, with no dedicated local tourism authority or comprehensive policies to guide development. In some areas, cultural constraints and limited acceptance of recreational activities restrict the establishment of tourism-related enterprises. Environmental concerns add to these challenges, as unregulated construction and inadequate waste management threaten the natural appeal of the region. Collectively, these constraints weaken tourism's role as an economic driver in District Khyber, despite its considerable potential.

Similarly, one of the major attractions in the early 1990's and 2000's was the Khyber Stream Safari which use to pass by many bridges and tunnels and was one of the attractions as people used to enjoy the scenic views and landscape of the area. An inspection of the damaged tracks in the Khyber District was carried out by officials and technical staff of Pakistan Railways in November 2021.

6.5.3 Sports Facilities

Active recreation comprises formal and informal, outdoor and indoor games. The more capital-intensive the facility is, the larger the catchment required for its viable operations. Sub-standard sizes may be considered for cricket and football where the games are limited to the pre-teen and early teen age group. The table below delineates the standards set forth by the National Reference Manual for Infrastructure and Planning[16], for the establishment of new active recreational facilities at various levels of settlements and threshold population:

Table 67: Active Recreation Facilities Allocation Criteria

Type of Facility	Population Criteria	Sports	Size
Metropolitan City Stadiums	Above 2,000,000	Cricket	2.5 hectares
		Hockey	2.8 hectares
		Football	1.5 hectares
City Stadium	Above 300,000	Cricket	2 hectares
	Above 200,000	Hockey	1.15 hectares
		Football	1.4 hectares
Community Level Playgrounds	Around 100,000	Combined Playground	2.14 hectares
Neighborhood Level Playgrounds	Around 25,000	Combined Playground	1.63 hectares

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

[16] 7 Government of Pakistan, Ministry of Housing and Works, Environment and Urban Affairs Division. National Reference Manual of Planning and Infrastructure Standards (NRM). Table 6.11 Active Recreation Standards

6.5.4 Hotels

The Khyber district, which is now included in Khyber Pakhtunkhwa province, has been becoming more popular with thousands of tourists every day due to its scenic beauty and historical sites. It offers several comfortable hotels and hill resorts to domestic and international tourists, along with stunning natural views.

Among the famous resorts are Hidden Hills Hotel & Resort, Husnain Resort, and various other luxurious hotels in the hill stations of this region. These resorts are ideal for everyone, presenting a peaceful retreat in lush greenery and cool climates, especially during the hot summer months. Apart from that, the hill resorts add tourism and conservation of the natural environment by promoting eco-friendly tourism practices.

6.5.5 Parks and Playgrounds

A total of 58 parks and playgrounds have been identified across the tehsils of Khyber district. The highest number is found in Tehsil Bara with 25 facilities, followed by Landi Kotal with 13, and Fort Salop with 10. Mulagori and Jamrud have 6 and 3 parks, respectively, while Bagh Maidan has only 1. This distribution shows that recreational infrastructure is uneven, with some tehsils having limited access to public leisure spaces.

Table 68: Parks and Playgrounds - Khyber

Name of Tehsil	No of Parks and Playgrounds
Bara	25
Landi Kotal	13
Jamrud	3
Mullagori	6
Fort Salop	10
Bagh Maidan	1
Total	**58**

Source: Land Use Survey

6.5.6 Proposed Recreational facilities and public parks

It is integral to propose parks in these areas because the Khyber District has a lack of Parks and recreational spaces. To calculate the requirement, the standard of NRM was followed and standard areas were proposed. To promote recreational opportunities, environmental quality, and overall livability, specific land areas have been designated as Parks, Sports Complexes, and Green Spaces across urban centers, potential urban centers, and settlements in Khyber District. These zones aim to provide residents with accessible open spaces for leisure, sports, and community activities, while also serving as ecological buffers within urban areas.

In urban centres, Landi Kotal's existing recreational land of 19.87 acres is proposed to expand to a total of 124.44 acres, distributed among parks (36.55 acres), sports complexes (30.67 acres), and green spaces/buffers (57.22 acres). Jamrud's recreational land increases from 37.79 acres to 668.91 acres, including a central park (120.09 acres), parks (222.31 acres), sports complexes (22.26 acres), and green space/buffer zones (304.24 acres), reflecting the town's larger population and urban footprint.

For potential urban centres, Bara is proposed to expand from 31.62 acres to 223.53 acres, comprising a central park (52.11 acres), parks (133.31 acres), and green spaces (38.11 acres). Mullagori's recreational land increases from 4.62 acres to 58.99 acres, including a central park (5.58 acres), parks (7.33 acres), sports complexes (18.12 acres), and green spaces (27.96 acres). In potential settlements, new recreational zones are introduced to improve quality of life, with Ali Masjid receiving 13.45 acres, Tatara 16.49 acres, Bazar Zakhakhel 2.34 acres, and Bagh Tirah 13.37 acres for parks and central park development.

The proposed recreational and green zones aim to enhance urban livability, promote physical activity, provide social gathering spaces, and create environmental buffers. By strategically distributing parks, sports facilities, and green areas within settlements, the plan supports sustainable urban growth and ensures equitable access to recreational amenities across the district.

Table 69: Proposed Facilities

Urban center/Settlements	*Existing (acres)*	*Proposed Zones (acres)*		
Urban Centre				
Landi Kotal	19.87	Park	36.55	124.44
		Sports Complex	30.67	
		Green Space/Buffer	57.22	
Jamrud	37.79	Central Park	120.09	668.91
		Park	222.31	
		Sports Complex	22.26	
		Green Space/Buffer	304.24	
Potential Urban Centre				
Bara	31.62	Central Park	52.11	223.53
		Park	133.31	
		Green Space	38.11	
Mullagori	4.62	Central Park	5.58	58.99
		Park	7.33	
		Sports Complex	18.12	

		Green Space	27.96	
Potential Settlement				
Ali Masjid	0.00	Park	13.45	
Tatara	0.00	Park	16.49	
Bazar Zakhakhel	0.00	Central Park	2.34	
Bagh Tirah	0.00	Park	13.37	

Source: Developed by Consultant

Figure 13: Design Concept for Parks with camping and other facilities



Source: Developed by Consultant (Concept)

Figure 14: Waterfront Park (Concept design)



Source: Developed by Consultant (Concept)

Figure 15: Proposed Community Park (Concept women and children park)






6.5.7 Phase-Wise Proposal

Short-Term Proposals

- Enhance security through multiple methods, including the installation of CCTV cameras and blue lights in commercial areas. The blue light acts as a deterrent, signaling a strong surveillance system, a practice successfully adopted in China, Baltimore, and Chicago.
- Launch targeted tourism promotion campaigns, highlighting attractions such as the Khyber Pass, Shagai Fort, and historical shrines.
- Invest in local entertainment facilities by developing cinemas, theaters, and children's play areas to encourage family-oriented tourism.

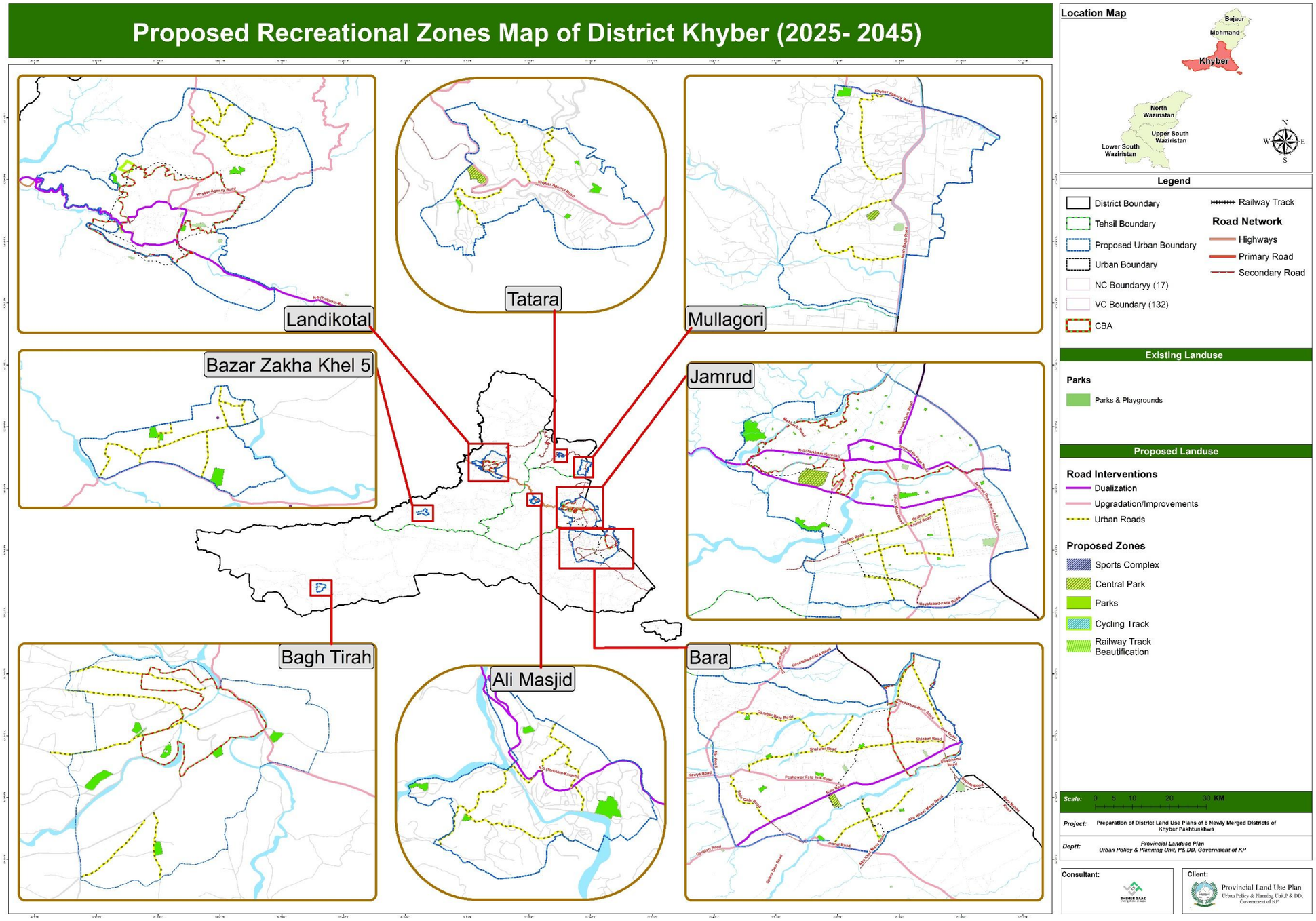
Medium-Term Proposals

- Relaunch the Khyber Steam Safari from Peshawar to Landi Kotal, with redevelopment of major tourist stops along the route.
- Provide structured management of heritage sites like Jamrud Fort and Shagai Fort, including guided tours and informative signboards narrating their history and significance.
- Introduce cultural and historical performances at heritage sites after infrastructure upgrades, modeled on initiatives such as the reenactments at Shahi Qila (Lahore Fort) organized by WCLA.

Long-Term Proposals

- Carry out comprehensive infrastructure upgrades, including the installation of bins and proper sanitation facilities to maintain cleanliness.
- Establish monitoring and evaluation systems to ensure security, upkeep, and a tourist-friendly environment.
- Prioritize the Shalman Valley as a key tourism destination, ensuring controlled development—restricting housing societies while implementing effective waste management systems to preserve natural beauty.

Map 37: Recreational and Tourism Sites – District Khyber



6.6 ENERGY & POWER

6.6.1 Review of National/ provincial policy regarding energy and power.

6.6.1.1 Khyber Pakhtunkhwa Hydel Development Fund Ordinance 2001

Established a dedicated fund for hydropower development in KP. Financed mainly through provincial profits from federal hydel projects, with additional federal, provincial, or external contributions. At least 10% of project profits are reinvested into the Fund.

- Minimum project cost: PKR 500 million (smaller projects only through joint ventures).
- Managed by a Board with authority over project approval and fund investment.
- Proposals initiated by the Irrigation & Power Department, reviewed by PDWP, and approved by the Board.
- Financial controls include annual audits by the Auditor General and strict withdrawal protocols.

6.6.1.2 National Electricity Plan (NEP) 2023–2027

A strategic roadmap to reform Pakistan's power sector with six objectives: diversification, resilience, self-sufficiency, affordability, financial viability, and sustainability.

- **Diversification:** Integrated energy planning, renewables, cross-border trade.
- **Resilience & Access:** Transmission expansion, robust distribution, electrification of remote areas.
- **Self-Sufficiency:** Promote local resources and technologies.
- **Affordability & Viability:** Rationalized subsidies, cost-reflective tariffs, improved recovery.
- **Sustainability:** Decarbonization, efficiency, institutional strengthening, digitalization. Includes clear performance indicators, monitoring, and social protection measures to ensure inclusive energy access.

6.6.1.3 National Electricity Policy 2021

Provides a comprehensive framework for reliable, affordable, and sustainable electricity.

- **Goals:** Affordable access, energy security (via diversified local resources), and sustainability.
- **Guiding principles:** Efficiency, transparency, competition, financial viability, indigenization, and environmental responsibility.
- **Focus areas:** Generation, transmission, distribution, market development, tariffs, subsidies, energy efficiency, integrated planning, and governance. Stresses competitive capacity expansion, grid strengthening, loss reduction, cost-reflective tariffs, and renewable energy promotion. Includes monitoring and coordinated federal–provincial implementation.

6.6.1.4 Policy for Development of Renewable Energy (2006)

Launched to mainstream renewables (small hydro, wind, solar) into Pakistan's energy mix and attract private investment.

- **Short-term:** Incentives, simplified regulations, guaranteed power purchase, net metering, and wheeling.

- **Medium/Long-term:** Market consolidation, competitive frameworks, and sector self-sufficiency.
- Key incentives: Deregulation for small-scale projects, predictable tariffs, risk allocation to power purchasers, and carbon credit facilitation.
- Institutions: AEDB (one-window for RE), NEPRA (regulation), PPIB (private sector facilitation).

Aims to reduce fossil fuel dependence, enhance energy security, create jobs, and promote sustainability.

6.6.2 Identification of Proposed Projects

The Khyber district in Pakistan utilizes both renewable and non-renewable energy sources. Renewable sources include solar, wind, and potentially hydropower from small streams and rivers. Non-renewable sources primarily consist of natural gas (though availability and infrastructure may be limited in some areas) and potentially coal (though its use is less common). Additionally, biomass (like wood) is a significant energy source for cooking and heating, especially in rural areas.

The energy and power sector's Annual Development Plan (ADP) 2024–25 outlines several initiatives that will be implemented.

ADP S.#.	Code, Name of the Scheme, (Status) with forum and date of last approval	Total Cost	Total Allocation	Exp. Upto June 24
322	191403 - 180492-Pilot Project for "installation of 13 no's of solar mini grids in merged areas" SUB COMPONENT "Solar Electrification of 300 Masajid/Worship places for Non-Muslims in Merged Districts (erstwhile FATA) Khyber Pakhtunkhwa". [MA].	777.89	127.848	650.042
323	191961 - 170364 Installation of Micro Hydel Power Units in Tribal Districts. [MA]	99.961	14.361	85.6
324	191990 - 180142 Construction of MHP units and Improvement of Civil Structure work of completed MHPs in District Khyber. [MA]	57	9.03	47.97
333	195211 - Providing New/bi-furcation / Bajaur, Mohmand and Khyber (AIP)	845.366	98.494	746.872
334	210368 - Construction of New 132 KV Grid Station Shah Kass with 2Km associated SDT T/L - Khyber	642.59	50	53
335	210369 - Rehabilitation of existing network and electrification of un-electrified villages Merged Areas	1500	172	360

337	210400 - Construction of 132 kv Grid Station Bara-II along with 132 kv D/C T/L with ACSR Lynx in / out from 132 kv D/C T/L Sheikh Muhammadi- Bara & Construction of 2nd Circuit from Bara to New Jamrud, (TESCO Self-Finance from AIP Projects. Cost of the Project Rs. 530 million) - Khyber	0.05	0.001	

The energy and power sector's Annual Development Plan (ADP) 2025–26 outlines several initiatives that will be implemented.

ADP S.#.	Code, Name of the Scheme, (Status) with forum and date of last approval	Total Cost	Total Allocation	Exp. Upto June 25
332	210365 - Construction of new 132 KV Grid 30.000 Station Tirah Maidan, along with associated 55 KM 132 KV SDT Transmission line with ACSR Lynx conductor (55 KM 132 KV SDT Transmission line with ACSR Lynx, Tower/Pole Foundations work, Erection of towers, Stringing of conductors) - Khyber	1,244.78	0.01	30
335	210368 - Construction of New 132 KV Grid Station Shah Kass with 2Kmassociated SDT T/L - Khyber	642.59	100	148.678
338	210400 - Construction of 132 kv Grid Station Bara-II along with 132 kv D/C T/L with ACSR Lynx in / out from 132 kv D/C T/L Sheikh Muhammadi- Bara & Construction of 2nd Circuit from Bara to New Jamrud, (TESCO Self Finance from AIP Projects. Cost of the Project Rs. 530 million) - Khyber	0.05	0.001	0

6.6.2.1 Available Energy Resources in Khyber

Khyber District (in Khyber Pakhtunkhwa, Pakistan) has a mix of **renewable and non-renewable energy resources** that can be tapped for local development and to reduce reliance on imported power. Here's a structured overview:

1. Solar Energy

- High Potential: Khyber District lies in Pakistan's *solar belt*, with Global Horizontal Irradiance (GHI) above 5.5–6.0 kWh/m²/day, making it ideal for photovoltaics (PV).[17]

[17] https://globalsolaratlas.info/map

- Applications: Rooftop solar for households, solar tube wells, solar-powered mini-grids, and hybrid solar systems for schools/clinics.

2. Hydropower (Small / Micro)

- Streams & Tributaries: The district is traversed by streams and seasonal nullahs flowing from the Tirah Valley and adjoining mountains, suitable for mini and micro-hydel projects.
- Potential: While no Two river passes through, **run-of-river micro-hydro** (50 kW – 1 MW) projects are possible for rural electrification as ome are under development according to ADP's.

3. Wind Energy

- Moderate Potential: Unlike coastal Sindh or Gharo-Jhimpir corridor, Khyber District does not have very high-speed wind corridors.
- Local Use: Small wind turbines (5–20 kW) may be feasible in elevated mountain passes and ridges in Tirah and Jamrud areas.

4. Biomass & Biogas

- Agricultural Residue: Wheat straw, maize stalks, and wood waste from orchards.
- Livestock Waste: Cattle and poultry farming in Bara and Jamrud tehsils can support biogas plants for cooking and heating.
- Potential Use: Household-level biogas digesters, community bioenergy plants.

5. Oil & Natural Gas (Nearby Fields)

- Regional Hydrocarbons: Khyber itself does not have large producing oil/gas wells, but it is adjacent to Kohat and Kurram, which have proven reserves.
- Benefit: Possible extension of gas distribution network (SNGPL) to urban centers like Jamrud and Landi Kotal.

6. Coal (Low-Quality)

- Presence in KP: Some coal deposits are in nearby Orakzai and Hangu, not directly in Khyber.
- Relevance: Khyber may use imported/local coal for brick kilns and small industries.

6.6.3 Proposed Locations for Potential Energy Sources

- **Optimal areas of small hydropower (1 10 MW)**

Tirah Valley 2/3 river & Masturafa junction (site of proposed Bara Dam)

This reach has the highest recorded head/flow combination in the district; this is where the proposed Bara Dam **(5.8 MW)** was located. This corridor is the search priority area in case you are targeting a grid-connected small plant.

- **Optimal mini hydro (100 kW 1 MW) areas**

Upper Bara River (Tirah → Bara Tehsil

The gradients of the rivers are higher in the regions above Bara Bazaar the flows are less likely to be intermittent than in the lowlands. Scout around in the short run of rivers and inside valleys draining into the main stem.

Bara Canal headworks / Sapera Dam reach (approximately 3-5km upstream of the current weir)
Dependable heads are provided by canal control structures, falls and offtakes that are suitable to canal turbine minis (low civil cost, easy O&M).

- **Micro, Pico hydro (<100 kW) best locations**

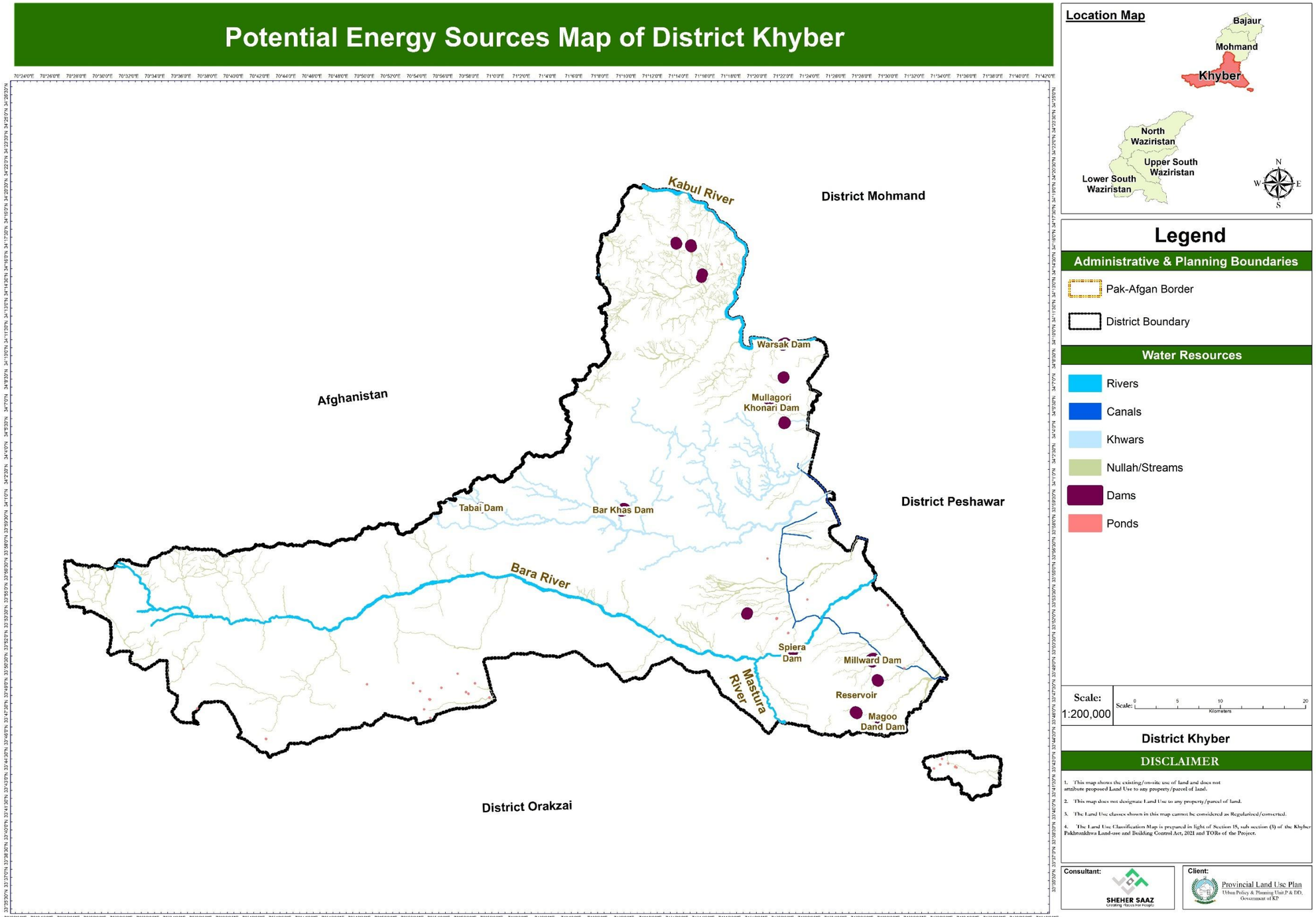
Ali Masjid & Landi Khana spring belts (Khyber Pass, Landi Kotal side)
Settlements often are associated with perennial springs or steep gullies, which would be in the right place to supply village-scale micro plants to serve clusters of households or community facilities.
Upper Bara -reconstructed irrigation canals (e.g., Sheikh Mali Baba locality)
Micro turbines may be accommodated at drops/turnouts in restored channels on the Bara River without interfering with irrigation.

6.6.4 Constraints and Recommendations.

Constraint	Recommendation
Grid Infrastructure Limitations ❖ Outdated and overloaded transmission/distribution network under PESCO/TESCO ❖ High technical and commercial losses (line losses, theft, poor voltage regulation) ❖ Limited coverage in rural/mountainous areas	**Strengthening Grid Infrastructure** ✓ Upgrade transmission lines, transformers, and substations ✓ Expand distribution network to underserved rural areas ✓ Implement smart metering and anti-theft technology
Unreliable Supply & Load Shedding ❖ 10–12 hours daily load-shedding (40–50% demand–supply gap) ❖ Frequent breakdowns and voltage fluctuations	**Scale-Up Renewable Energy Deployment** ✓ Expand solarization from schools/mosques to health centers, community halls, and government offices ✓ Promote community-based solar mini-grids (e.g., Bara Bazaar) ✓ Encourage private sector participation through subsidies and concessional financing
Dependence on Diesel & Private Generators ❖ High operational cost and environmental pollution ❖ Unsustainable energy security	**Hybrid Solutions for Agriculture** ✓ Introducing solar-powered tube wells and agro-processing equipment ✓ Provide subsidies to shift farmers from diesel pumps to solar irrigation

Limited Institutional Capacity & Policy Bottlenecks ❖ Coordination gaps between PEDO, PESCO/TESCO, and the local administration ❖ Poor maintenance/monitoring of installed solar systems	**Institutional Reforms & Capacity Building** ✓ Strengthening coordination between PEDO, distribution companies, and local governments ✓ Establish a district-level Energy Management Cell for planning, monitoring, and maintenance ✓ Train local technicians for upkeep of decentralized solar systems
Socioeconomic Constraints ❖ Affordability challenges for households/SMEs ❖ Lack of awareness/training on energy-efficient technologies	**Policy & Financial Support** ✓ Provide low-interest loans and microfinancing schemes for households/SMEs ✓ Introducing tariff incentives for renewable energy integration ✓ Develop a regulatory framework for community-owned micro-grids
Low Awareness & Inefficient Energy Use ❖ Lack of awareness of conservation and efficient technologies	**Awareness & Demand Management** ✓ Conduct awareness campaigns on energy efficiency and load management ✓ Promote efficient appliances (LEDs, efficient fans, water-saving pumps)
Hydropower Development Challenge (Bara River/Tirah–Masturafa) ❖ Need for proper geological/hydrological assessment before project implementation	**Hydropower Recommendation** ✓ Prioritize Tirah–Masturafa junction (Bara Dam site, 5.8 MW potential) as a high-priority grid-linked project ✓ Conduct thorough geological and hydrological assessments to evaluate seasonal flow and fine-tune capacity

Map 38: Energy and Power Sources - District Khyber



6.7 TRANSPORTATION NETWORK EXISTING AND PROPOSED

6.7.1 Existing

6.7.1.1 Road Network

Khyber District's Road infrastructure is the lifeline of its economy and communities. Nestled between Pakistan and Afghanistan, the district's location makes it a gateway for trade, travel, and cultural exchange. Yet, its terrain, security context, and maintenance gaps present both challenges and opportunities for sustainable connectivity.

Regional Connectivity

The district's backbone is the N-5 National Highway, connecting Karachi to the Torkham border via Peshawar. The Peshawar Torkham stretch passing through the historic Khyber Pass is not only a trade artery but also a strategic link between South and Central Asia. The Peshawar Ring Road helps divert traffic from the city's congested core, improving freight movement efficiency.

At the northern gateway, the Torkham border crossing is one of Pakistan's busiest land ports, part of the CAREC trade corridors. It handles thousands of trucks and passenger vehicles each week, linking markets in Peshawar to those in Kabul and beyond. The road to Torkham has seen continuous upgrades to meet the demands of cross-border trade and security clearance.

Air connectivity is anchored by Bacha Khan International Airport, just 10 km from Peshawar. As the province's primary air hub, it handles both passengers and cargo, with recent improvements aimed at streamlining customs and expanding capacity for international trade.

Major Transport Corridors

- **Khyber Pass**: A 53 km mountain route of global historical significance, now a modernized trade link. Its narrow gorges, steep gradients, and bridges still demand high maintenance and safety measures.
- **Peshawar Torkham Highway (N-5)**: Carries the bulk of the district's freight and passenger traffic; widening and safety works are underway.
- **Khyber Pass Economic Corridor (KPEC)**: A transformative initiative of the Government of Pakistan and the World Bank, building a 48 km four-lane expressway and associated economic zones. It is expected to cut travel times, reduce freight costs, attract investment, and open new employment opportunities, while modernizing customs and security facilities.

Intra-District Roads

Movement within Khyber District relies on a network connecting Jamrud, Landi Kotal, Bara, and surrounding villages. These range from paved two-lane roads to narrow single-lane rural paths. Many routes suffer from overloaded trucks, unregulated encroachments, and poor drainage.

Jamrud Roads:

- Tidi Bazar Road: 1 km, 24 ft wide with drainage; key commercial link.
- Doctor Sarfaraz Road: 14 ft wide, heavy truck use; lacks drainage and pedestrian facilities.
- Warsak/Frontier Road: 3 km, 24 ft wide; a major urban approach.
- Haji Abdullah Shah Road: 1 km, 22 ft; under construction.
- New Jamrud Bypass: 2 km, 20 ft; partially incomplete.

Landi Kotal Roads:

- Bypass Road: Relieves bazar congestion, improving through-traffic flow.
- Shalman/Perokhel Road: Moderate to heavy daily use for market access.
- Hamza Baba Mazar Road: Under construction to connect eastern neighborhoods.

Farm-to-Market Roads

Agriculture in Khyber relies on narrow but vital roads connecting farms to markets in Peshawar, Torkham, and beyond. Key routes include Jamrud–Peshawar, Landi Kotal–Torkham, Bara–Peshawar, Shagai Fort Road, Bazar Zakha Khel Road, and Tirah Valley links. These roads not only carry fruits and vegetables but also stone and mineral loads from mountain quarries. Poor surface and drainage in rural areas can hinder timely market deliveries, especially in the monsoon season.

6.7.1.2 Railway Network

Khyber District's railway infrastructure is limited and largely non-operational. The historic 52 km Peshawar–Landi Kotal line, once vital for trade, tourism, and cross-border movement, has been inactive since 2006 due to flood damage, neglect, and security concerns. Revitalization could significantly improve regional connectivity and economic activity.

- **Jamrud Railway Station**: Located at the Khyber Pass entrance, this colonial-era station was a key hub for passenger and freight services, including the Khyber Safari Train. Now defunct, its architecture and location retain high heritage value.
- **Landi Kotal Railway Station**: Established in 1925 at the western edge of the Khyber Pass, it served as a central terminal and tourist attraction, with trains traversing 34 tunnels and 92 bridges. Operations ceased in 2006 after flood damage.
- **Landi Khana Railway Station**: Near the Torkham border, it played a strategic role in cross-border trade and transport. Service ended due to infrastructure deterioration and security challenges.
- **Tora Tiga Railway Station**: Also, near Torkham, elevated at 870 m, it formed part of the Pakistan–Afghanistan link, showcasing significant engineering achievements.

These stations are historically significant assets with strong potential for heritage tourism and economic revitalization through targeted restoration and reactivation.

6.7.1.3 Origin Destination Surveys

The following OD analysis shows the percentage of travel to various destinations within the urban areas of Khyber District, specifically Jamrud and Landi Kotal.

Table 70: OD Analysis – District Khyber

Point ID	Origin	Origin %age	Destination	Destination% age
CP-1	Afghanistan	100	Landi Kotal	21
			Peshawar	62
			Jamrud	17
CP-2	Peshawar	67	Landi Kotal	28
	Nowshera	24	Torkham	72
	Islamabad	9		
CP-3	Peshawar	57	Jamrud	52
	Charsadda	27	Bara	29
	Pindiali	16	Kohat	19
CP-4	Peshawar	66	Bara	31
	Nowshera	31	Jamrud	55
	Gulshan Abad	3	Torkham	14
CP-5	Kohat	68	Jamrud	55
			Peshawar	29
	Orakzai	32	Bara	16

Source: Primary Data Collected in the Field

6.7.2 Annual Development Plans, Planned and In Progress

The Annual Development Programme (ADP) 2025–2026 for District Khyber outlines a comprehensive roadmap for improving road infrastructure, enhancing regional connectivity, and supporting socio-economic development in the merged areas. The planned and ongoing projects, as detailed below, focus on the construction, widening, rehabilitation, and blacktopping of key corridors across Bara, Tirah, Jamrud, Landikotal, and other strategic locations. These initiatives include both ongoing schemes and new feasibility/design-based projects, ensuring a balanced approach between immediate upgrades and long-term infrastructure planning. Through these interventions, the district aims to facilitate trade, improve access to remote areas, and strengthen linkages with provincial and national networks.

Table 71: On Going Programme - District Khyber

ADP code	Project title	Status	Length
191756	Construction of B/T road in Bara subdivision Khyber agency.	(A) /FDWP /15-12-2018 (Merged Areas / Ongoing)	—
191830	Construction of 6-Km B/T Road in District Khyber (CMD).	(A) /DDWP (Ongoing list)	6 Km
191815	Topping of Road from Sher Khel to Serai Kandow upto Dars Masjid (10.5 KMs) & Sarzai to Sangara Balance Portion (2.5 KMs) — Tirah, District Khyber.	(Ongoing)	10.5 Km + 2.5 Km

191844	Construction of Bara Bypasses Road from Nogazi Baba to Sheikhan Sports Stadium — TD Khyber (7 KMs).	(A) /PDWP /29-07-2024	7 Km
210582	Construction of road from New Bagh to Kowarah Malik den Khel Wadi Terah (5 Km) - Khyber.	(Ongoing Programme entries)	5 Km
195247	Construction of B/Topped Road from Mastak Bridge to Shadally via Methra in Tribal District, Khyber.	(AIP / accelerated Programme)	28 Km
210779	Improvement/Widening & Rehabilitation of road from Sirajuddin Madrassa to Jan Khan Kalay Bar Qamber Khel — District Khyber.	(AIP) / PDWP	12 Km
210628	Construction of road from Ali Masjid to Chora — Khyber.	(PDWP / listed under Merged Areas)	20 Km
210686	Improvement and Rehabilitation of 7-KMs road from Aman Talab to Sepayano Kalay — Bara / Khyber	(DDWP / listed)	7 Km

Source: ANNUAL DEVELOPMENT PROGRAMME 2025-2026 Province of Khyber Pakhtunkhwa Fiscal Year: July 1, 2025 - June 30, 2026

Table 72: New Projects - District Khyber

ADP code	Project title	Type / status	Length
251113	F/S and design for IMPROVEMENT, WIDENING AND BLACKTOPPING OF ROAD ATTARI CHOWK TO BAZGARAH KAMAR KHEL — District Khyber (5.5-KMS).	F/S (New Programme)	5.5 Km
251124	F/S and design for IMPROVEMENT, WIDENING & BLACKTOPPING OF ROAD SAM GHAKHI BQK TO KOHI CHOWK MDK — District Khyber (4.3-KMS).	F/S (New Programme)	4.3 Km
251099	F/S and design for Improvement/Widening of Road from Dogra to N-55 Mattani via Malgoo Darro Adda — District Khyber.	F/S (AIP / New Programme)	—
251100	F/S, design & Construction/Rehabilitation of road from Wazir Dhund (main Torkham Hwy) to Warsak Dam Road — Jamrud, District Khyber (8 km).	F/S (New Programme)	8 Km
251101	F/S & design for Improvement & Rehabilitation of road from Inzari to Bagh Kalay (Kam Shalman) Landikotal / District Khyber (14-km).	F/S (New)	14 Km
251102	F/S & design for Rehabilitation & Improvement of road from Lwaraa Meena to Tatara Masoom Baba — Mulagori / Landikotal (Khyber) (10-km).	F/S (New)	10 Km
251104	F/S & design for Rehabilitation & Improvement of road from Lwaraa Meena to Bara Daraa — Mulagori / Landikotal (Khyber) (10-km).	F/S (New)	10 Km

251459	F/S and design for Alhaj Shell Pump to Tirah / Abdul Ghani Afridi & Mahajr bazar Khyber abad road (PKHA Roads).	F/S (PKHA)	—

Source: ANNUAL DEVELOPMENT PROGRAMME 2025-2026 Province of Khyber Pakhtunkhwa Fiscal Year: July 1, 2025 - June 30, 2026

6.7.3 Improvement/ upgradation of Roads:

6.7.3.1 Primary Roads

These are the main regional and inter-district corridors providing connectivity to Peshawar, Torkham Border, and other key trade routes. Most are proposed for dualization to accommodate heavy traffic from cross-border trade and urban expansion.

Table 73: Primary Roads Proposals - District Khyber

Road Name	Type	Existing Width (ft)	Proposed Width (ft)	Length (Km)	Proposal	Description
Bara Road	Urban	80	80	10.99	Improvement	A key arterial passing through Bara town needs pavement strengthening and drainage.
Landi Kotal Bypass	Urban	60	65	3.56	Dualization	Proposed bypass to divert heavy trucks from town center; improve cross-border flow.
Jamrud Bypass	Urban	60	65	3.29	Dualization	Provides smooth flow for inter-city and trade vehicles bypassing congested Jamrud bazaar.
Torkham Highway Road (Urban)	Urban	60	65	40.20	Dualization	Main route connecting to Torkham border terminal; expansion needed for bilateral trade volume.
Torkham Highway Road (Rural)	Rural	60	100	6.26	Dualization	Strategic section linking Landi Kotal to the border; dual carriageway proposed for security and logistics.

Jamrud Southern Bypass	Urban	60	100	7.78	Dualization	New bypass proposed for southern Jamrud; relieves town congestion and facilitates freight traffic.

Summary:
Primary roads form the trade backbone of District Khyber and will be upgraded/dualized to meet regional connectivity.

6.7.3.2 Secondary Roads

These roads provide intra-district connectivity linking tehsil headquarters (Jamrud, Bara, Landi Kotal) and major settlements. Upgradation will enhance accessibility and economic activity.

Table 74: Secondary Roads Proposals - District Khyber

Road Name	Type	Existing Width (ft)	Proposed Width (ft)	Length (Km)	Proposal	Description
Tirah N-5 Link Road	Rural	40	50	52.91	Upgradation/ Improvement	Links Tirah valley to N-5 corridor; crucial for rural connectivity.
Bara Bypass Road	Urban	60	60	3.78	Improvement	Serves as urban bypass in Bara; only minor surface and drainage enhancement required.
Jamrud Bara Link Road	Urban	40	60	11.92	Upgradation/ Improvement	Connects Jamrud to Bara; widening proposed to accommodate growing vehicular flow.
Hayatabad FATA Road	Urban	60	60	13.21	Improvement	Urban corridor linking Hayatabad with merged areas; strengthening proposed.
Tirah Bara Road	Rural	30	60	106.18	Upgradation/ Improvement	Strategic road connecting interior rural areas to Bara tehsil.

Warsak Dam Road	Urban	60	80	7.56	Dualization	Upgraded to dual carriageway; supports hydropower and tourism traffic.

Summary:

Secondary roads aim to improve internal circulation and connectivity between tehsils and urban centers, facilitating socio-economic growth and access to services.

6.7.3.3 Arterial Roads

Arterials form the urban mobility network within towns, distributing traffic from major roads to residential and commercial areas.

Table 75: Arterial Roads Proposals - District Khyber

Road Name	Type	Existing Width (ft)	Proposed Width (ft)	Length (Km)	Proposal
Border Road	Rural	30	40	19.85	Upgradation/Improvement
Tirah Bazar Road	Urban	30	40	2.55	Upgradation/Improvement
Nawya Road	Urban	40	40	22.55	Improvement
Jhansi Road	Rural	30	40	21.23	Upgradation/Improvement
Regi Model Town Road	Urban	40	50	7.31	Upgradation/Improvement
Nasir Bagh Road	Urban	40	50	12.47	Upgradation/Improvement
Khyber Agency Road	Rural	40	50	52.84	Upgradation/Improvement

Summary:
These arterial roads improve mobility within urban limits and connect residential areas to key commercial and institutional nodes. Proposed works focus on widening, pavement strengthening, and drainage.

6.7.3.4 Local Access Roads

These roads provide last-mile connectivity to settlements, villages, and key institutions (schools, health centers, shrines). Upgradation is proposed mainly to 40–50 ft standards for improved accessibility.

Table 76: Local Access Roads Proposals - District Khyber

Road Name	Type	Existing Width (ft)	Proposed Width (ft)	Length	Proposal

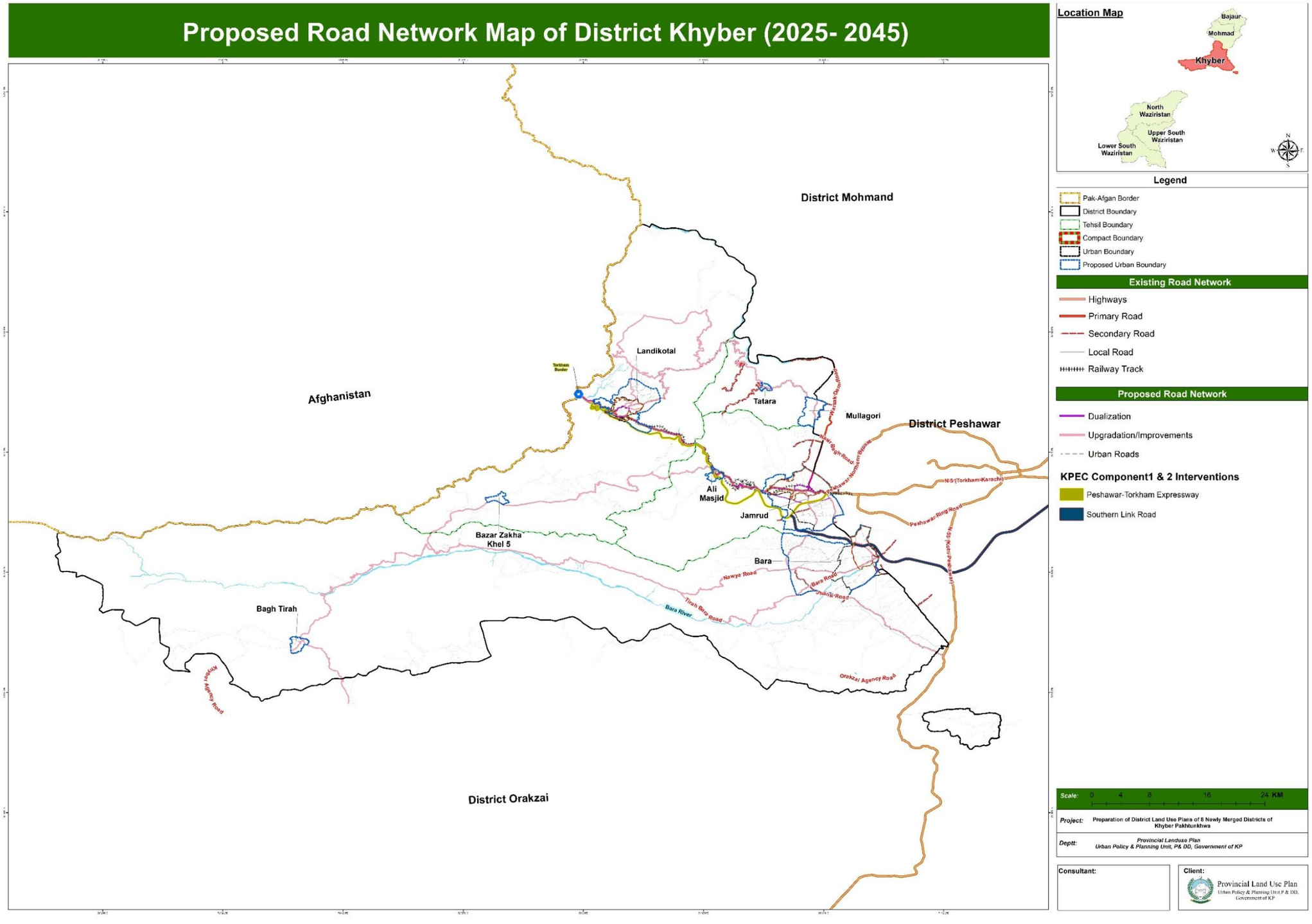
Shah Kass Road	Urban	30	30	6.01	Improvement
Perokhel Road	Urban	30	30	1.18	Improvement
Khyber Agncy Link Road	Rural	30	30	7.08	Improvement
Darma Khor to Isagai Road	Rural	30	40	9.00	Upgradation/Improvement
Shalman Road	Urban	30	40	1.58	Upgradation/Improvement
Darma Khor to Shaheed Miana Road	Rural	30	40	16.05	Upgradation/Improvement
Dr Sarfraz Khan Road	Urban	30	50	1.36	Upgradation/Improvement
Hamza Baba Mazar Road	Urban	40	50	1.47	Upgradation/Improvement

Summary:
Local access roads are crucial for rural uplift and urban service delivery, focusing on upgrading unpaved or narrow stretches to all-weather roads, improving safety and access to markets and services.

6.7.3.5 Urban Roads

The proposed urban roads in new residential areas are designed to enhance connectivity and circulation by linking emerging neighborhoods with the main arterial and local access routes. A clear hierarchical network of arterial and local roads ensures smooth internal circulation, efficient traffic flow, and easy access to key facilities. This integrated system supports compact urban growth, reduces congestion, and promotes safe movement for both vehicles and pedestrians within the expanding residential zones.

Map 39: Proposed Road Network Map – Khyber District



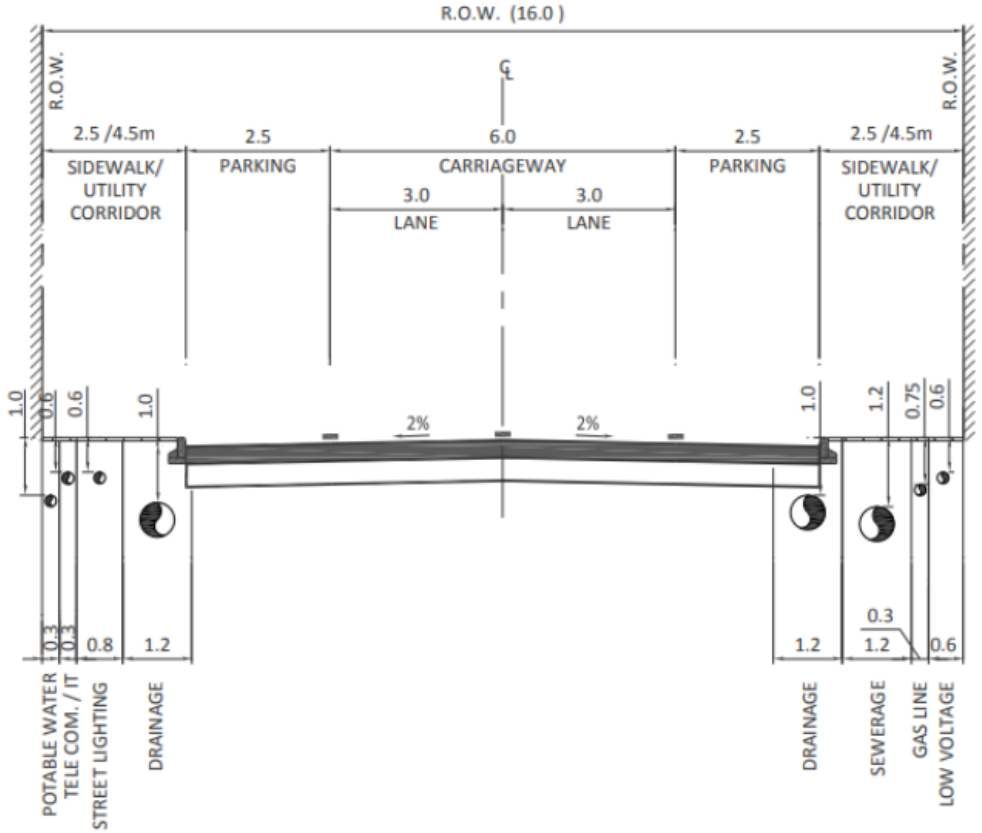


Figure 16: Typical Cross Section for Single Carriageway Roads in Khyber District

Source: Geometric Design Guidelines (UPPU)

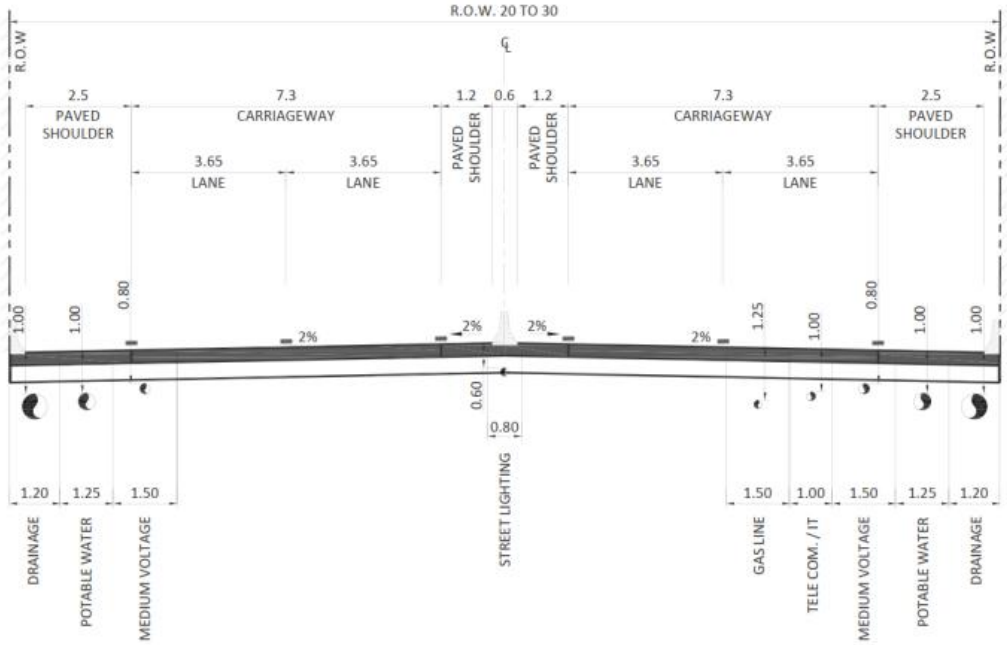


Figure 17: Typical Cross Section for Dual Carriageway Roads in Khyber District

Source: Geometric Design Guidelines (UPPU)

6.7.4 Bus Terminals Proposal

The analysis highlights significant gaps in bus terminal coverage across District Khyber, particularly in areas where passengers currently experience long travel times to access existing facilities. To address these issues, new bus terminals are proposed in major settlements including Jamrud, Landi Kotal, Bara, Tirah Valley and Mullagori. These terminals will be developed in coordination with the transport concerned authorities to improve accessibility, reduce roadside congestion, and enhance the overall efficiency of passenger movement within the district.

Table 77: Proposed Bus Terminals in District Khyber

Sr. No.	Project	Year	Land Required	Concerned Departments
1	Construction of Class-B Bus Terminal in Jamrud (Urban Area)	2025–30	As per Motor Vehicles Ordinance 1965 and Motor Vehicles Rules 1969	Transport Department / Provincial & Regional Transport Authority
2	Construction of Class-C Bus Terminal in Landi Kotal (Urban Area)	2025–35		
3	Construction of Class-C Bus Terminal in Bara (Urban Area)	2025–30		
4	Construction of Class-D Bus Terminal in Mullagori (Urban Area)	2030–40		
5	Construction of Class-D Bus Terminal in Tirah Valley (Urban Area)	2030–40		

Source: Developed by Consultant

The proposed development of bus terminals across the four urban centres of District Khyber reflects their functional hierarchy, travel demand levels, and long-term mobility needs. Jamrud, as the district's primary gateway and highest-demand node along the Peshawar–Torkham corridor, requires a Class-B terminal within 2025–30 to manage increasing inter-district passenger flows and resolve existing roadside congestion. Landi Kotal, serving as a strategic tehsil hub with growing cross-border and regional traffic, warrants a Class-C terminal in the 2025–35 period to organize medium-volume operations and enhance urban circulation. Bara, an expanding urban settlement with rising intra-district movement, similarly justifies a Class-C terminal during 2025–30 to streamline wagon, Hiace, and bus activities and support ongoing urban growth. In contrast, Tirah Valley and Mullagori's smaller population and low

transport activity make a Class-D terminal sufficient, with a longer implementation horizon of 2030–40 to match its limited but important local mobility role. Collectively, these interventions aim to modernize passenger handling, improve safety, and establish an efficient, structured public transport network across District Khyber.

6.7.5 Proposed Truck Terminal

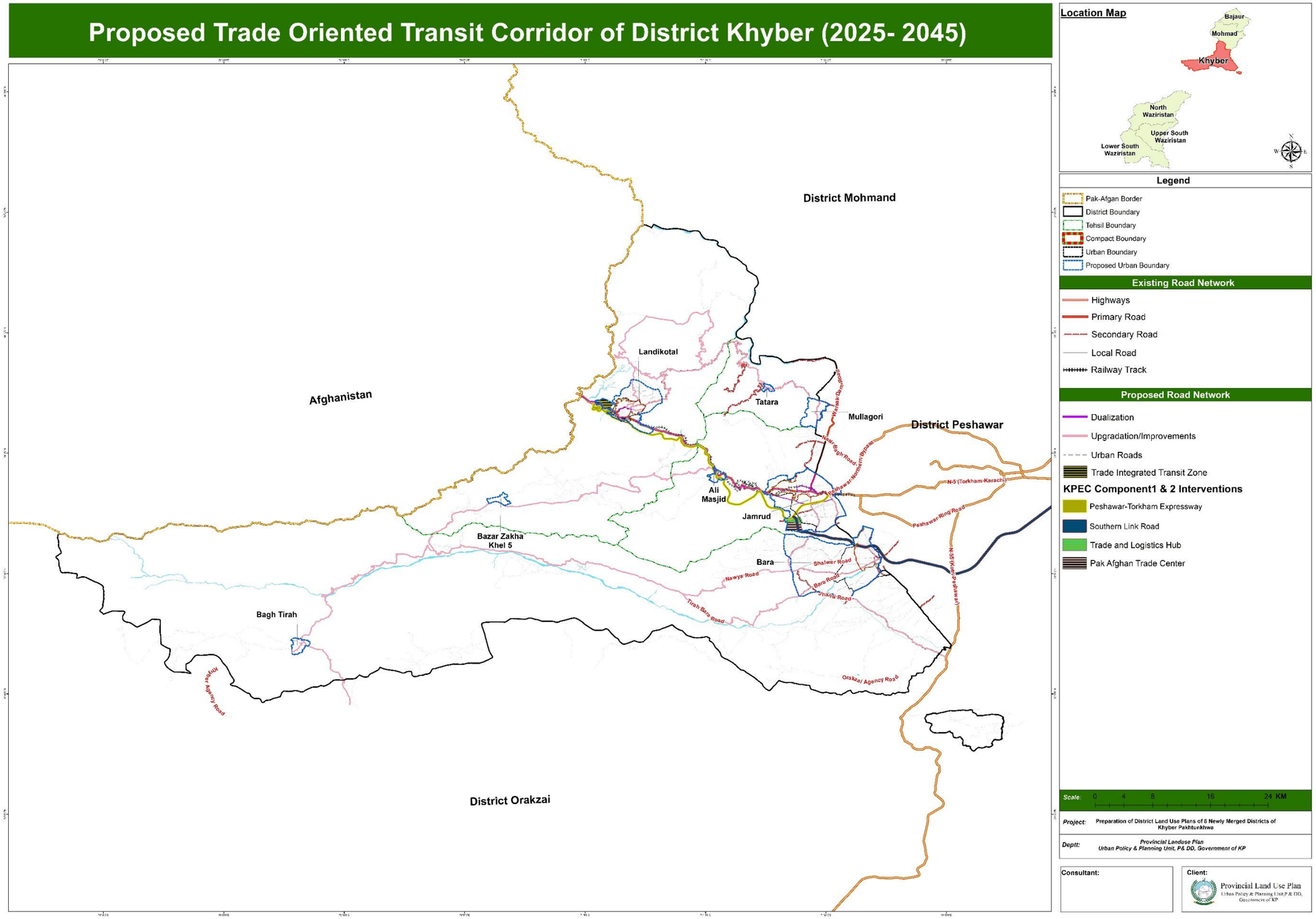
A 427-acre Integrated Truck Terminal and Logistics Zone is proposed near Torkham Border in District Khyber to serve as a modern freight and logistics hub for Pakistan-Afghanistan and Central Asia trade. Designed on international standards, the facility will accommodate around 3,000 trucks, with dedicated zones for parking, warehousing (1.0 million ft²), cold storage (70,000 MT), processing, and customs clearance. It will also include administrative offices, driver rest areas, fuel and maintenance stations, and a 5 MW solar-assisted utility system. The project aims to streamline border freight operations, reduce congestion on approach roads, minimize cargo dwell time, and support value-added trade activities. By introducing an organized logistics ecosystem, it will enhance trade efficiency, generate employment, and establish Khyber District as a key gateway for regional commerce.

Table 78: Trade Integrated Truck Terminal and Logistic Zone

Component	Function	Area (Acre)
Truck Parking and Staging Area	Parking for 3,000 loaded trucks	246.35
Warehousing Zone	General goods storage	47.90
Cold Storage Zone	Perishable goods storage	23.95
Food Storage Zone	Dry and bulk food storage	17.11
Processing & Packaging Zone	Value-added Agri-processing	20.53
Logistics & Handling Zone	Cargo handling interface	17.11
Administrative Offices	Terminal management & customs	6.84
Cold Chain Support Zone	Refer truck maintenance	5.47
Utilities & Waste Management	Water & waste treatment	4.11
Loading & Unloading Bays	Transshipment docks	5.47
Internal Roads & Circulation	Main & service roads	17.11
Green Buffer & Safety Zone	Environmental mitigation	15.05
Total		**427 acres**

Source: Developed by Consultant

Map 40: Proposed Trade Oriented Transit Corridor – Khyber District



6.7.6 Telecommunication, Postal Services & Telegraphs.

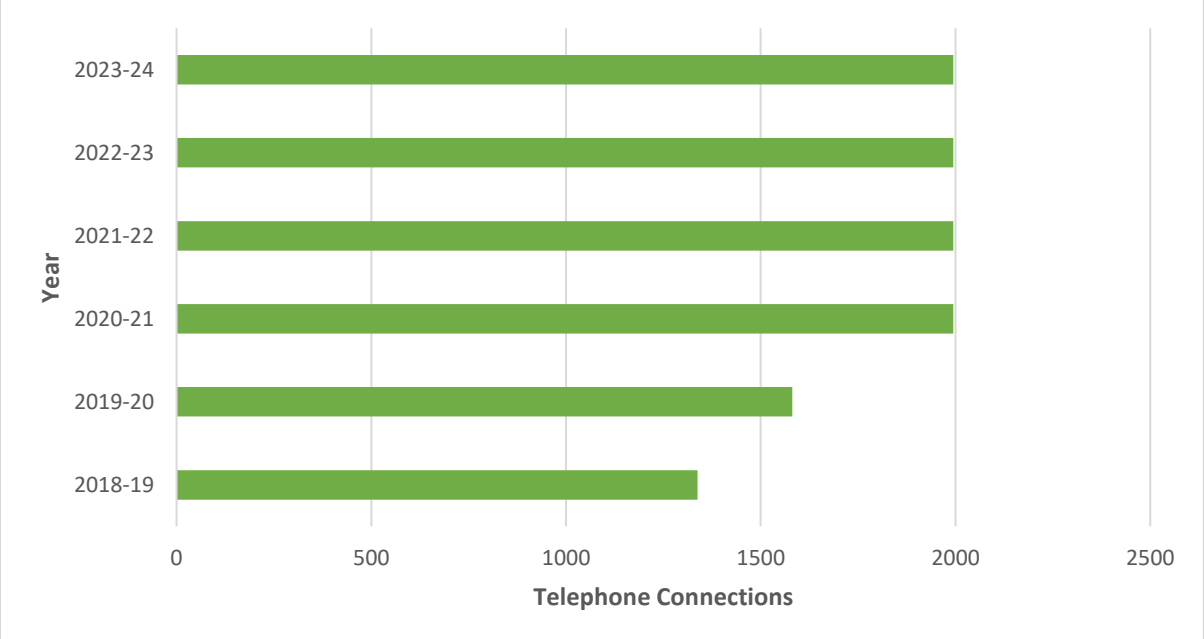
Telecommunication services in Khyber District are provided by major national operators, offering mobile, internet and postal services. The coverage has improved in recent years, but some remote areas still face connectivity issues. The existing services include 4G coverage in urban areas, while rural regions often rely on older 2G and 3G networks.

6.7.6.1 Level of services and their coverage.

Telecommunication services show significant variation across the district. Urban centers like Jamrud and Landi Kotal benefit from stronger network coverage and better service quality, whereas rural and remote areas face restricted connectivity and slower internet speeds. Continuous efforts are being made to expand the network and improve delivery service throughout the district. According to the Landi Kotal Master Plan, Pakistan Telecommunication (PTCL) and mobile services are accessible to most residents. A PTCL digital telephone exchange equipped with fiber optics operates in Landi Kotal. Nearly all major mobile service providers have established towers in the area, and the local bazaar hosts multiple mobile sales and repair shops.

Based on KP Development Statistics 2025, the district's telecommunication infrastructure includes both exchanges and a range of telephone connections. Currently, there are only three telephone exchanges in the district, the same number as in 2018. However, the number of telephone connections has shown an increasing trend till 2020-21 and then remains constant. The following figure illustrates the number of telephone connections in Khyber District:

Figure 18: Telephone Connections – Khyber Districts



Regarding the number of post offices in Khyber, the table below shows the distribution by type over a six-year period (2018–19 to 2023–24). The data indicates that the total number of post

offices remained constant at 21 during the first three years, declined to 12 in 2021–2022, and subsequently increased to 13 over the following two years (2022–2024). The trend shows an initial stability, a brief decline, and a gradual recovery, reflecting fluctuations in the postal infrastructure over time.

Table 79: Number of post offices categorized by type

Year	Post Offices	Number
2018-19	Total	21
	Head Offices	-
	Sub Post Offices	4
	Branch Offices	17
2019-20	Total	21
	Head Offices	-
	Sub Post Offices	4
	Branch Offices	17
2020-21	Total	21
	Head Offices	-
	Sub Post Offices	4
	Branch Offices	17
2021-22	Total	12
	Head Offices	-
	Sub Post Offices	3
	Branch Offices	9
2022-23	Total	13
	Head Offices	-
	Sub Post Offices	3
	Branch Offices	10
2023-24	Total	13
	Head Offices	-
	Sub Post Offices	3
	Branch Offices	10

Source: KP Development Statistics 2025

Currently, there are no head post offices in Khyber District. Considering the district's significance and its role in the region's economic development, establishing a head office is of vital importance.

An accessibility analysis was carried out to evaluate the service coverage of existing post offices across the district. The study identified areas located more than a 40-minute drive from the nearest post office as potential sites for new facilities. In addition, these candidate localities were assessed to ensure they meet the population thresholds defined in Pakistan's National Reference Manual.

6.7.6.2 Constraints and Recommendations

Constraints

Telecommunications in Khyber District encounter several challenges that affect both their efficiency and accessibility. Inadequate network infrastructure and insufficient maintenance restrict connectivity, especially in rural and remote regions. The district's rugged terrain, combined with access limitations stemming from security concerns, makes the installation and maintenance of telecommunications infrastructure both difficult and expensive. Additionally, economic limitations such as low funding and minimal market penetration worsen the situation, while outdated technology and limited coverage continue to result in poor service quality.

Recommendations

- Expand Network Coverage: Invest in developing and extending network infrastructure, focusing on underserved and remote areas. Explore satellite technology and other alternative solutions to improve access in hard-to-reach locations.
- Upgrade Technology: Introduce advanced telecommunications technologies, including 4G/5G networks, to improve both coverage and service quality.
- Government Incentives: Offer financial support, such as subsidies or tax incentives, to encourage telecommunications companies to invest in the Khyber District.
- Public-Private Partnerships: Promote collaboration between government entities and the private sector to share investment costs and resources for infrastructure development.

6.7.6.3 Requirement of new postal services in the district.

There is a pressing need to bridge service gaps where communities remain underserved, particularly in locations situated far from existing facilities. Residents in these areas often face long travel times to access basic postal functions, which hampers timely delivery of essential documents, parcels, and financial services.

To address this, strategically placing new post offices in areas beyond reasonable accessibility limits will help ensure equitable service delivery. Priority should be given to settlements with growing populations, active trade activities, and significant demand for communication and financial transactions. Enhancing human resource capacity and incorporating mobile or outreach-based postal services can also support these communities without requiring extensive infrastructure investment in every location.

6.7.6.4 Postal Network Proposals

The establishment and upgrading of postal facilities are proposed across District Khyber to enhance communication, logistics, and financial services, particularly in underserved and remote settlements. At present, the district lacks a Head Post Office and has limited Sub and Branch Post Offices, resulting in long travel times and delays in postal services. The proposed interventions aim to strengthen the postal network by establishing new Head and introducing sub-post offices in larger villages and neighborhoods.

These facilities will be developed in phases between 2025 and 2040 to ensure equitable service coverage, improve accessibility, and support socio-economic activities. Locations will be selected based on accessibility analysis, population thresholds, and the National Reference

Manual criteria. The details of the proposed postal facilities are summarized in the table below.

Table 80: Summary Provision of Post Offices as per National Reference Manual

Sr.	Project	Year	Land Required	Concerned Department
1	Establishment of Head Post Office at District Headquarters (Landi Kotal)	2025–30	As per National Reference Manual	Pakistan Post
2	Provision of Sub-Post Offices in larger settlements such as (Mullagouri, Tirah Valley)	2030–40		

Source: Developed by Consultant

6.8 WATER SUPPLY AND SANITATION NETWORKS

6.8.1 Tehsil Jamrud

6.8.1.1 Source(s) of drinking water supply in Jamrud

Jamrud Tehsil possesses a diverse range of water resources, primarily comprising surface water and groundwater reserves.

Surface Water:

The area benefits from its proximity to the Kabul River and its tributaries, particularly the Bara River, along with seasonal streams and nullahs that traverse the region. These surface water sources play a crucial role in supporting irrigation and agricultural activities in the fertile plains surrounding Jamrud, where wheat, maize, and vegetables are extensively cultivated. However, seasonal variability and dependence on rainfall affect the reliability of these sources.

Groundwater:

Groundwater is the principal source of drinking water in Jamrud, accessed through tube wells, dug wells, and boreholes. The aquifers are recharged by rainfall infiltration and seepage from rivers and streams. In the valley plains, groundwater is generally more abundant and of comparatively better quality, serving both domestic and agricultural needs. In contrast, areas closer to the rugged and mountainous terrain face challenges due to limited aquifer recharge and geological constraints that restrict the drilling of deep wells.

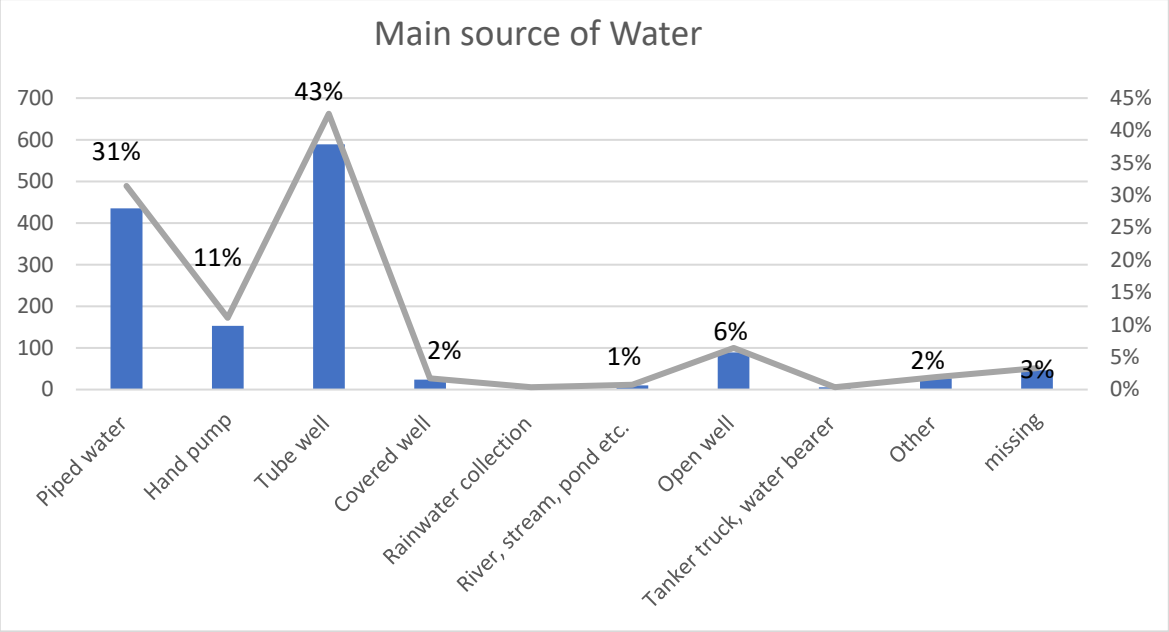
Overall, groundwater remains the most dependable source for domestic supply, while surface water holds untapped potential for future bulk supply schemes to meet the rapidly growing demand of Jamrud's population.

6.8.1.2 Water Data Analysis

The survey of 1,383 households in Jamrud Tehsil reveals tube wells as the dominant water source 43%, (589 respondents), followed by second major piped water 31%, (435

respondents). Traditional hand pumps serve 11% (153 respondents), while 6% (89 respondents) rely on unprotected open wells. Concerningly, 1% (10 respondents) use unsafe surface water from rivers/ponds. Only minimal numbers use rainwater collection, tanker trucks, covered well and others 5% (61 respondents). The data shows 3% (46 respondents) of missing information.

Figure 19: Main Source of Water



6.8.1.3 Quality/quantity of drinking water at source and user per WHO/local standards.

Water quality is a crucial aspect of ensuring safe and reliable drinking water for communities. It encompasses various parameters, including microbial safety, chemical composition, and physical characteristics. Microbial contamination, often from pathogens like bacteria, viruses, and protozoa, poses significant health risks and requires effective treatment and monitoring. Chemical contaminants, such as heavy metals, pesticides, and industrial pollutants, can affect water safety and require stringent regulatory measures to control. Additionally, physical characteristics like turbidity and color can impact the aesthetic quality of water and indicate potential contamination.

Following are the parameters and National Standards for Drinking Water Quality (NSDWG) adopted by Pakistan Environmental Protection Agency and WHO:

Figure 20: National Standards for Drinking Water Quality (NSDWG)

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Bacterial		

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
All water intended for drinking (e.Coli or Thermotolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Treated water in the distribution system (E.coli or thermotolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample in case of large supplies, where sufficient samples are examined, and must not be present in 95% of the samples taken throughout any 12 months.	Must not be detectable in any 100 ml sample. In case of large supplies, where sufficient samples are examined, it must not be present in 95% of the samples taken throughout any 12 months.
Physical		
Color	<15 U	<15 U
Taste	Non objectionable/Acceptable	Non objectionable/Acceptable
Oduor	Non objectionable/Acceptable	Non objectionable/Acceptable
Turbidity	< 5 NTU	<5 NTU
Total hardness as CaCO3	< 500 mg/l	---
TDS	< 1000	< 1000
pH	6.5 - 8.5	6.5 - 8.5
Chemical		
Essential Inorganic	mg/Liter	mg/Liter
Aluminum (Al) mg/l	<0.2	0.2
Antimony (Sb)	<0.005 (P)	0.02
Arsenic (As)	0.05 (P)	0.01
Barium (Ba)	0.7	0.7
Boron (B)	0.3	0.3
Cadmium (Cd)	0.01	0.003
Chloride (CI)	<250	250
Chromium (Cr)	<0.05	0.05
Copper (Cu)	2	2

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Toxic	mg/Liter	mg/Liter
Fluoride (F)*	<1.5	1.5
Lead (Pb)	<0.05	0.01
Manganese (Mn)	< 0.5	0.5
Mercury (Hg)	<0.001	0.001
Nickel (Ni)	<0.02	0.02
Nitrate (NO3)*	<50	50
Nitrite (NO2)*	<3 (P)	3
Selenium (Se)	0.01 (P)	0.01
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	--
Zinc (Zn)	5.0	3
Organic		
Pesticides mg/L		PSQCA No. 4639- 2004, Page No. 4 Table No. 3 Serial No. 20- 58 may be consulted
Phenolic compounds (as Phenols) mg/L		< 0.002
Polynuclear aromatic hydrocarbons (as PAH) g/L		0.01 (By GC/MS method)
Radioactive		
Alpha Emitters bq/L or pCi	0.1	0.1
Beta emitters	1	1

Source: National Standards for Drinking Water Quality (NSDWG), Pakistan Environmental Protection Agency

6.8.1.4 Quantity of Drinking Water at Source as Per WHO/Local Standards

The World Health Organization (WHO) recommends that the amount of water supplied for personal and domestic use should be adequate to meet an individual's needs. These encompass drinking, personal hygiene, washing, food preparation, and other household activities. WHO suggests a daily water allocation of 50 to 100 liters per person to satisfy these basic requirements.

The Public Health Engineering Department also provides guidelines for estimating the water needs when planning water supply infrastructure. This estimate is influenced by growth and directly correlates with population size. The table below outlines the water demand based on population variations for city planning purposes.

Table 81: Per Capita Consumption of Water as per the PHED Design Criteria

Design Population	Per Capita Consumption Per Day (Inclusive of Unaccounted for Water)
Up to 5,000	10 Gallons
5,001 – 10,000	15 Gallons
10,001 – 20,000	20 Gallons
20,001 – 50,000	30 Gallons
50,001 – 100,000	40 Gallons
100,001 – 200,000	50 Gallons
200,001 – 300,000	55 Gallons
300,001 – 400,000	60 Gallons
400,001 – 500,000	65 Gallons
500,001 – 600,000	70 Gallons
600,001 – 700,000	75 Gallons
700,001 – 800,000	80 Gallons
More than 800,000	85 Gallons

The amount of water needed varies based on several factors. However, it's important to note that Pakistan is facing severe water shortages due to climate change. Therefore, water demand figures may need adjustment based on local terrain, climate conditions, and international climate regulations. For Khyber District, where the urban population of Jamrud is 71,506 respectively, the average water requirement is adjusted to 35 gallons per capita per day for urban areas. Meanwhile, the water requirement of 15 gallons per capita per day for rural areas is considered suitable to meet demand of Khyber district.

6.8.1.5 Existing coverage of the water supply/gaps in demand in Jamrud.

This section outlines the current and projected water requirements for Jamrud, based on population growth trends and service level standards. The water demand has been calculated considering a minimum per capita water demand of 35 GPCD for urban areas (NCs) and 15 GPCD for rural areas (VCs).

Jamrud's population stood at 228,001 in 2017 and is projected to reach 1.00 million by 2045, with an annual growth rate of 4.63%. This rapid increase highlights the urgent need for improved water supply systems.

- Urban Demand (NCs): Jamrud Town clusters require higher service levels due to density and commercial activity.
- Rural Demand (VCs): Villages and peripheral settlements currently rely on groundwater and local sources, with lower per capita consumption but increasing pressure from population growth.

The calculated water demand forms the basis for planning phased water supply interventions, ensuring equitable and reliable distribution across both urban and rural settlements of Jamrud.

6.8.1.6 Urban Area Wise Existing and Proposed Water Demand of Jamrud

The future water requirements of the urban clusters (NCs) of Jamrud Tehsil have been calculated using a per-capita consumption of 35 gallons per capita per day (GPCD) and incorporating maximum-day and peak-hour design factors.

As shown in the table below, urban population is expected to more than double between 2025 and 2045 from 237,700 to 536,000 residents resulting in a sharp rise in daily water needs. Base demand is projected to grow from 8.32 MGPD in 2025 to 18.76 MGPD by 2045, while maximum-day requirements climb to 28.14 MGPD and peak-hour flows to 42.21 MGPD.

Table 82: Projected Urban Water Demand – Jamrud (NCs)

Year	Urban Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	237,700	8.319	12.475	18.718
2030	299,500	10.482	15.725	23.58
2035	377,700	13.219	19.825	29.743
2040	424,800	14.86	22.302	33.45
2045	536,000	18.76	28.14	42.21

These projections highlight the need for phased expansion of the urban water supply system, including source development, treatment facilities, and distribution networks, to meet Jamrud's growing domestic and commercial requirements.

6.8.1.7 Rural Area Wise Existing and Proposed Water Demand of Jamrud

The rural settlements of Jamrud Tehsil rely primarily on groundwater abstraction and community-based supply systems. Based on the projected rural population and a per-capita demand of 15 gallons per capita per day (GPCD), the current average daily requirement is estimated at 1.16 million gallons per day (MGPD) in 2025. With continued demographic growth, rural demand is expected to rise steadily to about 2.60 MGPD by 2045.

Design flows incorporating maximum-day and peak-hour factors indicate requirements increasing from 1.75 MGPD and 2.62 MGPD in 2025 to approximately 3.90 MGPD and 5.85 MGPD in 2045, respectively.

Table 83: Proposed Water Demand - Rural areas

Year	Rural Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	77,576	1.16	1.75	2.62
2030	97,903	1.47	2.20	3.30
2035	123,222	1.85	2.77	4.16
2040	138,015	2.07	3.11	4.66
2045	173,422	2.60	3.90	5.85

The analysis underscores the urgent need for integrated rural water supply planning to ensure equitable service coverage, address seasonal shortages, and enhance resilience against groundwater stress.

6.8.1.8 Proposed Water Supply System Jamrud Tehsil

To meet the projected water demand of Jamrud Tehsil (urban and rural areas) up to 2045, a phased and sustainable water supply system is required. The system design is based on per capita consumption of 35 GPCD (urban NCs) and 15 GPCD (rural VCs), accounting for maximum day demand and peak hour demand as per PHED & WASA.

Proposed Source (New Tube-Well)

Design Basis

Abstraction is planned in accordance with the demonstrated safe yield of the Jamrud alluvial aquifer, ensuring sustainable long-term groundwater availability. Production wells will be constructed to depths ranging from 250 to 350 ft, consistent with ERS investigations, to ensure reliable tapping of the productive aquifer zones.

Unit Well Capacity:

Each production well is designed for a 0.75 MGD continuous yield (1.25 cusec), with provision for standby operation and routine maintenance cycles.

Service Objective:

To meet projected urban water demand up to 21.36 MGD by 2045 while maintaining a 15 percent redundancy factor for emergency and maintenance downtime.

Table 84: Services Objectives

Stage	Implementation Period	Urban Demand to be Met (MGD)	New Production Wells*	Key Siting/Design Considerations
Immediate	2025 – 2030	up to 10.5	8 wells	Prioritize deficit reduction and creation of initial standby capacity. Wells to be located near existing distribution mains in Jamrud Town core and Ghundi periphery.
Short-Term	2031 – 2035	up to 13.2	7 wells	Focus on high-growth urban clusters and new housing developments around Jamrud Bazaar and Ghundi.
Medium-Term	2036 – 2040	up to 14.9	5 wells	Target deeper aquifer zones and integrate with artificial-recharge structures to offset declining water tables.
Long-Term	2041 – 2045	up to 18.8	8 wells	Includes strategic replacement of aging units and expansion to newly urbanized corridors along the Torkham Road axis.

1. Raw Water Storage

Urban Areas (NCs – 35 GPCD)

For Jamrud's urban clusters, a dedicated raw water balancing reservoir is required to stabilize abstraction from the Bara River and ensure continuous operation of the treatment plant.

Purpose: Equalize pumping, provide limited sedimentation, and ensure 12-hour buffer storage.

Phased Capacities (based on projected demand):

Table 85: Phased wise capacity of Urban Areas

Year	Urban Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	8.32	4.16	4.5 – 5.0
2030	10.48	5.24	5.5 – 6.0
2035	13.22	6.61	6.5 – 7.0
2040	14.87	7.44	7.5 – 8.0
2045	18.76	9.38	9.5 – 10.0

Location: Adjacent to the proposed urban treatment plant site at the southwest fringe of Jamrud Town, to allow gravity feed into treatment units.

Rural Areas (VCs – 15 GPCD)

For dispersed rural settlements, separate smaller balancing storages will provide supply reliability without oversizing infrastructure.

Purpose: Ensure reliable rural supply, provide 12-hour buffer, and reduce dependency on continuous pumping.

Phased Capacities (based on projected demand):

Table 86: Phased wise capacity of Rural Areas

Year	Urban Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	1.16	0.58	0.6 – 0.8
2030	1.47	0.74	0.8 – 1.0
2035	1.85	0.92	1.0 – 1.2
2040	2.07	1.04	1.1 – 1.3
2045	2.6	1.3	1.3 – 1.5
2025	1.16	0.58	0.6 – 0.8

Location: Intermediate elevated sites between Bara River intake and rural clusters e.g., Shalman corridor (northern VCs) and Ghundi side (eastern VCs) enabling gravity-assisted distribution where feasible.

2. Water Treatment Plant (WTP)

A modular conventional Water Treatment Plant (WTP) is proposed on state-owned land at the southwest fringe of Jamrud Town near the Jamrud to Peshawar Highway. The site offers secure land tenure, convenient road access, and direct linkage to major transmission corridors, providing a central distribution advantage for Jamrud's urban neighborhoods while maintaining reach to surrounding rural settlements. Located outside the Bara River floodplain, it ensures long-term operational resilience. Based on updated population and demand projections, the plant will be developed in phased modules to meet the combined urban–rural maximum-day demand, which is expected to rise from about 14 MGD in 2025 to over 32 MGD by 2045. Phase I (2025–2030) will install treatment modules of 15 MGD capacity, Phase II (2031–2035) will expand to 23 MGD, Phase III (2036–2040) to 26 MGD, and Phase IV (2041–2045) to 32 MGD. The process will employ conventional technology—coagulation, flocculation, sedimentation, rapid sand filtration, and final chlorination—with a layout including a raw-water intake structure, pre-treatment screens and grit chambers, chemical dosing and flash-mixing units, sedimentation basins, rapid sand filters, clear-water pumping gallery, covered reservoirs, chlorine contact tanks, sludge-handling facilities, and a fully equipped water-quality laboratory. Land will be reserved for both current work and future expansion, and the design will incorporate redundant pumping units, automated monitoring of key water-quality parameters, safe chemical storage and handling systems, and adequate maintenance access to ensure high operational reliability throughout the planning horizon.

Table 87: Phase wise Water treatment plant plan

Year	Total Population	Max-Day Demand (MGD)	Recommended WTP Installed Capacity (MGD)
2025	315,276	14.23	15
2030	397,403	17.92	18
2035	500,922	22.6	23
2040	562,815	25.41	26
2045	709,422	32.04	32

The treatment process will follow conventional methods comprising coagulation, flocculation, sedimentation, rapid sand filtration, and final disinfection through chlorination. The plant layout will incorporate a raw water inlet structure, pre-treatment screens and grit removal chambers, chemical dosing and flash-mixing units, sedimentation basins, rapid sand filter units, clear water pumping gallery, covered storage reservoirs, chlorine contact tanks, sludge management facilities, and a dedicated water quality laboratory. Land will be reserved not only for current infrastructure but also for future expansion requirements to avoid constraints in later phases. The design will include provisions for redundancy in pumping systems, automated monitoring of key parameters such as turbidity and residual chlorine, safe storage and handling of chemicals, and adequate access for maintenance and operational efficiency.

3. Treated Water Storage and Distribution System

A dedicated treated-water storage and distribution network is planned to provide continuous supply, operational flexibility and an adequate firefighting reserve for both the urban neighborhood councils and the rural village councils of Jamrud Tehsil. The system is sized to meet the combined maximum day demand of the urban and rural populations and will be expanded in phases from 2025 to 2045. Design parameters include a per capita demand of 35 gallons per day for urban areas and 15 gallons per day for rural areas with peak factors of 1.5 times the average day flow for maximum day conditions and 1.5 times the maximum day flow for peak hour demand. To stabilize pumping and maintain service during power outages or maintenance the system provides a 12-hour treated water buffer at maximum day flow. Based on these criteria the combined treated water reservoir capacity will increase from about 5 to 6 million gallons in 2025 to 6 to 7 million gallons in 2030, 7.5 to 8.5 million gallons in 2035, 8.5 to 9.5 million gallons in 2040 and ultimately 11 to 12 million gallons by 2045 ensuring reliable and resilient distribution across the entire Jamrud Tehsil service area.

6.8.1.9 Existing situation of the sanitation/drainage system in Tehsil Jamrud

Wastewater generation in Jamrud has been estimated based on 85% of average water demand for both urban and rural populations. To this base flow, an additional 5% for non-domestic usage has been included. Peak sewage flows have been factored as twice the average daily sewage flow, while stormwater inflow has been considered as 50% of the peak sewage flow. Further, infiltration losses have been accounted for as 10% of the average sewage flow in line with local conditions.

For design purposes, the per capita sewage generation has been derived as 42.65 GPCD for urban NCs and 7.5 GPCD for rural VCs. The projected wastewater flows for Jamrud are given below:

Table 88: Urban Area Wise Existing and Proposed Wastewater Demand – Jamrud NCs

Year	Avg. Daily Sewage (MGD)	Non-Domestic (MGD)	Peak Sewage (MGD)	Storm Water (MGD)	Infiltration (MGD)	Total Flow (MGD)
2025	6	0.3	12	6	0.6	18.9
2030	7.56	0.38	15.12	7.56	0.76	23.82
2035	9.54	0.48	19.08	9.54	0.95	29.57
2040	10.73	0.54	21.46	10.73	1.07	33.8
2045	13.54	0.68	27.08	13.54	1.35	42.65

The total wastewater from Jamrud NCs is projected to rise from 3.37 MGD in 2025 to 8.38 MGD in 2045, highlighting the need for phased sewerage network expansion and centralized wastewater treatment facilities.

Rural Area Wise Existing and Proposed Wastewater Demand – Jamrud VCs

In the rural villages of Jamrud Tehsil, where household clusters are scattered and the terrain is uneven, a conventional gravity sewer network is neither economically nor technically feasible. Full-scale pipe sewers demand high capital investment, continuous flow velocities, and regular skilled maintenance requirements that are impractical in sparsely populated settlements.

Instead, decentralized on-site sanitation is recommended. A combination of household septic tanks with soakage pits (leach pits) provides a low-cost, low-maintenance, and environmentally sound solution. This approach is well-suited to Jamrud's permeable sandy–gravel soils, which facilitate infiltration, and to the region's limited water availability.

Treatment Process

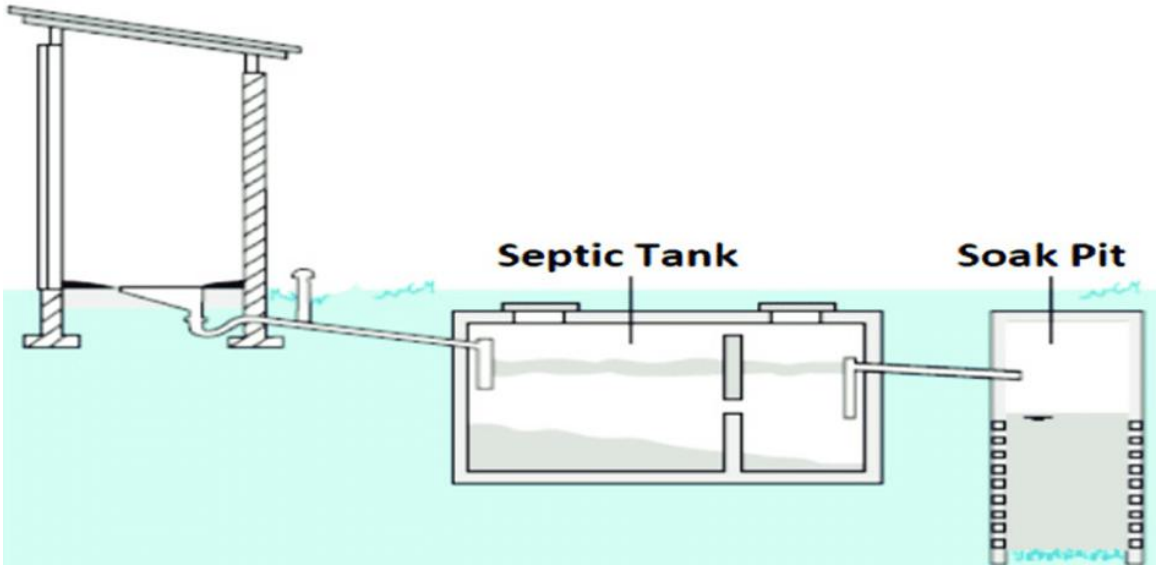
Wastewater from each dwelling enters a sealed septic tank, where solids settle to form sludge and lighter materials form a scum layer.

The clarified effluent passes to a soakage pit, where it percolates through the surrounding soil for further natural filtration and pathogen reduction.

Typical performance of a well-maintained system:

- Suspended Solids (TSS): 80–90 % removal
- Biochemical Oxygen Demand (BOD): 60–80 % reduction
- Pathogens: 80–90 % reduction
- Nutrients (N & P): 60–80 % reduction

This treatment level is adequate for protecting Jamrud's shallow aquifers and preventing nuisance conditions when tanks are properly sited and desludging.



The disposal of untreated wastewater into open drains, streams, and agricultural fields is a major cause of environmental degradation in Jamrud, contaminating both surface and groundwater resources. To address this challenge, a phased wastewater treatment strategy is proposed.

A centralized Wastewater Treatment Plant (WWTP) will be established near the Jamrud central plain, serving the urban NCs, while smaller decentralized treatment units (waste stabilization ponds or aerated lagoons) will be developed near rural clusters for VCs.

The WWTP design will follow international and national best practices, with process design based on average sewage flow and pollution loads, and hydraulic design based on peak flows. Treatment will target compliance with NEQS discharge limits (BOD < 80 mg/L, COD < 150 mg/L, TSS < 200 mg/L).

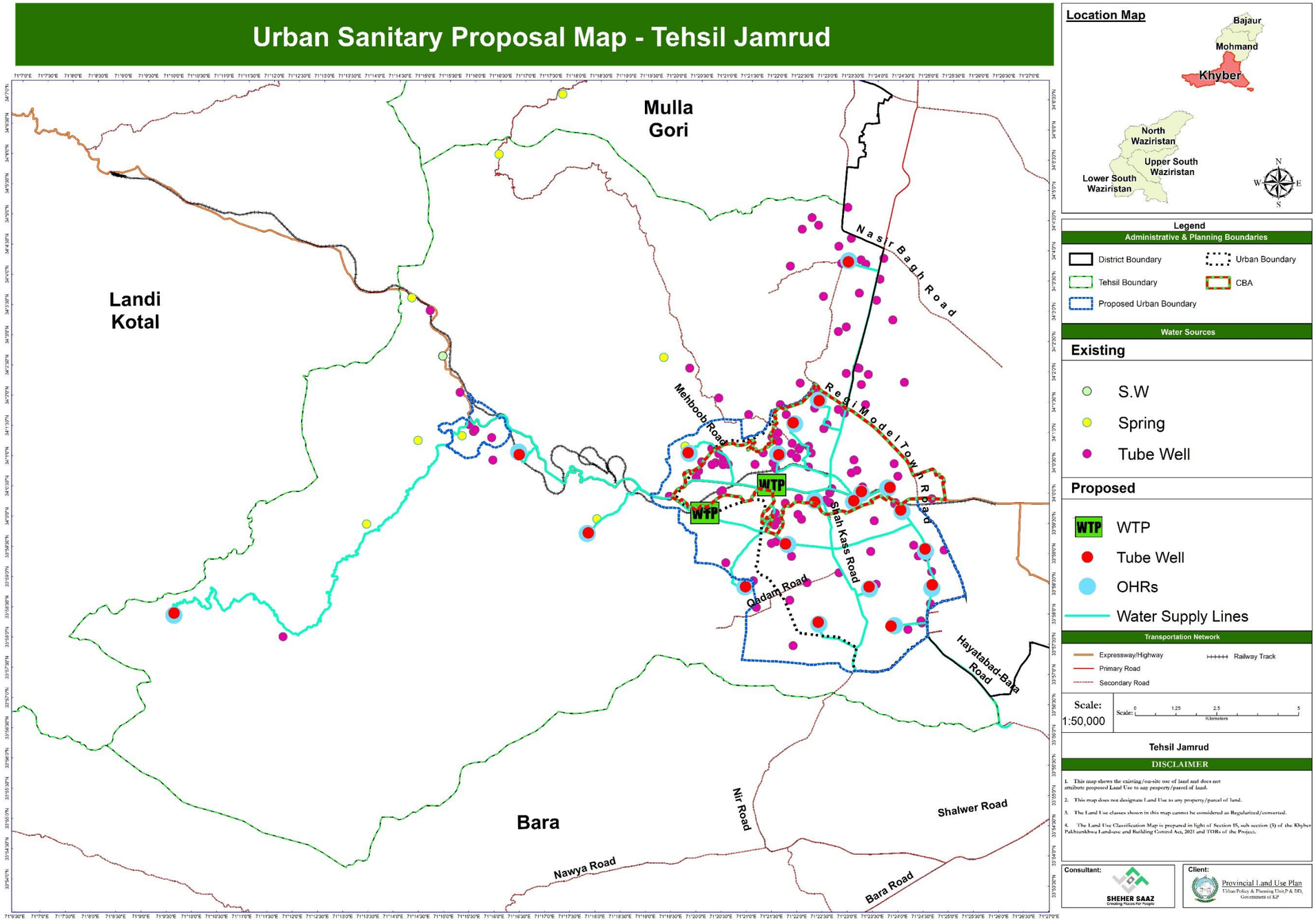
6.8.1.10 Available/proposed wastewater treatment plants and their feasible locations

At present, there is no existing wastewater treatment plant (WWTP) in Jamrud Tehsil, and domestic sewage is largely discharged untreated into natural drains, creating both environmental and public health concerns. Based on projected wastewater flows, the total generation in Jamrud is expected to rise from 5.80 MGD in 2025 to 15.88 MGD in 2045, with contributions from both urban neighborhood councils (NCs) and rural village councils (VCs). To address this growing demand, a phased wastewater treatment strategy is proposed. In Phase I (2025–2030), a 5 MGD centralized WWTP will be established for Jamrud NCs, complemented by decentralized stabilization ponds totaling 2 to 3 MGD for rural clusters. In Phase II (2031–2040), treatment capacity will be expanded to 10 MGD, integrating additional rural areas through modular extensions. In Phase III (2041–2045), total capacity will be increased to 16 MGD, ensuring complete coverage of projected wastewater flows. The main WWTP for urban NCs is proposed on state-owned land southwest of Jamrud Town, adjacent to the planned water treatment plant site, to maximize operational synergy and land utilization. For the rural settlements, decentralized satellite treatment facilities are recommended at Shahkas, Ghundi, and Prang Ghar, strategically located to reduce conveyance costs and improve service coverage.

Table 89: Projected wastewater generation

Year	Urban NCs (MGD)	Rural VCs (MGD)	Total Jamrud Wastewater (MGD)
2025	3.37	2.43	5.8
2035	5.36	4.22	9.58
2045	8.38	7.5	15.88

Map 41: Proposed WATSAN Map – Tehsil Jamrud



6.8.2 Tehsil Landi Kotal

6.8.2.1 Source(s) of drinking water supply in Landi Kotal

Landi Kotal Tehsil relies on a mix of groundwater reserves and limited surface water flows to meet domestic and agricultural requirements.

Surface Water:

The area is traversed by seasonal streams and nullahs that originate from the surrounding mountains and flow through the valleys during the monsoon and wet seasons. These sources provide supplementary irrigation for small patches of cultivated land, including wheat, maize, and vegetables. However, their highly seasonal nature and dependence on rainfall make them unreliable for sustained domestic or bulk water supply.

Groundwater:

Groundwater is the primary source of drinking water in Landi Kotal, accessed mainly through tube wells, dug wells, and hand pumps. Recharge occurs through rainfall infiltration, seepage from seasonal streams, and limited percolation in valley areas. In the plains and settled valley stretches, groundwater is comparatively more accessible and of usable quality, supporting domestic needs and small-scale irrigation. By contrast, the surrounding hilly and rocky terrain faces challenges of limited aquifer recharge and difficult hydrogeological conditions, restricting the potential for deep well development and resulting in localized water scarcity.

Overall, groundwater remains the most dependable source of drinking water for Landi Kotal, while seasonal surface flows offer only supplementary irrigation support. Future bulk supply schemes will need to focus primarily on groundwater development, with careful management to sustain aquifer yields against rising population demand.

6.8.2.2 Quality/quantity of drinking water at source and user per WHO/local standards.

Water quality is a crucial aspect of ensuring safe and reliable drinking water for communities. It encompasses various parameters, including microbial safety, chemical composition, and physical characteristics. Microbial contamination, often from pathogens like bacteria, viruses, and protozoa, poses significant health risks and requires effective treatment and monitoring. Chemical contaminants, such as heavy metals, pesticides, and industrial pollutants, can affect water safety and require stringent regulatory measures to control. Additionally, physical characteristics like turbidity and color can impact the aesthetic quality of water and indicate potential contamination.

The following are the parameters and National Standards for Drinking Water Quality (NSDWG) adopted by the Pakistan Environmental Protection Agency and WHO:

Table 90: National Standards for Drinking Water Quality (NSDWG)

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Bacterial		
All water intended for drinking (e.Coli or Thermotolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Treated water in the distribution system (E.coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample in case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.
Physical		
Colour	<15 U	<15 U
Taste	Non objectionable/Accept able	Non objectionable/Accept able
Odour	Non objectionable/Accept able	Non objectionable/Accept able
Turbidity	< 5 NTU	<5 NTU
Total hardness as CaCO3	< 500 mg/l	---
TDS	< 1000	< 1000
pH	6.5 - 8.5	6.5 - 8.5
Chemical		
Essential Inorganic	mg/Litre	mg/Litre
Aluminium (Al) mg/l	<0.2	0.2
Antimony (Sb)	<0.005 (P)	0.02
Arsenic (As)	0.05 (P)	0.01
Barium (Ba)	0.7	0.7
Boron (B)	0.3	0.3
Cadmium (Cd)	0.01	0.003
Chloride (CI)	<250	250

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Chromium (Cr)	<0.05	0.05
Copper (Cu)	2	2
Toxic	mg/Litre	mg/Litre
Fluoride (F)*	<1.5	1.5
Lead (Pb)	<0.05	0.01
Manganese (Mn)	< 0.5	0.5
Mercury (Hg)	<0.001	0.001
Nickel (Ni)	<0.02	0.02
Nitrate (NO3)*	<50	50
Nitrite (NO2)*	<3 (P)	3
Selenium (Se)	0.01 (P)	0.01
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	--
Zinc (Zn)	5.0	3
Organic		
Pesticides mg/L		PSQCA No. 4639- 2004, Page No. 4 Table No. 3 Serial No. 20- 58 may be consulted
Phenolic compounds (as Phenols) mg/L		< 0.002
Polynuclear aromatic hydrocarbons (as PAH) g/L		0.01 (By GC/MS method)
Radioactive		
Alpha Emitters bq/L or pCi	0.1	0.1
Beta emitters	1	1

Source: National Standards for Drinking Water Quality (NSDWG), Pakistan Environmental Protection Agency

6.8.2.3 Quantity of Drinking Water at Source as Per WHO/Local Standards

The World Health Organization (WHO) recommends that the amount of water supplied for personal and domestic use should be adequate to meet an individual's needs. These encompass drinking, personal hygiene, washing, food preparation, and other household activities. WHO suggests a daily water allocation of 50 to 100 liters per person to satisfy these basic requirements.

The Public Health Engineering Department also provides guidelines for estimating the water needs when planning water supply infrastructure. This estimate is influenced by growth and

directly correlates with the population size. The table below outlines the water demand based on population variations for city planning purposes.

Table 91: Per Capita Consumption of Water as per the PHED Design Criteria

Design Population	Per Capita Consumption Per Day (Inclusive of Unaccounted for Water)
Up to 5,000	10 Gallons
5,001 – 10,000	15 Gallons
10,001 – 20,000	20 Gallons
20,001 – 50,000	30 Gallons
50,001 – 100,000	40 Gallons
100,001 – 200,000	50 Gallons
200,001 – 300,000	55 Gallons
300,001 – 400,000	60 Gallons
400,001 – 500,000	65 Gallons
500,001 – 600,000	70 Gallons
600,001 – 700,000	75 Gallons
700,001 – 800,000	80 Gallons
More than 800,000	85 Gallons

The quantity of water required in Landi Kotal Tehsil is influenced by several factors, including population growth, settlement patterns, and the impacts of climate change. Pakistan as a whole is experiencing increasing water stress due to shifting rainfall patterns and rising temperatures, which necessitates careful adjustment of demand estimates in line with local conditions and sustainability considerations.

For Landi Kotal, where the urban population is 60,125, the average per capita demand is estimated at 35 gallons per capita per day (GPCD) for urban areas. For the rural population, a requirement of 15 GPCD is considered appropriate, reflecting both existing consumption patterns and the need to balance demand with available resources. These figures provide a realistic basis for planning water supply schemes in Landi Kotal, ensuring that both urban and rural settlements can be adequately served under future development scenarios.

6.8.2.4 Existing coverage of the water supply/gaps in demand in Landi Kotal

This section presents the current and projected water requirements for Landi Kotal, based on population growth patterns and established service level standards. The water demand has been estimated to use a per capita requirement of 35 gallons per capita per day (GPCD) for urban areas (NCs) and 15 GPCD for rural areas (VCs).

Landi Kotal's population was 189,680 in 2017 and is projected to grow to nearly 377,000 by 2045, reflecting an annual growth rate of 3.39%. This steady increase underscores the need for a well-planned and sustainable water supply system.

- Urban Demand (NCs): The Landi Kotal urban clusters require higher service levels due to their concentration of population, commercial activity, and administrative importance.
- Rural Demand (VCs): Villages and dispersed settlements currently rely primarily on groundwater sources, with lower per capita consumption but growing stress from rising population and agricultural needs.

The projected water demand provides a basis for designing phased water supply interventions in Landi Kotal, ensuring that both urban and rural communities are served with reliable and equitable access to drinking water.

6.8.2.5 Urban Area Wise Existing and Proposed Water Demand of Landi Kotal

The present and future water requirements for the urban clusters (NCs) of Landi Kotal Tehsil have been estimated based on projected urban population and a per capita water demand of 35 gallons per capita per day (GPCD). In 2025, the total urban water demand is projected at 1.5 million gallons per day (MGPD), which will steadily increase in line with population growth, reaching around 2.8 MGPD by 2045.

To ensure reliable supply, design flows have been computed by applying maximum day and peak hour demand factors. These demand projections provide the technical foundation for phased development of water supply sources, treatment capacity, and transmission/distribution systems in Landi Kotal's urban settlements.

Table 92: Projected Urban Water Demand – Landi Kotal (NCs)

Year	Urban Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	42,722	1.5	2.2	3.4
2030	50,613	1.8	2.7	4.0
2035	59,962	2.1	3.1	4.7
2040	67,372	2.4	3.5	5.3
2045	79,815	2.8	4.2	6.3

These projections emphasize the urgent need for phased expansion of urban water supply infrastructure, covering groundwater development, treatment facilities, and distribution networks, to effectively meet the growing domestic, commercial, and institutional demand in Landi Kotal's urban areas.

6.8.2.6 Rural Area Wise Existing and Proposed Water Demand of Landi Kotal

The rural settlements (VCs) of Landi Kotal Tehsil depend predominantly on groundwater abstraction through tube wells, dug wells, and hand pumps, supplemented by small-scale community-based supply systems. Based on projected rural population and a per capita water requirement of 15 gallons per capita per day (GPCD), the total rural water demand is

estimated at 4.13 million gallons per day (MGPD) in 2025. With steady demographic growth, this requirement will increase substantially, reaching around 6.51 MGPD by 2045.

These demand projections form the basis for phased expansion of rural water supply schemes, focusing on the development of additional well fields, piped distribution networks, and localized treatment solutions to ensure safe and equitable access across all villages.

Year	Urban Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	310,981	4.7	7.0	10.5
2030	368,429	5.5	8.3	12.4
2035	436,483	6.5	9.8	14.7
2040	490,411	7.4	11.0	16.6
2045	580,995	8.7	13.1	19.6

The analysis highlights the critical need for integrated rural water supply planning in Landi Kotal, including groundwater sustainability measures, seasonal storage, and climate-resilient infrastructure, to meet the growing demand and prevent stress on local aquifers.

6.8.2.7 Proposed groundwater supply strategy Landi Kotal Tehsil

For Landi Kotal Tehsil, meeting future water needs up to 2045 requires a carefully phased and resilient supply system. Design standards are based on 35 gallons per capita per day (GPCD) for urban neighbourhood councils (NCs) and 15 GPCD for rural village councils (VCs), with additional allowances made for maximum daily demand and peak hourly variation.

6.8.2.7.1 Intake groundwater Works

The proposed water supply for Landi Kotal will be developed through a distributed groundwater abstraction system based on production wellfields. Tube wells and boreholes will be constructed in the valley plains, where aquifer yields are highest and drilling conditions are most favorable. To ensure effective coverage and minimize conveyance requirements, the system will be organized into three to four zonal wellfields serving distinct areas, including the Landi Kotal town core, the northern rural clusters such as Loe Shalman and Dalkhad, the eastern and western rural clusters around Ghagra and the Bazar zones, and selected peripheral villages with higher demand. A detailed hydrogeological investigation will be undertaken to guide this development, beginning with desktop analysis and field surveys, followed by the drilling of exploratory boreholes and 72-hour pumping tests to confirm sustainable yields and water quality parameters. The results will provide a technical basis for finalizing the location, spacing, and construction specifications of the production wells. To safeguard the aquifers against depletion, managed abstraction limits will be applied in each wellfield, and recharge-enhancing interventions, such as managed aquifer recharge where feasible, will be incorporated into the long-term management strategy. This approach ensures both the adequacy and sustainability of groundwater as the primary source of supply for Landi Kotal's growing population.

6.8.2.7.2 Well sizing & approximate number of production wells

Because actual yields vary, Typical tube-well yields in valley aquifers here commonly range ~10–30 L/s depending on geology. For planning, use 20 L/s (≈1.728 MLD ≈ 0.456 MGD) as a mid-range design yield per production well.

Calculation method:

1 well@ 20 L/s
daily = 20 L/s × 86,400 s
= 1,728,000 L/day
= 1.728 MLD
= 0.456 MGD

Table 93: Projected Demand Calculations for Wells

Year	Total demand (MGD)	Wells required (0.456 MGD per well)
2025	10.5	23
2030	12.4	27
2035	14.7	32
2040	16.6	36
2045	19.6	43

6.8.2.7.3 Raw Water Storage

Urban Areas (NCs – 35 GPCD)

For Landi Kotal's urban clusters, a dedicated raw water balancing reservoir is required to stabilise groundwater abstraction and ensure continuous operation of the treatment and distribution system.

Purpose for Equalize pumping rates, provide limited sedimentation where required, and secure a 12-hour buffer to maintain supply during peak demand or short interruptions.

Phased Capacities (based on projected demand):

Table 94: Phase wise projection of water storage in urban areas

Year	Urban Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	1.495	0.75	0.8 – 1.0
2035	2.099	1.05	1.0 – 1.5
2045	3.49	1.75	1.5 – 2.0

Rural Areas (VCs – 15 GPCD)

In the case of Landi Kotal's dispersed rural villages, it is proposed to establish a series of smaller balancing storages to enhance supply reliability without the need for oversized

infrastructure. These reservoirs will function as 12-hour buffer storages, reducing dependency on continuous pumping while ensuring a steady and equitable distribution of water.

Phased Capacities (based on projected demand):

Table 95: : Phase wise projection of water storage in Rural areas

Year	Urban Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	3.4	1.7	1.7 – 2.0
2035	5.41	2.71	2.5 – 3.0
2045	10.83	5.42	5.5 – 6.0

Location: For Landi Kotal's rural clusters, intermediate elevated sites are recommended between the groundwater intake zones and the main settlements. Specifically, the Loe Shalman corridor is suitable for serving the northern villages, while elevated terrain towards Ghundi and the western peripheries can be utilized for eastern and peripheral clusters. These sites offer natural elevation advantages, allowing partial gravity-fed distribution and minimizing pumping costs, while also providing localized resilience for high-demand rural settlements.

6.8.2.7.4 Water Treatment Plant (WTP)

A modular conventional Water Treatment Plant is proposed on state-owned land at the eastern fringe of Landi Kotal town, near the Landi Kotal–Jamrud Road. The site provides secure land tenure, reliable accessibility, and direct linkage with the main distribution corridors. Its location ensures central coverage for the urban core of Landi Kotal while maintaining reach to the surrounding rural settlements. Importantly, it is outside the flood-prone zones of nearby streams, ensuring long-term operational resilience.

The facility will be implemented in phases to align with population growth and projected water demand. In the first phase (2025–2030), the plant will be designed for a capacity of 2.5 MGD. In the second phase (2031–2040), capacity will be increased to 4.5 MGD, and by the third phase (2041–2045), the plant will achieve its full planned capacity of 6.5 MGD.

The treatment system will adopt a conventional process including coagulation, flocculation, sedimentation, rapid sand filtration, and final disinfection through chlorination. The layout will include a raw water intake structure, pre-treatment screens and grit chambers, chemical dosing and flash-mixing units, sedimentation tanks, rapid sand filters, a clear water pumping station, covered storage reservoirs, chlorine contact tanks, sludge handling and drying facilities, and a fully equipped water quality laboratory.

Land will be allocated not only for current infrastructure but also for future expansion to avoid later constraints. The design will integrate redundancy in pumping systems, online monitoring

of turbidity and residual chlorine, safe chemical storage and handling facilities, and proper access for maintenance to ensure efficient and sustainable operation.

6.8.2.8 Treated Water Storage and Distribution System

The treated water storage and distribution system for Landi Kotal is planned to ensure a reliable supply for both the urban core and surrounding rural settlements in line with projected demand growth. For the urban clusters, a central service reservoir within Landi Kotal Town is proposed, with phased capacities of approximately 1.0 million gallons by 2025, 1.5 million gallons by 2035, and up to 2.0 million gallons by 2045.

For rural villages, a network of smaller elevated reservoirs is recommended at strategic nodes such as Loe Shalman (north), Ghagra (west), and Ghundi corridor (east). These reservoirs will range from 0.5 million gallons in 2025 to 1.5 million gallons by 2045, providing buffer storage to manage demand fluctuations and ensuring adequate service pressure across dispersed communities.

Treated water will be conveyed from the proposed treatment facility on the eastern fringe of Landi Kotal via ductile iron or HDPE rising mains (450–600 mm diameter) into the zonal reservoirs. Low-lift pumps at the groundwater intake and high-lift pumps at the treatment plant will secure reliable transfer, while gravity-fed distribution will be adopted wherever feasible to reduce energy costs. Booster pumping stations will only be introduced in peripheral or higher-elevation settlements to maintain equitable service levels.

All storage and pumping facilities will be equipped with standby power supply and energy-efficient pumping systems, ensuring resilience, operational efficiency, and long-term sustainability of the Landi Kotal water supply system.

6.8.2.9 Existing situation of the sanitation/drainage system in Tehsil Landi Kotal

Wastewater generation in Landi Kotal has been estimated based on 85% of the average water demand for both urban and rural populations. To this domestic base flow, an additional 5% allowance for non-domestic usage has been incorporated. For system design, peak sewage flows have been assumed at twice the average daily sewage flow, while stormwater inflows are considered as 50% of peak sewage flows. Infiltration losses are also factored at 10% of the average sewage flow, reflecting local hydrogeological and soil conditions.

Accordingly, the per capita sewage generation for Landi Kotal has been derived at 29.75 GPCD for urban clusters (NCs) and 12.75 GPCD for rural villages (VCs). These values form the technical basis for projecting wastewater flows up to 2045 and for planning phased investments in sewerage networks, pumping facilities, and wastewater treatment systems to serve the tehsil's growing population:

Urban Area Wise Existing and Proposed Wastewater Demand Landi Kotal NCs:

Year	Avg. Daily Sewage (MGD)	Non-Domestic (MGD)	Peak Sewage (MGD)	Storm Water (MGD)	Infiltration (MGD)	Total Flow (MGD)
2025	0.92	0.05	1.84	0.92	0.09	2.82
2030	1.15	0.06	2.3	1.15	0.12	3.63
2035	1.46	0.07	2.92	1.46	0.15	4.6
2040	1.84	0.09	3.68	1.84	0.18	5.79
2045	2.3	0.12	4.6	2.3	0.23	7.25

Wastewater generation in Landi Kotal's urban areas is expected to increase from 2.82 MGD in 2025 to 7.25 MGD by 2045. This trend highlights the necessity of expanding the urban sewerage network in phases and establishing centralized wastewater treatment facilities to ensure safe disposal and reuse.

Rural Area Wise Existing and Proposed Wastewater Demand Landi Kotal VCs

Year	Avg. Daily Sewage (MGD)	Non-Domestic (MGD)	Peak Sewage (MGD)	Storm Water (MGD)	Infiltration (MGD)	Total Flow (MGD)
2025	0.68	0.03	1.36	0.68	0.07	2.14
2030	0.86	0.04	1.72	0.86	0.09	2.67
2035	1.08	0.05	2.16	1.08	0.11	3.4
2040	1.43	0.07	2.86	1.43	0.14	4.5
2045	1.83	0.09	3.66	1.83	0.18	5.76

Wastewater from rural villages in Landi Kotal is projected to increase from 2.14 MGD in 2025 to 5.76 MGD in 2045. This underscores the need for decentralized wastewater management solutions, including small-scale treatment plants and localized collection systems, to effectively serve peripheral clusters and prevent environmental degradation.

Wastewater quality & Treatment Landi Kotal

The uncontrolled disposal of untreated wastewater into open drains, seasonal streams, and adjoining agricultural lands is one of the major causes of environmental degradation in Landi Kotal. This practice not only pollutes surface water bodies but also threatens the quality of groundwater resources that serve as the primary drinking water source for the local population. To mitigate these risks, a phased wastewater treatment strategy is proposed.

A centralized Wastewater Treatment Plant (WWTP) will be established in the central plain of Landi Kotal, strategically positioned to serve the urban NCs and surrounding high-density settlements. For the more dispersed rural VCs, smaller decentralized treatment systems such as waste stabilization ponds, aerated lagoons, or compact modular treatment units will be developed close to each cluster to reduce conveyance costs and ensure local reuse potential. The design of the WWTP will follow the best national and international practices, with process sizing based on average daily sewage flows and pollutant loads, while the hydraulic design will account for peak flows during high-demand and wet weather conditions. The treated effluent will be required to meet NEQS discharge standards, with key parameters including BOD < 80 mg/L, COD < 150 mg/L, and TSS < 200 mg/L. Provision will also be made for sludge management, effluent reuse in agriculture, and long-term expansion in line with population growth and rising wastewater volumes.

6.8.2.10 Available/proposed wastewater treatment plant and their feasible locations

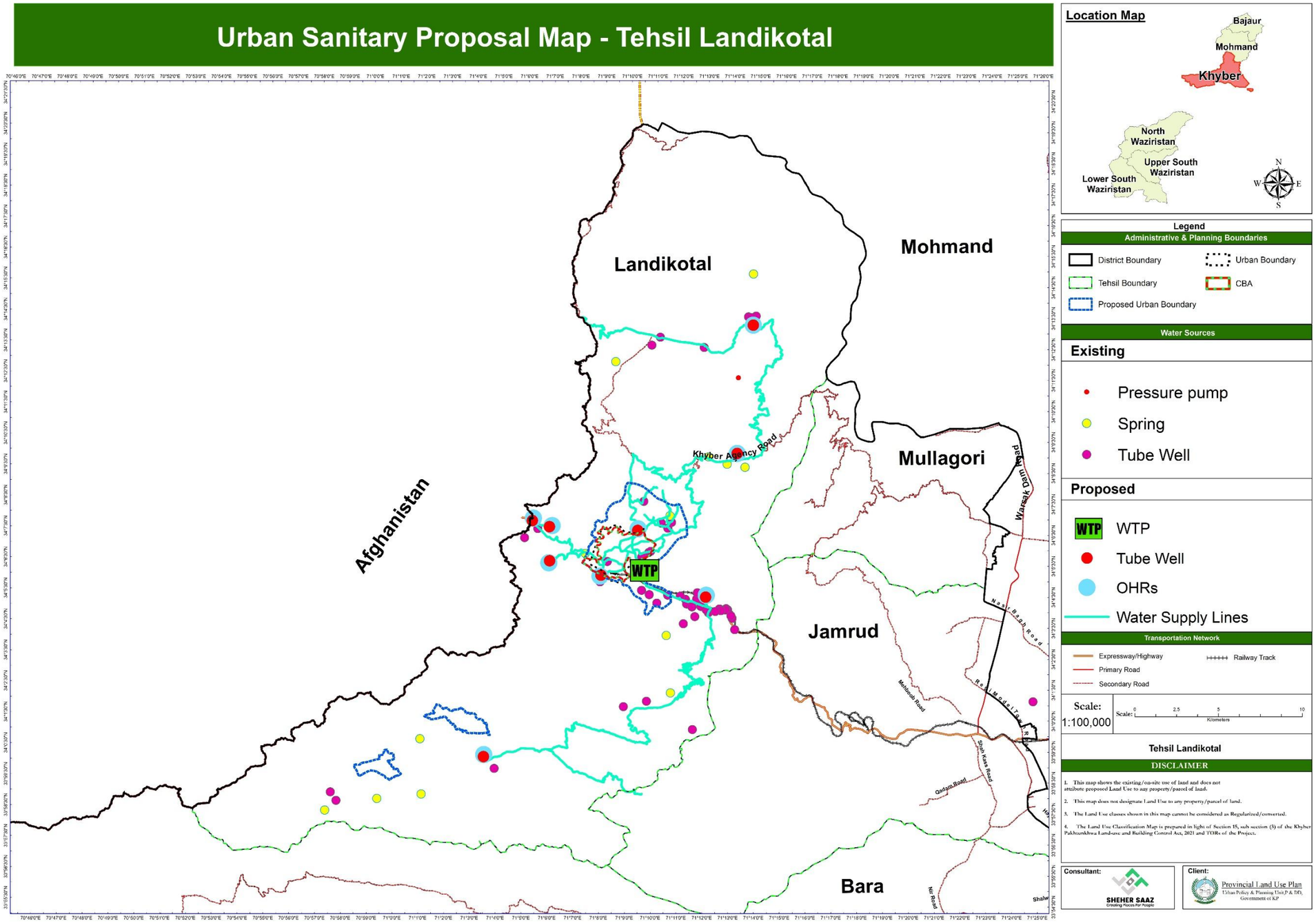
At present, Landi Kotal Tehsil does not have any wastewater treatment plant (WWTP), and domestic sewage is predominantly discharged untreated into open drains, seasonal streams, and agricultural lands. This practice poses serious environmental and public health risks, contaminating both surface and groundwater resources that are vital for local communities. Based on projections, total wastewater generation in Landi Kotal is expected to increase from 5.35 MGD in 2025 to nearly 15.5 MGD by 2045, with contributions from both urban neighborhood councils (NCs) and rural village councils (VCs).

To address this challenge, a phased wastewater management strategy is proposed. In Phase I (2025–2030), a 5 MGD centralized WWTP will be established to serve Landi Kotal's urban NCs, while decentralized stabilization ponds and aerated lagoons totaling 2–3 MGD will be developed to cover rural clusters. In Phase II (2031–2040), the treatment capacity will be expanded to 10 MGD, with modular extensions integrated to include additional rural settlements. In Phase III (2041–2045), total treatment capacity will reach 15–16 MGD, ensuring full coverage of projected wastewater flows across both urban and rural areas.

The main centralized WWTP is proposed on state-owned land along the Landi Kotal–Torkham corridor, near the central valley plains, where suitable elevation, accessibility, and connection to trunk sewers provide operational efficiency. For rural settlements, decentralized satellite treatment units are recommended near Loe Shalman (north), Ghagra (east), and Bazar Zakhakhel (west), strategically located to reduce conveyance costs, enable local reuse of treated effluent, and strengthen overall service coverage.

Year	Urban NCs (MGD)	Rural VCs (MGD)	Total Jamrud Wastewater (MGD)
2025	3.05	2.3	5.35
2035	5.1	4.05	9.15
2045	8	7.45	15.45

Map 42: Proposed WATSAN Map – Tehsil Landi Kotal



6.8.3 Tehsil Bara

6.8.3.1 Sources of Water Supply

Bara Tehsil is endowed with a combination of surface water and groundwater resources, which together support domestic, agricultural, and irrigation needs.

Surface Water

Bara Tehsil is traversed by several seasonal streams, nullahs, and smaller tributaries originating from surrounding hills and flowing through the Bara Valley. These surface water sources are primarily used for irrigation of crops such as wheat, maize, and vegetables. However, their availability is highly seasonal, and dependence on rainfall limits their reliability for continuous domestic or bulk water supply.

Groundwater

Groundwater forms the main source of drinking water in Bara Tehsil, accessed through tube wells, dug wells, and hand pumps. Recharge occurs via rainfall infiltration and seepage from local streams. In the valley plains, groundwater is generally accessible and of acceptable quality, serving domestic and small-scale agricultural needs. In contrast, the surrounding hilly areas have limited aquifer recharge, restricted deep well development and caused localized water scarcity.

6.8.3.2 Quality/quantity of drinking water at source and user per WHO/local standards.

Water quality is a crucial aspect of ensuring safe and reliable drinking water for communities. It encompasses various parameters, including microbial safety, chemical composition, and physical characteristics. Microbial contamination, often from pathogens like bacteria, viruses, and protozoa, poses significant health risks and requires effective treatment and monitoring. Chemical contaminants, such as heavy metals, pesticides, and industrial pollutants, can affect water safety and require stringent regulatory measures to control. Additionally, physical characteristics like turbidity and color can impact the aesthetic quality of water and indicate potential contamination.

Following are the parameters and National Standards for Drinking Water Quality (NSDWG) adopted by Pakistan Environmental Protection Agency and WHO:

Table 96: National Standards for Drinking Water Quality (NSDWG)

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Bacterial		
All water intended for drinking (e.Coli or	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Thermotolerant Coliform bacteria)		
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Treated water in the distribution system (E.coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample in case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.
Physical		
Colour	<15 U	<15 U
Taste	Non objectionable/Accept able	Non objectionable/Accept able
Odour	Non objectionable/Accept able	Non objectionable/Accept able
Turbidity	< 5 NTU	<5 NTU
Total hardness as CaCO3	< 500 mg/l	---
TDS	< 1000	< 1000
pH	6.5 - 8.5	6.5 - 8.5
Chemical		
Essential Inorganic	mg/Litre	mg/Litre
Aluminium (Al) mg/l	<0.2	0.2
Antimony (Sb)	<0.005 (P)	0.02
Arsenic (As)	0.05 (P)	0.01
Barium (Ba)	0.7	0.7
Boron (B)	0.3	0.3
Cadmium (Cd)	0.01	0.003
Chloride (CI)	<250	250
Chromium (Cr)	<0.05	0.05
Copper (Cu)	2	2
Toxic	mg/Litre	mg/Litre

PROPERTIES /PARAMETE RS	STANDARD VALUES FOR PAKISTAN	WHO STANDARDS
Fluoride (F)*	<1.5	1.5
Lead (Pb)	<0.05	0.01
Manganese (Mn)	< 0.5	0.5
Mercury (Hg)	<0.001	0.001
Nickel (Ni)	<0.02	0.02
Nitrate (NO3)*	<50	50
Nitrite (NO2)*	<3 (P)	3
Selenium (Se)	0.01 (P)	0.01
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	--
Zinc (Zn)	5.0	3
Organic		
Pesticides mg/L		PSQCA No. 4639- 2004, Page No. 4 Table No. 3 Serial No. 20- 58 may be consulted
Phenolic compounds (as Phenols) mg/L		< 0.002
Polynuclear aromatic hydrocarbons (as PAH) g/L		0.01 (By GC/MS method)
Radioactive		
Alpha Emitters bq/L or pCi	0.1	0.1
Beta emitters	1	1

Source: National Standards for Drinking Water Quality (NSDWG), Pakistan Environmental Protection Agency

6.8.3.3 Quantity of Drinking Water at Source as Per WHO/Local Standards

The World Health Organization (WHO) recommends that the amount of water supplied for personal and domestic use should be adequate to meet an individual's needs. These encompass drinking, personal hygiene, washing, food preparation, and other household activities. WHO suggests a daily water allocation of 50 to 100 liters per person to satisfy these basic requirements.

The Public Health Engineering Department also provides guidelines for estimating the water needs when planning water supply infrastructure. This estimate is influenced by growth and directly correlates with the population size. The table below outlines the water demand based on population variations for city planning purposes.

Table 97: Per Capita Consumption of Water as per the PHED Design Criteria

Design Population	Per Capita Consumption Per Day (Inclusive of Unaccounted for Water)
Up to 5,000	10 Gallons
5,001 – 10,000	15 Gallons
10,001 – 20,000	20 Gallons
20,001 – 50,000	30 Gallons
50,001 – 100,000	40 Gallons
100,001 – 200,000	50 Gallons
200,001 – 300,000	55 Gallons
300,001 – 400,000	60 Gallons
400,001 – 500,000	65 Gallons
500,001 – 600,000	70 Gallons
600,001 – 700,000	75 Gallons
700,001 – 800,000	80 Gallons
More than 800,000	85 Gallons

The amount of water needed varies based on several factors. However, it's important to note that Pakistan is facing severe water shortages due to climate change. Therefore, water demand figures may need adjustment based on local terrain, climate conditions, and international climate regulations. For Khyber District, where the urban population of Jamrud is 71,506 respectively, the average water requirement is adjusted to 35 gallons per capita per day for urban areas. Meanwhile, the water requirement of 15 gallons per capita per day for rural areas is considered suitable to meet demand of Khyber district.

6.8.3.4 Existing coverage of the water supply/gaps in demand in Bara

This section presents the existing and projected water requirements for Bara Tehsil, derived from population projections and service level standards. A per capita demand of 35 gallons per capita per day (GPCD) has been applied to urban neighborhood councils (NCs), while 15 GPCD has been considered for rural village councils (VCs). Bara's population in 2017 was 444,403 and is projected to increase significantly, crossing 1.5 million by 2045 at an annual growth rate of 2.33 percent. This growth places urgent pressure on water resources, requiring phased interventions in supply, treatment, and distribution.

Urban clusters (NCs) in Bara require higher service levels due to commercial activity and population density. Rural settlements (VCs), which presently rely mainly on groundwater and spring sources, have lower per capita consumption but are increasingly stressed by demographic expansion and seasonal shortages. The calculated water demand provides the baseline for phased planning of water supply systems to ensure equitable and reliable coverage across Bara.

6.8.3.4.1 Urban Area Wise Existing and Proposed Water Demand of Bara

The current and future water requirements of urban Bara have been assessed using projected populations and a design demand of 35 GPCD. In 2025, the total urban demand is estimated at 2.05 MGD, increasing to 3.41 MGD by 2045. Design flows accounting for maximum day and peak hour conditions are provided on the table below.

To ensure reliable supply, design flows have been computed considering maximum and peak demand factors. These projections form the technical basis for developing new water supply infrastructure, augmenting existing sources, and introducing demand management measures.

Projected Urban Water Demand Bara (NCs):

Year	Urban Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	59,000	2.05	2.56	3.59
2030	66,000	2.29	2.86	4.01
2035	75,000	2.61	3.26	4.56
2040	84,000	2.93	3.67	5.13
2045	98,000	3.41	4.27	5.97

These projections highlight the need for phased expansion of the urban water supply system, including source development, treatment facilities, and distribution networks, to meet bara's growing domestic and commercial requirements.

6.8.3.4.2 Rural Area Wise Existing and Proposed Water Demand of Jamrud

The rural settlements of Bara, representing the majority of its population, rely on wells, hand pumps, and community-based schemes. Based on 15 GPCD and projected populations, the rural water demand is estimated at 6.45 MGD in 2025, rising sharply to 13.12 MGD in 2045.

The demand projections provide a clear framework for phased expansion of rural water supply schemes, including well-field development, piped distribution networks, and localized treatment interventions.

Year	Urban Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	387,000	6.45	8.06	11.29
2030	435,000	7.25	9.06	12.69
2035	495,000	8.25	10.31	14.44
2040	555,000	9.25	11.56	16.19
2045	655,000	13.12	16.4	22.97

The analysis underscores the urgent need for integrated rural water supply planning to ensure equitable service coverage, address seasonal shortages, and enhance resilience against groundwater stress.

6.8.3.5 Proposed Water Supply System Bara Tehsil

6.8.3.5.1 Intake Source

Groundwater has been identified as the primary source of water for Bara's future supply system. A network of production wells and tube wells is proposed in the Bara Valley plains, targeting aquifers with stable yields and acceptable water quality. Each well will be equipped with low-lift pumps to extract raw water, which will then be conveyed via rising mains to the proposed treatment plant site, located southwest of Bara Town along the Bara–Peshawar corridor. The site has been selected for its state ownership, safe elevation above seasonal flood levels, and strategic proximity to transmission corridors, ensuring efficient distribution to both urban NCs and surrounding rural VCs.

6.8.3.5.2 Raw Water Storage

Urban Areas (NCs – 35 GPCD)

For Bara's urban clusters, a dedicated raw water balancing reservoir is required to stabilize abstraction from the groundwater and ensure continuous operation of the treatment plant.

Purpose: Equalize pumping, provide limited sedimentation, and ensure 12-hour buffer storage.

Phased Capacities (based on projected demand):

Year	Urban Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	2.05	1.03	1.0 – 1.5
2035	2.61	1.31	1.0 – 1.5
2045	3.41	1.71	1.5 – 2.0

Location: Central service reservoir within Bara Town, ensuring gravity-fed supply to all urban NCs and easy maintenance access.

Rural Areas (VCs – 15 GPCD)

For rural settlements, treated water storage tanks are essential to stabilize supply to dispersed villages and minimize pumping requirements.

Purpose Store treated water to meet daily and peak demands, facilitate gravity-fed distribution, and reduce dependency on continuous pumping.

Phased Capacities (based on projected demand):

Year	Rural Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	6.45	3.23	2.0 – 4.0
2035	8.25	4.13	2.5 – 5.5

2045	13.12	6.56	5.5 – 6.0

Location: Overhead tanks at Akakhel, Shalobar, and Tirah plateau villages, supporting gravity-fed distribution and ensuring uninterrupted service for rural VC populations.

6.8.3.5.3 Water Treatment Plant (WTP)

A modular conventional Water Treatment Plant (WTP) is planned on state-owned land at the southwest edge of Bara Town, along the Bara–Peshawar corridor. The site offers secure land tenure, convenient access, and direct linkage to the main transmission mains. Its central location allows efficient supply to Bara's urban clusters while maintaining service coverage for surrounding rural settlements. The site is positioned outside flood-prone areas, ensuring long-term operational reliability.

WTP will be implemented in three phases according to projected population growth and increasing water demand

Phase I (2025–2030): 3 MGD capacity

Phase II (2031–2040): Expansion to 5 MGD

Phase III (2041–2045): Full capacity of 7 MGD

The plant will employ conventional water treatment processes, including coagulation, flocculation, sedimentation, rapid sand filtration, and chlorination for disinfection. The layout will include:

- Raw water intake with screening and grit removal,
- Chemical dosing and flash-mixing units,
- Sedimentation basins and rapid sand filters,
- Clear water pumping gallery and covered storage reservoirs,
- Chlorine contact tanks, sludge management facilities, and a water quality laboratory.

Sufficient land will be reserved for both current operations and future expansion to accommodate later phases without constraints. The design also includes redundant pumping systems, automated monitoring of turbidity and residual chlorine safe chemical handling and easy operational and maintenance access.

6.8.3.5.4 Treated Water Storage and Distribution System

The treated water storage and distribution system for Bara Tehsil is planned to ensure reliable supply across both urban and rural areas, aligned with projected population growth and water demand. For urban neighborhoods, a central service reservoir within Bara Town is proposed, with phased capacities of approximately one million gallons by 2025, 1.5 million gallons by 2035, and up to two million gallons by 2045.

For the rural settlements, smaller overhead reservoirs will be constructed at key villages such as Akakhel, Shalobar, and Tirah plateau, with capacities ranging from 0.5 million gallons in 2025 to 1.5 million gallons by 2045. These reservoirs will balance daily demand fluctuations and maintain adequate pressure in outlying areas.

Treated water will be transported from the Groundwater intake, through the treatment plant, into these storage facilities via ductile iron or HDPE rising mains of 450–600 mm diameter.

Low-lift pumps at the intake and high-lift pumps at the treatment plant will ensure continuous water transfer. Wherever feasible, gravity-fed distribution will be adopted, with booster pumping provided only for peripheral or elevated settlements. All storage and distribution infrastructure will include standby power, energy-efficient systems, and resilient designs to support long-term operational efficiency and sustainability.

6.8.3.6 Existing Situation of the Sanitation/Drainage System in Tehsil Bara

Bara Tehsil currently lacks formal sewerage networks, with domestic wastewater largely discharged into open drains, natural watercourses, and agricultural fields. Both urban and rural settlements experience a combination of katcha (earthen), pucca (lined), open, and partially covered drains, which are often insufficient to convey wastewater safely, leading to contamination of surface and groundwater.

For design purposes, wastewater generation in Bara has been estimated as 85% of average water demand, with an additional 5% allowance for non-domestic use. Peak sewage flows are considered twice the average daily sewage, while stormwater inflow is calculated as 50% of peak sewage. Infiltration losses have been accounted for as 10% of average sewage flow, reflecting local soil and drainage conditions.

The per capita sewage generation has been derived as 29.75 GPCD for urban NCs and 12.75 GPCD for rural VCs, in line with Bara's projected water consumption. The projected wastewater flows are as follows:

Table 98: Urban Area Wise Existing and Proposed Wastewater Demand Bara NCs

Year	Avg. Daily Sewage (MGD)	Non-Domestic (MGD)	Peak Sewage (MGD)	Storm Water (MGD)	Infiltration (MGD)	Total Flow (MGD)
2025	1.74	0.09	3.48	1.74	0.17	3.37
2030	1.94	0.1	3.88	1.94	0.19	4.22
2035	2.22	0.11	4.44	2.22	0.22	5.36
2040	2.61	0.13	5.22	2.61	0.26	6.74
2045	2.84	0.14	5.68	2.84	0.28	8.38

Urban wastewater flows in Bara are projected to increase from 3.37 MGD in 2025 to 8.38 MGD in 2045, highlighting the need for phased sewerage network expansion and centralized wastewater treatment facilities.

Table 99: Rural Area Wise Existing and Proposed Wastewater Demand Bara VCs

Year	Avg. Daily Sewage (MGD)	Non-Domestic (MGD)	Peak Sewage (MGD)	Storm Water (MGD)	Infiltration (MGD)	Total Flow (MGD)
2025	5.48	0.27	10.96	5.48	0.55	12.26
2030	6.11	0.31	12.22	6.11	0.61	13.55
	7.01	0.35	14.02	7.01	0.7	15.88
2035	8.14	0.41	16.28	8.14	0.81	18.5
2040	11.15	0.56	22.3	11.15	1.12	23.89
2045	5.48	0.27	10.96	5.48	0.55	12.26

Wastewater from Jamrud's rural villages is expected to increase from 2.43 MGD in 2025 to 7.50 MGD in 2045, necessitating decentralized collection and treatment systems in peripheral clusters.

Wastewater quality & Treatment Jamrud

The disposal of untreated wastewater into open drains, streams, and agricultural fields is a major cause of environmental degradation in Jamrud, contaminating both surface and groundwater resources. To address this challenge, a phased wastewater treatment strategy is proposed.

A centralized Wastewater Treatment Plant (WWTP) will be established near the Jamrud central plain, serving the urban NCs, while smaller decentralized treatment units (waste stabilization ponds or aerated lagoons) will be developed near rural clusters for VCs.

The WWTP design will follow international and national best practices, with process design based on average sewage flow and pollution loads, and hydraulic design based on peak flows. Treatment will target compliance with NEQS discharge limits (BOD < 80 mg/L, COD < 150 mg/L, TSS < 200 mg/L).

6.8.3.6.1 Available and Proposed Wastewater Treatment Plants – Bara Tehsil

Currently, Bara Tehsil has no formal wastewater treatment plant (WWTP), and domestic sewage is predominantly discharged untreated into open drains, streams, and fields, posing serious environmental and public health risks. Based on projected wastewater generation, total flows in Bara are expected to increase from 15.63 MGD in 2025 to 32.27 MGD in 2045, with contributions from both urban neighbourhood councils (NCs) and rural village councils (VCs).

To manage this growing demand, a phased wastewater treatment strategy is proposed:

Phase I (2025–2030): A 5 MGD centralized WWTP will serve the urban NCs of Bara, complemented by 2–3 MGD decentralized stabilization ponds for the rural clusters at Akakhel, Shalobar, and Tirah plateau villages.

Phase II (2031–2040): Treatment capacity will be expanded to 10 MGD, integrating additional rural settlements through modular satellite facilities.

Phase III (2041–2045): Total treatment capacity will reach 16 MGD, ensuring full coverage of all projected urban and rural wastewater flows.

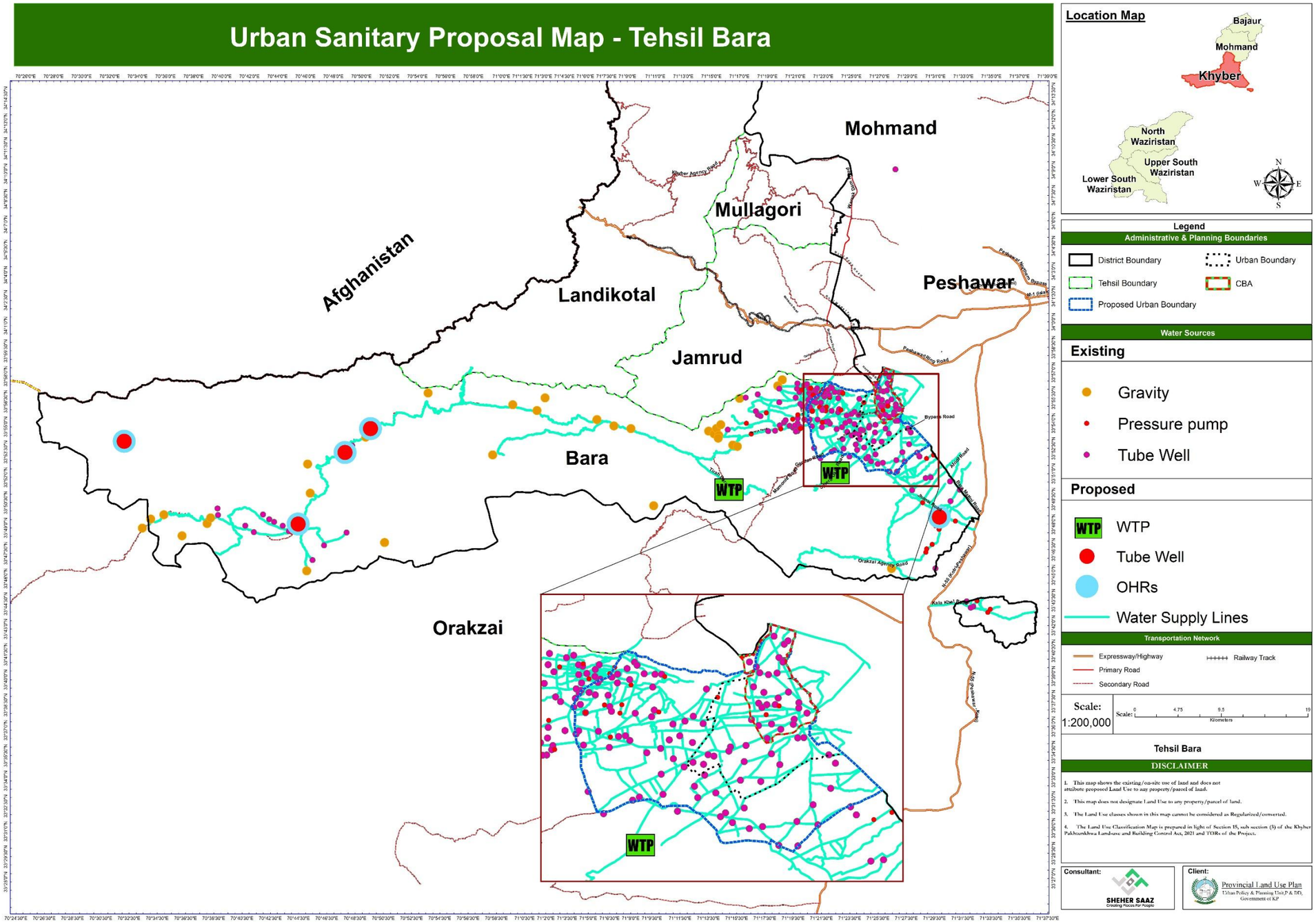
The main urban WWTP is proposed on state-owned land southwest of Bara Town, adjacent to the planned water treatment plant, allowing operational synergy, centralized management, and efficient land use. Decentralized satellite treatment facilities for rural settlements will be located strategically at Akakhel, Shalobar, and Tirah villages to minimize conveyance distances, reduce pumping costs, and enhance service coverage.

Year	Urban NCs (MGD)	Rural VCs (MGD)	Total Jamrud Wastewater (MGD)
2025	3.37	12.26	15.63
2035	5.36	15.88	21.24
2045	8.38	23.89	32.27

6.8.3.6.2 Wastewater Treatment Technologies

There are many different wastewater treatment technologies present such as Waste Stabilization Ponds, Activated Sludge Treatment, Aerated Lagoons, Trickling Filters and more. The selection of the individual treatment technology is dependent on a multitude of factors pertaining to site, terrain, economy, area, temperature and more. The treatment process is a multi-stage one starting from preliminary treatment and ending in secondary or tertiary level treatment.

Map 43: Proposed WATSAN Map – Tehsil Bara



6.8.4 Tehsil Mulla Gori

6.8.4.1 Source(s) of drinking water supply in Mulla Gori

Surface Water:

Mulla Gori Tehsil is influenced by the rugged terrain of the Tatara hills and adjoining valleys. The area is traversed by small seasonal streams and drainage channels that emerge from the surrounding hills during the monsoon and wet seasons. These ephemeral flows provide limited irrigation support for localized cultivation of wheat, maize, and vegetables. However, their high dependence on rainfall and short flow duration makes them unreliable for sustained domestic or municipal water supply.

Groundwater:

Groundwater forms the primary and most dependable source of drinking water in Mulla Gori. It is accessed through tube wells, dug wells, and hand pumps across the settled valley stretches. Recharge occurs mainly from rainfall infiltration, seepage from seasonal streams, and localized percolation in the alluvial pockets near the Kabul River. In low-lying plains and valley bottoms, groundwater is relatively accessible and of reasonable quality, supporting domestic consumption and small-scale irrigation. Conversely, the hilly and rocky upland zones face constrained recharge potential, poor aquifer development, and greater technical difficulty for deep well drilling, leading to localized water scarcity.

6.8.4.2 Existing coverage of the water supply/gaps in demand in Mulla Gori

This section outlines the present and future water requirements for Mulla Gori Tehsil, derived from population growth trends and standard service level benchmarks. Given that Mulla Gori is composed entirely of Village Councils (VCs) with dispersed rural settlements, the per capita water demand has been estimated at 15 gallons per capita per day (GPCD).

The total population of the six VCs (Mian Morcha, Gujar Dhand, Lora Miana, Paindi Lalma No. 1, Paindi Lalma No. 2, and Tatara) stood at 40,160 in 2017 and is projected to rise to approximately 123,836 by 2045, reflecting an annual growth rate of 3.83%. This rapid increase highlights the urgency of planning for an expanded and sustainable water supply system to meet future needs.

- Rural Demand (VCs): Water demand in Mulla Gori is almost entirely rural in nature, with households and small farms dependent primarily on groundwater sources accessed through tube wells, dug wells, and hand pumps. Although current per capita consumption is relatively low, population growth and the expansion of irrigated plots for wheat, maize, and vegetables are steadily increasing pressure on groundwater resources.

The Tatara Hills and associated rocky uplands limit aquifer recharge in many parts of the tehsil, creating localized scarcity. By contrast, valley bottoms and areas adjacent to the Kabul River offer relatively better groundwater availability and recharge potential.

6.8.4.3 Rural Area Wise Existing and Proposed Water Demand of Mulla gori

The rural settlements of Mulla Gori Tehsil, consisting of six Village Councils — Mian Morcha, Gujar Dhand, Lora Miana, Paindi Lalma No. 1, Paindi Lalma No. 2, and Tatara — rely primarily

on groundwater abstraction through tube wells, dug wells, and hand pumps. Seasonal flows from hill torrents provide limited supplementary water but are not dependable for sustained domestic supply.

Based on projected rural populations and a per capita water requirement of 15 gallons per capita per day (GPCD), the total water demand in Mulla Gori is estimated at 1.25 million gallons per day (MGPD) in 2025. With an average annual growth rate of 3.83%, the demand is expected to rise substantially, reaching approximately 3.87 MGPD by 2045.

These demand projections provide the foundation for phased expansion of rural water supply schemes, focusing on:

- Development of additional well fields,
- Construction of piped distribution networks, and
- Localized disinfection and treatment units to ensure safe and equitable access across all VCs.

Table 100: Projected Water Demand

Year	Urban Population	Water Demand (MGPD)	Maximum Day Demand (MGPD)	Peak Hour Demand (MGPD)
2025	52,508	0.788	0.985	1.378
2030	63,371	0.951	1.188	1.663
2035	75,076	1.126	1.408	1.971
2040	84,353	1.581	1.976	2.766
2045	99,934	1.873	2.341	3.277

6.8.4.4 Proposed groundwater supply strategy Mulla Gori Tehsil

Meeting future water requirements in Mulla Gori Tehsil up to 2045 calls for a phased and sustainable supply strategy. The design standards are based on 15 gallons per capita per day (GPCD) for rural village councils (VCs), with allowances included for maximum daily demand and peak hourly variation.

The proposed supply system will rely primarily on distributed groundwater abstraction through strategically located tube wells and boreholes. Wells will be developed in the valley plains and low-lying zones, where aquifer yields are expected to be more favorable and drilling conditions relatively easier compared to the surrounding rugged terrain.

6.8.4.4.1 Intake groundwater Works

To ensure efficient service delivery and reduce conveyance requirements, the groundwater system will be organized into two to three zonal wellfields, each catering to a cluster of settlements. Priority areas include:

1. Central Mulla Gori clusters, where population density and domestic demand are relatively higher.
2. Peripheral VCs near natural drainage lines, where shallow aquifers are accessible.

3. Remote hamlets, where decentralized boreholes may be required to avoid long transmission mains.

A detailed hydrogeological investigation will precede development, beginning with desktop analysis and field reconnaissance, followed by exploratory boreholes and extended (72-hour) pumping tests. These studies will establish sustainable yields, aquifer characteristics, and groundwater quality.

To protect against over-extraction, managed abstraction limits will be enforced for each wellfield. Where technically feasible, aquifer recharge measures (e.g., infiltration ponds, check dams along seasonal nullahs) will be integrated to enhance sustainability.

This approach ensures that groundwater remains the dependable backbone of Mulla Gori's rural water supply system, providing resilience to population growth and seasonal variability in demand.

6.8.4.4.2 Well sizing & approximate number of production wells

Because actual yields vary, Typical tube-well yields in valley aquifers here commonly range ~10–30 L/s depending on geology. For planning, use 20 L/s (≈1.728 MLD ≈ 0.456 MGD) as a mid-range design yield per production well.

Calculation method:

1 well@ 20 L/s
daily = 20 L/s × 86,400 s
= 1,728,000 L/day
= 1.728 MLD
= 0.456 MGD

Table 101: Projected Demand for Wells

Year	Total demand (MGD)	Wells required (0.456 MGD per well)
2025	6.16	14 wells
2030	7.297	17 wells
2035	8.646	19 wells
2040	12.135	27 wells
2045	14.377	32 wells

6.8.4.4.3 Water Storage

Rural Areas (VCs – 15 GPCD)

in the case of Mulla Gori's dispersed rural settlements, it is proposed to establish a series of smaller balancing storages to enhance supply reliability without requiring oversized infrastructure. These reservoirs will serve as 12-hour buffer storage, thereby reducing dependence on continuous pumping while ensuring a steady and equitable distribution of water across all Village Councils.

Phased Capacities (based on projected demand):

Table 102: Phase wise water storage capacity rural areas

Year	Urban Demand (MGD)	12-Hour Buffer (MG)	Recommended Reservoir Capacity (MG)
2025	3.4	1.7	1.7 – 2.0
2035	5.41	2.71	2.5 – 3.0
2045	10.83	5.42	5.5 – 6.0

Location: For Mulla Gori's rural clusters, intermediate elevated sites are recommended between the groundwater abstraction zones and the main settlements. Specifically, the central valley plains offer suitable sites to serve the larger clusters (Mian Morcha, Paindi Lalma No. 1 & 2, and Tatara), while elevated terrain along the peripheral ridges can be utilized for smaller settlements such as Gujar Dhand and Lora Miana.

These locations provide natural elevation advantages, enabling partial gravity-fed distribution and minimizing pumping costs. At the same time, the siting of storages close to demand centers ensures localized resilience during peak demand and enhances supply reliability across dispersed rural households.

6.8.4.5 Existing situation of the sanitation/drainage system in Tehsil Mulla Gori

In Mulla Gori, wastewater generation has been estimated at approximately 80–85% of the average water demand for both urbanizing clusters and dispersed rural settlements, with an additional 5% allowance incorporated for non-domestic usage. Considering the semi-rural character of the area and limited central sewerage infrastructure, the projected wastewater load is relatively moderate, with per capita sewage generation estimated at around 28–30 GPCD for clustered settlements and 12–14 GPCD for dispersed rural villages. Given the absence of a comprehensive sewerage network and the scattered settlement pattern, decentralized wastewater management is recommended. Household- and community-level septic tanks combined with soakage pits are proposed as the most feasible and sustainable solution, ensuring localized treatment and safe disposal of effluents into the subsurface while reducing risks of groundwater contamination. This approach minimizes infrastructure costs, enhances adaptability to population growth, and provides an immediate, practical sanitation response suited to Mulla Gori's real-world conditions:

Rural Area Wise Existing and Proposed Wastewater Demand Mulla gori VCs

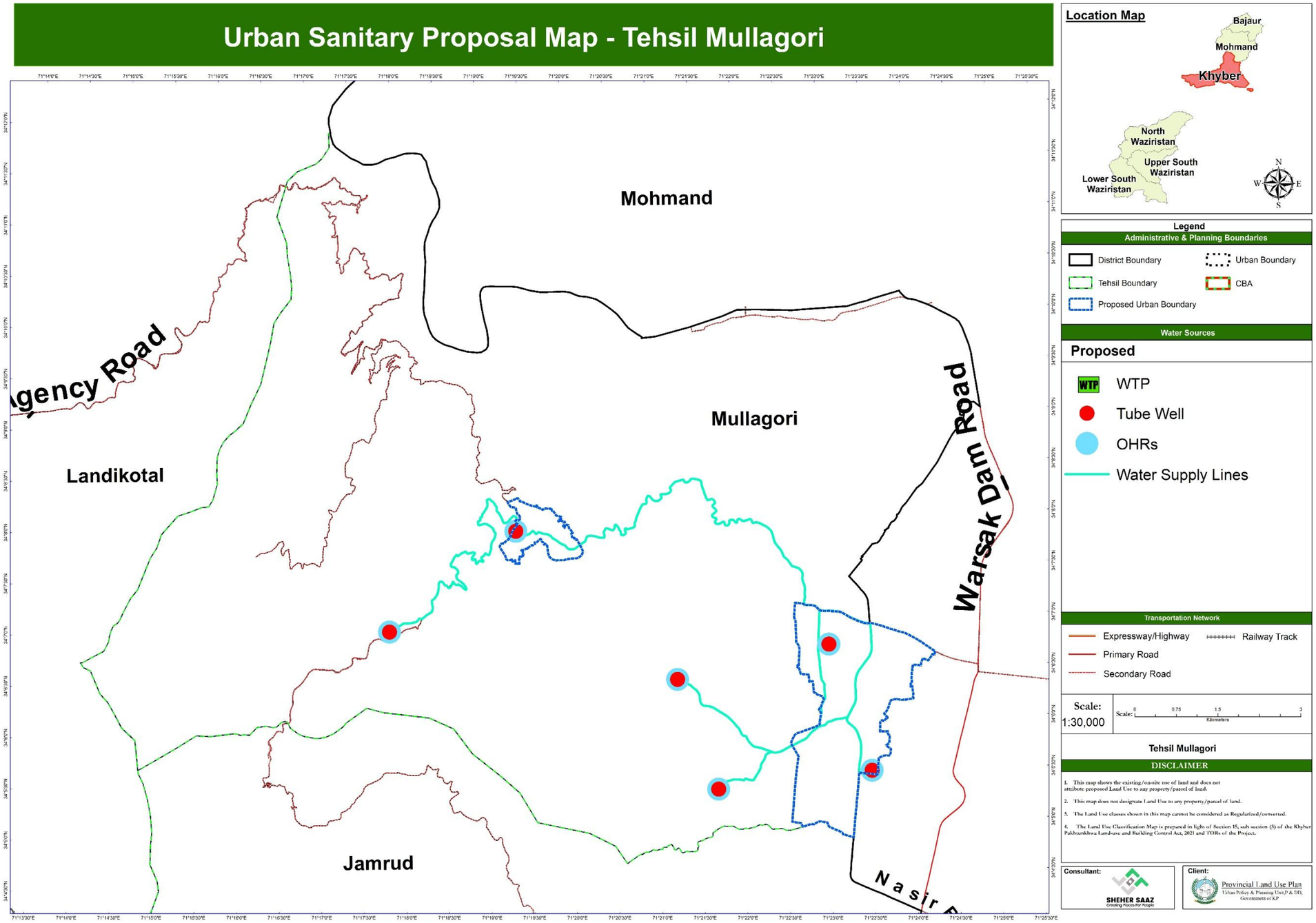
Unit Type	Population Served	Septic Tank Capacity (Liters)	Septic Tank Dimensions (L × W × D) m	Soakage Pit Capacity (Liters/day)	Soakage Pit Dimensions (Dia. × Depth) m	Remarks
Household	5–7 persons	3,000–4,000 L	2.2 × 1.2 ×1.7	800–1,000 L/day	1.2 × 2.5	Suitable for individual houses
Cluster (5–7 houses)	30–40 persons	15,000–20,000 L	5.0 × 2.0 × 2.0	5,000–6,000 L/day	2.5 × 3.0	Shared system, reduces cost
Communal (10–15 houses)	60–100 persons	30,000–40,000 L	7.0 × 3.0 × 2.5	10,000–12,000 L/day	4.0 × 3.5	Recommended for dense clusters

Wastewater quality & Treatment Mulla Gori

In Mulla Gori, where settlements are dispersed and dependent on groundwater, wastewater management will rely on onsite sanitation systems rather than large, centralized infrastructure. Each household will be equipped with a properly designed septic tank coupled with a soakage pit to allow for safe treatment and percolation of effluent. Based on rural household size (average 8 persons/household) and sewage generation (approximately 12–15 gallons per capita per day), septic tanks will be sized to provide a minimum 2–3 days retention time, while soakage pits will be designed for adequate infiltration according to soil permeability. For denser clusters of houses in Village Councils, shared septic tanks with larger soakage pits will be promoted as cost-effective solutions. Periodic desludging and safe

disposal of septage will be integrated into the municipal service framework to maintain long-term functionality and groundwater protection.

Map 44: Proposed WATSAN Map – Tehsil Mulla gori



6.9 SOLID WASTE MANAGEMENT

6.9.1 Objectives

- Implement a comprehensive and sustainable approach to improve waste management, including the collection, storage, transfer, disposal, and treatment of all types of waste, including hazardous waste.
- Provide new, improved, economical, efficient, and cost-effective solutions for SWM to ensure minimal environmental and social impacts, considering the socio-cultural norms.
- Create the Khyber District as Model District with minimum waste generation, plotting the state-of-the-art 3R system, waste-to-energy, zero plastic, Material recovery through reuse, repurpose, and composting units.
- To build capacity for SWM staff, ensuring effective operations.

6.9.2 Design Methodology

To ensure the successful implementation of the proposed Solid Waste Management system in Khyber District, the following methodology will be adopted for short-term, medium, and long-term period:

- **Waste Collection and Segregation:** Implement a structured collection system, including door-to-door waste collection and designated waste bins or hand carts for mixed municipal solid waste, including recyclable, organic, and non-recyclable waste. Encourage community participation in source segregation to facilitate recycling and composting at later stages of solid waste management system development, as determined by the service provider's willingness.
- **Infrastructure Development:** Establish controlled landfill sites with leachate treatment systems, methane gas recovery, and proper waste compaction techniques. Develop transfer stations to streamline waste transportation from rural areas to main disposal sites.
- **Capacity Building and Training:** Conduct specialized training programs for SWM personnel on modern waste collection, recycling techniques, and landfill management. Strengthening the institutional framework by integrating IT-based monitoring systems to improve operational efficiency.
- **Machinery and Equipment Upgrade:** Procure and maintain essential waste management machinery, including compactors, dump trucks, mechanical sweepers, and recycling equipment. Establish maintenance workshops to ensure the longevity and efficiency of these assets.
- **Public Awareness Campaigns:** Launch community engagement programs to educate residents on the benefits of the 3R approach. Collaborate with local schools, businesses, and organizations to promote waste reduction, responsible waste disposal, and sustainable recycling practices.

- **Regulatory and Institutional Strengthening:** Develop and enforce local regulations to promote compliance with waste management guidelines. Strengthening coordination between municipal authorities, environmental agencies, and private waste management firms to enhance service delivery.

6.9.2.1 Identification of Solid Waste Disposal Sites

Solid waste Disposal			
sr.	**Type**	**No. of respondents**	**%**
1	Collection from house by TMA	5	0.4%
2	Local Dumping site	156	11.3%
3	Disposal in municipal container	9	0.7%
4	On Street	151	10.9%
5	Fields/Open Space	984	71.1%
6	Open drains	5	0.4%
7	Other	5	0.4%
8	Missing	73	5.3%
9	**Total**	**1383**	**100.00%**

6.9.3 Existing Condition of Solid Waste Management in the Settlement

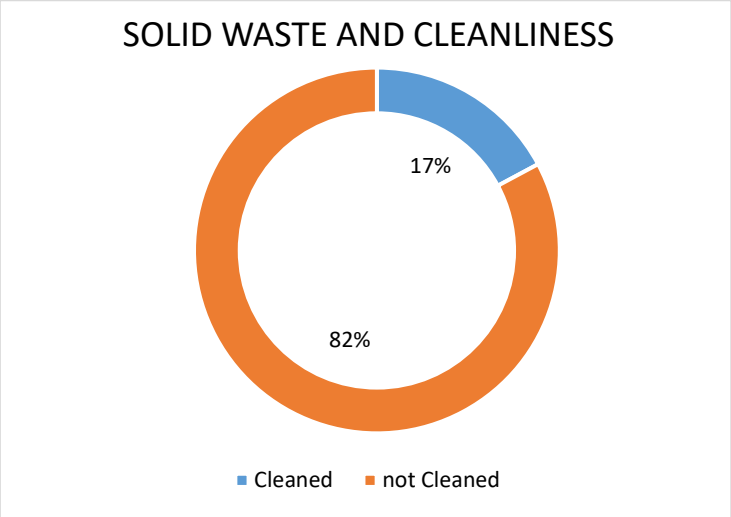
The solid waste management situation in District Khyber mirrors the challenges prevalent in many developing areas, marked by substantial issues in managing and processing waste. Solid waste in Khyber encompasses various types, including residential, commercial, industrial, and agricultural waste, with major contributors being urban centers such as Khyber and surrounding towns. Currently, waste management in these areas lacks advanced recycling techniques found in more developed regions. Instead, waste disposal practices predominantly involve dumping in open spaces, leading to severe environmental repercussions such as soil degradation and potential contamination of groundwater resources.

The condition of waste disposal sites in Khyber reveals noticeable environmental impacts. Soil analysis indicates significant alterations in texture and composition at waste disposal sites compared to control areas. The waste in Khyber contains high levels of organic matter, particularly evident in urban centers like Khyber and nearby areas. Plastic waste is consistently high across all monitored sites. Other components such as paper, glass, clothes, and metals are present in varying concentrations, with paper waste being notably lower in some locations. The presence of heavy metals in the waste further exacerbates environmental concerns, affecting soil chemistry and potentially impairing plant growth. Addressing these issues is crucial for improving waste management practices in Khyber and mitigating the associated environmental impacts.

The survey findings highlight significant gaps in SWM and overall cleanliness across the Khyber region. As illustrated in **Figure below,** only 17 percent of the assessed areas were reported as “cleaned,” while an overwhelming 82 percent remained “not cleaned.” This imbalance

underscores systemic challenges in municipal solid waste collection, disposal, and monitoring, with implications for public health, environmental sustainability, and community well-being. The data points to the urgent need for targeted investments in SWM infrastructure, strengthened capacity of municipal authorities, and the promotion of community-led cleanliness initiatives. Addressing these service delivery gaps will not only improve environmental outcomes but also directly enhance the health, productivity, and resilience of urban and peri-urban populations in the Khyber region.

Figure 21: Community response for the Solid Waste and Cleanliness situation in Khyber District



The data reveals a heavy reliance on informal and environmentally harmful disposal practices. A striking 71.1 percent of solid waste is discarded in open fields and spaces, highlighting both the absence of effective municipal collection systems and weak enforcement of waste management regulations. Smaller yet notable shares are disposed of on streets (10.9 percent) and at local dumping sites (11.3 percent), further contributing to environmental degradation, blocked drainage systems, and heightened risks of vector-borne diseases. Formal waste management mechanisms appear almost non-existent: only 0.4 percent of households benefit from collection services by the Tehsil Municipal Administration (TMA), and 0.7 percent utilize municipal containers. Disposal into open drains and “other” means account for marginal proportions (0.4 percent each), yet remain concerning due to their direct implications for water pollution and public health.

This pattern underscores an urgent need for systemic reforms. Scaling up municipal solid waste services, introducing community-level segregation and recycling initiatives, and establishing sanitary landfills are critical interventions. Without these measures, the current reliance on open dumping and street disposal will continue to erode environmental quality, increase health risks, and undermine local development objectives in the Khyber region.

Urban areas have limited waste collection, often leading to uncontrolled dumping, while rural regions lack any structured disposal system, exacerbating environmental, and health risks. The

absence of designated landfill sites and inefficient machinery further hinders effective waste management. Waste generation is projected to increase significantly (Figure 2-3).

Figure 22: Solid Waste Management practices in Khyber district

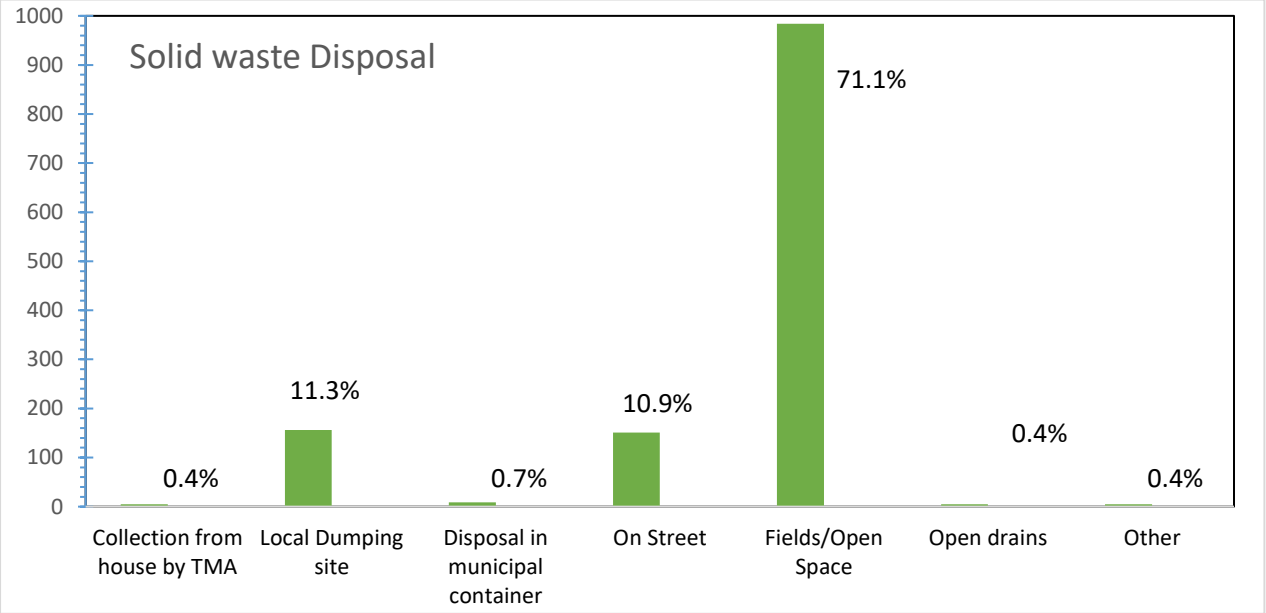


Figure 23: Existing Solid Waste Management System in Khyber District indicating open dumping along drains and roads.



6.9.3.1 Current and Projected Solid Waste Generation in the settlement/ district

In Pakistan, solid waste generation ranges between 0.283 to 0.612 kg/capita/day, with an estimated annual growth rate of 2.4%. Using an average waste generation of 0.45 kg/capita/day, the current and future solid waste generation for District Khyber has been projected based on updated population estimates.

As of 2023, the district produces approximately 516 tons of solid waste per day, which equals about 188,274 tons per year. With a projected population of 1.25 million in 2025, annual solid waste generation is expected to increase to 205,565 tons, and further rise to around 320,438 tons by 2045, corresponding to a population of approximately 1.95 million.

Year	Population	Per Capita Waste (kg/day)	Total Waste (tons/day)	Total Waste (tons/year)
2023	1146267	0.45	516	188274
2025	1250877	0.45	563	205565
2030	1406501	0.45	633	231084
2035	1574056	0.45	708	258504
2040	1755159	0.45	790	288362
2045	1951642	0.45	878	320438

6.9.4 Strategic Approach for Solid Waste Management

The proposed SWMP is designed to provide broad guidelines to suggest measures to manage the growing solid waste in the Khyber District. This has been determined after assessing the potential and constraints in the existing SWM of the tehsils in Khyber. The proposed action plans aim to identify gaps in existing municipal services and address the needs for incremental population growth. Additionally, the plans include provisions for capacity building to ensure effective operation and maintenance of municipal services.

One of the key principles underlying the waste management hierarchy is to ensure that waste is dealt with as high up the hierarchy as possible[18]. Since all waste management options have some impact on the environment, the only way to avoid impact is not to produce waste in the first place, and waste prevention/avoidance reduction is therefore at the top of the hierarchy. Minimization of waste through re-use and recycling, followed by recovery techniques (treatment, composting, and generating energy from waste), follows, while disposal to landfill (the least favorable option) is at the bottom of the hierarchy.

6.9.5 Existing Resources

In the Khyber district, the existing resources for solid waste management are notably insufficient to effectively address the waste management needs of the local population. The growing demand for waste collection, transportation, and disposal services, coupled with the

[18] World Bank. (2018). *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Washington, DC: World Bank.

expanding urban and rural areas, necessitates a substantial increase in resources to meet these challenges.

To ensure a cleaner and more sustainable environment in the Khyber district, it is imperative to urgently allocate additional resources to improve and specifically allocate the existing solid waste management infrastructure for Khyber District. This includes investing in more waste containers, vehicles, recycling facilities, and critically, enhancing the workforce to manage waste efficiently. The table below represents the existing resources of Khyber district.

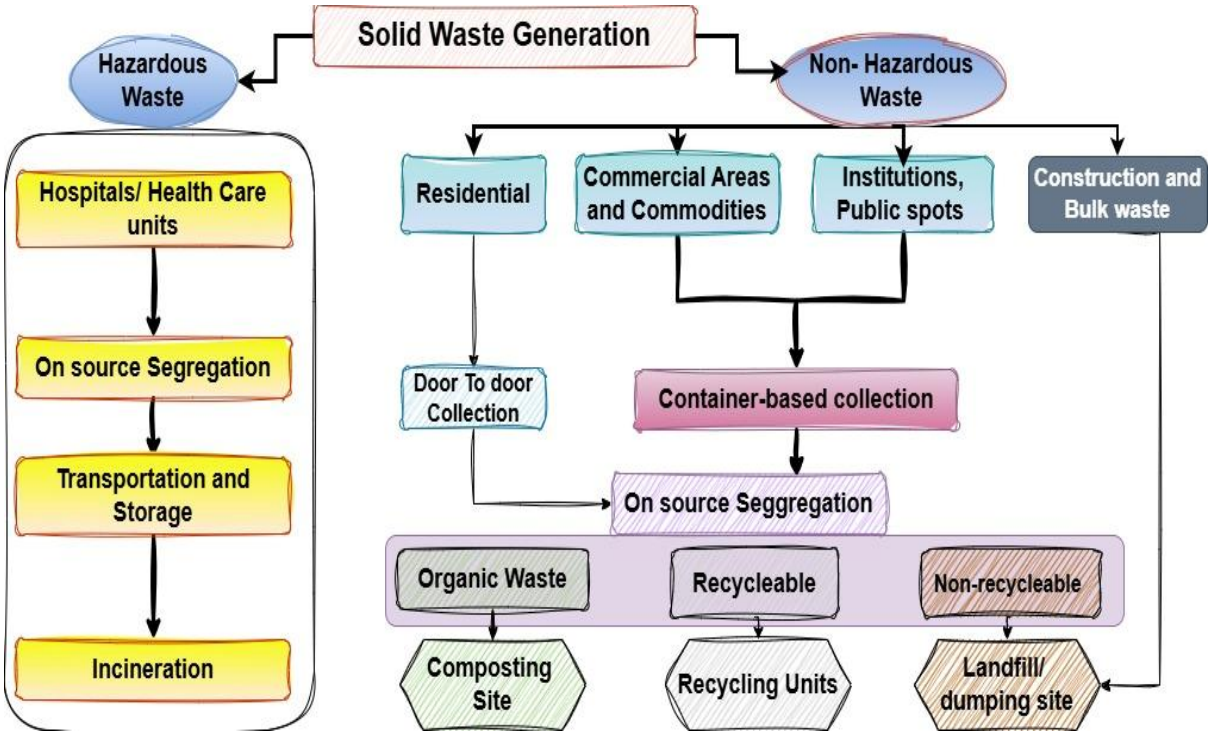
6.9.6 Proposed Solid Waste Management Plan

A comprehensive Solid Waste Management (SWM) system is essential for addressing waste management challenges in Khyber urban areas. The plan, designed from 2025 to 2045, aims to transform current waste management practices into a more efficient and advanced system. This long-term strategy focuses on waste collection from households, commercial establishments, institutions, offices, public spaces, and parks, ensuring proper storage in containers and environmentally safe transportation to controlled dumpsites, unlike the existing practice of open dumping.

The proposed SWM system for Karak urban areas will consist of four major components:

- Primary & Secondary collection system
- Waste Transportation
- Final Disposal

Figure 24: Proposed Waste Management Model for Khyber



6.9.7 Phase-Wise Development Proposal

This SWMP focuses on all the Khyber District including three Tehsils. The solid waste generated from different sources, including domestic level (households), Commercial waste, institutional waste (offices, educational institutes), industrial waste, hospital waste, and Construction and Demolition (C&D).

Figure 25: Key Challenges in establishing an Effective Solid Waste Management in Khyber District



1. ***Strategic plan for Hazardous Waste***

A strategic plan for hazardous waste management should prioritize the development of a safe, regulated, and traceable system that minimizes risks to public health and the environment. Core actions include establishing a formal collection and segregation mechanism for hospital, industrial, and commercial hazardous waste; deploying sealed, clearly labeled containers and dedicated transport vehicles; and ensuring strict compliance with handling, storage, and spill-prevention protocols. A centralized hazardous waste facility equipped with an incinerator, autoclave, and secure storage area should be developed to enable proper treatment and final disposal. Capacity building for health workers, industry operators, and municipal staff is essential to ensure adherence to safety standards, while enforcement of regulatory

frameworks, licensing requirements, and mandatory record-keeping will strengthen accountability. Regular monitoring and environmental audits should be instituted to maintain compliance and safeguard water, soil, and air quality in accordance with international best practices.

2. Strategic plan for Non-Hazardous Waste

Non-hazardous waste *is waste that does not pose a direct threat to human health or the environment and does not meet the criteria for classification as hazardous waste under the Resource Conservation and Recovery Act (RCRA). It includes everyday waste generated from households, commercial establishments, and certain industrial activities, such as food waste, paper, plastics, and construction debris*[19]*.*

Non-hazardous waste is essentially the waste that causes no harm to human health or the environment. However, while these wastes generally don't cause immediate harm, they're still regulated, just not as strict as hazardous wastes are.

Waste Minimization

For the minimization of Solid waste generation at the village level, the community shall be highly encouraged to implement the 4Rs (Refuse, Reduce, Reuse, Recycle) plus composting and community education. Before purchasing any material, all alternatives for the least solid waste should be explored (for instance, plastic versus paper packaging).

Collection and Segregation

Solid waste management starts with meticulous segregation at the point of generation. Each household, hotel, clinic, and commercial outlet must be provided with color-coded bins for segregating organic waste and recyclables (plastics, metals, glass, and paper). Non-hazardous SW is produced in high quantities by all villages.

- ***Short Term Actions (2025-2030)***

- **Eliminate Unregulated Disposal:** Cease all open-dump and open-burn practices by deploying rapid-action "no-dump" barriers and fines for violators.
- **Activate Community Bin Network:** installation of community bins in hot spot areas, which are easily accessible.
- **Door-to-Door Waste Collection:** Establish the door-to-door waste collection once a week with source separation into organics vs. dry recyclables.

- ***Medium Term Actions (2030-2040)***

- **Smart Bin Infrastructure:** Install standardized, color-coded 240 L bins at pre-surveyed village points.

[19] United States Environmental Protection Agency (USEPA). (n.d.). *Non-Hazardous Waste*. Retrieved from https://www.epa.gov/rcra/non-hazardous-waste

- **Weekly Dynamic Collection:** Schedule route-optimized trike rounds on a once-weekly basis. Utilize a GPS for real-time monitoring of the SWM fleet and predictive load models to adjust pickup windows per village demand.
- **Zero Waste Collection Charges:** strict implementation of waste charges for open dumping, burning, and improper segregation of solid waste.
- **Mandate two-stream sorting at curbside:**
    - **Organics** (food scraps, yard trimmings) → compost chain
    - **Dry Recyclables** (plastics, paper, metal, glass) → MRF pipeline

    - ***Long-Term Actions (2040-2045)***

- **Dual-Cycle Door-to-Door Service: U**pgrade to a twice-weekly door-to-door collection. Deploy electric-assist trikes equipped with modular compartments for organics and recyclables.
- **Waste to Green Credits:** incentivize the community for low residual waste, redeemable for utility discounts or agricultural inputs-recycling, and reducing the waste through green credits. For instance, home-based composting of organic materials and kitchen waste.

Figure 26: Types of Containers for Segregation of Non-hazardous Waste



6.9.8 Waste Transportation

The waste transportation in Khyber District requires appropriate facilities including equipment, human capital and vehicles. It shall be the responsibility of TMA to provide an effective system of transportation of solid waste, hazardous waste and recyclables from industrial storage sites to the ex-situ treatment. It shall further be part of SWMP to develop appropriate contracts with waste collectors to collect waste from residential, commercial, hospital, and tourism spots premises as per the schedule.

The door-to-door waste collection on weekly bases, and from the community site to the final disposal site is planned, followed by the Transportation of waste from community bins to the treatment/ disposal site with appropriate source segregation.

- Identification of hotspots for excessive waste generation and setting the frequency accordingly.
- The transportation of solid wastes (or materials which have been separated for ex-situ recycling) shall be conducted in a safe, efficient manner, strictly obeying all applicable traffic and other laws.
- The transportation vehicle operator shall be responsible for immediately cleaning up all spillage caused by his operations, for protecting private and public property from damage resulting from these operations, and for creating no undue disturbance of the peace in residential areas in and through which it operates.
- All vehicles used for the collection and transportation of solid waste (or materials which have been separated for ex-situ recycling) shall be enclosed, or adequate provisions shall be made for suitable cover, so that while in transit, there can be no spillage.
- Vehicles should be maintained and serviced according to manufacturers' recommendations and receive periodic vehicle safety checks, including, but not limited to, inspection of brakes, windshield wipers, taillights, backup lights, audible reverse warning devices, tires, and hydraulic systems. Any irregularities should be repaired before the vehicle is used. ***Vehicles should also be cleaned thoroughly at least once a week.***
- The record for this must be maintained.
- The waste is sometimes compacted at transfer stations to reduce the number of trips to disposal sites.

1. Transportation Frequency

- Non-hazardous SW (or materials which have been separated for recycling) shall be transported with sufficient frequency to inhibit the propagation or attraction of vectors and the creation of nuisances.
- Solid wastes, which contain food wastes, shall be collected at a minimum of once during each week, while bulky wastes shall be collected at a minimum of once every 3 months.
- The minimum collection frequency consistent with public health and safety should be adopted to minimize collection costs and fuel consumption. In establishing collection frequencies, generation rates, waste composition, and storage capacity should be taken into consideration.
- When solid wastes are separated at the point of storage into various categories for the purpose of resource recovery, a collection frequency should be designated for each waste category.
- No scavenging or unauthorized collection in designated segregation containers or areas shall be allowed.

- **Labelling**

All non-hazardous waste shall be segregated from other types of hazardous waste at each village's community bins sites. At all facilities, the following types of containers, with color coding for easy identification, shall be kept collecting and segregating common wastes.

- **Community bins, Temporary Storage, and Handling**

- All non-hazardous solid wastes (or materials which have been separated for the purpose of recycling) shall be stored in such a manner that they do not constitute a fire, health, or safety hazard or provide food or home for vectors and shall be contained or bundled so as not to result in spillage.
- All non-hazardous solid waste containing food waste shall be securely stored in covered or closed containers that are nonabsorbent, leak-proof, durable, easily cleanable (if reusable), and designed for safe handling.
- Storage of bulky wastes shall include, but is not limited to, removing all doors from large household appliances and covering the item(s) to reduce the problems of an attractive nuisance, and the accumulation of solid waste and water in and around the bulky items.
- Reusable waste containers that are emptied manually shall not exceed 75 pounds (34.05 kg) when filled and shall be capable of being serviced without the collector coming into physical contact with the solid waste.
- For the temporary storage of non-hazardous waste on community waste sites, before, appropriate fixed storage bins must be used.
- The storage and disposal sites should be stored in different zones and blocks and should not generate secondary dust.

➢ ***Location and Design of Storage containers***

The location of temporary storage containers should be in areas that are easily accessible by collection vehicles, as well as within an approachable distance for intended users. Moreover, this location must not be in a location that may cause a public nuisance.

It is the best practice to design waste collection containers according to the waste type, volume, and ease of use. The containers must be selected to minimize the direct contact of waste management personnel. In case of organic waste and hazardous waste, appropriate sanitation measures must be maintained. Containers shall be of adequate size and in sufficient numbers to contain all food wastes, rubbish, and ashes that a residence or other establishment generates in the period between collections. Containers shall be maintained in a clean condition so that they do not constitute a nuisance, and to retard the harborage, feeding, and breeding of vectors. When serviced, storage containers should be emptied completely of all solid waste. The Waste collection fleets may need to collect waste (transport to permanent disposal/ treatment) more frequently and quickly reach capacity. The temporary storage sites must be planned in such a way that climatic impacts may not affect the composition or overall characteristics of solid waste. For instance, the rain and stormwater.

2. Non-Hazardous Solid Waste Handling Operational Guidelines

i. All solid waste collection personnel should receive instructions and training in safe container and waste handling techniques, and in the proper operation of collection equipment.
ii. Personal protective equipment (PPEs) such as gloves, safety glasses, respirators, and footwear should be used by collection employees, as appropriate.
iii. Scavenging should be prohibited at all times to avoid injury and to prevent interference with collection operations.
iv. When conducting carryout collection, a leakproof and puncture-proof carrying container should be used to minimize the potential for physical contact between the collector and the solid waste or the liquids that may derive from it.

3. Transportation of Non-Hazardous Waste

- It shall be the part of TMA to provide an effective system of transportation of solid waste, hazardous waste, and recyclables from the industrial storage site to the ex-situ treatment. It shall further be part of the SWMP to develop appropriate contracts with waste collectors to collect waste from industrial premises as per the schedule.
- The transportation of solid wastes (or materials which have been separated for the purpose of ex-situ recycling) shall be conducted in a safe, efficient manner, strictly obeying all applicable traffic and other laws.
- The transportation vehicle operator shall be responsible for immediately cleaning up all spillage caused by his operations, for protecting private and public property from damage resulting from his operations, and for creating no undue disturbance of the peace and quiet in residential areas in and through which he operates.
- All vehicles used for the collection and transportation of solid waste (or materials which have been separated for the purpose of ex-situ recycling) shall be enclosed or adequate provisions shall be made for suitable cover, so that while in transit, there can be no spillage.
- Transportation vehicles should be maintained and serviced according to manufacturers' recommendations and receive periodic vehicle safety checks, including, but not limited to, inspection of brakes, windshield wipers, taillights, backup lights, audible reverse warning devices, tires, and hydraulic systems. Any irregularities should be repaired before the vehicle is used. ***Vehicles should also be cleaned thoroughly at least once a week.***
- The record for this must be maintained.
- The waste is sometimes compacted at transfer stations to reduce the number of trips to disposal sites.

Transportation Frequency

Non-hazardous Solid wastes (or materials which have been separated for the purpose of recycling) shall be collected with frequency sufficient to inhibit the propagation or attraction of vectors and the creation of nuisances. Solid wastes, which contain food wastes, shall be collected at a minimum of once during each week, while bulky wastes shall be collected at a minimum of once every 3 months. The minimum collection frequency consistent with public health and safety should be adopted to minimize collection costs and fuel consumption. In establishing collection frequencies, generation rates, waste composition, and storage capacity should be taken into consideration.

4. ***Guidelines specific to the operational collection and transportation of Industrial Non-hazardous Solid Waste***

- Solid waste collection systems should be operated in a manner designed to minimize fuel consumption, including, but not limited to, the following procedures.
- Transportation vehicle routes should be designed to minimize driving distances and delays.
- Transportation vehicles should receive regular tune-ups, tires should be maintained at recommended pressures, and compaction equipment should be serviced regularly to achieve the most efficient compaction.
- Compactor trucks should be used to reduce the number of trips to the disposal site.
- When the distance or travel time from collection routes to disposal sites is great, transfer stations should be used when cost-effective.
- **Record Keeping**

The local TMA should keep all the records for SW generated in terms of quantities, characterization of waste, responsibilities in waste collection, segregation, transportation, and final disposal. The record for hazardous waste collection and protocols should also be maintained. The periodic training of staff and monitoring shall be maintained and updated. In addition, the record for any emergency or incidents within the premises of Khyber Tehsils due to solid waste or hazardous material contact should be maintained too.

5. ***Waste Treatment and Disposal***

- **Reuse/ Repurpose**

In-situ reuse involves the reuse of raw materials, such as cutting scraps, as input to the same process from which they came, or using them in other processes in the facility (repurposing). This reduces the need for treatment or disposal and conserves energy and resources. The purpose of reuse/ repurpose involves the in-situ reuse of materials. This reduces the need for transportation, treatment, or disposal and conserves resources and energy.

- **Recycling**

Recycling is a series of activities that includes collecting used, reused, or unused items that would otherwise be considered waste; sorting and processing the recyclable products into

raw materials; and remanufacturing the recycled raw materials into new products. Atleast one recycling unit in each tehsil must be operational to reduce the plastic waste. The community must be encouraged to purchase recycled items instead of virgin plastic.

- **Material Recovery Units**

The Material Recovery of the constitutes from the waste stream ensures that the waste is appropriately segregated and no further component can be utilized for the same or any other purpose within industry.

The in-situ waste management process includes collection, categorization and segregation, quantification, and storage, while the ex-situ process includes disposal, recycling, composting, landfill and incineration. All these processes are explained in the sections below. The selection of process and its implementation criteria is highly based on the type of waste.

6. Non-Hazardous Solid Waste Treatment

i. Ex-situ Solid Waste Treatments

ii. Burial Pits

Immediate and short term SWM

Only segregated food waste shall be buried in burial pits. Buried waste should be covered with a thick layer of soil as 'daily cover' to reduce the environmental problems, such as odor from decaying/ degrading waste, spreading of waste into other areas due to wind, vermin and disease vectors, flies, mosquitoes, etc. These pits are intended only for truly non-recoverable, non-hazardous residuals (e.g. ash, small non-recyclables, unsegregated bulk inserts) where no other treatment is possible. Site Selection Criteria is suggested as under.

- Minimum 100 m buffer from water sources (springs, streams).
- Stable ground with ≤15% slope; well-drained.
- Accessible within 200 m of the community bin hub, ≥50 m from residences.
- Prefer low-permeability soils; avoid shallow rock/gravel aquifers.

Appropriate closure protocols shall be followed, including Excavate to specified depth, final inspection, and post filling treatment.

iii. Incineration

To safely dispose of infectious medical waste from the operational hospital in Khyber District using a controlled, low-emission incinerator system that prevents open burning, toxic emissions, and groundwater contamination. The incinerator will be operationalized as per the guidelines of the Pakistan Hospital Waste Management Rules 200520.

It is recommended to install a dual-chamber design for complete combustion and control of atmospheric pollution. The wet scrubbers or dry filter system will ensure air quality. The ash

[20] Pakistan Hospital Waste Management Rules (2005).

removal tray will be installed for safe handling of the residue. As per the WHO guidelines21 the chimney height will be a minimum of 10 meters. Incinerator will also be used for disposal of waste, but before burning the trash, plastics, metal, glass, and any other items that are not to be burned should be segregated first. Ash from the incinerator shall be buried in the lined landfill, as it may contain heavy metals.

7. Evaporation *Ponds*

The evaporation ponds are used to dispose of produced water at some facilities by evaporation. All evaporation ponds should be lined.

8. Ex-Situ (Off-Site Treatment)

The non-hazardous solid waste, which cannot be treated or reused within the industrial premises, requires ex-situ treatment. The selection of the treatment methods is based on the physical and chemical characteristics of the waste.

- The industries shall ensure that waste is appropriately segregated within the industrial premises and appropriate treatment/ disposal techniques are carried out. For this purpose, the industries will make appropriate arrangements, such as contracts and agreements, for effective transportation and treatment/ disposal of waste.
- The non-hazardous materials that can be used in the processing of any industry as raw material (input) can be sold to industries that can generate revenue and economic benefit.
- The Waste Managers shall also ensure the timely renewal of the contracts.
- For the appropriate treatment/ disposal of solid waste, the following practices can be selected based on their composition.

9. *Composting*

Compost is the stable end product derived from the biological degradation of organic material, which can vary from dead leaves and roots to kitchen waste and vegetable remains. Finished compost looks like soil– dark brown and crumbly22. The majority of the solid waste generated at the village level is composed of organic material, there for the composting can be an effective way to reduce waste amount as nature nature-based solution, as well as have an economic impact.

10. Landfill (Hazardous Waste *Management*)

A landfill means a waste disposal site for the deposit of waste onto or into land (underground), including; internal waste disposal sites (i.e. landfill where a producer of waste is carrying out

[21] WHO (2014). *Safe Management of Wastes from Health-care Activities*.

[22] UN. ESCAP (2012). Operational Manual on Composting for an Integrated Resource Recovery Center (IRRC).

its own waste disposal at the place of production), and a permanent site (i.e. more than one year) which is used for temporary storage of waste, but it excludes23;

This guideline covers site-selection criteria, landfill cell design, liner and cover systems, stormwater management, leachate collection/treatment, gas control, operational protocols, monitoring, and closure/reclamation.

11. Waste *Streams* Accepted

Waste streams accepted includes Non-Recoverable Inerts & Plastics (e.g., broken ceramics, contaminated plastics, shredded textiles), Residual Ash (e.g., cooled incinerator ash from a hospital), Non-hazardous Bulky Items (e.g., broken furniture not suitable for reuse), while the Excluded Wastes, Hazardous (chemicals, batteries, e-waste) → route to incinerator or burial pits, Untreated Medical Waste → must be pre-treated/incinerated, and Liquid Wastes → not accepted (use separate wastewater treatment).

12. Site *Selection* Criteria

The site for landfill will be selected based on Hydrogeological Considerations (including; Minimum 100 m horizontal buffer from any surface water bodies (streams, springs) and 300 m from community water intakes), Underlain by a low-permeability soil layer (clay loam or silty clay) of at least 0.5 m thickness. Avoid sites with shallow bedrock (<1.0 m) or coarse gravel aquifers, Topography & Accessibility (Gentle slope (5 – 15 %) to facilitate gravity drainage of surface run-on/out without excessive erosion), Accessible by trikes or small trucks year-round (consider snow and monsoon conditions). Road grade ≤10 % where possible, Land Use & Buffer Zones (At least 300 m buffer from residences, schools, and places of worship to mitigate odor and vector nuisance), At least 50 m from cultivated lands to minimize crop-water contamination risks, Climate & Drainage (Avoid floodplains or areas prone to landslides during monsoon), Ensure natural drainage away from community; design perimeter berms if necessary to divert stormwater, Land Tenure & Permits (Verify land ownership; obtain written consent from local councils), and Secure a No Objection Certificate (NOC) from the Provincial Environmental Protection Agency (EPA).

13. Daily *Environmental* Inspection

To send waste off-site, TMAs must make appropriate arrangements. The following actions are recommended.

All waste collection, transportation, and disposal activities must be tracked and carried out by designated staff members,

[23] Council Directive, European Communities (1999). Official Journal of European Communities/31/EC

The compliance of the environmental waste management plan must be strictly followed for the appropriate segregation, material recovery, hazardous waste segregation, and final disposal.

6.9.9 Capacity Building, Awareness, and Advocacy of the Local Community

Strengthening the capacity of local communities through targeted training, awareness campaigns, and advocacy programs focused on sustainable waste practices. Emphasize behavior change, segregation at source, and the environmental and health risks of open dumping and burning. Engage local District offices, and TMAs, women, and youth as key agents of change to ensure community ownership and long-term impact.

1. Capacity building of DOs, TMAs

- Develop and implement a structured waste collection schedule across all four tehsils, ensuring regular pickup, designated storage points, and coverage of remote settlements.
- Invest in basic waste infrastructure, including litter bins, covered transport vehicles, and intermediate waste storage stations, in line with NEQS and KPEPA 2014.
- Establish a data-driven monitoring system for waste volumes, disposal practices, and service delivery efficiency to guide evidence-based planning and compliance reporting.

Table 103: Summarizing the Solid Waste Management Recommendations for Khyber District

Sr. No.	Component	Required Corrective Action
1	Waste Storage	• Implement door-to-door collection to decrease littering on streets and improve waste collection efficiency. • Develop and implement effective behavior change communication programs to promote civic sense and encourage responsible waste disposal practices among citizens. • Consider the removal of roadside communal bins to encourage citizens to use household bins and discourage illegal dumping.
2	Waste Segregation	• Develop segregation and materials recovery facilities to facilitate waste separation and recycling. • Establish a system for the conversion of organic waste into compost, reducing the amount of waste sent to landfills. • Encourage source segregation by raising awareness and providing incentives for households and businesses to separate their waste.

3	Waste Collection	• Conducting behavior change communication programs to encourage citizens to properly dispose of waste. • Establishing a pool of collection vehicles for efficient waste collection. • Providing personal protective equipment (PPE) to all collection staff for their safety and well-being. • Ensuring citizen accountability in daily door-to-door waste collection.
4	Streets Sweeping	• Implementing a comprehensive door-to-door collection system would reduce the need for daily sweeping of all streets, allowing for more efficient and effective cleaning schedules, with a maximum frequency of twice a week.
5	Communal Storage	• All unnecessary communal storage points in residential areas would be removed; • Waste throwing in the streets should be banned and penalized;
6	Waste Transportation	• Commercial areas and institutions would have communal bins; • User charges would be levied to induce financial sustainability. • Waste would be carried in fully covered vehicles, in order to avoid any littering and pollution; • Number of vehicles would be minimized, with transfer stations and larger hauling containers; • Environment-friendly transfer facilities with dust & odor control.
7	Waste Disposal	• Landfill would be properly designed and operated; • Segregation, MRF, and Composting facilities would enhance the useful life of the Landfill;

6.9.10 Solid Waste Management Plan (Tehsil - Wise)

- ***Bara Tehsil***

○ *Estimated Waste Generation in Bara Tehsil*

The graph for Bara Tehsil, Khyber District depicts a clear upward trend in both population and estimated waste generation over the projection period. As the population steadily increases, waste generation rises in parallel, reaching over 1,000 tons annually by 2045. This strong correlation underscores the growing pressure on local waste management systems. Without timely interventions, the rising volumes risk overwhelming existing infrastructure. The

projections emphasize the need for scalable, phased strategies—including improved collection coverage, waste segregation, and development of engineered disposal facilities—to ensure environmentally sound and sustainable waste management in the long term.

Figure 27: Estimated Waste Generated and Population in Bara Tehsil of Khyber District

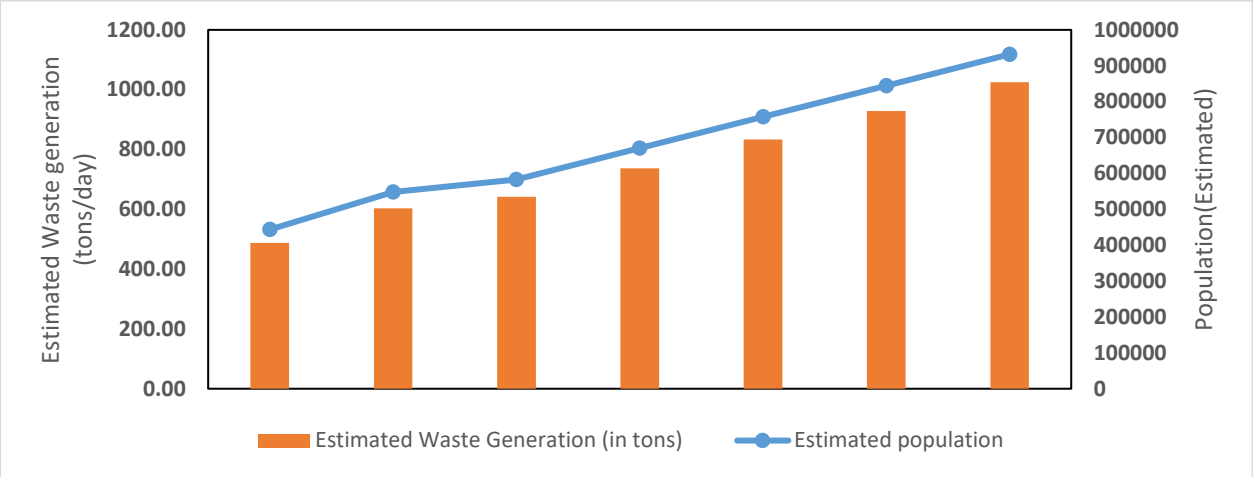


Table 2 outlines the Waste Management Plan for Bara Tehsil, Khyber District, projecting waste generation and management requirements from 2017 to 2045. Waste generation is expected to increase from 177,379 kg in 2017 to over 372,698 kg by 2045, aligned with population growth.

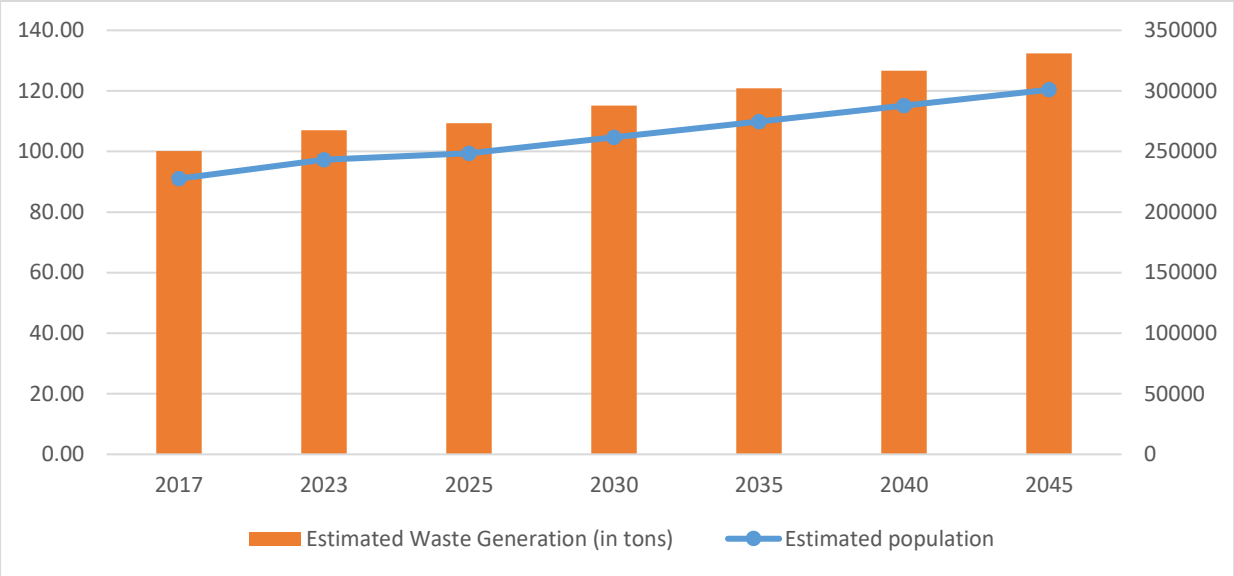
Phased interventions include:

- **Baseline (2017–2023):** Community capacity building, training, and site assessments for landfill and incineration facilities.
- **Medium Term (2025–2035):** Daily door-to-door collection, source segregation of organics and recyclables, and development of temporary storage and disposal sites.
- **Long Term (2040–2045):** Strengthened systems with daily collection of organic waste, weekly collection of segregated dry recyclables, and improved landfill management through earth berm enclosures and weekly covering.

- ***Jamrud Tehsil***

The table outlines the Solid Waste Management Plan for Jamrud Tehsil, Khyber District, covering the period 2017–2045. Waste generation is projected to increase from 91,022 kg in 2017 to over 120,391 kg by 2045, requiring progressive interventions to match population growth.

Figure 28: Estimated Waste Generated and Population in Jamrud Tehsil of Khyber District



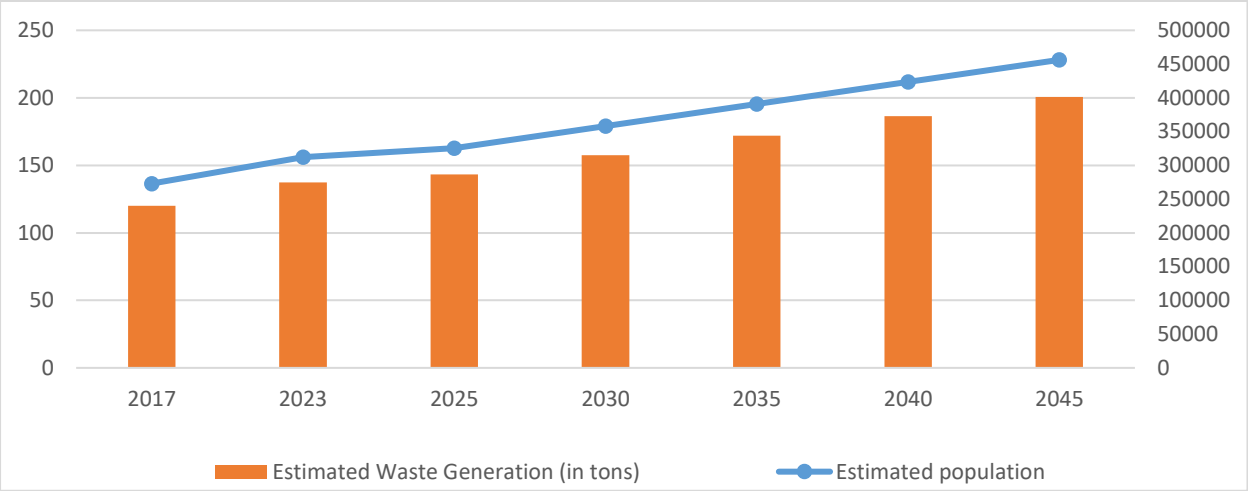
The plan is phased as follows:

- **Baseline (2017–2023):** Initial stage with capacity-building, training, and planning.
- **Short Term (2025):** Daily collection initiated, supported by community capacity building and site assessments for landfill and incineration facilities.
- **Medium Term (2030–2035):** Introduction of daily door-to-door collection, source segregation of organic vs. dry recyclables, and establishment of storage and disposal sites.
- **Long Term (2040–2045):** Strengthened systems for daily collection of organics and weekly segregated collection of recyclables, with controlled landfill management practices and enforcement of fines for unsafe disposal (open dumping, burning).

- ***Landi Kotal Tehsil***

The table presents the Solid Waste Management Plan for Landi Kotal Tehsil, Khyber District, projecting waste generation and management requirements from 2017 to 2045. Waste generation is expected to grow from 109,220 kg in 2017 to more than 182,500 kg by 2045, reflecting population increases.

Figure 29: Estimated Waste Generated and Population in Landi Kotal Tehsil of Khyber District



The plan is structured as follows:

Baseline (2017–2023): Focus on community awareness, training, and planning, alongside site assessments for landfill and incineration approvals.
Short Term (2025): Daily collection with community engagement, capacity building, and the introduction of bins and initial infrastructure.
Medium Term (2030–2035): Door-to-door collection six days per week, with segregation of organics and recyclables, supported by development of temporary storage and waste disposal sites.
Long Term (2040–2045): Comprehensive system with daily organic collection and weekly segregated collection of recyclables (plastic, paper, metal), controlled community dumps with berm enclosures and weekly covering, and enforcement of fines for open dumping or unsafe practices.

- ***Mulla Gori Tehsil***

Figure 30: Estimated Waste Generated and Population in Mulla Gori Tehsil of Khyber District

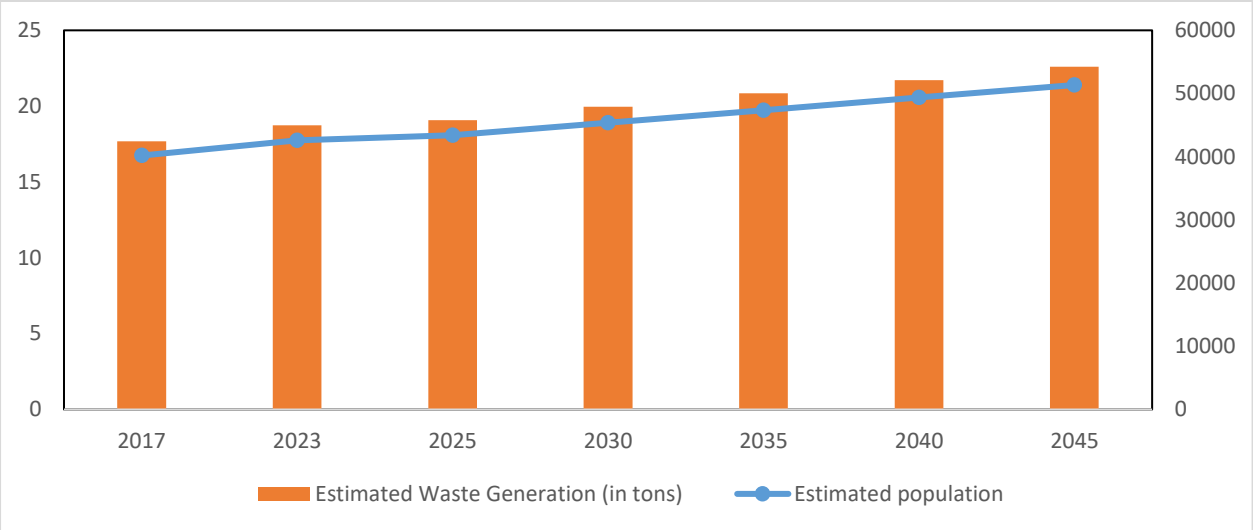


Table below presents a phased Solid Waste Management Plan for Mullagori Tehsil, Khyber District, projecting waste generation from 2017 to 2045. Population growth corresponds with increasing waste volumes, rising from 16,075 kg in 2017 to over 20,500 kg by 2045. The plan identifies short-term (2025–2030), mid-term (2030–2035), and long-term (2040–2045) management periods with progressively structured systems.

Key actions include:

- **Short-term:** Daily collection, capacity building, and site approvals for landfill and incineration.
- **Mid-term:** Door-to-door collection, segregation of organics and recyclables, and development of disposal and storage facilities.
- **Long-term:** Comprehensive segregation, weekly collection of dry waste, and improved landfill management, with penalties for non-compliance.

Table 104: Waste Management Plan for Bara Tehsil, Khyber District

Year	Estimated population	Estimated Waste Generation (in kg)	Estimated Waste Generation (in tons)	Weekly waste generation (tons per month)	monthly waste generation (tons/ month)	Waste Management Period	No. of Community Bins required	Frequency of Waste Collection	Management Approach	Final Disposal	Collection Charges
2017	443449	177379.6	195.12	1366		Baseline			community capacity building, training, and planning	Site assessment and government approvals for the incineration and landfill sites	Not applicable
2023	548084	219233.6	241.16	1688	7235						
2025	582962	233184.933	256.50	1796	7695						
2030	670158	268063.267	294.87	2064	8846	Medium Term	4468	Daily	Door-to-door daily in 6 days a week; source separation into organics vs. dry recyclables	development of waste temporary storage sites, waste disposal sites, including the incinerator and landfills	Not Applicable
2035	757354	302941.6	333.24	2333	9997		5049				
2040	844550	337819.933	371.60	2601	11148	Long Term	5630	Daily	Daily collection of organic waste, weekly collection of segregated dry waste (plastic, metal, paper, etc.)	Uncontrolled community dump—earth berm enclosure, weekly spreading and covering	fine for open dumping, burning, or inappropriate waste management practices
2045	931746	372698.267	409.97	2870	12299		6212				

Table 105: Solid Waste Management Plan for Jamrud Tehsil, Khyber District

Year	Estimated population	Estimated Waste Generation (in kg)	Estimated Waste Generation (in tons)	Weekly waste generation (tons per week)	monthly waste generation (tons/ month)	Waste Management Period	No. of Community Bins required	Frequency of Waste Collection	Management Approach	Final Disposal	Collection Charges
2017	227557	91022.8	100.1251	700.87	3003.75	Baseline	-	-	-	-	-
2023	243290	97316	107.0476	749.33	3211.42						
2025	248534.3	99413.73	109.3551	765.48	3280.65	Short Term	662.75	Daily	community capacity building, training, and planning	Site assessment and government approvals for the incineration and landfill sites	Not applicable
2030	261645.2	104658.1	115.1239	805.86	3453.716	Medium Term	697.72	Daily	Door-to-door daily in 6 days a week; source separation into organics vs. dry recyclables	development of waste temporary storage sites, waste disposal sites, including the incinerator, and landfills	Not Applicable
2035	274756	109902.4	120.8926	846.24	3626.779		732.68				
2040	287866.8	115146.7	126.6614	886.62	3799.842	Long Term	767.64	Daily	Daily collection of organic	Uncontrolled community dump—	fine for open dumping, burning, or
2045	300977.7	120391.1	132.4302	927.01	3972.905		802.61				

									waste, weekly collection of segregated dry waste (plastic, metal, paper, etc.)	earth berm enclosure, weekly spreading and covering	inappropriate waste management practices

Table 106: Solid Waste Management Plan for Landi Kotal Tehsil, Khyber District

Year	Estimated population	Estimated Waste Generation (in kg)	Estimated Waste Generation (in tons)	Weekly waste generation (tons per week)	monthly waste generation (tons/ month)	Waste Management Period	No. of Community Bins required	Frequency of Waste Collection	Management Approach	Final Disposal	Collection Charges
2017	273052	109220.8	120.1429	841.0002	3604.286	Baseline					
2023	312313	124925.2	137.4177	961.924	4122.532						
2025	325400	130160	143.176	1002.232	4295.28	Short Term	867.73	Daily	community capacity building, training, and planning	Site assessment and government approvals for the incarceration and landfill sites	Not applicable
2030	358117.5	143247	157.5717	1103.002	4727.151	Mid Term	954.98	Daily	Door-to-door pickup daily in 6 days a	development of waste temporary	Not Applicable
2035	390835	156334	171.9674	1203.772	5159.022		1042.27				

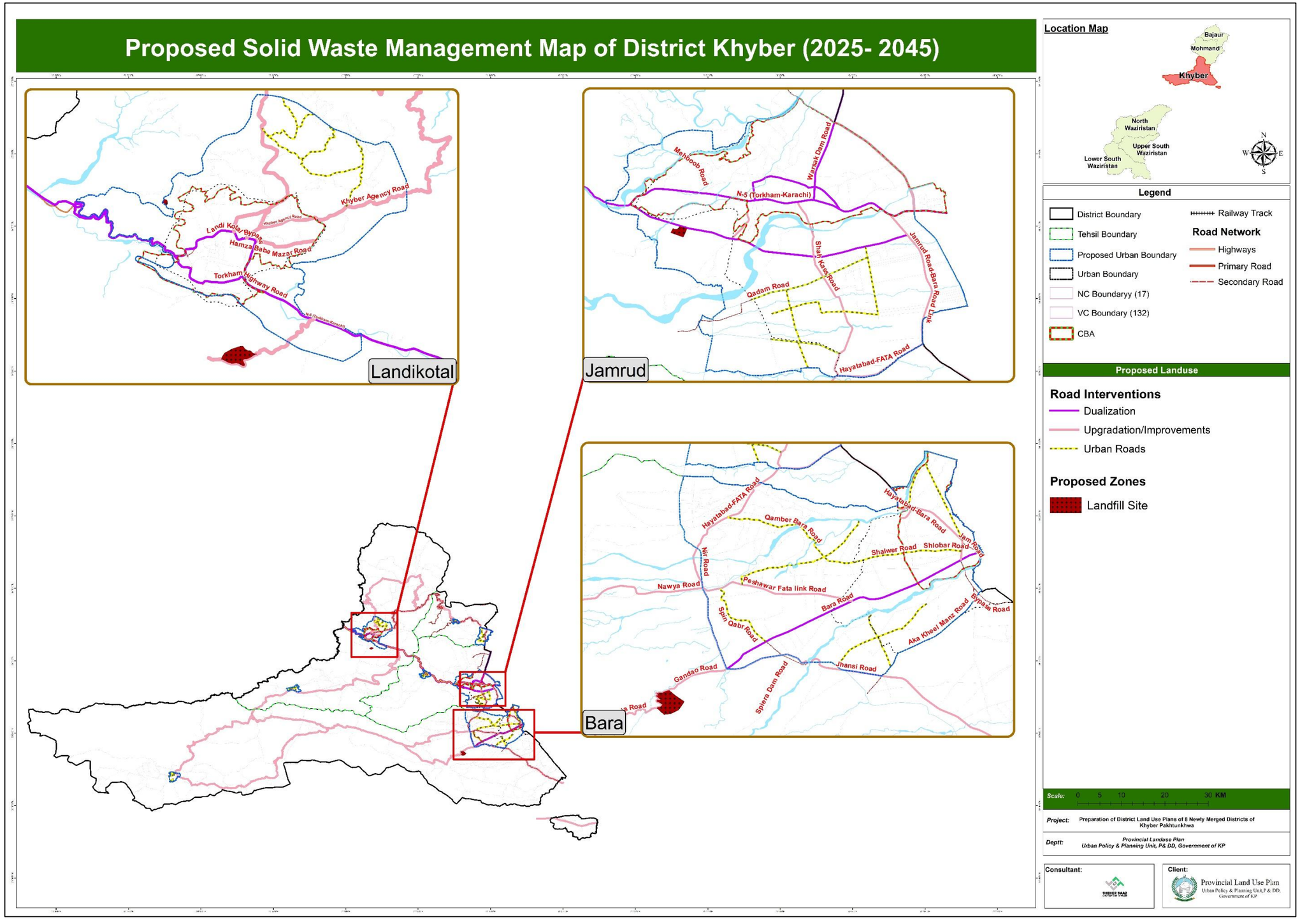
									week; source separation into organics vs. dry recyclables	storage sites, waste disposal sites, including the incinerator and landfills	
2040	423552.5	169421	186.3631	1304.542	5590.893	Long Term	1129.47	Daily	Daily collection of organic waste, weekly collection of segregated dry waste (plastic, metal, paper etc.)	Uncontrolled community dump—earth berm enclosure, weekly spreading and covering	fine for open dumping, burning, or inappropriate waste management practices
2045	456270	182508	200.7588	1405.312	6022.764		1216.7				

Table 107: Solid Waste Management Plan for Mullagori Tehsil, Khyber District

Year	Estimated population	Estimated Waste Generation (in kg)	Estimated Waste Generation (in tons)	Weekly waste generation (tons per week)	monthly waste generation (tons/ month)	Waste Management Period	Collection System	Frequency of Waste Collection	Management Approach	Final Disposal	Collection Charges
2017	40188	16075.2	17.68272	123.779	530.48	Baseline					
2023	42580	17032	18.7352	131.1464	562.06						
2025	43377.33	17350.93	19.08603	133.6022	572.59	Short Term	115.6729	Daily	community capacity building,	Site assessment and	Not applicable

									training, and planning	government approvals for the incineration and landfill sites	
2030	45370.67	18148.27	19.96309	139.7417	598.89	Mid Term	120.9884	Daily	Door-to-door pickup daily on 6 days a week; source separation into organics vs. dry recyclables	development of waste temporary storage sites, waste disposal sites, including the incinerator, and landfills	Not Applicable
2035	47364	18945.6	20.84016	145.8811	625.20		126.304				
2040	49357.33	19742.93	21.71723	152.0206	651.52	Long Term	131.6196	Daily	Daily collection of organic waste, weekly collection of segregated dry waste (plastic, metal, paper, etc.)	Uncontrolled community dump—earth berm enclosure, weekly spreading and covering	fine for open dumping, burning, or inappropriate waste management practices
2045	51350.67	20540.27	22.59429	158.1601	677.83		136.9351				

Map 45: Proposed Solid Waste Management Map



6.9.11 Constraints and Recommendations

Table 108: Current gaps identified in Solid Waste Management of Khyber District

Sr. No.	Component	Current Practice and Issues	Priority of risk
1	Waste Generation	• Solid waste generation in the tehsils of Khyber district ranges from 17-200 tons per day • Due to a shortage of required resources, TMA is not capable of serving the entire city.	Medium
2	Storage of waste at source	• Lack of public awareness, motivation, and education regarding waste management practices; • Poor civic sense and harmful littering habits; • Inadequate cooperation from households, trade, and commerce; • Inadequate availability of litter bins at the community level. • Significant distances between community bins;	Medium
3	Waste Collection	People dump waste on the roads, streets, and near water bodies, instead of utilizing communal waste containers, causing scattered waste to accumulate; • No waste segregation before final disposal; • Insufficient awareness and motivation among citizens to properly dispose of waste; • Existing equipment and machinery require maintenance and repair to function effectively; • Citizens have not been responsive enough in addressing these waste management issues.	High
4	Hazardous waste	There is no appropriate segregation, storage, or overall management of hazardous waste.	High
5	Sweeping of Streets	TMA capacity is not sufficient to meet the daily sweeping of streets and roads.	Medium
6	Transportation	• Difficulty accessing certain areas and narrow lanes, which do not allow for sufficient space to place containers; • Use of open vehicles for waste transport, which can lead to spillage and health hazards; • Inadequate funds to replace old vehicles, leading to inefficiencies and increased maintenance costs; • Lack of a scheduling system for lifting of waste containers, resulting in irregular collection and overflowing containers.	High
7	Disposal of waste	Lack of any engineered landfill site. Lack of technical and manpower resources for the appropriate disposal of waste	High

6.10 NATURAL HAZARDS

Khyber District, located in the newly merged areas of Khyber Pakhtunkhwa (KP), is highly exposed to multiple natural hazards due to its geographical position, fragile ecosystem, and socio-economic vulnerabilities. The district, comprising four Tehsils—Bara, Jamrud, Landi Kotal, and Mullagori—lies within a seismically active zone influenced by the Hindu Kush Mountain range, making it prone to earthquakes. Additionally, seasonal monsoon rains and inadequate drainage systems lead to flash flooding and urban inundation, particularly in Bara and Jamrud. Mountainous terrain and deforestation have increased the incidence of landslides in Mullagori and Landi Kotal, while changing climatic patterns have contributed to recurrent droughts and forest fires.

The vulnerability of Khyber District is compounded by its socio-economic context. Large sections of the population rely on subsistence agriculture, cross-border trade, and forest resources, which are directly impacted by climatic shocks and disasters. Furthermore, internally displaced populations (IDPs) and marginalized groups, including women, children, and the elderly, face disproportionate risks due to limited access to resources, healthcare, and secure infrastructure[24]

Given these risks, a localized Natural Disaster Management Plan (NDMP) is essential to strengthen resilience, reduce disaster-induced losses, and align community-based preparedness with provincial and national frameworks. This plan is informed by the Sendai Framework for Disaster Risk Reduction (2015–2030), the National Disaster Management Plan of Pakistan (NDMA, 2019), and the Sustainable Development Goals (SDGs 11 and 13), which emphasize the need for resilient infrastructure, risk-informed governance, and community-centered approaches to disaster management.

The NDMP for Khyber District adopts a multi-hazard, multi-sectoral approach, focusing on short-term preparedness, medium-term mitigation, and long-term resilience-building measures. It also emphasizes institutional coordination between the District Disaster Management Authority (DDMA), line departments, and community structures to ensure effective prevention, preparedness, response, and recovery.

6.10.1 Hazard Profile of Khyber District

The major natural disaster risks identified in Khyber district include;

- **Earthquakes:** High seismic zone due to Hindu Kush region.
- **Floods/ Flash Floods:** Seasonal monsoon rains, poor drainage in Bara and Jamrud.
- **Landslides:** Mountainous terrain in Landi Kotal & Mullagori.
- **Drought & Water Scarcity:** Seasonal stress in arid zones.
- **Forest Fires:** Mullagori hills (dry season).

[24] World Bank. (2021). *Pakistan: Resilient Recovery and Risk Reduction Report*. Washington, DC: World Bank.

- **Extreme Weather Events:** Heatwaves, heavy snowfall in elevated areas.

6.10.2 Earthquakes

Khyber District is situated within the seismically active Hindu Kush–Koh-e-Safaid mountain range, which subjects the area to recurrent earthquake shocks of moderate to high intensity. Khyber district falls within a moderate seismic hazard zone as per the Seismic Hazard Map of Pakistan (Pakistan Meteorological Department, 2006; NDMA, 2007), which categorizes it in Zone 2B. The district's proximity to active fault lines, including segments of the Main Boundary Thrust (MBT) and associated fault systems, makes it vulnerable to earthquake activity, though not as severely as northern districts such as Chitral or Kohistan. The Main Boundary Thrust (MBT) is one of the most important geological fault systems in South Asia. It marks the boundary where the Indian Plate is actively colliding with and being pushed beneath the Eurasian Plate, giving rise to the Himalayan Mountain system. The MBT extends from Pakistan through northern India, Nepal, and into Bhutan, running for thousands of kilometers along the southern edge of the Himalayas.

In Pakistan, the MBT passes through northern Khyber Pakhtunkhwa and parts of Azad Kashmir, making these areas geologically active. Along with this fault, older rocks of the Himalayas are thrust over the younger sediments of the plains, which explains both the region's rugged topography and its earthquake vulnerability. Movement along the MBT is responsible for significant seismic activity, including moderate to large earthquakes.

In short, the MBT is a major tectonic boundary that defines the Himalayan front, and its presence near districts like Khyber increases their exposure to moderate seismic risk, even if epicenters are not directly located there.

6.10.3 Land Sliding

The topography—marked by steep slopes ranging between 30–60% gradients in Landi Kotal, Mullagori, and Tirah Valley—further exacerbates the risks of landslides triggered by seismic activity or intense rainfall events. With 258,576 hectares of land, the district is dominated by rugged mountains, narrow valleys (Rajgal, Maidan, Bazar), and only 7.8% arable land, restricting settlements and infrastructure to a few accessible plains such as Bara and Khajuri.

- **Severity:**

The risk level is high, as earthquakes and slope failures can cause widespread damage to settlements concentrated in valleys and along transport corridors. Population density is highest in Bara Tehsil, where plains support agriculture and urban expansion. However, unregulated construction and high population pressure in these confined flatlands increase seismic vulnerability. In contrast, sparsely populated but topographically unstable areas of

Mullagori and Landi Kotal face landslide hazards, particularly along the Khyber Pass and road networks connecting to Torkham border, where slope instability poses risks to both communities and critical trade routes.

- **Development Impacts:**

Earthquake and landslide risks present significant barriers to infrastructure and economic development. Slope instability restricts safe construction of housing, roads, and public facilities, while the high costs of slope stabilization discourage large-scale investment. Urban sprawl in Khajuri and Bara plains is likely to overburden the limited flat land, increasing population exposure to seismic shocks. Moreover, repeated landslides disrupt connectivity, hampering cross-border trade and emergency response.

6.10.4 Floods

The PDMA ranking assigns a score of 10 out of 100, placing Khyber in the "Low Threat" category; the potential consequences for roughly 10% of the population already considered vulnerable cannot be disregarded. Proactive measures to address these vulnerabilities are essential to minimize the impact of potential floods on the community. Table below and Figure below illustrate the flood risk ranking of Khyber district.

Table 109: Flood Risk Ranking of 2024 – Khyber District

District	Likelihood of flood event	Impact on Population	Impact on Livelihood	Impact on Infrastructure	Accessibility of the Area	Risk Score	Risk Class
	1. Very Rare 2. Rare 3. Occasional 4. Frequent 5. Most Frequent	1. Very Rare Impact 2. Rare Impact 3. Substantial 4. Major 5. Severe					
Khyber	2	3	3	1	1	10	Low Threat

Source: Summar Hazard Contingency Plan, Provincial Disaster Management Authority, KP

Khyber district is generally not considered a high-risk area for flooding; however, Takhta Baigh Khwar is vulnerable to occasional flash floods. Apart from this, issues such as urban flooding, hailstorms, or landslides are not significant concerns in the district.

6.10.5 Forest Fires

In Khyber District 2096 hectares of land is covered by forest. These forests, primarily comprising pine, oak, and scrub vegetation, are critical for local livelihoods, fuelwood

collection, and biodiversity conservation. However, steep slopes, dry summers, and increasing deforestation have made these ecosystems highly susceptible to seasonal forest fires. The rugged terrain and limited accessibility make firefighting and rapid response extremely challenging.

Severity:

The risk level is moderate to high, especially during the dry season (April–June) when rising temperatures and prolonged dry spells create highly combustible conditions. Human-induced factors, such as uncontrolled grazing, slash-and-burn cultivation in Tirah, and illegal timber cutting, further aggravate fire hazards. Mullagori and Landi Kotal are particularly exposed due to their dry **forest cover** and proximity to population settlements that depend on forests for daily needs.

Development Impacts:

Forest fires result in severe ecological and socio-economic losses. They degrade forest ecosystems, reduce soil fertility, and accelerate erosion on already steep slopes, increasing downstream flood and landslide risks. For communities, fires destroy fuelwood and fodder resources, threatening household energy security and livestock production. Repeated fire incidents also undermine the eco-tourism potential in the Khyber Pass and surrounding valleys. Critically, forest loss diminishes the district's natural capacity for carbon sequestration and climate regulation, thereby contributing to long-term climate vulnerability.

6.10.6 Climate Change Risks

Khyber District is highly sensitive to the adverse effects of climate change due to its semi-arid climate, fragile mountainous ecosystem, and reliance on rain-fed agriculture. The district's topography—comprising the Koh-e-Safaid range, Tirah Valley, and plains of Bara and Jamrud—makes it vulnerable to both slow-onset climate processes (droughts, water scarcity, rising temperatures) and sudden-onset events (flash floods, heatwaves, glacial melt-related floods in upper catchments). Climate variability is already being observed, with shifts in rainfall patterns, longer dry spells, and increased frequency of extreme events.

Severity:

The risk level is very high. According to Pakistan's Third National Communication to UNFCCC (2023), the northwestern region, including Khyber Pakhtunkhwa, is projected to face **Temperature** increases of 1.5–2.0°C by 2050, intensifying heat stress in Bara and Jamrud plains. Decline in precipitation during rabi (winter) season and erratic monsoon rainfall, increasing both drought and flood risks. **Glacial retreat** in upper catchments that feed rivers and springs, threatening long-term water availability in Tirah and Rajgal valleys.

Development Impacts:

- **Agriculture and Livelihoods:** Climate variability reduces crop productivity, threatening food security in rain-fed areas (only 7.8% arable land in the district).
- **Water Resources:** Increasing drought frequency and groundwater depletion heighten **water scarcity** in Bara and Jamrud, already the most densely populated Tehsils.
- **Health:** Heatwaves, poor water quality, and vector-borne diseases will disproportionately affect vulnerable groups (children, elderly, women).
- **Infrastructure:** Intense rainfall events combined with seismic risks increase the likelihood of **landslides and road blockages**, disrupting trade through Khyber Pass and connectivity with Torkham border.
- **Ecosystems:** Forest degradation in Mullagori and Tirah reduces natural resilience, while forest fires are expected to rise under hotter, drier conditions.

6.10.7 Ranking of Winter Seasonal Hazard

About winters, the Winter Contingency Plan 2023-24 puts Khyber district at Medium Risk during the winters, however, the scoring is composite of various winter hazards. The table below illustrates the scoring of different hazards in winter.

Table 110: Winter Hazard Risk Assessment – Khyber District

Sr. No.	Winter Hazard	Score
1	Snowfall(A)	3
2	Extreme Cold, Cold Waves (B)	2
3	Avalanches (C)	1
4	Landslides (D)	1
5	*Heavy Rainfall (E)*	*3*
6	FOG/SMOG (F)	2
7	Forecast- ed Winter Severity (G)	2
8	Composite Risk Score (A+B+C+D+E+F+G)	14
9	Risk Level	Medium

Source: Winter Contingency Plan 2023-24, Provincial Disaster Management Authority, KP

The Khyber district is mostly prone to snow falling in the southern side of the district. In the south of Khyber District, the terrain merges into the Spin Ghar (Safed Koh) mountain range, which extends along the Pakistan–Afghanistan border. These mountains are relatively high in elevation (many peaks over 3,500–4,500 meters) and receive significant snowfall during winter.[25]

Table 111: Affected areas from Snowfall

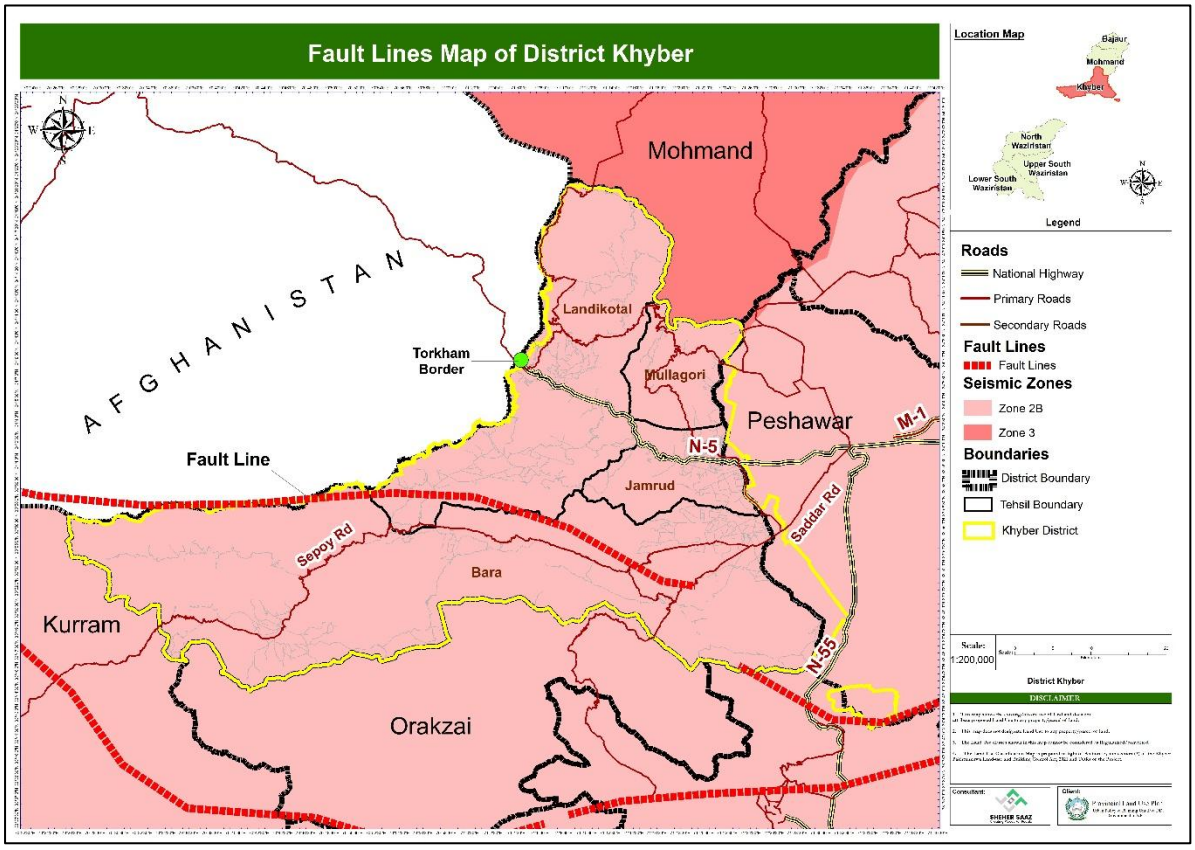
District	Potentially Affected Area	Distance from NHA Road (km)	Type of Vulnerability
Khyber District	Tambo/ Tirah	5	

[25] https://www.britannica.com/place/Pakistan/The-Himalayan-and-Karakoram-ranges

	Mirkholi/ Tirah	8	Heavy Snowfall, Land Sliding
	Dre Naghri Tirrah	10	
	Sandapul Tirrah	8	
	Tara Tirrah	7	
	Landawar Tirrah	8	

Source: Winter Contingency Plan 2023-24, Provincial Disaster Management Authority, KP

Map 46: Fault Line Map of District Khyber



6.10.8 Vulnerability & Risk Assessment (Tehsil-wise)

The hazard and vulnerability profile of Khyber District indicates that each Tehsil faces distinct but interlinked risks. Bara, with its dense population and cultivated plains, is highly exposed to flash floods and droughts, disproportionately affecting women, children, and displaced populations, alongside risks to schools and health centers.

Jamrud, as a commercial hub, is vulnerable to urban flooding and earthquakes, with market vendors and transport networks at risk, particularly the Karkhano trading area. Landi Kotal, located in the mountainous zone and serving as a key border corridor, faces recurrent landslides, seismic shocks, and snowfall hazards, threatening border communities, students, and the Torkham trade route. Mullagori, dominated by forested terrain, is exposed to landslides and seasonal forest fires, endangering forest-dependent households as well as natural assets such as forest cover and water channels.

Table 112: Tehsil-wise vulnerability and risk assessment of Khyber District

Tehsil	Major Risks	Major Vulnerable Groups	Critical Infrastructure at Risk
Bara	Flash floods, drought	Women, children, IDPs	Schools, health centers
Jamrud	Urban flooding, earthquakes	Market vendors, transport hubs	Markets, Karkhano area
Landi Kotal	Landslides, earthquakes, snow	Border communities, students	Torkham border, road links
Mullagori	Landslides, forest fire	Forest-dependent families	Forest lands, water channels

6.10.8.1 Institutional Framework

The institutional framework for early warning system, disaster preparedness, mitigation and response are;

- District Disaster Management Authority (DDMA Khyber) as lead.
- Coordination with **PDMA KP, Rescue 1122, Health, Police, Education, Forest, and Local Government.**
- **Community Disaster Management Committees (CDMCs)** in each Tehsil.
- Integration with NGOs, UN agencies, and civil society.

6.10.8.2 Available Relief Stock

According to PDMA every district is equipped with a certain amount of relief equipment which is available in case of emergency. Below is the list of available stock.

Table 113: Available of Stock of District Khyber

Stock	Quantity
Tables	116
Blankets	215
Cooler	50
Buckets	75
Net Mosquito	235
Quilts	225
Cylinder	53
Kitchen Set	200
Hygiene Kit	100
Plastic Matts	40
Daris	50
Tarpaulin Sheets	100

Source: Monsoon Contingency Plan 2025, Provincial Disaster Management Authority, KP

Although several items, such as tents, chairs, soap, and other essentials, are missing, the overall stock is reasonably well-equipped, as the district experiences relatively fewer hazards.

6.10.9 Phase-Wise Development Proposal

The detailed phase and disaster specific proposal:

Short Term (2025-2030)

- Install community-level early warning systems for flash floods in Takhta Baigh Khwar and snowfall-prone Tirah Valley.
- Conduct monthly disaster preparedness drills, especially in snow-affected southern areas.
- Fill critical gaps in relief stock (tents, soap, chairs, medical kits).
- Ensure decentralized storage for quick access in remote valleys.
- Awareness campaigns on earthquake safety and winter hazard preparedness.
- Train local volunteers as **first responders** for snow emergencies and landslides.

Medium Term (2030-2035)

- Upgrade rural roads (especially Tirah access routes) with snow/landslide protection structures.
- Retrofit public buildings (schools, health units) against earthquakes in line with NDMA seismic codes.
- Establish basic winterized shelters in southern mountainous settlements.
- Equip local BHUs/health posts with supplies for cold waves and snowfall emergencies.
- Develop a District Disaster Management Plan (DDMP) integrating floods, earthquakes, and winter hazards.
- Strengthen PDMA coordination with local councils.

Long Term (2035-2045)

- Develop a multi-hazard risk mapping system (GIS-based) for earthquakes, floods, and winter risks.
- Promote land-use planning to prevent settlements in high-risk flash flood zones.
- Support climate-resilient agriculture in Tirah and other valleys.
- Introduce alternative livelihoods to reduce dependency on vulnerable mountain farming.
- Invest in climate-smart housing and earthquake-resistant designs for new settlements.

Table 114: Detailed Natural Hazards Risk Management Framework for Khyber District (2025–2040)

Hazard Type	Timeframe	Capacity Building	Infrastructure / Engineering	Afforestation / Environmental	Early Warning & ICT	Community Engagement	Responsible Department(s)
Earthquakes	Short-Term (2025–2030)	Train 500 volunteers & teachers in earthquake drills	Rapid safety audit of 50 schools & 10 health centers	N/A	Establish SMS & mosque-based alerts in 4 Tehsils	Awareness sessions in 30 villages	DDMA, Education, Health, Rescue 1122
	Medium-Term (2030–2035)	Advanced training for 200 engineers & masons in seismic construction	Retrofit 30 schools & 5 hospitals		Install seismic monitoring stations in each Tehsil	District-wide earthquake simulation exercises	PDMA, C&W Dept., Building Authority
	Long-Term (2035–2040)	Institutionalize DRM curriculum in all schools & colleges	100% new govt. buildings earthquake-resilient		Research & monitoring hub establishment in Peshawar/Khyber	Regular district-wide preparedness campaigns	MoCC, Academia
Landslides	Short-Term	Train 200 locals as slope watch volunteers	Slope stability surveys in all Tehsils, and identification of high risk areas	Small-scale reforestation of 200 ha	GIS hazard mapping (pilot)	20 community workshops	DDMA, C&W, Forest Dept.
	Medium-Term	Training 50 technicians in slope stabilization methods	Build check dams & retaining walls	Reforest 1,000 ha on degraded slopes	Expand GIS mapping to all Tehsils	School awareness in high-risk zones	Forest Dept., PDMA
	Long-Term	Institutionalize slope risk management at DDMA	Climate-resilient road standards in all Tehsils	Reforest 5,000 ha by 2040	District-wide landslide monitoring	100% communities	NHA, Forest, DDMA

						integrated in CDMCs	
Floods / Flash Floods	Short-Term	Train 1000 community members in evacuation drills	Identify 20 flood shelters; stockpile 3-month rations	Rehabilitate riverbank vegetation (50 km)	SMS alert pilot in Bara & Jamrud	Safe school programs	Irrigation, PDMA, Rescue 1122
	Medium-Term	Training 100 engineers in flood defense design	Build 15 embankments & 10 drainage improvements	Expand riverbank rehabilitation to 100 km	Install 20 hydrological monitoring stations	Community-based flood warning system	Irrigation, C&W
	Long-Term	Institutionalize flood response in DDMA	Large-scale flood protection covering 250 km	Integrated watershed management in Bara Valley	District-wide flood forecast center	Annual flood preparedness drills	PDMA, Irrigation
Drought & Water Scarcity	Short-Term	Train 500 farmers in water conservation	Install 200 rainwater harvesting tanks	N/A	Awareness campaigns on water saving	Women water committees in 20 villages	Agriculture, PHE, NGOs
	Medium-Term	Training in climate-smart agriculture	Build 20 reservoirs & check dams	Plantation along water channels (500 ha)	Pilot groundwater monitoring	Youth mobilization programs	Irrigation, Agriculture
	Long-Term	Integrate drought management in education curricula	District-wide water supply network	Afforestation of 2,000 ha for water recharge	GIS-based water resource monitoring	100% union councils with water user associations	MoCC, Irrigation
Forest Fires	Short-Term	Train 200 volunteers in firefighting	Fire breaks in 100 ha	Reforest 500 ha with fire-resistant species	Community hotlines	Fire watch groups in 50 villages	Forest Dept., DDMA

	Medium-Term	Training of 100 forest guards	Watchtowers in 5 hotspots	Reforest 2,000 ha	Satellite-based monitoring pilot	Village-level fire management plans	Forest, PDMA
	Long-Term	Institutionalized fire training in KP Forest School	District fire risk monitoring system	Reforest 10,000 ha with resilient species	GIS + drones for fire detection	District-wide forest user committees	KP Forest Dept.
Snowfall / Extreme Weather	Short-Term	Train 200 responders in snow rescue	Pre-position 50 winter relief kits	N/A	Weather alerts through FM radios	Awareness in Landi Kotal schools	C&W, DDMA
	Medium-Term	Build local capacity in snow clearance	Snow clearance equipment at 3 key passes	N/A	District weather stations	Community winter task forces	NHA, PDMA
	Long-Term	Establish mountain hazard training center	Climate-adaptive housing in uplands	N/A	Regional weather monitoring center	Institutionalized resilience programs	MoCC, C&W
Climate Change	Short-Term	Train 200 DDMA officials in adaptation, Establishing weather monitoring stations in each Tehsil	Developing regulations for vulnrability and high-risk areas constructions	Pilot 200 ha afforestation	Awareness on climate change	Student eco-clubs	MoCC, PDMA
	Medium-Term	Establishing weather simulation laboratory, Academic training programs (climate resilience, adaptation, mitigation)	Mainstream resilience in 50% of projects	Expand afforestation to 2,000 ha	GIS-based climate data sharing	NGO-led campaigns	KP Climate Change Dept.

	Long-Term	adaptation to Climate resilience Farm practices, infrastructure development	atleast 80% infrastructure climate-proof	promoting urban forestry	Regional climate department	Youth-led climate action networks	MoCC, Academia

6.11 PHYSICAL ENVIRONMENTAL STUDY

6.11.1 Introduction

Increasing development and industrialization in global emerging markets have led to rapid migration from rural areas, escalating poverty and significantly undermining the environmental and social stability of underdeveloped regions. These issues are further exacerbated by political instability. At the same time, climate change, environmental challenges, and natural disasters are becoming more intense, increasing the vulnerability of people who rely on ecosystem goods and services for food and livelihood. These problems in rural and underdeveloped areas highlight the need for durable solutions to complex economic, political, environmental, and social challenges.

Pakistan inherited the Federally Administered Tribal Areas (FATA) in 1947 following partition. Spanning about 27,224 square kilometers along the northwestern border of the country, the FATA region along the Durand Line is considered one of the most volatile regions. Historical political conflicts and the presence of terrorist groups have hindered the region's development. Despite its beautiful landscape, the region has experienced environmental degradation and biodiversity loss due to high poverty levels, climate change, poor legal and governance structures, and urban sprawl.

In 2017, the federal government proposed merging FATA with the adjacent Pashtun-dominated Khyber Pakhtunkhwa (KP) province, a move supported by most political parties and the tribal areas. The merger was officially accepted in 2018. Considering these developments, the Government of Khyber Pakhtunkhwa now aims to develop the urban areas of the merged districts into sustainable, livable, and well-managed engines of economic growth.

6.11.2 Environmental Governance Legal Framework

The 25th Constitutional Amendment serves as the legal foundation for integrating and expanding all state institutions and legislations into the Merged Districts. Finalized in May 2018, the FATA Reform Bill, known as the 25th Amendment, merged FATA with Khyber Pakhtunkhwa (KP), fundamentally changing FATA's constitutional status. The administrative system underwent significant changes following the merger, eliminating the colonial legacy of political administration under the discretionary powers of political agents. The offices formerly known as political agents were re-designated as Deputy Commissioner and Assistant Commissioner, and the oppressive Frontier Crimes Regulation (FCR) was abolished.

Before the merger, the executive authority over FATA was exercised by the governor of KP. Post-merger, this authority shifted to the chief minister and his cabinet, and the merged areas no longer retained a special status. All provincial laws now apply equally to these areas, and FATA received due representation in the provincial assembly with about 16 general seats out of 21, including 4 seats for women and 1 seat for non-Muslims. Prior to the merger, the 1973 Constitution provided FATA with a unique yet legally inferior status. According to Article 1,

FATA was considered a separate entity within the country, like the four provinces. Article 246 placed the president of Pakistan as the constitutional head and chief executive of the tribal areas. However, following the merger, Clause 'C' of Article 246, which dealt with the tribal areas, was omitted, and Article 247, which granted discretionary powers to the president, was also removed.

Before 2018, FATA was governed by the Frontier Crimes Regulations, a set of laws enacted in 1901 by the British Empire to manage Pashtun revolutionaries. Decades of conflict and poor administrative and governance setups have left the region vulnerable and deprived, affecting local people's health, education, and livelihoods. Since 2000, FATA's development priorities and resource allocation were primarily guided by various charters, but these efforts were often insufficient to address the region's complex challenges. The merger with KP marked a significant step towards improving the governance, development, and integration of these historically neglected areas.

6.11.2.1 Environmental Legal Landscape at National Scale

The Government of Pakistan has taken concrete steps towards the protection of the environment in the shape of passing the Pakistan Environmental Protection Act (PEPA), 1997. Later, after the passage of the 18th constitutional amendment in 2010 which devolved the subject of the environment from the federal government to the provincial government, the government of Khyber Pakhtunkhwa (KP) passed its own environmental protection law called Khyber Pakhtunkhwa Environmental Protection Act (KPEPA), 2014. The province has an exclusive power-related environment. All the provincial governments then subsequently passed their own environmental protection laws and the government of KP was the last to legislate its own KPEPA, in 2014. It is almost an amended and modified act of PEPA, 1997 with certain changes, keeping in view new experiences.

6.11.2.2 Environmental Laws/ Rules/ Regulations/ Policies at National Level

Pakistan's Vision 2025 recognizes the vital role of creative, smart, and green cities in driving economic growth and achieving sustainable development. The vision acknowledges climate change as a significant threat, with its impacts including more frequent and intense floods, droughts, and a decline in biodiversity and natural resources. There is a strong national consensus, reflected in the manifestos of all leading political parties, to allocate substantial new resources through public and private sector collaboration to address these challenges. This commitment includes ensuring adequate production and storage capacities while focusing on conservation, efficient resource distribution, and usage, as well as preventing contamination and environmental degradation.

The Pakistan Penal Code addresses offenses that affect public or private property and human lives due to intentional or accidental misconduct by individuals or groups. Environmentalironmental issues, the Penal Code empowers local authorities to regulate individuals based on relevant laws. The Pakistan Environmental Protection Act (PEPA) of 1997 was the first comprehensive environmental law in the country, establishing a regulatory

framework for environmental protection, preservation, conservation, treatment, and rehabilitation. It aims to prevent or control pollution and promote sustainable development. The Constitution of Pakistan has significantly redefined the division of legislative powers between the National and Provincial Assemblies, enhancing provincial autonomy. Following the approval of the 18th Amendment, environmental regulatory powers were delegated to the Provincial Environmental Protection Agencies and Departments (EPAs/EPDs). The table below outlines the various laws, rules, regulations, policies, strategies, and standards present at the national level (highlighted in light green) and their applicability to the provinces. The frameworks in grey color depict those which are either adopted as it is, or similar drafts are available at the provincial scale.

Table 115: Environmental Laws/ Rules/ Regulations/ Policies at National

Acts	Rules	Regulations	Policies	Strategies	Guidelines	Standards
Pakistan Environmental Protection Act 1997	The Compound of Offences and Payment of Administrative Penalty Rules October 2015	Pakistan Environmental Protection Agency Ban on (Manufacturing, Import, Sale, Purchase, Storage, and Usage) Polythene Bags Regulations, 2019	National Environmental Policy, 2005	Pakistan National Conservation Strategy, 1992	Guidelines for Sensitive Areas	National Environment Quality Standards (NEQS) 2010
Cutting of Trees Act, 1975	Pakistan Biosafety Rules 2005	National Environmental Quality Standards (Certification of Environmental Laboratories) Regulations, 2000	National Climate Change Policy 2012	Clean Development Mechanism (CDM), National Operational Strategy	Guidelines for Public Consultation	
The Forest Act 1927	Self-Monitoring and Reporting by Industries Rules, 2001	Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000	National Forest Policy Pakistan, 2001			
Pakistan Trade Control of Wild Fauna and Flora Act, 2012	Hospital Waste Management Rules, 2005		National Water Policy, 201826			
	The Pollution Charge for Industry (Calculation and Collection) Rules, 2001					
	Environmental Samples Rules, 2001					
	Environmental Tribunal (Procedure and Functions) Rules, 1999					

[26] National Water Policy 2019, Section 21(1)

This structured approach reflects Pakistan's commitment to tackling environmental challenges through comprehensive legislation and collaborative efforts across different levels of government and the private sector.

6.11.2.3 Environmental Legal Landscape at Provincial Scale

Environmental management and regulation have not been in practice in the MDs as the environmental legislation has only recently been extended to the Areas after the 25th Constitution amendment27. Therefore, an Environment Cell is established, as an ad hoc arrangement, at the NMD Secretariat Financed by the Swiss Agency for Development and Cooperation (SDC) and managed by IUCN Pakistan.[28] This Environment Cell is set up to provide following tasks:

- Environmental review of public sector schemes
- Environmental awareness and education
- Baseline studies

Currently, a proposal (PC-1) to set up an Environment Directorate within the Khyber Pakhtunkhwa Environmental Protection Agency (KP EPA), dedicated to the Merged Areas/MDs, is in the approval process. [29]

In the MDs, the Forest Directorate of the FATA Secretariat[30] is mainly dealing with forest (including non-timber forest products) management and wildlife conservation. However, the existing capacity of the technical staff is limited and very few conservation and management efforts have been taken, except extensive tree plantation drive.[31] Moreover, community involvement in sustainable resource management and in conservation efforts is low. A strong commitment at the local scale and involvement of the private sector (public-private partnerships) are essential to achieve sustainable development in the region. Literature is evident that the mining, extractive, and manufacturing industries are operating without following the environmental quality standards due to the absence of the regulatory regime (institutions and legal framework) in all MDs (including Orakzai) which has negatively impacted the environmental quality of the area.[32] However, the KP-FATA merger is an opportunity to manage environmental resources under the ambit of KP and the national legal framework, when and where required.

[27] The KPEPA 2014 has become applicable to the Merged Areas as a result of 25th Constitutional Amendment on 27 May 2018. Similarly, environmental magistracy powers have also been extended to the Magistrates Class-I effective 1 Mar 2019.
[28] Technical Studies of Water Resources in FATA. 2019. FATA Water Governance Project, FATA Environment Cell. IUCN. pp. 130.
[29] Government of Khyber Pakhtunkhwa. 2019. Tribal Decade Strategy (2020 -2030). Planning & Development Department, GoKP.
[30] Upgraded to the Directorate in 2006 from the FATA Forest Circle, which was there since 1976. It is headed by Conservator Forests. Government of Khyber Pakhtunkhwa. 2019. Tribal Decade Strategy (2020 -2030). Planning & Development Department, GoKP
[31] Government of Khyber Pakhtunkhwa. 2019. Tribal Decade Strategy (2020 -2030). Planning & Development Department, GoKP.
[32] ibid

6.11.3 Physical Characteristics

6.11.3.1 Physiography and Geology

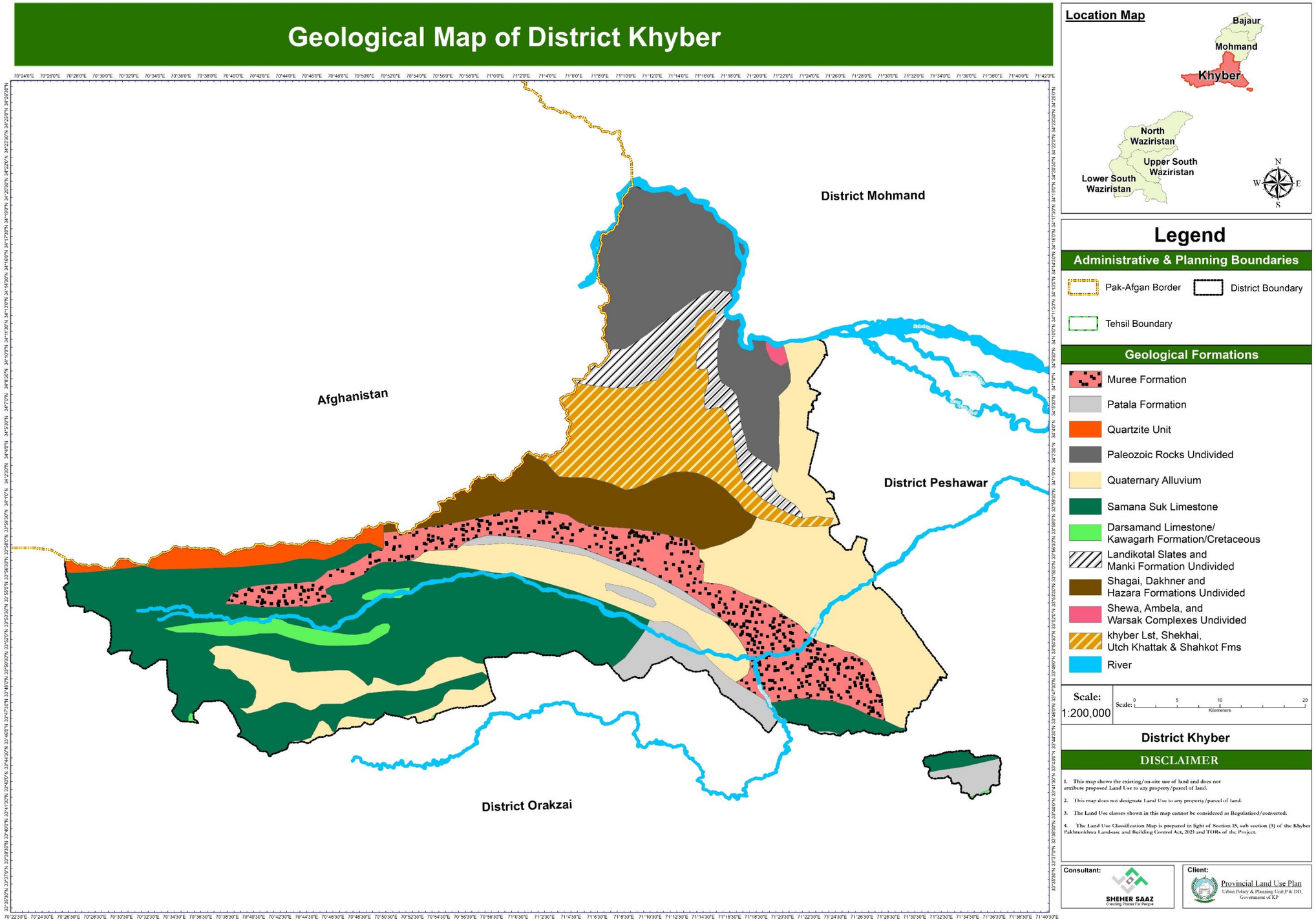
Khyber is located in the north of Pakistan, bordered by Afghanistan, Peshawar city, Kurram, and Orakzai districts. It covers an area of 2,576 square kilometers and has a population of 986,973. Forests make up 8.22% of its area. The terrain of Khyber is mostly barren and rugged, with hilly tracks and mountains, and narrow valleys. It is where several mountain ranges meet, including the Koh-e-Safaid, an offshoot of the Hindukush Mountains.

The region has beautiful valleys with arable plains, such as the valleys of Rajgal, Maidan, Bara, and Bazaar. The major plains are the Khajuri Plain and the Bara Plain. Khyber has two main rivers, the Bara and Chora Rivers. The River Kabul runs along the northern border, separating Khyber from Mohmand. These rivers flow into the Peshawar Valley.

Khyber is one of Pakistan's busiest trade routes due to its proximity to Afghanistan and Central Asia. Declaring Khyber a Free Trade Zone could further boost trade. There is also potential for olive tree cultivation on a commercial scale. Additionally, the "Khyber Safari train," a popular train ride among local and foreign tourists, should be restarted given the improved security situation in the region.

Tectonically, the Khyber District lies at the junction of two major tectonic zones of northern Pakistan; (i) Northwest Himalayan fold and thrust belt (ii) Himalayan Crystalline Nappe and Thrust Belt. The Khyber Ranges are a part of the Khyber Lower Hazara Metasedimentary Fold and Thrust belt (Figure-4). This Metasedimentary Fold and Thrust Belt lie towards the north of Khairabad-Panjal Thrust and extend eastward from Khyber Pass region to Garhi Habibullah. The Khyber-Hazara Metasedimentary Belt is largely composed of Precambrian to early Mesozoic Sediments. The Precambrian sequence is mainly comprised of slates and phyllites with subordinate quartzite and marbles, which crop out in the southern part of the belt. The Khyber-Hazara Metasedimentary fold and thrust belt have been intruded by mafic dykes, sills and granitic rocks of which the extensive Ambela pluton and Warsak granite are conspicuous. These intrusive rocks range in age from Late Paleozoic to Early Mesozoic. This Metasedimentary Belt is characterized by tight, asymmetrical or isoclinal folds imbricated by several thrust faults.

Map 47: Existing Geological Map - District Khyber



6.11.3.2 Hydrology and Water Resource

The primary water resource in the Khyber District is surface water, including floodwater and minor perennial streams, which are predominantly used for agriculture and account for over 90% of the total water supply. Groundwater is scarce and has been extensively extracted for multiple purposes, leading to a rapid decline in the water table[33].

Despite its high potential for farming, spate irrigation has received minimal investment in the Khyber District. There has been a lack of significant efforts to develop sustainable spate irrigation systems, which could help recharge groundwater and mitigate the impact of floods. As a result, flash floods continue to damage infrastructure and agriculture in the region.

6.11.3.3 Surface Water

Bara River, which flows in the southern part of the Khyber District, is the main source of irrigation for the cultivated land in the area. Another stream that passes through Jamrud is Jabba Khawar. This stream is the second largest source for irrigation of the cultivated lands in Jamrud Tehsil.

The Bara River Canal, which originates from the Bara River, also provides water for irrigation in the Khyber District. The total length of this canal is 2,680 meters and it has a discharge rate of 276 cusecs10. Out of the total cultivated area of 24,518 hectares in the Khyber District, an area of 9,050 hectares (36.91 %) is irrigated from these sources of surface water.

The total surface water available in Khyber District is 802.5 million cubic meters. Less than 50% (385.3 million cubic meters) is used for irrigation, while most of the water (417 million cubic meters) flows out of the district and drains into the Kabul River.

6.11.3.4 Ground Water

Ground water is the main source of drinking water, and it is also used for irrigation. Around 42% of the households in the Khyber District use open wells and hand pumps for their drinking. The average depth to the water table was noticed to be 117 feet in Khyber District. Due to the uncontrolled abstraction of ground water resources, the water table in this area is lowering very rapidly. Overuse of water has caused many existing waters supply schemes to stop functioning in Khyber District. Due to the lowering of the water table, people could not afford to bore at their houses, therefore, the wells are dug at one or two places in a village and all the community shares these wells.

The northwestern border areas of Pakistan have been facing regional instability and poor governance that have caused the ecological crisis. The ecological changes have resulted in reduced recharge to aquifers and the drying up of many springs, streams, and perennial watercourses. Thus, groundwater as the major source of water in most areas. Without any alternate source of water for domestic purposes, the abstraction rate of ground water is increasing. If 42% of the households use ground water for drinking as mentioned above, this means that if not all of these households but still a major portion of them would be using

[33] Technical Studies of Water Resources in FATA, IUCN Pakistan, SDC and FATA Environment Cell, https://pcrwr.gov.pk/wp-content/uploads/2020/Water-Management-Reports/FATA-water-studies.pdf

ground water for domestic uses as well. Also, around 11% of the total cultivated areas, which is 2697 hectares, depend on ground water for irrigation.

6.11.3.5 Soil

The soil of Khyber District, now part of Khyber Pakhtunkhwa province in Pakistan, is diverse due to its varied topography, climate, and geological characteristics. The district's landscape ranges from fertile valleys to rugged mountainous terrain, which contributes to the variation in soil types found in the region. Here is a comprehensive note on the soil of Khyber District:

- **Alluvial Soil:** In the valleys and plains of Khyber District, particularly along the banks of rivers and streams, alluvial soils are commonly found. Alluvial soils are formed by the deposition of fine sediments brought down by rivers and streams from the mountains. These soils are generally fertile and well-suited for agricultural activities, making them important for farming in the region.
- **Regur (Black Soil):** Regur or black soil is another type of soil found in some parts of Khyber District. This soil is characterized by its dark color and is typically rich in clay and organic matter. Black soil is highly fertile and retains moisture well, making it suitable for a variety of crops, including wheat, barley, and pulses.
- **Mountainous Soil:** In the hilly and mountainous regions of Khyber District, the soil composition varies significantly. The soil in these areas is often shallow and less fertile due to erosion and the steep slopes. However, these mountainous regions are valuable for grazing livestock and are home to various pastoral communities.
- **Sandy Soil:** Certain parts of Khyber District may have sandy soil, especially in arid and semi-arid regions. Sandy soils have larger particles and tend to drain water quickly, making them less suitable for agriculture without proper irrigation and soil management.
- **Loam Soil:** Loam soil, a balanced mixture of sand, silt, and clay, can be found in some areas of the district. Loam soils are highly productive and retain moisture, making them well-suited for a wide range of crops.
- **Saline and Alkaline Soil:** In some areas, especially in regions with poor drainage and high evaporation rates, saline and alkaline soils may occur. These soils are characterized by high salt content and can be challenging for agriculture unless proper soil reclamation measures are taken.
- **Soil Erosion and Conservation:** Like many other mountainous regions, Khyber District faces soil erosion challenges due to its rugged topography and heavy rainfall during monsoon seasons. Soil conservation practices, such as terracing, contour plowing, and afforestation, are essential to prevent soil degradation and maintain soil fertility.

Acknowledging the critical role of soil conservation, agroforestry, and sustainable land management is pivotal in restoring degraded lands and watersheds in the district. Soil conservation prevents erosion, enhancing soil fertility for sustainable agriculture. Agroforestry optimizes land use by integrating trees with crops, bolstering productivity and fostering environmental resilience. Sustainable land management practices ensure a delicate

balance, revitalizing degraded areas and securing the district's ecological integrity and water resources.

The diverse soil types found in Khyber District offer both opportunities and challenges for agriculture and land use. Sustainable soil management practices, combined with appropriate agricultural techniques, can help maximize the productivity of the land and support the livelihoods of the local communities in the district.

6.11.3.6 Forestry and Ecological Profile

The district's forest cover is only 17.9% of its total area. The forests of the district are mainly found in the high hills and mountainous tracts, like the Spin Ghar range, where natural cover has been retained. The lowlands and plains — the flat valley tracts — are essentially desert or barren due to aridness or have been denuded for agricultural use.

The Forestry Department plays a critical role in preserving these forested areas, it has the following roles to play for forest preservation:

1. Forest Planning and Management:

The Khyber Pakhtunkhwa Forest Department takes the lead in formulating comprehensive forest management plans for Khyber District. These plans encompass strategic allocation of forested areas, sustainable harvesting practices, and conservation strategies that align with both local needs and long-term ecological balance.

2. Protection and Anti-Deforestation Measures:

A primary responsibility of the Forest Department is to protect the forests within Khyber District from illegal logging, encroachments, and deforestation. Implementing robust anti-deforestation measures, such as regular patrols, monitoring systems, and community awareness campaigns, are pivotal to safeguarding the forested areas.

3. Regeneration and Reforestation Initiatives:

The department focuses on regenerating forests through reforestation initiatives. This involves identifying degraded areas, replanting indigenous tree species, and nurturing these plantations to ensure their growth and vitality. Reforestation efforts contribute to increasing forest cover and improving ecosystem health.

4. Community Engagement and Sustainable Forest Practices:

Engaging with local communities is integral to the department's approach. Educating communities about sustainable forest practices, encouraging their active involvement in conservation efforts, and fostering a sense of ownership lead to more responsible resource utilization and a shared commitment to forest protection.

5. Overall Ecosystem Development and Ecological Restoration:

The Forest Department aims at the holistic development of the forest ecosystem in Khyber District. This includes habitat restoration, promoting biodiversity, and managing watersheds to sustainably regulate water flow and quality. By restoring the ecological balance, the department contributes to the overall health and resilience of the region's ecosystems.

6.11.3.7 Ecological profile

Forests are critical elements of the ecosystem, providing an array of necessary services. Forests act as natural reservoirs, shielding watersheds and ensuring an ongoing supply of pure water. Forests also ensure climate stability by acting as sinks for carbon dioxide and mitigating regional temperature fluctuations while, simultaneously, providing critical habitats to millions of species. This biodiversity enhances ecosystems so that they can endure environmental pressures and maintain necessary ecological processes

Conservation of forest biodiversity is not only important for the survival of millions of species but also for the protection of resources that are essential for agriculture, medicine, and the environment. Conservation of forest biodiversity is central to ecological health and the survival of species, many of which are essential for agricultural, medicinal, and environmental sustainability. Practices like habitat conservation, reforestation, sustainable forest management, and the establishment of protected areas are essential in the protection of these ecosystems from deforestation and loss of habitats.

Economically, forests have an important function in livelihood support. They provide timber for building and industry, fuel wood and fodder for daily use, and stimulate local economies through eco-tourism and recreation. Safeguarding the ecological integrity of forests while facilitating sustainable economic opportunity is essential to maintaining these landscapes for generations to come.

6.11.3.8 Sustainable forest management

In Khyber District, sustainable forest management will open promising avenues. Community-based Forest management fosters local involvement, while ecotourism harnesses natural beauty, attracting visitors. Agroforestry integrates trees with agriculture, optimizing land use. These strategies align conservation with development, paving a sustainable path for the district's forests and communities. All the planning will be done considering the Sustainable Development Goals in addition to IPCC recommendations.

6.11.4 Proposed Intervention

There are four specific proposals given to maintain the physical characteristics in the area and promote greenery in the area. These include green space, plantation, riparian zone, and green belt.

6.11.4.1 Green Space

According to the Khyber Pakhtunkhwa Urban Policy, a mandatory green buffer zone of approximately 61 meters must be established around all designated industrial zones to mitigate environmental impacts, reduce pollution exposure for nearby communities, and preserve ecological balance. This standardized green space requirement is strictly implemented in the industrial zones of Mullagori, Bara, and Landi Kotal, where the buffer serves as a critical barrier between industrial activities and residential or agricultural areas. However, in the case of Jamrud, which experiences significantly higher population density compared to the other tehsils, the green buffer has been intentionally expanded beyond the standard 61-meter width. This augmented green space not only enhances environmental

protection but also provides additional recreational areas, improves air quality, and supports urban heat island mitigation in a more densely populated setting. Such adaptive planning reflects a responsive approach to local demographic pressures while upholding the core objectives of sustainable industrial development and public health safeguards across the region.

6.11.4.2 Plantation

To foster a healthier urban environment and enhance ecological resilience, extensive plantations are mandated within the major cities of the region, in full alignment with sustainable development goals. These afforestation initiatives will employ the renowned Miyawaki method, a proven technique for creating dense, native, multi-layered forests that rapidly establish biodiversity, improve air quality, sequester carbon, and stabilize soil within just a few years. By mimicking natural forest ecosystems, Miyawaki plantations promote self-sustaining green cover that requires minimal maintenance after the initial establishment phase, thereby ensuring long-term environmental stability across urban and peri-urban landscapes.

The selection of plant species will prioritize locally adapted, indigenous, and ecologically significant trees and shrubs that are well-suited to the region's soil, climate, and topography. The plantation should be done given the area most frequently grown plants such as the kikar (Prosopis juliflora), phulai (Acacia modesta), kao (Olea cuspidata), ber (Ziziphus; Ziziphus numularia), gurgura (Monotheca boxifolia), blue pine (Pinus wallichiana), cedar (Cedrus deodara), oak (Quercus incana), sanatha (Dodonea viscosa), eucalyptus (Eucalyptus camaldulensis), poplar (Populas sp), mulberry or toot (Morus alba), shisham (Dalbergio sissoo), and farash (Tamarix articulate).[34]

6.11.4.3 Green Belt

A green belt is strategically established around each settlement wherever the need arises, primarily to impose a definitive boundary that curtails uncontrolled urban sprawl, preserves agricultural land, and safeguards natural ecosystems from encroachment. In the specific cases of Jamrud, Landi Kotal, Ali Masjid, and Mullagori, a robust 500-meter-wide green belt has been mandated to encircle these areas, serving as both a physical and ecological barrier. This expansive buffer not only prevents the merging of settlements but also enhances biodiversity, improves groundwater recharge, and acts as a natural shield against dust, noise, and industrial emissions. Furthermore, it promotes climate resilience by mitigating urban heat islands and provides potential space for community recreation and agroforestry, aligning with sustainable land-use principles under the KP Urban Policy.

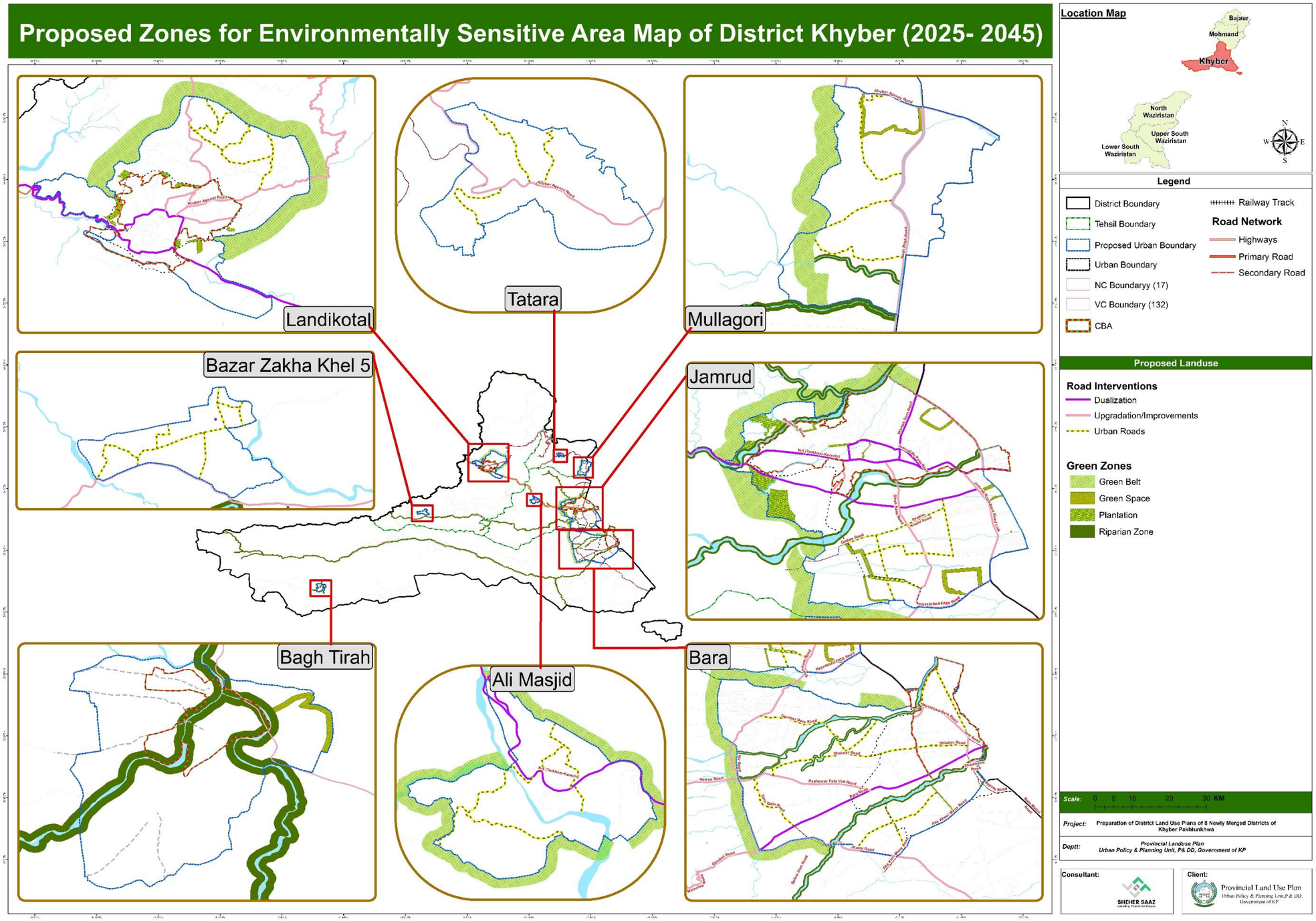
6.11.4.4 Riparian Zone

A riparian buffer zone is mandated around all water bodies within the project area to prevent infiltration of pollutants, control erosion, and maintain water quality by filtering sediments, nutrients, and contaminants before they enter the stream. These protective corridors are

[34] November 7, 2025. Almanac, https://pakistanalmanac.com/kp-khyber/#1633497144852-f0a014d6

specifically proposed along the Bara River in Bara, as well as the Gudar Khwar and Barg Khwar in Jamrud key watercourses that traverse the designated industrial and urban development zones. A minimum 50-meter-wide riparian zone is established on both banks of these water bodies, comprising dense native vegetation. This buffer not only safeguards aquatic ecosystems and groundwater recharge but also aligns with the Khyber Pakhtunkhwa Environmental Protection Act and National Water Policy standards.

Map 48: Environmentally Sensitive Areas - District Khyber



6.12 AGRICULTURAL ZONES (PRIME LANDS, TERRACES)

6.12.1 Agriculture

6.12.1.1 Existing Condition

Agriculture is the backbone of Pakistan's economy, contributing 22.9% to GDP and employing 37.4% of the workforce, while in Khyber Pakhtunkhwa it provides 19.2% of provincial GDP and jobs for 31.8% of the labor force. In District Khyber, where most people depend on farming, fertile alluvial plains in Bara and Jamrud and the terraced slopes of Tirah support wheat, maize, sugarcane, pulses, fodder, and vegetables. The Bara River, hill torrents, seasonal streams, canals, and tube-wells provide irrigation, though upland terraces remain largely rain-fed. The district also cultivates high-value horticulture such as apricot, apple, grapes, and plum, while off-season vegetables from Tirah meet strong regional demand. Livestock rearing, including cattle, goats, sheep, and poultry, further strengthens rural incomes and food security.

Agriculture in District Khyber faces multiple challenges that threaten its sustainability and productivity. Unplanned development of housing societies and related infrastructure on fertile agricultural land poses a serious risk to food security. Farmers also struggle with the unavailability of quality seeds, fertilizers, and pesticides, alongside rising production costs and low returns. The situation is further aggravated by climate change and the rapid increase of wild boar and pig populations, which damage standing crops and reduce yields.

Despite these challenges, agriculture remains a major source of employment in the district. It provides work opportunities in farm labour and crop production, particularly in wheat, maize, oil crops, and vegetables such as tomato, potato, and onion. The sector also supports local markets by connecting buyers and sellers within Khyber as well as neighbouring districts. Employment is generated for transporters moving produce to other areas, while dealers of seeds, fertilizers, and pesticides also benefit. Overall, the sector plays an essential role in ensuring food security for the region.

Rapid urbanization and settlement expansion in District Khyber have emerged as a significant threat to agriculture. The growing population has led to shrinking landholdings, with fertile agricultural areas being converted into residential zones. This transformation not only reduces cultivable land but also contributes to contamination and depletion of irrigation water resources, further straining agricultural productivity.

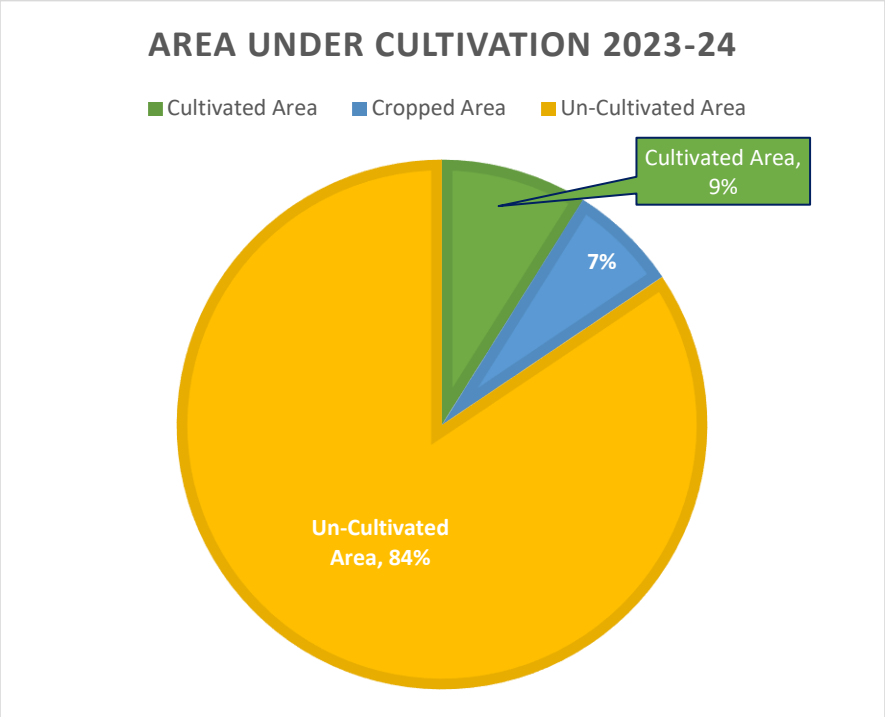
6.12.1.2 Area Under Cultivation

According to the existing land-use classification[35], District Khyber covers a total reported area of 636,731 acres, of which about 60,815 acres, roughly 9.5 percent of the district's land, are classified as agricultural. Within this agricultural area, approximately 36,000 acres (around 59 percent) are net sown in the current year, while the remaining land consists of fallow fields and other agricultural uses. In addition, 2,167 acres are recorded as orchards, highlighting the

[35] District wise land use utilization statistics in KPK, Development Statistics of KPK-2025

district's potential for specialized fruit cultivation. This land distribution reflects the constraints imposed by Khyber's mountainous terrain, limited water resources, and scattered pockets of arable land, while also pointing toward opportunities to boost productivity through efficient irrigation, crop diversification, orchard expansion, and sustainable land-management practices.

Figure 31: Area Under Cultivation in District Khyber[36]



6.12.1.3 Crop Production Profile

The production profile of District Khyber[37] shows a farming system dominated by a few key crops with distinct seasonal patterns. During the Kharif season, maize occupies the largest cultivated area at about 3,116 acres, producing over 3,182 tons, followed by sugarcane with a smaller area of 230 acres but a remarkably high output of around 5,494 tons, reflecting its high yield potential. Potatoes also contribute significantly with 357 acres yielding 4,351 tons, while vegetables, tomatoes, jowar, and fruits are grown on comparatively smaller plots yet provide valuable diversification for local food supply. In the Rabi season, wheat clearly dominates with over 12,600 acres under cultivation and a production of more than 25,000 tons, underscoring its role as the district's staple crop. Other Rabi crops such as onion, potato, vegetables, fruits, and tomato are cultivated on limited acreage but achieve relatively high productivity, particularly onions with 7,874 tons and potatoes with 2,494 tons from modest land areas.

[36] District wise land use utilization statistics in KPK, Development Statistics of KPK-2025

[37] Agriculture Department, District Khyber

Overall, the data reveal that District Khyber's agriculture relies heavily on wheat and maize for staple food security, while high-value crops like sugarcane, onion, and potato offer significant income potential despite their smaller areas. The clear dominance of irrigated farming in most crops indicates dependence on managed water supply, whereas the limited share of unirrigated land highlights the constraints imposed by the district's mountainous terrain and scarce natural water resources.

Table 116: Distribution of Area by Crops in District Khyber

Name of Crop	Area in Acre			Production in tons		
	Irrigated (acres)	Un-irrigated (acres)	Area (acres)	Irrigated (tons)	Un-irrigated (tons)	Production (tons)
Kharif crops						
Maize	3,013	103	3,116	3,103	79	3,182
Jowar	251	77	328	185	27	212
Tomato	71	–	71	463	–	463
Sugar cane	230	–	230	5,494	–	5,494
Potato	357	–	357	4,351	–	4,351
Vegetable	229	–	229	1,282	–	1,282
Fruits	195	–	195	302	–	302
Rabi crops						
Wheat	10,596	2,036	12,632	23,035	2,253	25,288
Onion	538	–	538	7,874	–	7,874
Tomato	71	–	71	498	–	498
Fruits	113	–	113	740	–	740
Potato	201	–	201	2494	–	2494
Vegetable	263	–	57	1,812	–	1,812
Fodders	57	–	57	875	–	875

Source: Khyber Pakhtunkhwa Development Statistics 2025, Bureau of Statistics, KP

6.12.1.4 Water Management and Type of Irrigation

According to the Food and Agriculture Organization, OECD, and World Bank (2025), Pakistan's renewable internal freshwater resources stood at approximately 1,253 cubic meters per person per year in 2017. This level places the country firmly in the "high water-stress" category, as it falls below the widely recognized threshold of 1,700 m^3/person/year. The decline is driven by population growth, urbanization, industrial expansion, and climate variability, all of which exert increasing pressure on limited water resources. In many regions,

over-extraction of groundwater has led to lowered water tables, while pollution and salinity further constrain water quality and availability.

In District Khyber, agriculture relies on a mix of surface and groundwater irrigation sources. The total irrigated area has gradually expanded from 35,171 acres in 2021-22 to 35,502 acres in 2023-24. Government canals remain the dominant source, consistently irrigating over 26,380 acres and accounting for nearly three-fourths of the total. Private canals add a modest share of about 894-922 acres, serving smaller agricultural pockets. Among groundwater sources, wells play a significant role, expanding from 5,577 acres in 2021-22 to 5,861 acres in 2023-24, while tube-wells make only a negligible contribution of about 7 acres in 2021-22 before disappearing from official records in subsequent years. Lift-pumps provide irrigation over 652-684 acres, and other minor methods cover around 996-1,029 acres, with a small portion (603-628 acres) falling under unspecified sources. This distribution highlights the district's strong dependence on government canal systems, supplemented by wells and localized methods to balance variability in water availability.

Table 117: Year-wise Irrigated Area in Khyber District through Different Sources

Year	Total	Canals		Tanks	Tubewells	Wells	Lift-pumps	Others
		Govt.	Private					
2021-22	35,171	26,383	894	7	5,577	652	1,029	628
2022-23	35,250	26,412	909	-	5,615	664	1,036	613
2023-24	35,502	26,434	922	-	5,861	684	996	603

**Area is in acres*

Source: Khyber Pakhtunkhwa Development Statistics 2025, Bureau of Statistics, KP

6.12.1.5 Plans and Future direction

6.12.1.5.1 Plans and Strategies by Government

To counter these challenges, a number of plans and strategies are being promoted[38]. These include the adoption of vertical farming, integrated crop and pest management, and the efficient use of modern farming technologies. Efforts are also being directed towards improving per-acre yields of major crops, adapting to the impacts of climate change, and reducing post-harvest losses. Value chain development and value addition for major cash crops are also being encouraged to strengthen the agricultural economy. Additionally, the introduction and promotion of high-value cash crops are viewed as a promising opportunity to diversify farm incomes.

However, several constraints continue to hinder agricultural development. Farmers often lack awareness of modern techniques and technologies, and small landholdings limit productivity. Irrigation systems are inefficient, with shortages of water reducing yields per acre. Moreover, the absence of effective support and crop insurance policies from the government leaves farmers vulnerable to losses. Addressing these constraints will be essential to making agriculture in District Khyber more sustainable, resilient, and profitable.

[38] Agriculture Department, Khyber

6.12.1.6 Future Proposals

- ***Proposal for Reserved Agriculture Zone***

With only about 9.5% of District Khyber's total land (60,815 acres) under cultivation, the preservation of fertile farmland is crucial to food security and rural livelihoods. Rapid urbanization and competing land uses continue to threaten agricultural sustainability. To safeguard these critical resources, it is proposed that approximately **52,292 acres** of prime agricultural land be officially designated as Reserved Agriculture Zones. These areas will remain dedicated to staple crops, vegetables, and fodder production, with zoning focused on high-yield tracts that benefit from irrigation potential. The details of the proposed Reserved Agriculture Zones across different tehsils of District Khyber are presented in the table below:

Table 118: Preserve Agriculture Zones – District Khyber

Proposal Location	Area in acre
District Khyber	**52292.79**
Tehsil Bara	47895.005
Tehsil Jamrud	1613.71
Tehsil Mullagori	310.74
Tehsil Landi Kotal	2473.32

Source: Proposed District Khyber Land Use Plan, 2025

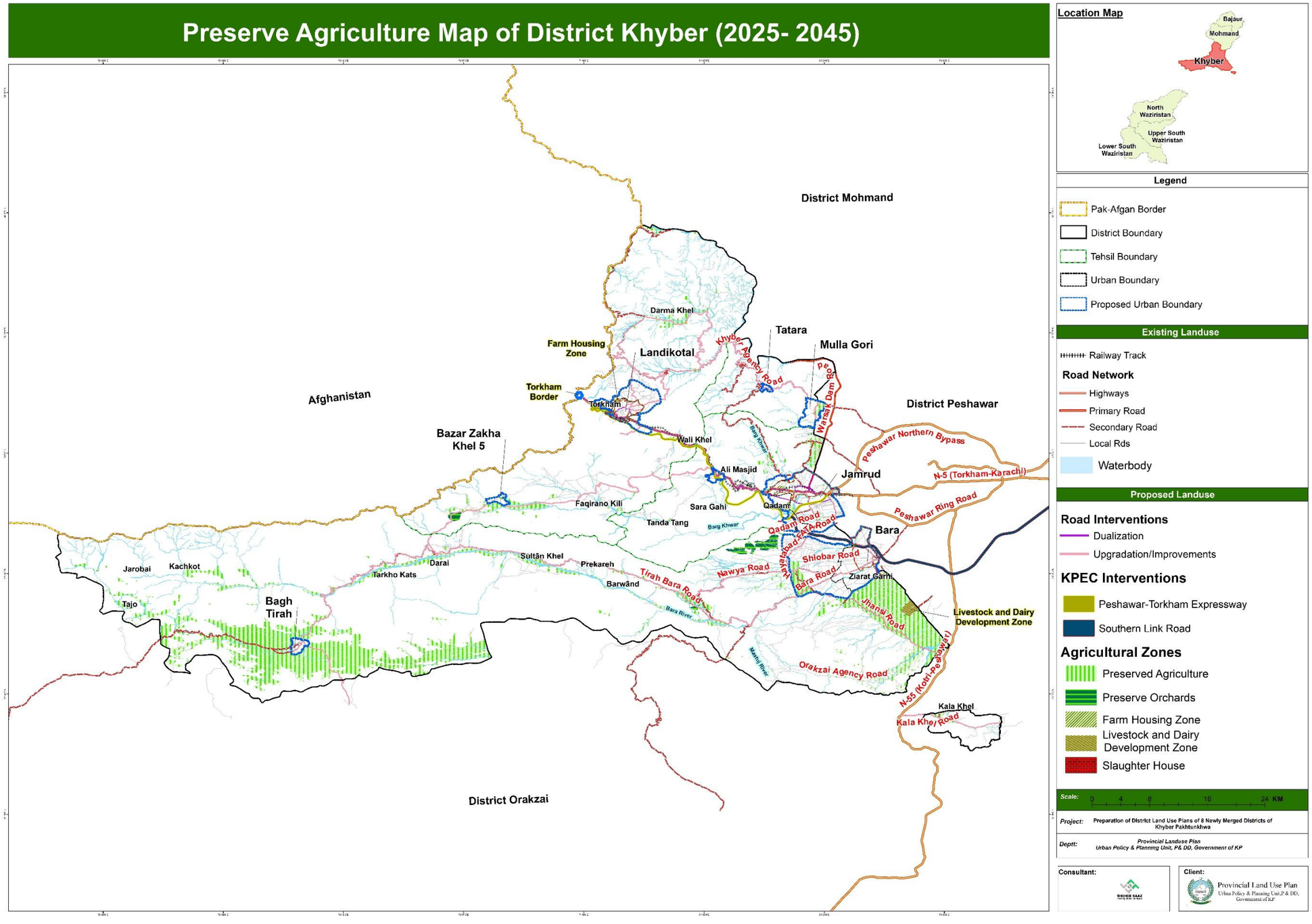
6.12.1.7 Zoning Regulation for Agriculture Land Use

Here are the guidelines developed for Agricultural zone development:

Category	Regulations / Activities
Permitted Uses	• Development of land strictly for agricultural purposes in designated areas. • Crop cultivation, horticulture, orchards, and greenhouse farming. • Livestock farming, poultry, and related animal husbandry. • Aquaculture and small-scale fish farming (where suitable). • Establishment of farmer's markets and direct sale outlets for agricultural products. • Construction of basic storage facilities (silos, cold storage, warehouses) directly linked to farming activities.
Permissible Uses	• Agro-processing and value addition industries (e.g., food processing, packaging). • Renewable energy generation integrated with farming (e.g., solar panels, biogas units). • Rural tourism initiatives (e.g., farm stays, guided agro-tours, demonstration farms). • Agroforestry and sustainable land management practices. • Agricultural research and demonstration centers.

	• Accommodation and housing for farmers and farm labor (subject to local authority approval).
Prohibited Uses	• Conversion of agricultural land to non-agricultural uses such as residential, commercial, or industrial development. • Cultivation of crops or rearing of livestock not suitable for the local climate or requiring excessive water/resources. • Use of harmful agrochemicals or practices that degrade soil quality, reduce productivity, or pollute water sources. • Encroachment or fragmentation of reserved agricultural areas for unplanned development. • Any activity harmful to public health, the natural environment, or biodiversity.

Map 49: Proposed Agriculture Zones



6.12.1.8 Recommendations

- Line and concrete water channels and tube-well outlets to minimize seepage losses and reduce pumping costs.
- Promote modern irrigation systems such as drip and sprinkler methods to make the most of scarce water resources and improve yields.
- Establish small water reservoirs, rainwater harvesting structures, and check dams in rainfed areas to enhance water availability for off-season crops.
- Reclaim and cultivate idle or underused lands through land leveling, soil preparation, and improved irrigation practices.
- Encourage multiple cropping and efficient rotation (e.g., wheat–maize, wheat–vegetables) to increase output from limited acreage.
- Expand production of high-value crops such as sugarcane, onion, potato, tomato, and fruits (including orchard development) to increase farmer income.
- Introduce plastic tunnel technology for off-season vegetables to enable early market entry and better prices.
- Promote organic farming and compost use to improve soil fertility and reduce dependence on costly chemical inputs.
- Provide timely access to certified seeds, fertilizers, and pesticides at affordable rates, with strict monitoring of seed and fertilizer quality.
- Encourage adoption of high-yield, disease-resistant varieties of wheat, maize, potato, and vegetables suited to the district's climate.
- Strengthen agricultural extension services to educate farmers on pest management, irrigation scheduling, and modern farming techniques.
- Expand credit and loan facilities through commercial banks and microfinance institutions, enabling smallholders to purchase quality inputs and equipment.
- Improve farm-to-market roads and transport services to reduce post-harvest losses and provide farmers easier access to urban markets.
- Support establishment of storage and processing facilities (e.g., cold storage for potatoes and onions, sugarcane processing units) to stabilize prices and add value locally.
- Promote water conservation measures, agroforestry, and soil conservation to safeguard natural resources.
- Encourage women's participation and small-scale agribusiness ventures to boost household income and food security.

6.12.2 Livestock Sector

6.12.2.1 Existing Available Livestock and Services

Khyber District holds a distinct share of the livestock resources of Khyber Pakhtunkhwa, with a total population of 949,918 animals, representing about 1.98% of the provincial total of 47.9 million. Poultry dominates the sector, with 496,731 birds accounting for 2.60% of the province's poultry. Goats follow as the second-largest category, numbering 240,597 and contributing 2.40% to the provincial herd. Sheep (64,472) and camels (1,982) also show notable presence, making up 1.53% and 1.59% of provincial stocks, respectively.

Cattle (114,789) and buffaloes (6,060) are comparatively fewer, with shares of 1.30% and 0.18%, respectively, in the provincial population. Equines are limited, with only 205 horses (0.08%) and 930 mules (0.03%), while donkeys are somewhat more common at 21,248, representing 0.46% of the provincial total. An additional 21,854 animals are grouped under the "other" category, forming a significant 19.46% of the district's livestock composition.

This varied distribution highlights both the diversity and the relative weight of different livestock types in shaping the district's agrarian economy, where poultry and small ruminants dominate, but other categories also contribute to household income and subsistence.

Table 119: Existing Livestock Population in 2021 – Khyber District

Animal	Khyber Pakhtunkhwa	Khyber District	Portion of Khyber District (%)
Total	47,911,692	949,918	1.98
Cattle	8,837,227	114,789	1.30
Buffaloes	3,402,135	6,060	0.18
Sheep	4,219,238	64,472	1.53
Goats	10,041,678	240,597	2.40
Poultry	19,100,442	496,731	2.60
Camel	124,663	1,982	1.59
Horse	268,953	205	0.08
Donkey	502,821	2,298	0.46
Mules	3,022,101	930	0.03
Other	112,325	21,854	19.46

Source: Khyber Pakhtunkhwa Development Statistics 2022, Bureau of Statistics, KP

According to the Livestock and Dairy Development Department of Khyber Pakhtunkhwa, Khyber District hosts around 150 poultry farms in addition to a network of veterinary and animal husbandry services. The district is equipped with civil veterinary hospitals, dispensaries, centers, artificial insemination facilities, and diagnostic labs that support livestock health and productivity. However, compared with some other merged districts, the overall number of service facilities in Khyber remains moderate, highlighting the need for expansion and modernization.

Table 120: Existing Animal Husbandry Facilities and Level of Services

Sr. No	District	CVH	CVD	CVC	AIC	District MVC	Mobile Milk Lab	Diag. Lab	SPU	Model Dairy Farm	Total
1	**Khyber**	3	12	36	36	1	1	2	–	–	91

Key:
CVH = Civil Veterinary Hospital, CVD = Civil Veterinary Dispensary, CVC = Civil Veterinary Centre, AIC = Artificial Insemination Centre, MVC = Mobile Veterinary Centre, SPU = Semen Production Unit

Source: Livestock and Dairy Development Department of Khyber Pakhtunkhwa

6.12.3 Fisheries Sector

Although fisheries were earlier considered underdeveloped in Khyber District, official data from the Livestock and Dairy Development Department, KP shows that the sector has strong potential for growth. The district possesses abundant freshwater resources from rivers, streams, dams, and spring water sources in areas such as Rajgal Valley, Wersak, Maidan, and Tirah Valley, which are well-suited for aquaculture. The cold climate supports high-value species like trout (rainbow, brown, Kamloope, golden), while warm-water fish including silver, grass, rahu, tilapia, and catfish can be cultivated in ponds and small dams across Bara, Shalobar, Akkhel, and Mula Ghori. Fisheries present major economic opportunities through income generation, employment creation, and export potential, particularly of trout to Gulf countries. They also offer strong tourism linkages, with trout farming sites positioned to attract eco-tourism. However, the sector faces challenges such as limited hatcheries, cold storage, diagnostic facilities, poor awareness of modern aquaculture practices, weak connectivity to markets, and lingering impacts of past security issues. To address these gaps, the KP Fisheries and Aquaculture Act (2022) provides regulatory support through licensing, seasonal bans, and sustainable harvesting rules, while government programs under the Blue Economy framework are promoting hatchery development, fingerling distribution, and community engagement. If supported with targeted investment, the fisheries sector could create jobs, improve nutrition and food security, boost household incomes, and ensure sustainable resource utilization in Khyber District.

Figure 32: SWOT Analysis for Fisheries – District Khyber



6.12.4 Existing and Future plans

6.12.4.1 Existing Plans by Government

- ***Establishment of Model Dairy Farms in Khyber District***

The project has a total cost of **PKR 410 million**, with **PKR 98.5 million** allocated for the fiscal year **2023-24**. This initiative aims to modernize dairy farming practices in the district by introducing advanced technologies and sustainable methods, including automated milking systems, cold storage chains, and artificial insemination facilities. By setting up model dairy farms, the project seeks to boost milk production, improve livestock genetics, and enhance livelihoods for 1,200+ local farmers. The allocated funds reflect the government's priority to strengthen Khyber's dairy sector, a key driver of the rural economy.

- ***Provision of Veterinary Health Facilities in Khyber District***

With a total budget of PKR 85.2 million (including PKR 45 million for FY 2023-24), this project focuses on upgrading animal healthcare services. It will establish 24/7 emergency veterinary clinics, deploy mobile veterinary units to remote areas (e.g., Tirah Valley), and implement large-scale vaccination programs targeting foot-and-mouth disease and other livestock ailments. These efforts are critical for safeguarding the district's 500,000+ livestock population, ensuring productivity and food security.

- ***Construction/Reconstruction of Veterinary Facilities***

This **PKR 500 million** infrastructure project addresses chronic shortages in veterinary services. Key components include:

- Building **12 new veterinary hospitals** in underserved regions.
- Upgrading **15 existing facilities** with surgical units and diagnostic labs.

- Providing **essential medicines**, including vaccines and de-wormers, to all government-run veterinary centers.

In FY 2022-23, **PKR 120 million** was utilized to initiate construction in Landi Kotal and Jamrud. The project aligns with national goals to improve livestock management in former tribal areas.

6.12.5 Future Proposals

- ***Livestock and Dairy Development Zones***

To strengthen livestock production and improve the dairy value chain, two dedicated Livestock and Dairy Development Zones are proposed in Khyber District, covering a combined area of 757 acres (shown in table below). The largest allocation is in Tehsil Bara (625 acres), which is suitable for establishing model dairy farms, fodder cultivation, and feed processing units due to its available land resources and proximity to major livestock-rearing communities. In Tehsil Jamrud (87 acres) and Tehsil Landikotal (45 acres), smaller zones are proposed to promote smallholder dairy clusters, artificial insemination services, and livestock breed improvement initiatives. These zones will serve as hubs for modern husbandry practices, veterinary services, and farmer training, thereby addressing productivity gaps and ensuring sustained livestock growth in the district.

Table 121: Livestock and Dairy Development Zones – District Khyber

Proposal Location	Area in acre
Tehsil Bara	625.84
Tehsil Jamrud	109.97
Tehsil Landikotal	29.86
Disrict Khyber	765.67

Source: Proposed District Khyber Land Use Plan, 2025

- ***Slaughterhouse Zones***

To improve meat quality, food safety, and market access, two Slaughterhouse Zones are proposed with a total area of 117 acres (shown in table below). The main facility will be located in Tehsil Jamrud (112 acres), strategically positioned along the trade and transport corridor to cater to both domestic consumption and cross-border trade. A smaller facility of 5 acres in Tehsil Landikotal will provide localized services for surrounding communities, ensuring hygienic meat processing and reducing reliance on unregulated slaughter practices. These zones are envisioned to operate with modern infrastructure, including holding pens, veterinary inspection units, waste treatment systems, and cold storage facilities, in compliance with the West Pakistan Slaughter Control Act (1963).

Table 122: Slaughterhouse Zones – District Khyber

Proposal Location	Area in acre
Tehsil Jamrud	1.83
Tehsil Landikotal	5.27

District Khyber	7.1

Source: Proposed District Khyber Land Use Plan, 2025

By combining Livestock & Dairy Development Zones with modern slaughterhouse facilities, District Khyber will be able to enhance livestock productivity, ensure food safety standards, and strengthen its role as a significant contributor to the provincial livestock economy.

- ***Farm Housing Zones***

To support the growing livestock sector and provide secure, well-managed spaces for animal rearing, two Farm Housing Zones are proposed in Khyber District with a total allocation of 229 acres. The larger site is in Tehsil Landikotal (128 acres), designed to accommodate organized cattle and small ruminant housing, feed storage, and integrated veterinary support facilities. The second site in Tehsil Jamrud (101 acres) will focus on establishing community-based farm housing clusters, where small-scale farmers can benefit from shared infrastructure such as fodder storage, water supply systems, and training centers for modern farm management.
These farm housing zones are intended to reduce the pressure of scattered and unregulated livestock keeping within populated areas, improve animal health and biosecurity, and create opportunities for scaling up dairy and meat production. By offering planned housing units, proper waste management, and collective veterinary services, the zones will not only raise productivity but also help meet hygiene and environmental standards. Over time, these facilities can evolve into demonstration centers showcasing modern livestock housing practices, ultimately strengthening Khyber's position in livestock development and enhancing farmer livelihoods.

Table 123: Farm Housing Zones – District Khyber

Proposal Location	Area in acre
District Khyber	**229**
Tehsil Jamrud	101
Tehsil Landikotal	128

Source: Proposed District Khyber Land Use Plan, 2025

6.12.6 Recommendations

- ***Pond and Dam-Based Aquaculture:*** Promote warm-water fish farming (silver carp, grass carp, tilapia, catfish, rahu) in existing small dams and ponds such as Shalobar, Akkhel, Mula Ghori, Bara, Aziz Khuwar, and Zawo Dam. Encourage community-based cooperatives for fishpond management.
- ***Fisheries Development Centers:*** Establish Fisheries Training and Hatchery Centers in Bara and Jamrud to provide fingerlings, technical assistance, and hands-on training in aquaculture. These centers can serve as anchor points for expanding smallholder fish farming.
- ***Veterinary & Aquaculture Services Expansion:*** Strengthen veterinary hospitals and diagnostic labs to cover both livestock and fisheries. Introduce mobile aqua-vet units for remote valleys to support disease management and water quality monitoring.
- ***Fodder–Feed Integration:*** Develop a dual-feed strategy, fodder crops for livestock and feed formulations for fish, using locally available grains and by-products. Encourage private sector investment in feed processing units.
- ***Market-Oriented Clusters:*** Create integrated livestock and fish markets with auction halls, cold storage, and hygienic slaughter/fish processing units in Jamrud (gateway hub) and Bara (production hub) to improve value addition and regional trade.
- ***Public–Private Partnerships (PPP):*** Attract private investors to set up eco-tourism-based trout farms in Rajgal and Tirah valleys, combining fish production with recreation to diversify income streams.
- ***Microfinance & Insurance:*** Extend credit facilities and livestock/fish insurance schemes to small farmers for investment in high-yielding breeds, improved feed, fish ponds, and hatcheries.
- ***Extension & Awareness:*** Train farmers in modern livestock husbandry and aquaculture practices, disease control, biosecurity, and market trends through regular extension programs, community workshops, and demonstration sites.

6.13 FOREST/RANGELAND ZONES

6.13.1 Existing Status of Forests and Rangelands

District Khyber contains some of the most ecologically significant tracts of natural vegetation along its rugged hills and valleys, but decades of population growth, settlement expansion, fuelwood dependency, and unregulated grazing have steadily reduced the density and health of these resources. Today, forests occupy only about 5,241 acres (0.8%) of the district's total 636,731 acres, while 368,376 acres (57.8%) constitute rangelands that remain vital for grazing, fuelwood, and ecosystem services.

6.13.2 Sensitive Areas and Management Gaps

The Khyber Forest Division identifies Tirah Maidan, Rajgal, Qambar Khel, Zakhakhel, and Sheen Qamar as particularly sensitive forest areas, prone to fire, deforestation, and degradation. Despite their ecological significance, no formal working or management plan has been devised to systematically assess or conserve Khyber's Forest resources. Until 2019, the area was only nominally under the jurisdiction of the KP Forest Act (2002), and meaningful interventions began after the extension of provincial law in 2022. Afforestation efforts, mainly under projects such as the Billion Tree Afforestation Program (BTAP), have been undertaken since 2020-21, but remain fragmented and insufficient to offset large-scale deforestation pressures.

6.13.3 Regional Comparison

Forest vegetation is diverse, ranging from natural oak, wild olive, and chilghoza at higher elevations, to phulai, sanatha, and acacia scrub on lower slopes, with scattered plantations of eucalyptus, poplar, and shisham. Yet, most areas remain unclassified under provincial categories, limiting systematic management and formal protection. Compared to forest-rich districts of Khyber Pakhtunkhwa, such as Swat (952,983 acres), Dir Upper (716,141 acres), Kohistan (1,145,023 acres), and South Waziristan (1,211,808 acres), Khyber's notified forest estate is modest. However, its rangeland share is among the highest in the province, forming the backbone of household economies and supporting livestock rearing in a semi-arid setting.

6.13.4 Community Dependency and Traditional Practices

Historically, forest and rangeland resources were managed under tribal customs, with seasonal grazing bans and selective cutting helping preserve vegetation. Today, however, rising population, rural poverty, and commercial pressures have driven unregulated wood cutting and overgrazing. The Forest Department notes that many households remain economically dependent on forest produce, timber, firewood, medicinal plants, and grazing, while small-scale firewood trade provides crucial winter income for low-income families.

6.13.5 Environmental Impacts of Deforestation

The impacts of deforestation are already evident. According to the Forest Division, key consequences include loss of biodiversity, climate change vulnerability, soil erosion, disruption of water cycles, loss of ecosystem services, increased greenhouse gas emissions, flooding risks, and desertification. These changes are undermining both agricultural

productivity and grazing potential, while contributing to broader climate instability across the region.

6.13.6 Ecological Functions and Way Forward

Beyond their wood products, forests and rangelands perform critical ecological functions: reducing soil erosion, improving water infiltration, stabilizing slopes, and regulating local climate. Mitigation therefore requires sustained afforestation, community-based forest governance, and rangeland management systems. Locally adapted measures such as agroforestry, farmland woodlots, controlled grazing systems, and replantation of indigenous species are essential to safeguard ecological services.

6.13.7 Plans and Future direction

6.13.8 Future Proposals

Proposal for Protected Forest Conservation Zone

The official notified forest estate in District Khyber is very limited, covering only 5,241 acres (0.8%) under the KP Forest Act. However, for planning purposes, the proposed Protected Forest Conservation Zone has been reserved across 195,201 acres (30.6%) of land-use classified forest/green cover (shown in table below). This includes 194,078 acres in Tehsil Bara and 1,122 acres in Tehsil Landikotal. The difference between the official and proposed figures reflects two perspectives: the Forest Department recognizes only legally notified forests, while land-use assessments also include scrublands, woodlands, and community-managed vegetation that function as critical ecological assets.

By reserving this broader area as a Protected Forest Conservation Zone, Khyber District can ensure that both the small, notified estate and the larger functional green cover are safeguarded. Sensitive tracts such as Tirah Maidan, Rajgal, Qambar Khel, Zakhakhel, and Sheen Qamar should be prioritized for strict protection against fire, illegal cutting, and overgrazing. Meanwhile, the wider unclassified green cover requires community-based management, afforestation with indigenous species, and targeted restoration. This dual approach strengthens ecological services, protects watersheds, and secures sustainable benefits for rural communities.

Proposal for Reserved Rangeland Zone

Rangelands form the backbone of District Khyber's ecology and rural economy, covering 358,467 acres (57.8% of total area). These are distributed across Tehsil Bara (122,236 acres), Tehsil Jamrud (62,410 acres), Tehsil Mullagori (24,951 acres), and Tehsil Landikotal (148,869 acres). Historically managed under tribal customs with seasonal grazing restrictions, these lands have suffered from overgrazing, fuelwood collection, and encroachment, leading to 60-70% degradation and declining fodder productivity.

The proposal is to designate these rangelands as Reserved Rangeland Zones with a focus on rehabilitation, sustainable grazing, and afforestation. Key measures include rotational grazing systems, community-based pasture management committees, soil and water conservation structures, and the introduction of fodder plots to ease pressure on natural vegetation. Integrating agroforestry and non-timber forest products (NTFPs) such as medicinal plants,

beekeeping, and wild fruits will diversify livelihoods while reducing unsustainable dependence on rangelands.

By reserving and managing these rangelands, Khyber can restore ecological balance, secure fodder supplies for its large livestock population, and reduce vulnerability to soil erosion, flash floods, and desertification.

Table 124: Reserved Rangeland Zone – District Khyber

Proposal Location	Area in acre
District Khyber	**358466.68**
Tehsil Bara	122236.07
Tehsil Jamrud	62409.74
Tehsil Mullagori	24951.46
Tehsil Landikotal	148869.42

Source: Proposed District Khyber Land Use Plan, 2025

6.13.9 Recommendations

- Since only 0.8% (5,241 acres) of the district is under notified forest, priority should be given to afforestation on degraded rangelands (368,376 acres, 57.8%), particularly in Tirah, Rajgal, and Sheen Qamar. Introducing fruit orchards, indigenous tree plantations, and agroforestry systems can enhance both livelihoods and ecological resilience.
- Strengthen and formalize traditional systems of selective cutting and seasonal grazing bans by developing community forest management committees. Linking these to the Forest Department will ensure sustainable use, fire prevention, and protection against overgrazing.
- To reduce pressure on fuelwood, promote renewable energy options such as solar panels, biogas units, and improved energy-efficient stoves. Targeted programs for low-income households should be introduced in forest-sensitive areas.
- Establish early warning and rapid response systems for forest fires in sensitive areas (Tirah Maidan, Rajgal, Qambar Khel, Zakhakhel, Sheen Qamar). Capacity building of local communities in fire management and provision of basic firefighting equipment is essential.
- Replantation efforts should prioritize native species (oak, wild olive, chilghoza, phulai, sanatha, acacia) over exotic species. This ensures biodiversity conservation and long-term ecological balance.
- Introduce programs for non-timber forest products (NTFPs) such as medicinal plants, wild fruits, honeybee keeping, and fodder cultivation. This will diversify income and reduce direct dependence on timber and fuelwood.
- Prepare and implement a comprehensive Forest and Rangeland Working Plan for District Khyber under the KP Forest Act (extended in 2022). This should include clear zoning of forests, rangelands, grazing areas, and conservation sites.

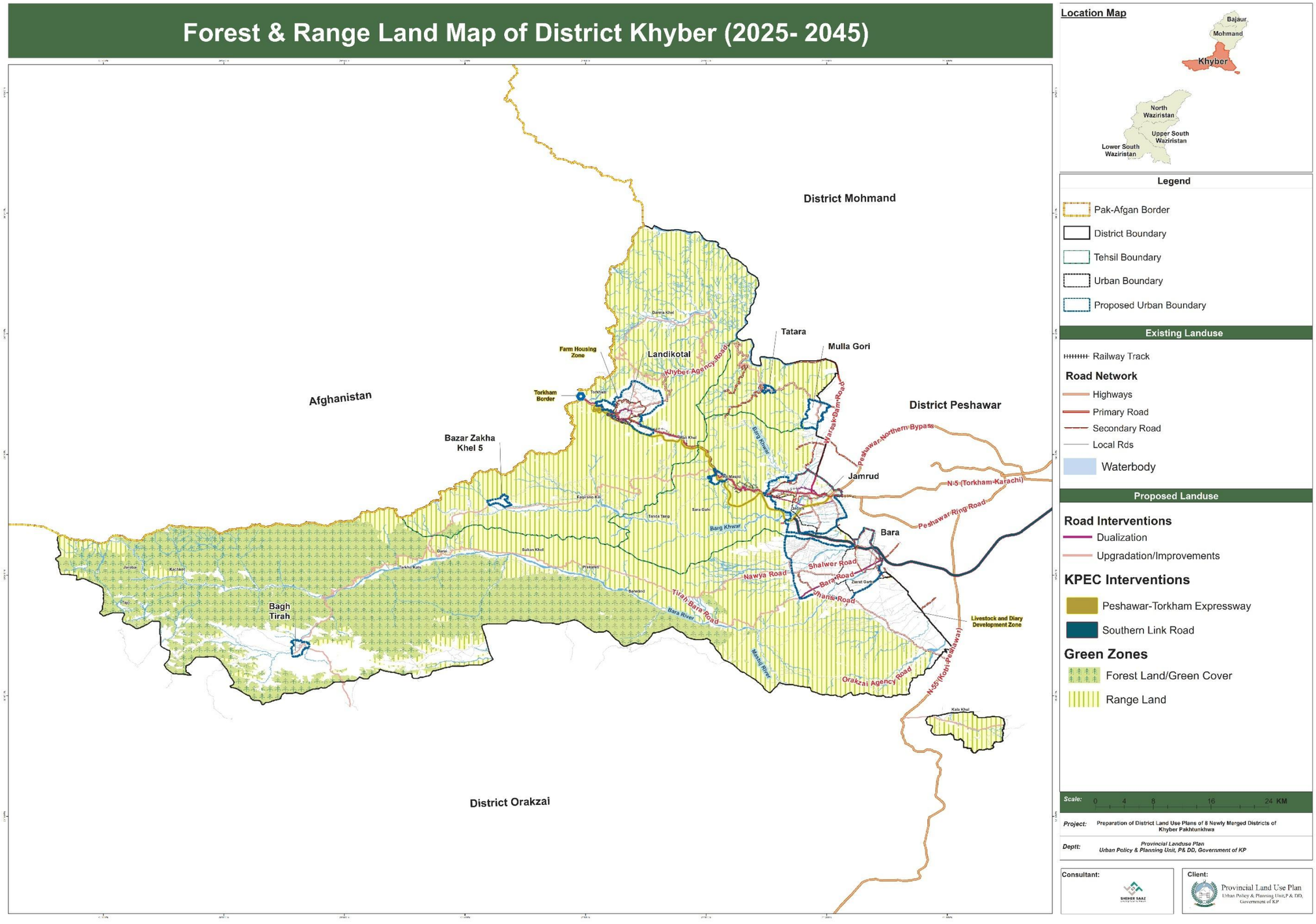
- Forest and rangeland management should be mainstreamed into district-level climate change adaptation and disaster risk reduction strategies, recognizing their role in reducing flash floods, desertification, and land degradation.

6.13.10 Zoning Regulation for Forest Land Use

Here are the guidelines developed for Forest zone development:

Category	Regulations / Activities
Permitted Uses	• Conservation and protection of natural forest cover. • Plantation and afforestation/reforestation activities. • Sustainable harvesting of non-timber forest products (NTFPs) such as medicinal plants, fruits, nuts, honey, and herbs. • Eco-tourism and recreational activities (e.g., guided trails, nature parks, camping areas) under controlled conditions. • Controlled grazing (only in designated forest-grazing zones and with proper management). • Wildlife conservation and establishment of natural habitats.
Permissible Uses	• Establishment of forest nurseries and research stations. • Agroforestry initiatives along forest edges. • Community-based Forest management programs. • Development of eco-education centers and awareness facilities. • Renewable energy projects that do not harm the ecosystem (e.g., small-scale solar, micro-hydel units within forest clearings).
Prohibited Uses	• Conversion of forest land to agricultural, residential, commercial, or industrial use. • Large-scale logging or unsustainable extraction of timber and fuelwood. • Illegal hunting, poaching, or wildlife trafficking. • Use of chemicals or practices harmful to forest soil, water, and biodiversity. • Encroachment, squatting, or expansion of settlements within forest boundaries. • Mining, quarrying, or other extractive activities within designated forest zones. • Any activity leading to deforestation, habitat destruction, or increased disaster risk (landslides, erosion, flooding).

Map 50: Forest & Range Land Map - District Khyber



7 CHAPTER VI: PROPOSED DISTRICT LAND USE PLAN

7.1 Overview

Khyber District occupies a strategic position as a gateway between Pakistan and Afghanistan, serving as a transit corridor for regional trade while also accommodating a rapidly growing population. Despite this importance, the district has long operated without a coherent land use framework, resulting in ad-hoc decision-making, overlapping mandates of departments, and unsystematic conversion of land from one use to another. In particular, the absence of an integrated district-level land use plan has led to competing claims between agriculture, housing, industrial development, and ecological conservation, with each sector pursuing its priorities independently.

The preparation of the Khyber District Land Use Plan provides the first structured framework for rationalizing competing demands on land resources and aligning them with provincial and national development objectives. The plan recognizes land as a finite and highly valuable resource that must be allocated based on suitability, sustainability, and long-term socio-economic benefits. Accordingly, prime agricultural land will be protected from urban encroachment and non-agricultural activities, while urban growth will be steered towards designated zones in Jamrud, Bara, and Landi Kotal, with provisions for affordable housing, commercial expansion, and industrial estates linked to the Peshawar–Khyber Economic Corridor.

The plan also takes into account the district's unique socio-economic context. Large areas are still dependent on rangelands for grazing, yet unregulated use has already degraded pasturelands, threatening local livelihoods. Similarly, deforestation and extraction pressures in mountainous zones require clear designation of conservation and ecological zones to preserve ecosystem services. At the same time, the return and resettlement of displaced populations, coupled with the demand for new housing schemes, necessitates careful allocation of residential and community infrastructure land to prevent unplanned sprawl.

By assigning each parcel of land to its most appropriate use, the Khyber District Land Use Plan seeks to balance development and conservation. It serves as a guiding framework for provincial departments, local government authorities, and development partners to pursue integrated and coordinated planning. The plan also establishes a hierarchy of settlements, primary centers such as Jamrud and Landi Kotal, intermediate settlements such as Bara, and rural service centers in Mullagori and Tirah, ensuring that growth is spatially distributed and pressure on larger cities like Peshawar is reduced. Ultimately, the Khyber District Land Use Plan is envisaged as a roadmap for sustainable urban and rural development, economic diversification, and improved quality of life for local communities.

7.2 Planning Methodology and Settlement Hierarchy

The preparation of the District Land Use Plan for Khyber District was based on a structured methodology that integrated settlement hierarchy analysis, review of existing master plans, and spatial planning tools at urban, rural, tehsil, and district levels.

Hierarchy of Human Settlements was established using multiple criteria, including population size and density, administrative status, education and health facilities, and accessibility through major roads. This analysis categorized Jamrud as the primary city, Landi Kotal as the secondary city, Bara as a tertiary urban center, and Mullah Gohri with other smaller settlements as potential growth nodes for future urbanization. The results highlighted a key imbalance: although Landi Kotal functions as the district headquarters, it lacks the service base expected at this administrative level, while Jamrud has organically developed into the most dominant urban center.

To ensure continuity with ongoing initiatives, the approved Master Plans of Jamrud and Landi Kotal were thoroughly reviewed and refined to align with recent ground realities and updated data. For Bara, Mullah Gohri, and emerging rural settlements projected to urbanize by 2045, new spatial frameworks were developed. These included delineation of compact settlement boundaries, land suitability analysis, growth trend assessments, and accessibility mapping for key services such as health and education.

At the district-wide scale, spatial zoning was carried out to distinguish between development zones and no-development zones, the latter including protected forests, reserved agricultural land, and environmentally sensitive areas. The zoning process prioritized the use of vacant or underutilized land for future growth, while also factoring in slope and terrain constraints to ensure sustainable expansion.

This integrated approach provided a coherent framework that balances urban consolidation, rural transformation, and environmental conservation, while also setting a staged direction for development up to the year 2045.

7.3 Framework for District Land Use Plan and Guidelines

Land use planning in Khyber District requires a structured and integrated framework due to its complex socio-economic and institutional context. As a newly merged tribal district, Khyber faces overlapping responsibilities among government departments, weak enforcement of building regulations, and limited institutional capacity at the Tehsil and local government level. Historically, Khyber Pakhtunkhwa lacked a unified institutional framework for land use planning. Prior to 2021, planning responsibilities were dispersed across multiple agencies. Tehsil Municipal Administrations (TMAs), under the Khyber Pakhtunkhwa Local Government Act 2013, were legally mandated to undertake land use planning and building control. However, due to limited technical capacity, resource constraints, and overlapping mandates, TMAs could only perform building regulation functions in urban centers, while broader spatial planning remained neglected. This institutional vacuum led to fragmented decision-making, where departments-initiated projects without a common planning

framework, resulting in inconsistent land allocations, ad-hoc approvals, and frequent inter-departmental conflicts.

Recognizing these challenges, the provincial government enacted the Khyber Pakhtunkhwa Land Use and Building Control Authority (LUBCA) Act, 2021, which established a dedicated authority to regulate and oversee land use planning at the district level. LUBCA was created to provide coherence, eliminate duplication, and ensure that district-level land use plans are prepared, implemented, and monitored systematically. The Act empowers LUBCA to develop District Land Use Plans (DLUPs), enforce zoning regulations, and rationalize the conversion of land from one use to another.

In practice, Urban Policy and Planning Unit (UPPU), P&D Department, plays a technical coordination role, guiding the preparation of DLUPs and ensuring consistency with the Provincial Land Use Plan (PLUP). At the local level, TMAs and line departments (Housing, Forests, Agriculture, Industries, etc.) remain key partners, responsible for sector-specific inputs and implementation within their jurisdictions. For the newly merged districts such as Khyber, this framework is particularly significant, as institutional consolidation is still evolving after the 18th Amendment and the FATA merger.

To operationalize this framework effectively in Khyber District, the following guidelines are proposed:

Figure 33: Guidelines for District Land Use Plan

District Coordination Mechanism:	Establish a district-level steering/coordination committee chaired by the Deputy Commissioner, with representatives from TMAs, LUBCA, and line departments, to ensure alignment of sectoral projects with the approved DLUP.
Integration of Sectoral Plans:	All departmental plans (roads, housing schemes, industrial zones, forest reserves, irrigation, etc.) must be aligned with the designated land uses approved by LUBCA.
Monitoring and Review:	LUBCA, in coordination with UPPU, should conduct periodic reviews (every 5 years) of the DLUP for Khyber to incorporate demographic shifts, emerging economic opportunities, and climate-resilience needs.
Capacity Building:	Strengthening the technical capacity of TMAs and local line departments is essential for on-ground enforcement, GIS-based monitoring, and community awareness campaigns.
Stakeholder Engagement:	Community and private sector participation should be institutionalized through consultative forums, ensuring that planning decisions reflect both developmental priorities and local needs.

This framework ensures that land use in Khyber District transitions from an ad-hoc, fragmented approach to a coherent, legally backed, and evidence-based system. By anchoring the process within LUBCA's mandate while enhancing coordination with local institutions, the plan provides a sustainable mechanism for guiding urban expansion, protecting agricultural and forest resources, and accommodating industrial and commercial growth.

7.4 Economic/Transport Corridors (Roads, Trade Routes)

District Khyber holds a unique geo-economic position as it functions as the gateway between Pakistan and Afghanistan through the historic Khyber Pass, making it a critical node in both national and regional trade. The district's transport corridors are not merely local roads but form part of strategic economic arteries that sustain commerce, cross-border linkages, and regional mobility.

The N-5 National Highway (Peshawar–Torkham Corridor) serves as the backbone of economic and transport activity in the district. It connects Jamrud, Landi Kotal, and Torkham with Peshawar and onward to the national highway grid, facilitating high volumes of passenger movement and freight transport. This route is recognized as part of the Khyber Pass Economic Corridor (KPEC), supported by international investment to improve road capacity, safety, and trade efficiency. Upon full development, this corridor is expected to significantly increase

bilateral trade with Afghanistan and the Central Asian Republics, while also enhancing accessibility for local settlements.

Supporting the N-5 are secondary economic corridors, such as the Jamrud–Bara Road and Bara–Akkakhel linkages, which connect the industrial and commercial centers of Bara Tehsil with the main highway network. These corridors not only support industrial freight (notably marble, minerals, and agro-produce) but also serve daily commuter flows between markets, industries, and surrounding settlements.

The Landi Kotal–Mullagori link provides direct connectivity to quarrying and mineral extraction areas, channeling goods towards both local processing units and external markets. Similarly, internal access routes within Jamrud and Bara are emerging as feeder economic corridors, directing traffic towards the N-5 spine and ensuring integration of local markets with the regional trade system.

In the broader transport context, these corridors are not limited to goods movement; they also sustain public transport flows, with minibuses, coaches, and informal transport systems concentrated along the same trade routes. Their dual function as economic and mobility lifelines underscores the necessity of structured parking, freight handling areas, and dedicated bus terminals as part of corridor development.

Future corridor enhancement under the District Land Use Plan envisions:

- Upgrading of N-5 and feeder roads for improved capacity and safety standards.
- Integration of logistics and warehousing facilities near Torkham and Jamrud to manage freight flows.
- Strengthening of industrial–trade linkages through improved connectivity to Bara and Mullagori clusters.

In sum, District Khyber's economic and transport corridors are the lifeblood of its integration with national and regional economies. Prioritizing these routes ensures not only the facilitation of cross-border trade but also the uplift of local commerce, industrial development, and urban mobility across the district.

7.5 Proposed District Land Use Plan

The proposed urban boundaries of Khyber District have been systematically divided into multiple functional zones, each designated for a specific land-use purpose. These zones have been carefully delineated to guide future development in urban centres, potential urban centres, and potential settlements, ensuring adherence to established planning regulations and guidelines for each category. The zoning framework is designed to promote orderly and sustainable growth, addressing the long-term needs of the population while integrating essential urban design principles. Key considerations include providing equitable access to residential, educational, healthcare, civic, recreational, and burial spaces, supporting economic activities, and ensuring environmental sustainability. By strategically allocating land, the framework enhances liveability, resilience, and the efficient provision of public services.

All existing built-up areas have been excluded from the proposed zones to prevent conflicts with current land uses. The remaining available land has been systematically allocated based on suitability and projected demand. For example, major urban centres like Landi Kotal and Jamrud have been prioritized for expanded residential, educational, healthcare, and recreational zones, reflecting their role as primary and secondary urban hubs. Potential urban centres such as Bara and Mullagori are planned with a balanced mix of residential, health, civic, and green zones to accommodate anticipated growth, while smaller settlements like Ali Masjid, Tatara, Bazar Zakhakhel, and Bagh Tirah have been assigned scaled zones that meet projected population needs. The allocation process considers population projections, infrastructure requirements, and demand for public amenities up to the planning horizon of 2045. By integrating these factors, the proposed zoning framework provides a comprehensive guide for sustainable urban expansion, ensuring that growth is managed efficiently while preserving community values and enhancing overall quality of life across the district.

7.5.1 Recommended Land Uses for Existing Urban Centre

7.5.1.1 Landi Kotal Urban Center



Landi Kotal is a key urban area and administrative capital of Khyber District, located in Khyber Pakhtunkhwa, Pakistan. It sits at an elevation of approximately 1,072 meters (3,517 feet) above sea level, making it the highest point on the historic Khyber Pass. Situated about 7 kilometers inside Pakistan from the Afghan border, Landi Kotal serves as a crucial gateway on the trade and transit route between Pakistan and Afghanistan. It is known for its strategic importance, linking major trade corridors and serving as a vital commercial and logistical hub in the region. The town combines historical significance with growing economic activity due to its location on the ancient Khyber Pass route.

7.5.1.1.1 Proposed Land Use Zoning

The Landi Kotal urban area has been organized into multiple functional zones, including Residential, Mixed-Use, Commercial, Health, Light Manufacturing, Agriculture, Urban Forestry, Recreation, and Public Buildings. Dedicated areas have also been allocated for essential services and amenities. Each zone has been planned to fulfill a specific role in supporting the urban infrastructure, economic activity, and community needs, with detailed allocations provided in the following sections.

- **Residential Zone**

The proposed residential allocation for Landi Kotal Urban Centre builds on the existing residential footprint of 1,488.62 acres and introduces an additional 4,415.90 acres across infill, short-, medium-, and long-term residential zones, resulting in a combined residential area of 5,904.52 acres. Specifically, 607.23 acres have been designated as Infill Residential, primarily utilizing vacant and underutilized land within the existing urban fabric to accommodate 7,200 housing units. The Short-Term Residential Zone covers 634.88 acres, providing space for 12,425 units, while the Medium-Term Residential Zone encompasses 1,213.51 acres for 14,496 units, and the Long-Term Residential Zone includes 1,736.92 acres to accommodate 8,283 units.

To support the projected population and housing requirements, an additional 50% of residential land area is allocated for allied uses, including roads, educational facilities, healthcare facilities, commercial areas, mixed-use development, open spaces, and community services. This integrated and phase-wise development approach ensures that housing provision is supported by adequate infrastructure and services, promotes efficient land utilization, and enables sustainable urban expansion in line with future growth needs.

- **Commercial Zone**

The commercial sector occupies 2.20% of the total area, with existing commercial land of 60.63 acres expanded by 107.15 acres in new commercial zones. The plan also designates linear commercial corridors, a grain market, and a central business district (CBD) totaling 309.9 acres, enhancing trade, retail, and service activities within the urban core.

- **Institutional Sector (Public Buildings, Education, Health)**

The institutional sector is allocated 2.25% of the total area, including civic, educational, and healthcare facilities. Existing public buildings and mosques (20.30 acres) are complemented by 3.54 acres of Civic Amenities Zone, while educational facilities expand from 51.48 acres to 84.12 acres, and healthcare land increases from 17.46 acres to 88.66 acres. Additional regional healthcare facilities account for 51.60 acres, supporting both primary and specialized services.

- **Industrial Sector**

The industrial and trade sector covers 3.58% of the urban area. Existing scattered industrial land of 1.29 acres is proposed to expand into 87.69 acres of industrial zones and 415.76 acres of trade-integrated transit zones, facilitating industrial growth, logistics, and integration with commercial activities.

- **Recreational/Open Spaces**

Parks, sports complexes, and green buffers account for 1.02% of the total area. Existing recreational land (19.87 acres) is supplemented by 36.55 acres of parkland, 30.67 acres of sports complexes, and 57.22 acres of green space/buffer zones, promoting community recreation, environmental quality, and urban aesthetics.

- **Graveyard**

The graveyard sector is allocated 0.88% of total land, combining existing graveyards (77.60 acres) with 46.23 acres of new burial zones, ensuring sufficient capacity for future population needs.

- **Other Land Uses (Agriculture, Military, Transportation, Vacant Land, Waterbodies)**

The largest portion of remaining land, 48.17%, is reserved for mixed “other” uses, including:

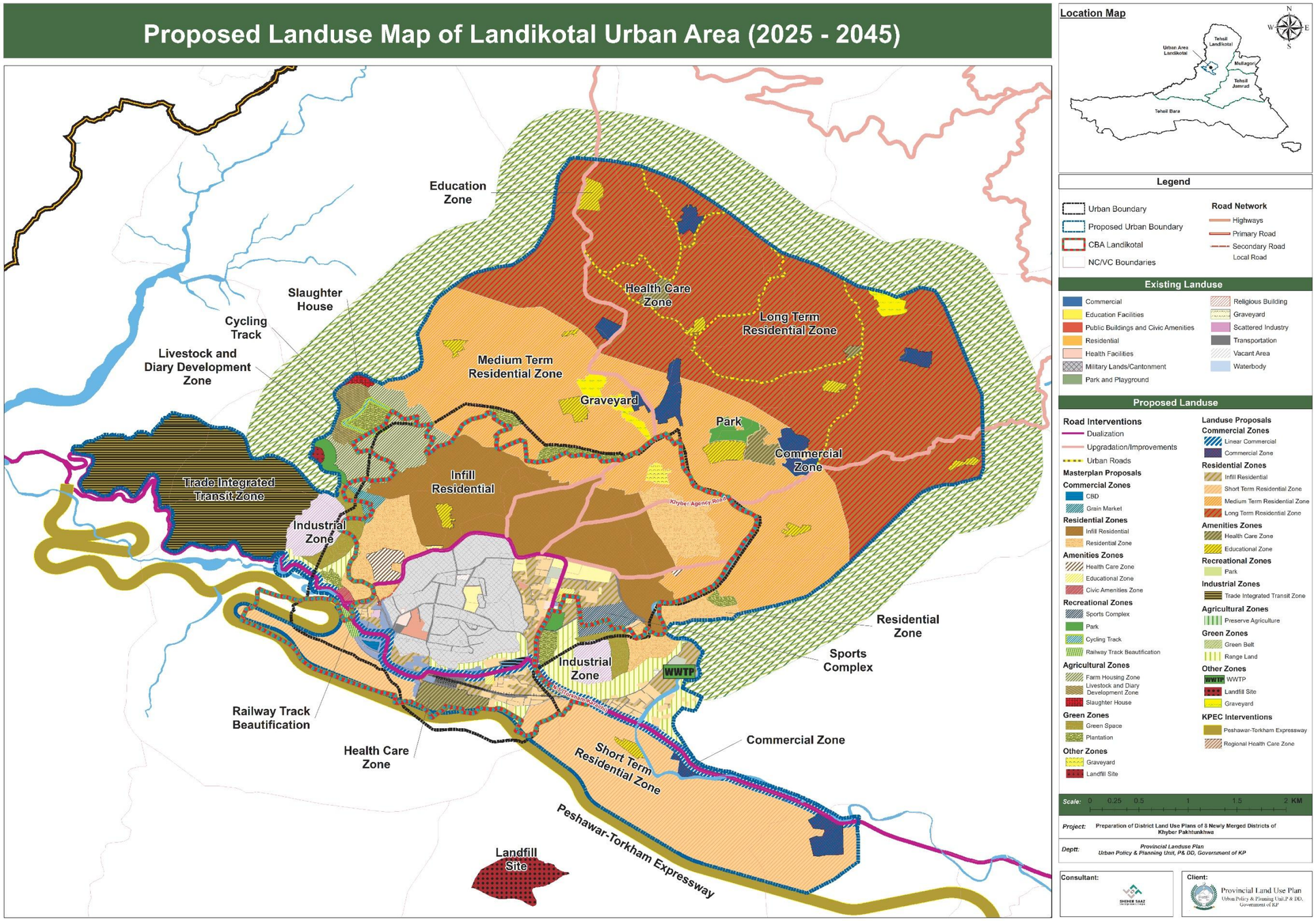
- Green belts and plantation areas: 1,827.13 acres
- Military/cantonment lands: 264.85 acres
- Range land: 2,316.35 acres
- Transportation corridors, slaughterhouses, farm housing, livestock zones, cycling tracks, and railway beautification: totaling 179.8 acres
- Water bodies: 36.52 acres

This allocation emphasizes environmental buffers, agricultural preservation, and integration of supporting infrastructure with urban development.

Table 125: Existing and Proposed Land Uses in Landi Kotal

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use%
Residential	Residential	1488.62	Infill Residential	607.23	5904.53	41.89
			Residential Zone	223.36		
			Short Term Residential Zone	634.88		
			Medium Term Residential Zone	1213.51		
			Long Term Residential Zone	1736.92		
Commercial	Commercial	60.63	Commercial Zone	107.15	309.9	2.20
			Linear Commercial	129.04		
			Grain Market	11.17		
			CBD	1.91		
Institutional	Public Building & Mosque	20.30	Civic Amenities Zone	3.54	317.17	2.25
	Education	51.48	Educational Zone	84.12		
	Health	17.46	Health Care Zone	88.66		
			Regional Health Care Zone	51.60		
Industry	Scattered Industry	1.29	Industrial Zone	87.69	504.75	3.58
			Trade Integrated Transit Zone	415.76		
Recreational/Open Spaces	Park/Playground	19.87	Park	36.55	144.3	1.02
			Sports Complex	30.67		
			Green Space/Buffer	57.22		
Graveyard	Graveyard	77.60	Graveyard	46.23	123.83	0.88
Others	Agriculture	4.07	Green Belt	1827.13	6789.85	48.17
	Military Lands/Cantonment	264.85	Landfill Site	65.16		
	Range Land	2316.35	Plantation	64.01		
	Transportation	376.91	Slaughter House	5.28		
	Vacant Area	1656.06	Farm Housing	128.30		
	Waterbody	36.52	Livestock and Diary Development Zone	29.86		
			Cycling Track	8.46		
			Railway Track Beautification	6.90		
Total Existing		6392.007927	Total Proposed	7702.31	14094.33	100.00

Map 51: Proposed Land Use Map – Landi Kotal Urban Center



7.5.1.2 Jamrud



Jamrud is a strategic area at the eastern gateway of District Khyber, situated at an elevation of approximately 370 meters (1,214 feet) above sea level. Positioned along the crucial Peshawar–Torkham trade corridor, it serves as a major transit and commercial hub. In 2025, the population is 56,576, with a projected increase to 58,644 by 2045. The area features a mix of urban settlements, agricultural land, and natural green spaces, making it vital for regional trade, agriculture, and sustainable development.

7.5.1.2.1 Proposed Land Use Zoning

- **Residential Sector**

The proposed residential allocation for Jamrud Urban Centre builds upon the existing residential footprint of 3,226.94 acres and introduces an additional 3,802.19 acres through infill, medium-term, and long-term residential zones, resulting in a total residential area of 7,029.13 acres.

The Infill Residential Zone, covering 2,283.88 acres, strategically utilizes vacant and underutilized land within the existing urban fabric to accommodate high-density development and maximize population absorption. The Medium-Term Residential Zone (710.47 acres) and Long-Term Residential Zone (406.51 acres) provide space for phased expansion and lower-density housing, supporting sustainable urban growth over time.

To address high population densities, particularly in the infill and medium-density zones, vertical development with G+3 to G+4 storeys is proposed, allowing more households to be accommodated within limited land. Long-term residential areas follow a low-density, single-storey or low-rise pattern, consistent with less dense development.

- **Commercial Sector**

The commercial sector represents 5.12% of Jamrud's total urban area. Existing commercial land (138.24 acres) is expanded through several new allocations, including Gem City (31.18 acres), CBD (5.75 acres), commercial zones (94.34 acres), grain market (3.2 acres), linear commercial corridors (194.96 acres), Pak-Afghan Trade Center (469.95 acres), and Trade and Logistics Hub (264.66 acres), totaling 1,202.27 acres. These expansions support trade, retail, logistics, and cross-border commercial activities, reflecting Jamrud's strategic role as a commercial hub.

- **Industrial Sector**

Industrial land covers 2.64% of the urban area, combining 92.55 acres of existing scattered industry with 160.59 acres of industrial park and 365.93 acres of industrial zones. This sector provides space for manufacturing, small-scale industries, and industrial support services integrated with trade and logistics.

- **Institutional Sector (Public Buildings, Education, Health)**

Institutional uses account for 2.01% of the total area, encompassing civic amenities, educational facilities, and healthcare. Existing public buildings and mosques (71 acres) are complemented with 124.66 acres of civic amenities, 87.94 acres of educational facilities expanded to 113.96 acres, and healthcare services increased from 8.94 acres to 66.46 acres, ensuring adequate infrastructure to meet social and community needs.

- **Recreational/Open Spaces**

Recreational spaces constitute 3.01% of total land, integrating existing parks and playgrounds (37.79 acres) with new central park (120.09 acres), additional parks (222.31 acres), sports complexes (22.26 acres), and green buffer zones (304.24 acres). This allocation enhances livability, promotes community recreation, and provides environmental benefits.

- **Graveyard**

The graveyard sector is allocated 1.01% of Jamrud's land, combining 67.20 acres of existing graveyard with 169.90 acres of proposed graveyard zones, ensuring long-term capacity for burial needs.

- **Other Uses (Agriculture, Military, Transportation, Vacant Land, Waterbodies, and Miscellaneous)**

Other land uses make up the largest portion of Jamrud's urban area at 56.29%, including:

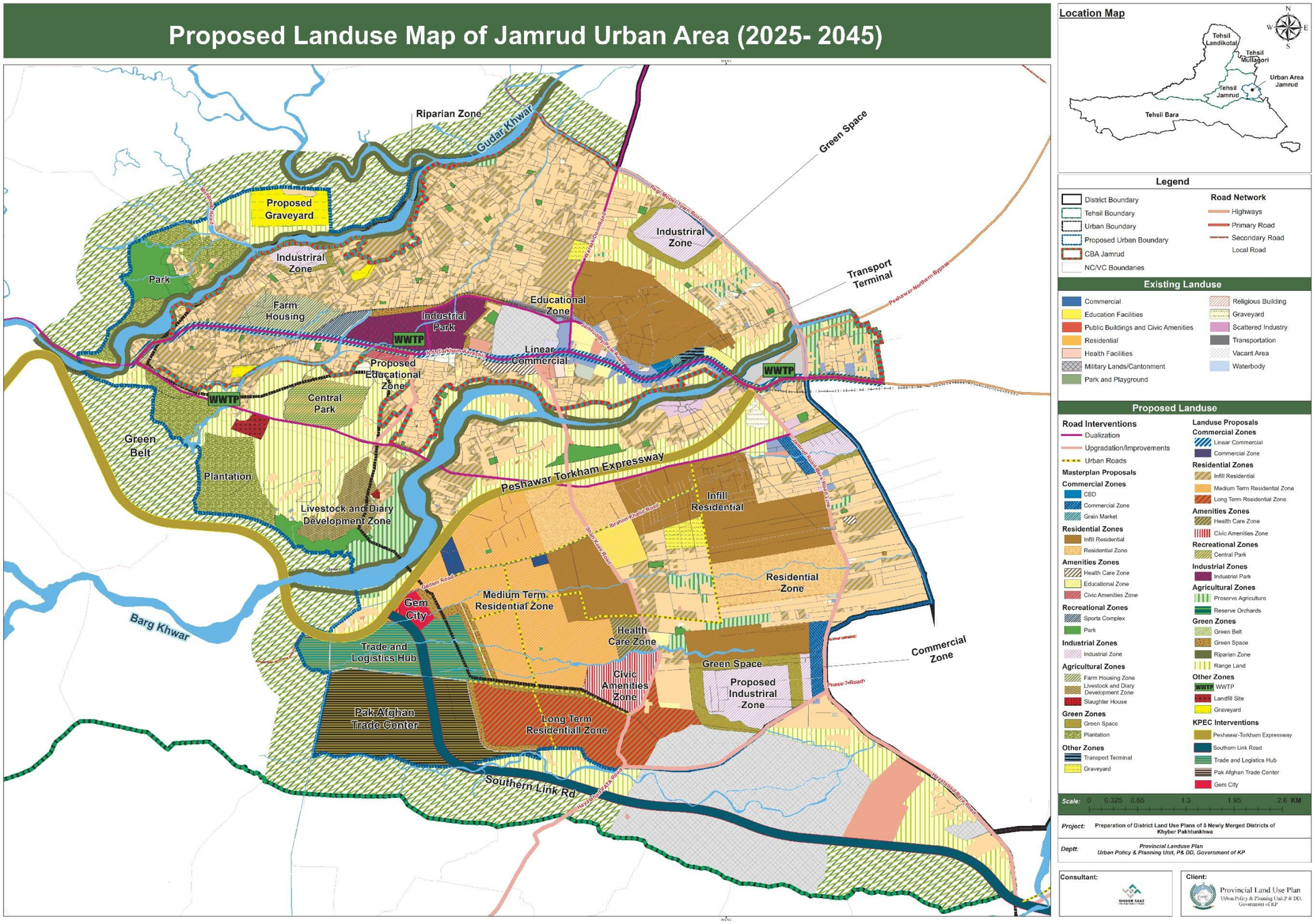
- Green belts and plantations: 2,630.77 acres
- Agricultural land: 430.23 acres
- Heritage sites, WWTP, and landfill: 77.26 acres
- Military/cantonment lands: 223.68 acres
- Range lands: 4,614.46 acres
- Transportation, farm housing, livestock zones, riparian areas: totaling 1,469.33 acres
- Orchards and water bodies: 447.49 acres

These allocations integrate environmental buffers, infrastructure support, and open land preservation while accommodating future growth.

Table 126: Proposed Land Uses in Jamrud

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use%
Residential	Residential	3226.94	Infill Residential	2283.88	7029.13	29.93
			Residential Zone	401.33		
			Medium Term Residential Zone	710.47		
			Long Term Residential Zone	406.51		
Commercial	Commercial	138.24	Gem City	31.18	1202.27	5.12
			CBD	5.75		
			Commercial Zone	94.34		
			Grain Market	3.20		
			Linear Commercial	194.96		
			Pak Afghan Trade Center	469.95		
			Trade and Logistics Hub	264.66		
Industry	Scattered Industry	92.55	Industrial Park	160.59	619.08	2.64
			Industrial Zone	365.93		
Institutional	Public Building & Mosque	71	Civic Amenities Zone	124.66	473	2.01
	Education	87.94	Educational Zone	113.96		
	Health	8.94	Health Care Zone	66.46		
Recreational/Open Spaces	Parks & Playground	37.79	Central Park	120.09	706.7	3.01
			Park	222.31		
			Sports Complex	22.26		
			Green Space/Buffer	304.24		
Graveyard	Graveyard	67.20	Graveyard	169.90	237.1	1.01
Others	Agriculture	430.23	Green Belt	2630.77	13220.12	56.29
	Heritage Site	4.31	WWTP	51.47		
	Military Lands/Cantonment	223.68	Landfill Site	21.79		
	Orchards	8.96	Plantation	418.05		
	Range Land	4614.46	Slaughter House	1.83		
	Transportation	610.36	Livestock and Diary Development Zone	109.67		
	Vacant Area	2927.28	Farm Housing	101.25		
	Waterbody	438.53	Riparian Zone	627.48		
Existing Total		12988.42	Proposed Total	10498.94	23487.4	100.00

Map 52: Proposed Land Use Map - Jamrud Urban Center



7.5.2 Recommended Land Uses for Potential Urban Centers

7.5.2.1 Bara Potential Urban Center



Bara is the largest and most populous tehsil of District Khyber, functioning as the district's principal urban and administrative hub. Spanning approximately 74.97 sq. km, it accommodates a diverse mix of established settlements, commercial centers, and productive agricultural lands. With a population of 219,044 in 2025, projected to rise to 403,394 by 2045, Bara continues to experience steady growth influenced by both natural population increase and regional migration. Its strategic position along key transport routes linking Peshawar with the interior parts of Khyber District has made it a focal point for residential, commercial, and emerging industrial activity. As urban expansion accelerates, a balanced and well-coordinated land-use strategy is essential to support future development while ensuring the sustainable management of agricultural areas and natural resources.

7.5.2.1.1 Proposed land Uses

The proposed residential allocation for Bara Potential Urban Centre builds upon the existing residential footprint of 3,917.16 acres and introduces an additional 12,621.40 acres through Short-Term, Medium-Term, Long-Term, and Vertical Housing zones, resulting in a total residential area of 16,538.56 acres.

The Vertical Housing zone (1,213.11 acres) is designed to accommodate high-density development on underutilized or vacant land, utilizing G+3 to G+4 storey buildings to maximize population absorption. The Short-Term Residential Zone (3,366.88 acres) provides space for medium- to high-density housing, while the Medium-Term Residential Zone (6,007.16 acres) supports medium-density development, and the Long-Term Residential Zone (2,034.26 acres) is allocated for low-density, low-rise housing to facilitate future expansion.

- **Commercial**

Commercial land accounts for 2.71 percent of the urban area. Existing commercial land of 266.79 acres is expanded with 746.83 acres of commercial zones and 41.09 acres of grain market. These areas support trade, retail, and local economic activities for the growing population.

- **Industrial**

Industrial land covers 2.14 percent of the total area, combining 162.81 acres of existing scattered industry with 668.87 acres of industrial zones. The industrial sector provides space

for manufacturing, small-scale industry, and industrial support services while minimizing conflicts with residential zones.

- **Institutional (Civic, Education, Health)**

Institutional uses account for 3.22 percent of the area, including civic amenities, education, and healthcare. Existing public buildings and mosques (55.71 acres) are complemented with 646.74 acres of civic amenities. Educational facilities expand from 54.69 acres to 282.31 acres, and healthcare facilities increase from 24.23 acres to 188.77 acres, providing adequate social infrastructure.

- **Recreational and Open Spaces**

Recreational areas represent 0.66 percent of the urban land. Existing parks and playgrounds (31.62 acres) are supplemented with 52.11 acres of central park, 133.31 acres of additional parks, and 38.11 acres of green space. These areas promote community recreation, livability, and environmental quality.

- **Graveyards**

Graveyard zones cover 0.61 percent of the urban area. Existing graveyards (47.98 acres) are expanded with 187.50 acres of proposed burial areas to meet long-term needs.

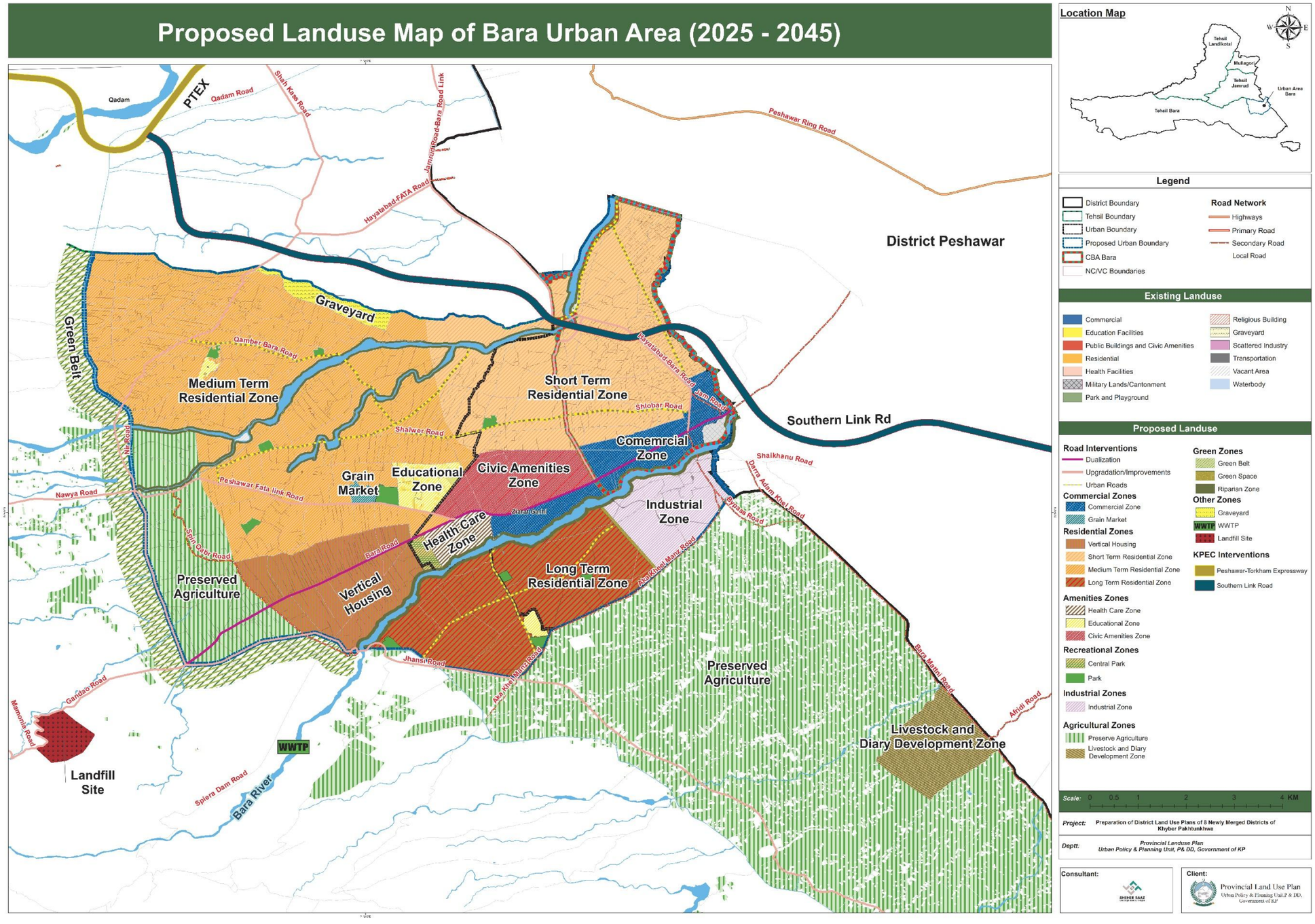
- **Other Uses**

Other land uses account for 48.12 percent of Bara's urban area. This includes agriculture, landfill sites, riparian zones, livestock and dairy development, preserved agriculture, green belts, barren lands, military/cantonment lands, range lands, transportation corridors, vacant areas, and water bodies. These areas ensure environmental sustainability, preserve productive lands, and provide space for future growth.

Table 127: Proposed Land Uses in Bara Potential Urban Center

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use%
Residential	Residential	3917.16	Short Term Residential Zone	3366.88	16538.57	42.54
			Medium Term Residential Zone	6007.16		
			Long Term Residential Zone	2034.26		
			Vertical Housing	1213.11		
Commercial	Commercial	266.79	Commercial Zone	746.83	1054.71	2.71
			Grain Market	41.09		
Industry	Scattered Industry	162.81	Industrial Zone	668.87	831.67	2.14
Institutional	Public Building & Mosque	55.71	Civic Amenities Zone	646.74	1252.45	3.22
	Education	54.69	Educational Zone	282.31		
	Health	24.23	Health Care Zone	188.77		
Recreational/Open Spaces	Park/Playground	31.62	Central Park	52.11	255.15	0.66
			Park	133.31		
			Green Space	38.11		
Graveyard	Graveyard	47.98	Graveyard	187.50	235.48	0.61
Others	Agriculture	9209.01	Landfill Site	178.08	18709.72	48.12
	Barren Land	1.94	Riparian Zone	713.52		
	Military Lands/Cantonment	52.25	Livestock and Diary Development Zone	625.84		
	Orchards	12.44	Preserve Agriculture	1654.50		
	Range Land	1114.38	Green Belt	1572.88		
	Transportation	800.64				
	Vacant Area	2320.14				
	Waterbody	454.11				
Total		18525.91	Total	20351.84	38877.75	100

Map 53: Proposed Land Use Map – Bara Urban Center



7.5.2.2 Mullagori Potential Urban Center



Mullagori is a tehsil and tribal area located within Khyber District, Khyber Pakhtunkhwa, Pakistan. It lies among the Tatara hills, positioned west of Peshawar and north of the Khyber Pass in the Tahtara range. Geographically, Mullagori extends from just west of Chauki Sparsang to the crest of Dabrai hill, bordered to the north by the Kabul River and to the south by Lakka Sar, neighboring other tribal clans including the Afridis and Shinwaris. It is situated at an elevation of about 401 meters (1,316 feet). Mullagori serves as an important tribal area with historical and cultural significance, playing a role in the broader socio-political landscape of the Khyber region. The Mullagori area in Khyber District is renowned for its significant marble deposits, considered among the largest in the world alongside famous deposits in Carrara, Italy, and Makrana, India. Located chiefly at Shahid Mena and Kambela Khwar, these marble reserves feature high-quality white, yellow, grey, and brown marble that is medium to fine-grained and largely free of impurities, making it highly comparable to international standards.

7.5.2.2.1 Proposed Land Uses

- **Residential**

The residential sector in Mullagori covers 37.12 percent of the total urban area. Existing residential land of 282.38 acres is expanded through 248.29 acres of short-term residential zones, 250.43 acres of medium-term zones, 383.39 acres of long-term zones, and 0.71 acres of infill residential development. This allocation provides adequate housing to accommodate future population growth while promoting compact and planned residential expansion.

- **Commercial**

Commercial land accounts for 1.03 percent of the total area. Existing commercial land of 20.16 acres is supplemented with 12.23 acres of proposed commercial zones. This supports local trade and small-scale retail services within the urban centre.

- **Industrial**

Industrial areas cover 4.00 percent of the urban land, combining 11.64 acres of existing scattered industry with 113.97 acres of proposed industrial zones. These areas provide space for small-scale manufacturing and related industrial activities while minimizing conflicts with residential and commercial sectors.

- **Institutional (Civic, Education, Health)**

Institutional uses represent 1.46 percent of the land, including healthcare, education, and civic facilities. Existing healthcare land of 1.83 acres is expanded with 8.45 acres of health care zones. Educational facilities increase from 5.85 acres to 9.40 acres, and public buildings and mosques expand from 3.58 acres to 8.76 acres, ensuring sufficient social infrastructure to meet community needs.

- **Recreational and Open Spaces**

Recreational and open spaces cover 2.03 percent of Mullagori's land. Existing parks and playgrounds (4.62 acres) are complemented by 5.58 acres of central park, 7.33 acres of additional parks, 18.12 acres of sports complexes, and 27.96 acres of green space. These areas enhance quality of life and environmental sustainability.

- **Graveyards**

Graveyards occupy 0.62 percent of the total area, combining 2.01 acres of existing graveyards with 17.45 acres of proposed burial zones to meet long-term population needs.

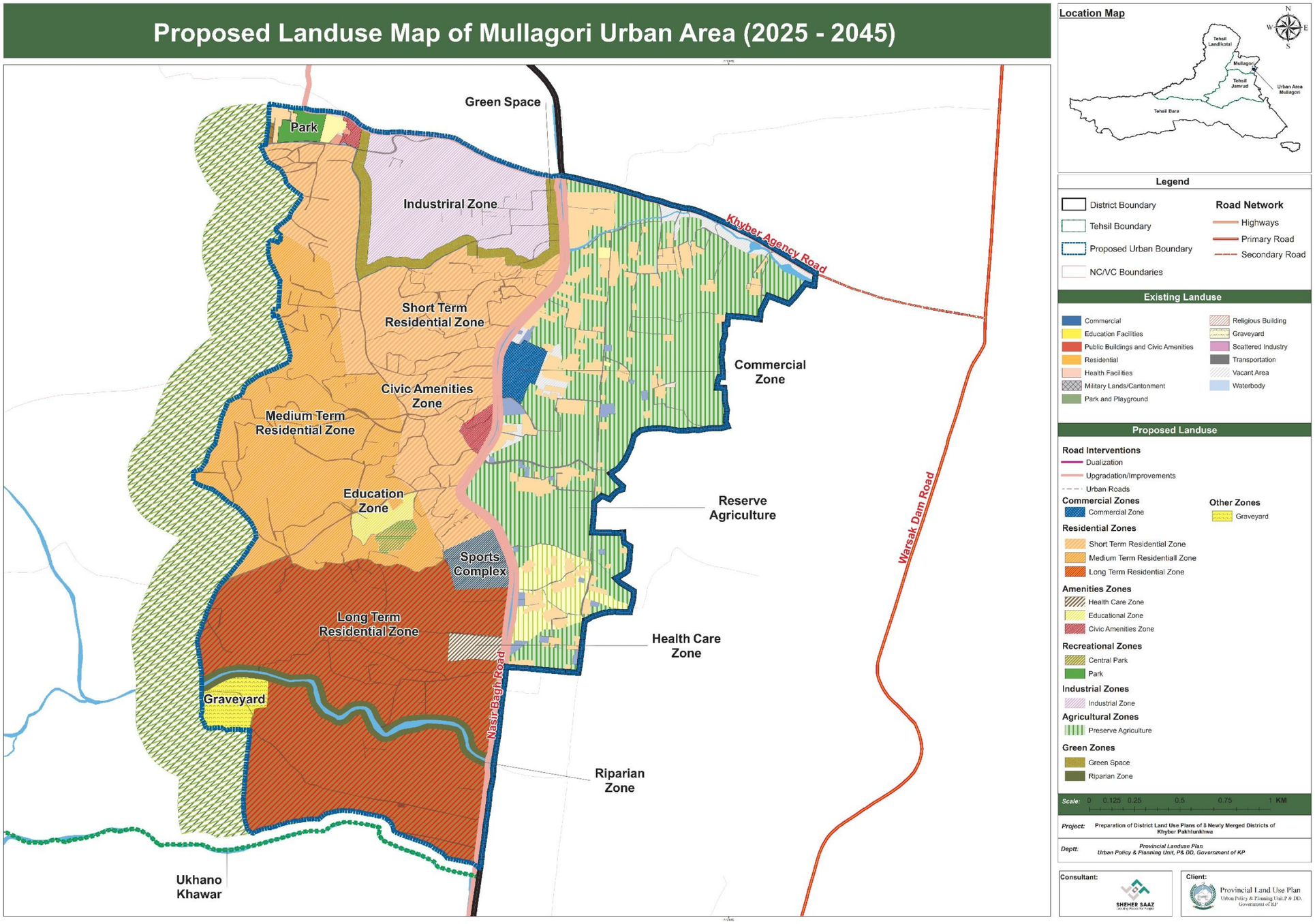
- **Other Uses**

Other land uses account for 53.73 percent of the total area, including agriculture, riparian zones, green belts, range lands, transportation corridors, vacant areas, and water bodies. This allocation ensures preservation of open and productive lands, supports environmental sustainability, and accommodates future urban growth.

Table 128: Proposed Land uses in Mullagori

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use%
Residential	Residential	282.38	Short Term Residential Zone	248.29	1165.2	37.12
			Medium Term Residential Zone	250.43		
			Long Term Residential Zone	383.39		
			Infill Residential	0.71		
Commercial	Commercial	20.16	Commercial Zone	12.23	32.39	1.03
Industry	Scattered Industry	11.64	Industrial Zone	113.97	125.61	4.00
Institutional	Health	1.83	Health Care Zone	8.45	45.93	1.46
	Education	5.85	Educational Zone	9.40		
	Public Building & Mosque	3.58	Civic Amenities Zone	8.76		
Recreational/Open Spaces	Park/Playground	4.62	Central Park	5.58	63.61	2.03
			Park	7.33		
			Sports Complex	18.12		
			Green Space	27.96		
Graveyard	Graveyard	2.01	Graveyard	17.45	19.46	0.62
Others	Agriculture	318.99	Riparian Zone	25.32	1686.48	53.73
	Range Land	220.74	Green Belt	341.77		
	Transportation	80.97				
	Vacant Area	673.85				
	Waterbody	24.84				
Total		1651.46	Total	1479.17	3138.68	100.00

Map 54: Proposed Land Use Map – Mulla Gori Urban Center



7.5.2 Recommended Land Uses for Potential Urban Settlement/Areas

7.5.2.1 Ali Masjid



Ali Masjid, covering an area of 2.20 sq. km, is a small but growing settlement with a population of 14,215 in 2025, projected to reach 26,088 by 2045.

Ali Masjid marks the narrowest and most historically important point of the Khyber Pass in Khyber District, Khyber Pakhtunkhwa. Sitting at an elevation of 3,174 feet (967 meters) and located about 10 miles (16 kilometers) east of Landi Kotal, this site has witnessed centuries of conquests, trade, and cultural exchanges. The point was so narrow that historically, only one fully laden camel could pass through at a time, making it a vital and contested bottleneck along the ancient trading routes.

Serving both as a shrine dedicated to ʻAlī ibn Abī Ṭālib and a strategic military post, Ali Masjid was a stopping point for travelers, merchants, and pilgrims, who would pause to pray before braving the rugged journey between Kadam and Ali Masjid. Control over this area conferred great advantage, as commanding the heights near Ali Masjid allowed defenders to monitor and block the passage of armies, traders, and invaders ranging from the Sikhs to the British and Afghans. Throughout the 19th century, Ali Masjid Fort played a prominent role during the Anglo-Afghan Wars. Its origins trace back to the Afghan ruler Dost Muhammad Khan in 1837, and the British later rebuilt and occupied the fort, which witnessed fierce battles and strategic maneuvers. Today, Ali Masjid stands as a symbol of the Khyber Pass's enduring legacy, blending spiritual reverence with remarkable military and historical significance.



7.5.2.1.1 Proposed Land Uses

- **Residential**

The proposed residential allocation for Ali Masjid Potential Settlement builds upon the existing residential footprint of 106.13 acres and introduces an additional 425.14 acres through Short-Term, Medium-Term, and Long-Term Residential Zones, resulting in a total proposed residential area of 531.27 acres.

The Short-Term Residential Zone (94.73 acres) provides medium- to high-density housing suitable for near-term population growth, while the Medium-Term Residential Zone (109.36 acres) supports medium-density development. The Long-Term Residential Zone (221.06

acres) is designated for low-density, low-rise housing to accommodate future phased expansion.

- **Commercial**

Commercial uses account for 2.98 percent of the total area. Existing commercial land of 4.51 acres is supplemented by 10.35 acres of commercial zones and 21.33 acres of linear commercial development to support local trade and retail activities.

- **Institutional (Civic, Education, Health)**

Institutional land covers 1.87 percent of the urban area. Existing education (4.10 acres), health (1.95 acres), and public buildings/mosques (1.58 acres) are complemented with 3.78 acres of educational zones, 5.25 acres of health care zones, and 5.99 acres of civic amenities. This ensures sufficient social infrastructure for the settlement's population.

- **Recreational and Open Spaces**

Recreational areas cover 1.11 percent of Ali Masjid. While no parks currently exist, 13.45 acres are proposed for park development to enhance community recreation and environmental quality.

- **Graveyards**

Graveyards represent 1.10 percent of the total area. Existing graveyards of 0.42 acres are supplemented with 12.95 acres of proposed burial areas to meet future requirements.

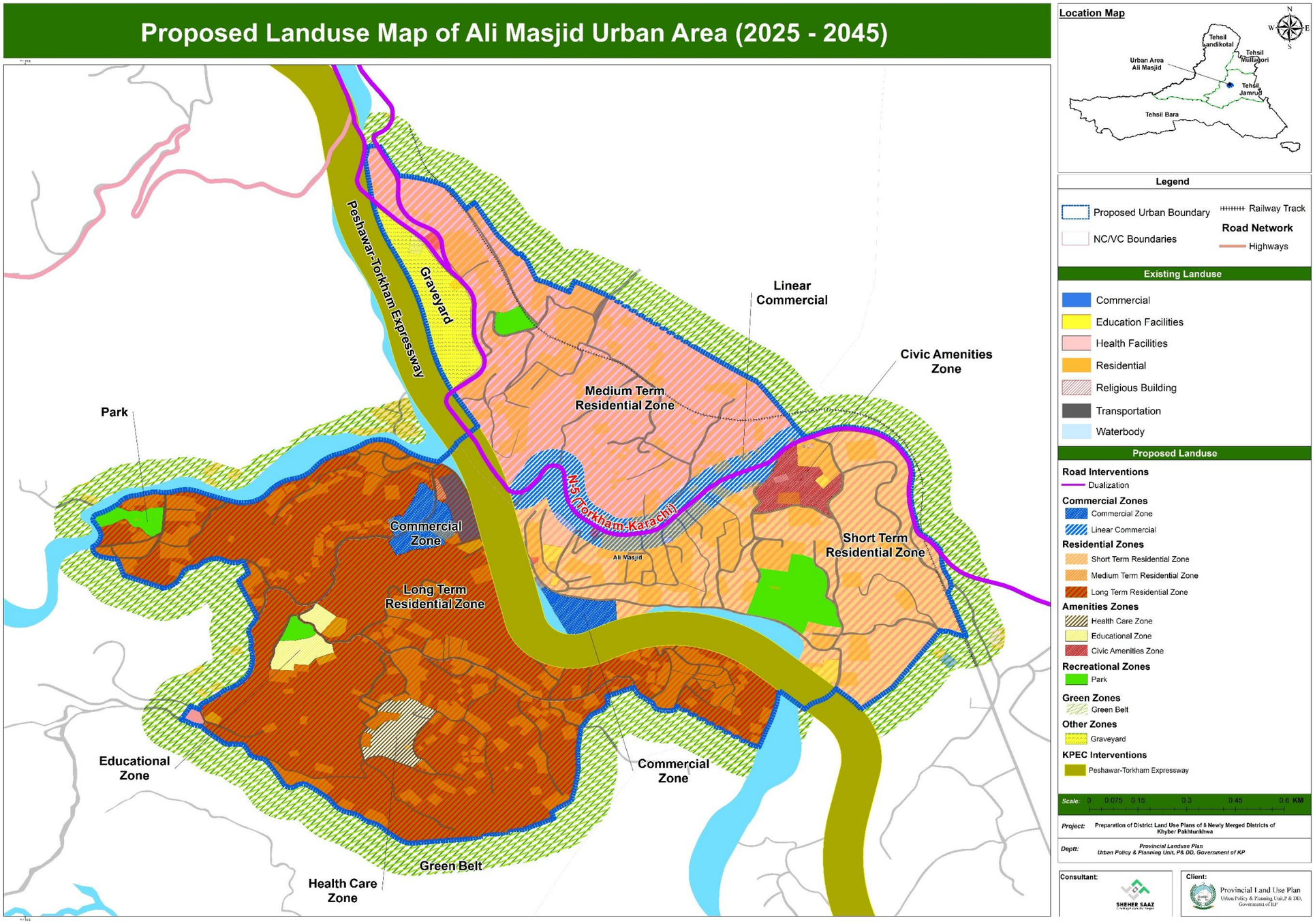
- **Other Uses**

Other land uses account for 50.22 percent of the total area, including range land, green belts, transportation corridors, vacant land, and water bodies. Proposed green belt areas cover 183.82 acres, preserving open spaces and ensuring environmental sustainability.

Table 129: Proposed Land Uses in Ali Masjid

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use%
Residential	Residential	106.13	Short Term Residential Zone	94.73	531.27	43.81
			Medium Term Residential Zone	109.36		
			Long Term Residential Zone	221.06		
COM	Commercial	4.51	Commercial Zone	10.35	36.18	2.98
			Linear Commercial	21.33		
Institutional	Education	4.10	Educational Zone	3.78	22.66	1.87
	Health	1.95	Health Care Zone	5.25		
	Public Building & Mosque	1.58	Civic Amenities Zone	5.99		
Recreational/Open Spaces	Park/Playground	0.00	Park	13.45	13.45	1.11
Graveyard	Graveyard	0.42	Graveyard	12.95	13.38	1.10
Others	Range Land	126.77	Green Belt	183.82	608.98	50.22
	Transportation	43.91				
	Vacant Area	241.70				
	Waterbody	12.79				
Total		543.85	Total	682.07	1212.54	100.00

Map 55: Proposed Land Use Map of Potential Settlement - Ali Masjid



7.5.2.2 Tatara



Tatara refers to the Tatara hills, a notable mountain range located in the Khyber District, Khyber Pakhtunkhwa, Pakistan. These hills lie north of the Khyber Pass and are home to the Mullagori tribe, with the area often known as the Tatara or Mullagori hills. The Tatara range is easily recognized from Peshawar, marked by its characteristic three-peaked summit, which is sometimes called "Laka Sar" or "Laka Tsuka." Tatara, covering an area of 0.93 sq. km, is a small potential settlement with a population of 4,364 in 2025, projected to rise to 6,816 by 2045, resulting in a projected population density of 29.74 persons per sq. km

7.5.2.2.1 Proposed Land Uses

- **Residential**

The proposed residential allocation for Tatara Potential Settlement builds upon the existing residential footprint of 98.82 acres and introduces an additional 489.06 acres through Short-Term, Medium-Term, and Long-Term Residential Zones, resulting in a total proposed residential area of 587.88 acres.

The Short-Term Residential Zone (83.75 acres) accommodates medium-density housing suitable for immediate population growth, while the Medium-Term Residential Zone (171.20 acres) provides space for medium-density development to support phased expansion. The Long-Term Residential Zone (135.28 acres) is designated for low-density, low-rise housing, allowing future growth and maintaining neighborhood balance.

- **Commercial**

Commercial areas represent 6.00 percent of the total land. Existing commercial land of 0.91 acres is supplemented by 45.06 acres of proposed commercial zones to support local trade and economic activity.

- **Institutional (Civic, Education, Health)**

Institutional uses cover 3.60 percent of Tatara's land. Existing public buildings and mosques (0.66 acres), educational facilities (2.92 acres), and health facilities (1.20 acres) are expanded with 7.51 acres of civic amenities, 6.81 acres of educational zones, and 8.45 acres of health care zones, ensuring adequate social infrastructure.

- **Recreational and Open Spaces**

Recreational areas account for 2.15 percent of the total area. While no parks currently exist, 16.49 acres are proposed for park development to enhance community well-being and environmental quality.

- **Graveyards**

Graveyards cover 1.22 percent of the area, combining 7.05 acres of existing graveyards with 2.28 acres of proposed burial zones to accommodate future needs.

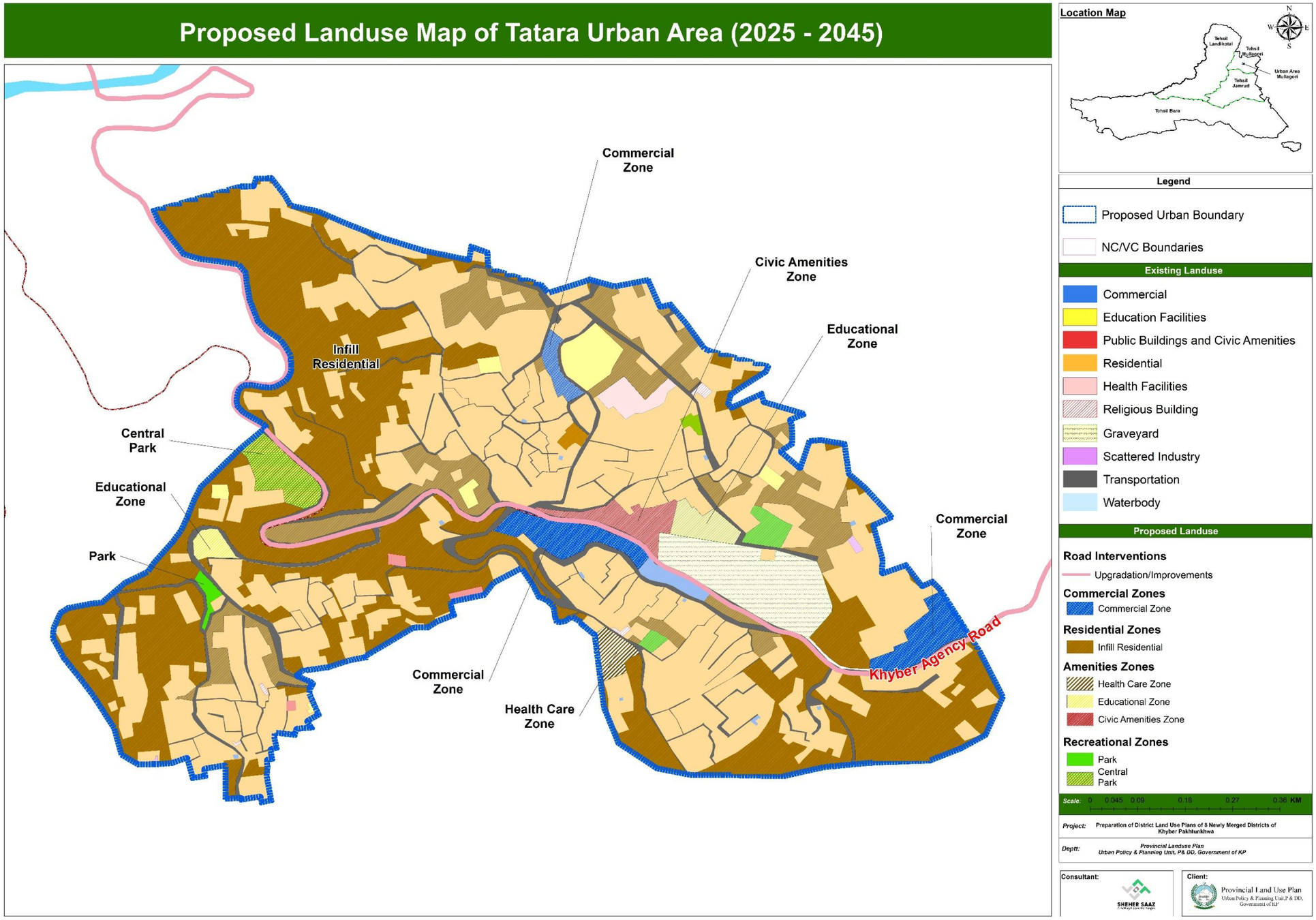
- **Other Uses**

Other land uses account for 23.14 percent of Tatara's area. This includes range lands, preserved agriculture (59.49 acres), transportation corridors, and vacant lands, which collectively support sustainable land management and environmental preservation.

Table 130: Proposed Land Uses in Tatara

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use%
Residential	Residential	68.46	Infill Residential	84.74	153.21	24.08
Commercial	Commercial	16.03	Commercial Zone	5.81	21.84	3.43
Institutional	Education	0.32	Educational Zone	2.02	6.15	0.97
	Health	0.35	Health Care Zone	1.09		
	Public Building & Mosque	0.37	Civic Amenities Zone	1.99		
Recreational/Open Spaces	Park/Playground	0.00	Central Park	2.34	4.04	0.64
			Park	1.70		
Others	Agriculture	62.22			451.09	70.89
	Range Land	385.47				
	Transportation	3.40				
Total		536.63	Total	99.70	636.32	100.00

Map 56: Proposed Land Use Map Potential Settlement - Tatara



7.5.2.3 Bazar Zakha Khel 5



Bazar Zakha Khel is a prominent locality situated within the Khyber District, Khyber Pakhtunkhwa, Pakistan. It lies in the tribal territory dominated by the Zakha Khel subgroup of the Afridi Pashtuns and serves as a key settlement along the historic Khyber Pass. The area stands at an elevation of around 1,954 meters and is positioned near Tanda, not far from the trade route linking Peshawar to the border town of Torkham. Known for its longstanding traditions in regional trade, Bazar Zakha Khel is an important bazaar and transit point for goods moving through the pass, and it serves surrounding villages with supplies and market access. The community is recognized for its rich Pashtun culture, strategic location, and significance within the broader Afridi tribal network.

7.5.2.3.1 Proposed Land Uses

- **Residential**

The proposed residential allocation for Bazar Zakha Khel 5 Potential Settlement builds upon the existing residential footprint of 68.46 acres and introduces an additional 84.74 acres through the Infill Residential Zone, resulting in a total residential area of 153.21 acres.

This zone is designed for high-density development, utilizing vacant and underutilized land to accommodate the projected population efficiently. Vertical development (G+3 to G+4 storeys) is proposed to maximize population absorption within the available land.

- **Commercial**

Commercial uses represent 3.43 percent of the total area. Existing commercial land of 16.03 acres is complemented by 5.81 acres of proposed commercial zones, supporting local trade and neighborhood-level economic activities.

- **Institutional (Civic, Education, Health)**

Institutional land covers 0.97 percent of Bazar Zakha Khel. Existing education (0.32 acres), health (0.35 acres), and public building/mosque (0.37 acres) are supplemented with 2.02 acres of educational zones, 1.09 acres of health care zones, and 1.99 acres of civic amenities to meet future social infrastructure needs.

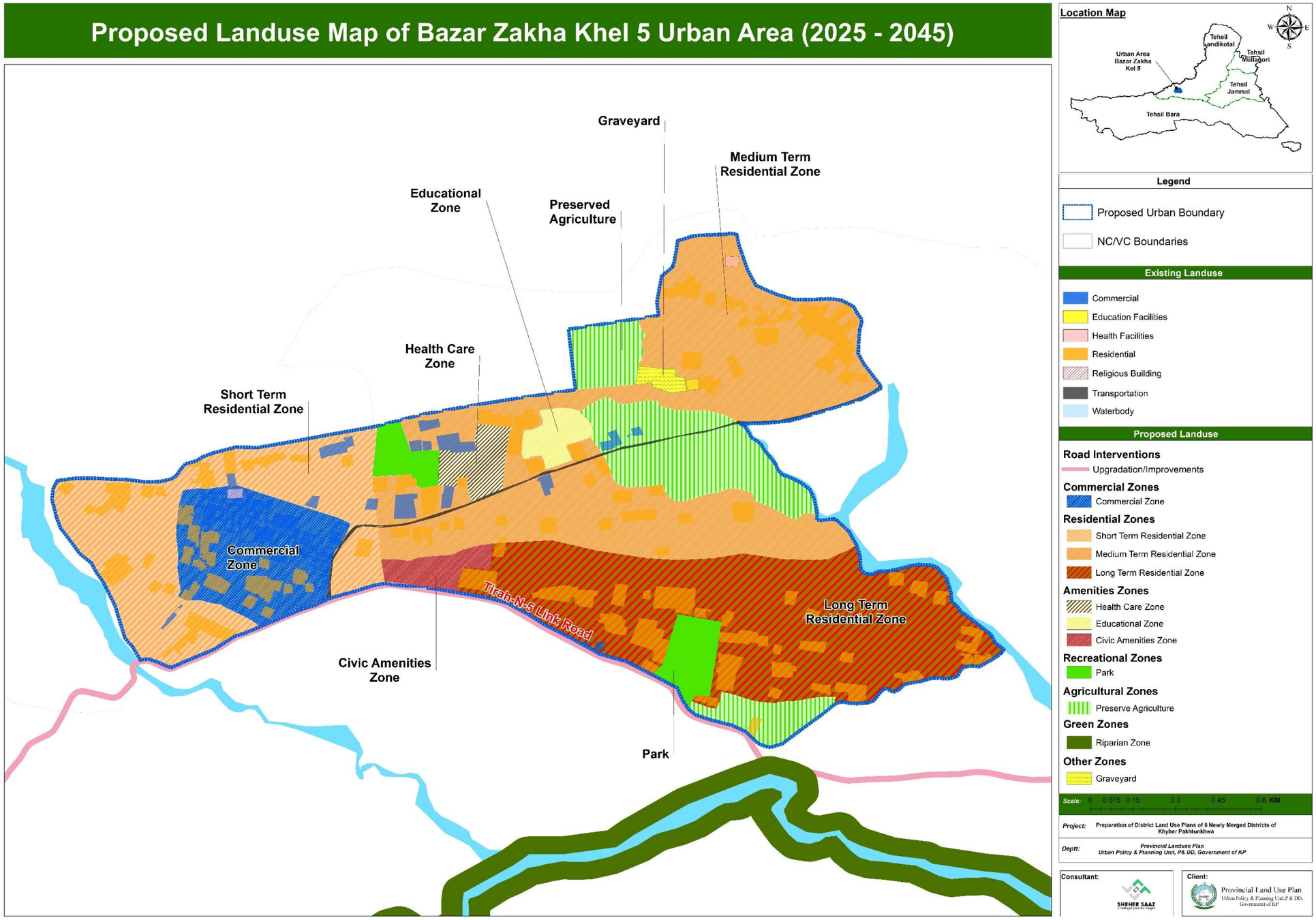
- **Recreational and Open Spaces**

Recreational areas account for 0.64 percent of the total area. While currently there are no parks, 2.34 acres of central park and 1.70 acres of additional park space are proposed to enhance community well-being and environmental quality.

Table 131: Proposed Land Uses in Bazar Zakha

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre
Residential	Residential	98.70	Infill Residential	88.75
Commercial	Commercial	0.91	Commercial Zone	2.61
Institutional	Education	2.92	Educational Zone	2.83
	Health	1.20	Health Care Zone	1.09
	Public Building & Mosque	0.66	Civic Amenities Zone	1.99
Recreational/Open Spaces	Park/Playground	0.00	Central Park	2.34
			Park	0.63
Others	Agriculture	62.22		
	Range Land	385.47		
	Transportation	3.40		
Total		536.63	Total	99.70

Map 57: Proposed Land Use Map Potential Settlement - Bazar Zakha Khel 5



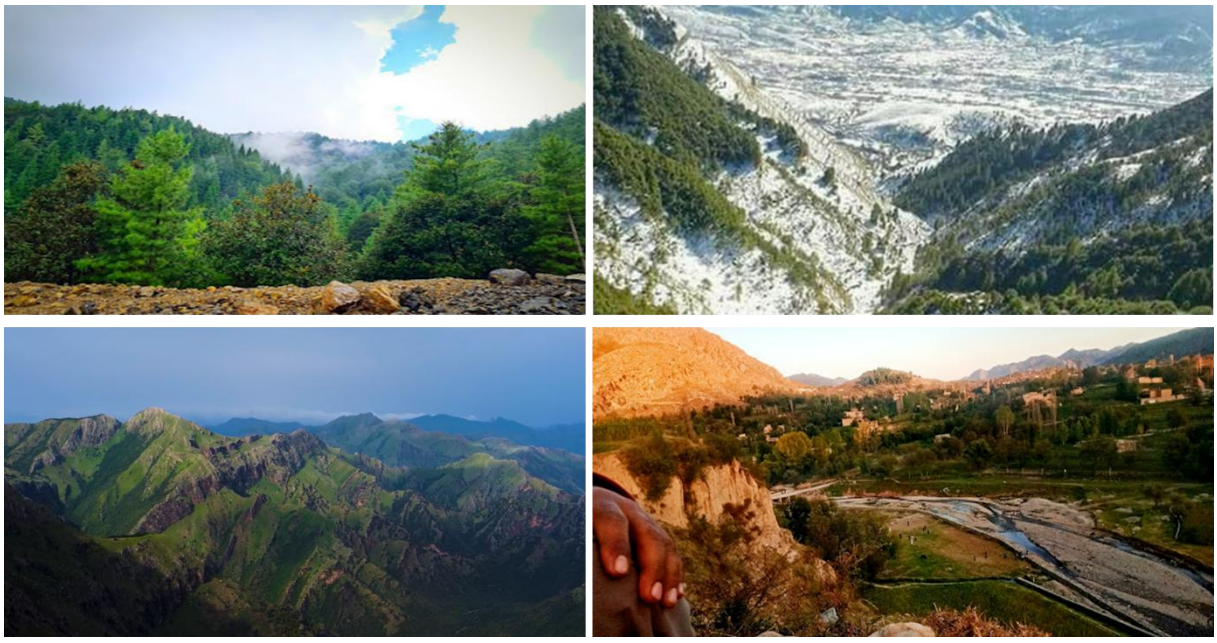
7.5.2.4 Tirah

Bagh Tirah, located at 33°48'53.34"N and 70°44'50.31"E, covers an area of ***3.08 sq. km*** and has an estimated population of **12,434** in 2025, projected to grow to **22,807** by 2045. Situated in **Khyber Agency (Khyber District)** within the broader **Tirah Valley**, the area is part of one of the most picturesque and rugged landscapes in northern Pakistan, known for its dramatic mountains, deep valleys, and scenic natural features.

Tirah Valley is celebrated for its lush meadows, springs, forests, and breathtaking terrain that rivals many well-known hill stations in the country, offering rich sightseeing experiences and cultural depth. Locals and visitors alike describe this region as having **"heaven on earth"** beauty, with towering mountain backdrops, serene valleys, and the potential for **waterfalls, trekking, and hiking trails** that remain largely untapped due to limited infrastructure.

The valley's natural charm and cultural richness have long attracted those seeking peaceful retreats, nature walks, and traditional tribal hospitality, contributing to a strong **hidden tourism potential** that, if developed with proper access, facilities, and security, could draw domestic and regional visitors for eco-tourism, adventure tourism, and cultural exploration.

Figure 34: Bagh Tirah - District Khyber



7.5.2.4.1 Proposed Land Uses

- **Residential**

The proposed residential allocation for Tirah Potential Settlement builds upon the existing residential footprint of 48.64 acres and introduces an additional 636.32 acres through Short-Term, Medium-Term, and Long-Term Residential Zones, resulting in a total residential area of 684.96 acres.

The Short-Term Residential Zone (141.05 acres) is designed for medium-density development to accommodate near-term housing needs, while the Medium-Term Residential Zone (105.61 acres) supports medium-density housing for phased growth. The Long-Term Residential Zone (237.89 acres) is allocated for low-density, low-rise development to allow future expansion.

- **Commercial**

Commercial activity accounts for 2.53 percent of the land. The existing 32.39 acres of commercial area are supported by an additional 11.13 acres of proposed commercial zones, strengthening local markets and improving economic accessibility.

- **Industry**

Industrial uses represent 1.68 percent of the total land. While no industrial areas currently exist, 28.92 acres of industrial zones are proposed to support small-scale production and local employment generation in the long term.

- **Institutional (Civic, Education, Health)**

Institutional land covers 1.33 percent of Tirah's area. Existing public buildings and health facilities total only 0.61 acres, which is expanded through 8.09 acres of civic amenities, 11.12 acres of educational zones, and 3.01 acres of health care facilities—improving access to essential public services.

- **Graveyard**

Graveyard space accounts for 0.47 percent of the total land. The existing graveyard area is supplemented by 8.07 acres of proposed graveyard land to meet future community needs.

- **Recreational and Open Spaces**

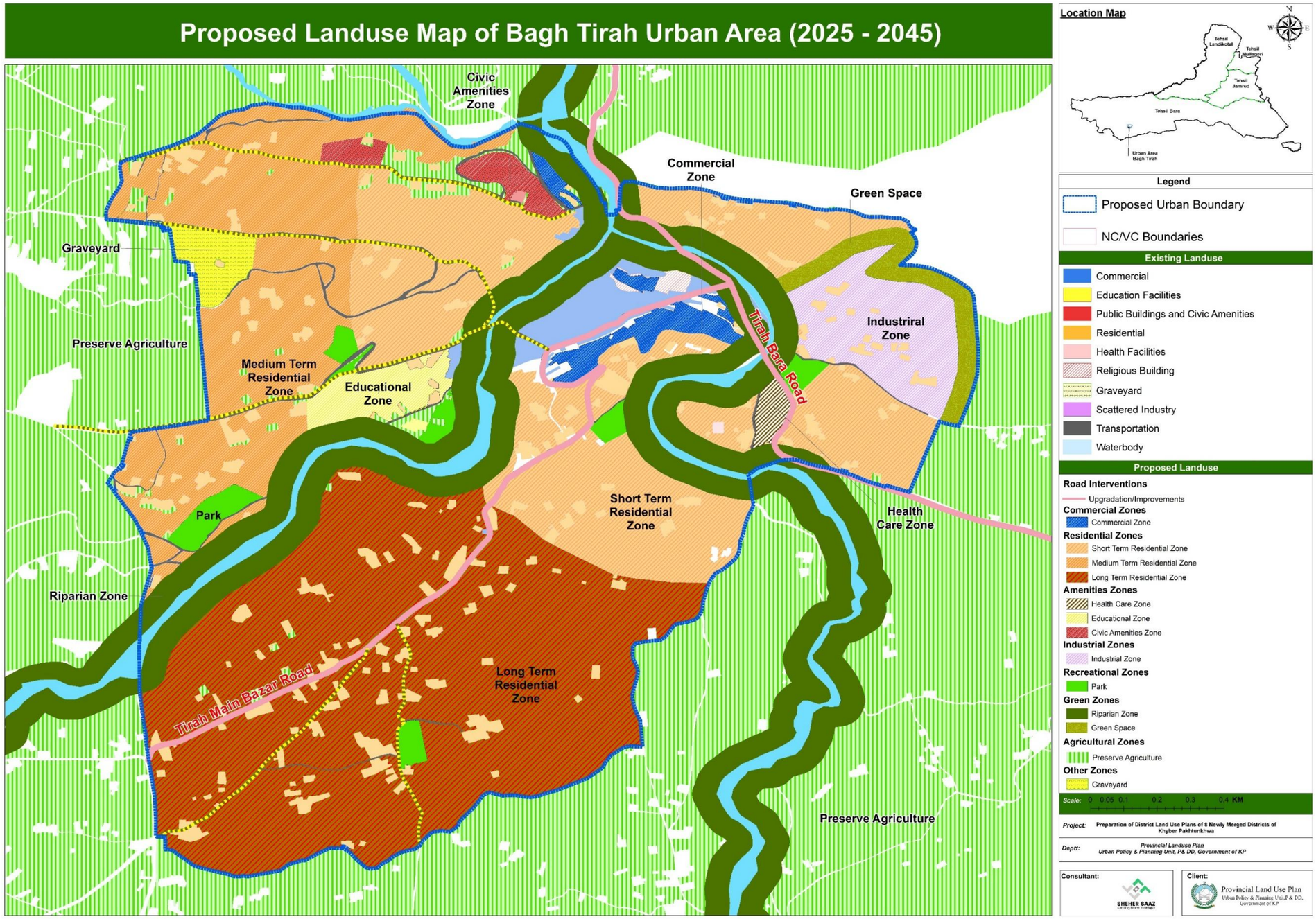
Recreational land makes up 0.78 percent of the planning area. Although no parks currently exist, 13.37 acres of parkland are proposed to introduce much-needed public open space and environmental enhancements.

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Table 132: Proposed Land Uses in Tirah

Land use	Existing	Existing Area/Acre	Proposed	Proposed Area/Acre	Sum of Existing & Proposed	Land use %
Residential	Residential	48.64	Short Term Residential Zone	141.05	636.32	37.02
			Medium Term Residential Zone	105.61		
			Long Term Residential Zone	237.89		
Commercial	Commercial	32.39	Commercial Zone	11.13	43.53	2.53
Industry		0.00	Industrial Zone	28.92	28.92	1.68
Institutional	Public Building & Mosque	0.38	Civic Amenities Zone	8.09	22.83	1.33
	Health	0.23	Health Care	3.01		
	Education		Educational Zone	11.12		
Graveyard	Graveyard	Graveyard	Graveyard	8.07	8.07	0.47
Recreational/Open Spaces	Park/Playground	0.00	Park	13.37	13.37	0.78
Others	Agriculture	673.16	Green Space	13.37	965.64	56.19
	Range Land	4.56	Riparian Zone	232.52		
	Transportation	24.53				
	Vacant Area	1.06				
	Waterbody	16.44				
Total		801.39	Total	814.15	1718.67	100.00

Map 58: Proposed Land Use Map Potential Settlement - Tirah



8 CHAPTER VIII: LAND USE REGULATIONS & GUIDELINES

Land use regulations constitute the legal and procedural backbone of spatial governance, enabling the orderly transformation of land while safeguarding public interest, environmental assets, and urban form.

As part of the zoning framework, these regulations establish the functional character of each land parcel by defining what activities are allowable, conditionally approvable, or strictly restricted within designated zones. Central to this framework are three key categories:

• Permitted Uses refer to those land use activities that are inherently aligned with the primary intent and planning objectives of a specific zone. These uses are allowed by right and do not require discretionary approval, provided they comply with applicable building codes, design guidelines, floor area ratios (FAR), setbacks, and height restrictions. Permitted uses facilitate predictable development outcomes and ensure efficient processing of building permits and planning approvals.

• Permissible Uses represent a secondary tier of land use activities that may be allowed within a zone subject to certain conditions. These uses are not automatically permitted but may be approved through a special review process—often involving impact assessment, stakeholder consultation, and compliance with supplementary criteria. The intent is to provide flexibility while maintaining compatibility with surrounding uses and minimizing potential land use conflicts.

• Prohibited Uses encompass activities that are fundamentally incompatible with the intended function of a zone due to their adverse environmental impacts, socio-spatial externalities, or infrastructure demands. These uses are categorically disallowed to preserve the integrity of zoning objectives, protect public health and safety, and maintain functional coherence in urban and rural areas.

These regulatory distinctions are essential to preserving urban form, promoting functional integration, managing growth, and facilitating context-sensitive development. They also empower local planning authorities to enforce zoning compliance, monitor land use change, and guide investment in alignment with strategic spatial frameworks.

The zoning regulations apply uniformly across the district and are tailored to the land use character and development intensity of each zone. The regulatory structure covers the following major land use categories:

• Residential Zones

• Commercial Zone (CBD)

• Industrial Zones

- Agricultural Zones
- Mining Zones
- Forest Zones
- Institutional Zones (including Education, Health, and Governmental uses)
- Mixed Land Use Zones
- Recreation Zone

Each of these zones is governed by a specific matrix of permitted, permissible, and prohibited uses, as detailed in the following subsections. This structured approach ensures the development of an inclusive, sustainable, and resilient urban-rural fabric while balancing socio-economic development with environmental stewardship.

8.1 Residential Zone

Permitted Uses	Permissible Uses	Prohibited Uses
• Detached/semi-detached dwellings, • place of worship or prayer, • Social/cultural institutions, • Parks and playgrounds, • Apartment buildings, • Graveyard or place of burial, horticultural nursery. • Urban farm, • Old age home or orphanage, • Urban forest,	• Commercial offices and service, • Shops of local character, • Raising of poultry for non-commercial purposes, • Private community centre or club • Day-care centre or Pre-schools, • primary school; • secondary school; • Rehabilitation centres, • Petrol pump, • Gas filling station, • Taxi/rickshaw stand. • Guest houses offices of TMAs/other tiers of local Govt. • Offices of professionals with	• Heavy, large and extensive industries: noxious, obnoxious and hazardous industries, • Warehousing, storage go-downs of perishables, hazardous, inflammable goods, • Workshops for buses, • Slaughter-housing, • wholesale mandis, • treatment Sewage plant/disposal work, • Water treatment plant, • Solid waste dumping yards, • Outdoor games stadium, • Indoor games stadium, shooting range,

	• adequate parking facilities, • Local shopping areas/retail shops,	• Zoological botanical garden, garden, • Bird sanctuary, • Picnic hut,

8.2 Commercial Zone (CBD)

Permitted Uses	Permissible Uses	Prohibited Uses
• Commercial buildings, • Markets, shopping mall departmental stores and Outlets, • Shops except dealing in hazardous dangerous substances • Taxi/rickshaw stand. • Public Squares and Parks • Bakery or confectionary, • Clinic or polyclinic, • place of worship or prayer, • Courier service or logistics office, • Private exchange operation telephone or cable JO • mobile franchise offices, • Memorial and monument, • Hotel or motel, • Hostel • Car showroom, • Police station, post office and fire station,	• Pedestrian friendly streetscape, • Mixed-use buildings, • Technical vocational institution, and • Seasonal commercial fare site, • Stadium; amusement park /play land, • Bus terminal, • Fuel Stations, • Wholesale market, • Second hand goods market, • Coal, wood or Timber yard. • Education institution • Marriage or banquet hall, concert hall • petrol pump or gas or LPG or LNG station; • bus or truck terminal; • private hospital; • auto workshop; • athletic club, gymnasium, fitness centre or • indoor sport facility,	• Dwellings except those of service apartment, essential operational, watch and ward personnel, • Heavy, extensive, noxious, obnoxious, hazardous and extractive industrial units, • Hospitals/research laboratories treating contagious diseases, • Poultry farms/dairy farms, • Slaughter-houses, • Sewage sites, treatment/disposal • Agricultural uses, • Storage of perishable and inflammable commodities, • Quarrying of gravel, sand, clay and stone, • Zoological garden, botanical garden, • Bird sanctuary, • Forensic science laboratory and all other activities which may cause nuisance

• Boutique or garment outlets or beauty parlour, • Restaurant, • Social welfare institutions such as community centre, art gallery and museum, • Parking plaza or Parking site.		and are noxious and obnoxious in nature. • A local government shall not allow person to use land or building commercial area for any neither purpose which is permitted nor permissible.

8.3 Industrial Zone

Permitted Use	Permissible Use	Prohibited Use
• Small and Medium Scale Industries • vertical green industry, • construction equipment, building material store; • Processing Units • Manufacturing Activities • Warehouses storage or Go-down; • Workshops • Cold storage and Ice factory • Petro chemicals, petroleum and gas products • Loading and unloading space; • Parking lot • Industrial park or estate	• Showrooms • Mixed-buildings used • Residence for workers • Fuel stations and Oil depot; • Restaurant; • Hospital; • Power plant • Grid Station • Place of Worship • Essential residential, • commercial, health and educational facility for workers or employees • Auto workshop, service and station; garage service	• Private residential housing schemes • Large health, commercial and educational institutions • The land use for storing, packing, pursing, cleaning, preparing, and manufacturing of blushing power, ammunition, fireworks, gun powder, Sutphin, mercury, gases, nitro-compounds, phosphorous, 'dynamite, explosives, bombs or any other obnoxious hazardous material shall not be permissible In a

• Police station, fire station and post office; • restaurant: • green area, park or forest • bank or automated teller machine (ATM); • Industrial research institute; • Treatment or recycling plant; • Grid station; • Vocational training institute		declared industrial area. • A local government shall not allow person to use land or property in an industrial area for any purpose which is neither permitted nor permissible.

8.4 Agriculture Zone

Permitted Use	Permissible Use	Prohibited Use
• Crop, • Orchard, • Pastureland • livestock such as dairy or poultry farm • Forest, • or a green house, Nursery horticulture, • Tube well, • Existing rural settlement or village, • place of worship or prayer. • Agro-based industry • Public slaughterhouse • Storage activities of agricultural goods which are non-hazardous in nature.	• Milk Chilling and Pasteurization • Animal husbandry clinic, veterinary dispensary or hospital. • Agricultural workshop machinery • Basic health unit • clinic or hospital; • Country club, • Zoological garden, • Farmhouse • Slaughterhouses, • Dairy production, • Botanical garden, • recreational club or resort or country club; • Bird sanctuary,	• Other than permitted and permissible

	• Zoo or wildlife park, • Grain market • Cattle farm • Poultry Farm, • Cattle market • Fruit and vegetable market, • Agriculture, Livestock research institute • monument, Park, playground, gymnasium or sports complex • public or private recreational or theme park; • Vegetable, fruit and grain market • water filtration plant; • wastewater treatment plant; • Power plant • petrol pump or gas station or LPG or LNG storage and filling station. • Base trans-receiver station • Or communication tower. • shooting range; • swimming pool; • library; • Detached/semi-detached dwellings.	

8.5 Mining Zone

Permitted Use	Permissible Use	Prohibited Use

• Extraction of minerals (e.g., coal, sand, gravel, stone), quarrying, and other resource mining activities.	• Housing or colony for workers (including schools and corner shops, health facility) • Processing plants for mined materials, • storage facilities for mined goods, • Industrial parks related to mining activities (Processing plants, Storage facilities • Workshops and manufacturing units, Logistics infrastructure), Transportation infrastructure. • Utilities for mining operations (water treatment plants, power plants for mining operations),	• Housing or colony for workers (including schools and corner shops, health facility) • Processing plants for mined materials, • storage facilities for mined goods, • Industrial parks related to mining activities (Processing plants, Storage facilities • Workshops and manufacturing units, Logistics infrastructure), Transportation infrastructure. • Utilities for mining operations (water treatment plants, power plants for mining operations),

8.6 Forest Zone

Permitted Use	Permissible Use	Prohibited Use
• Forestry activities such as timber extraction (sustainable logging), reforestation, ecotourism (e.g., hiking, agroforestry, camping), conservation efforts. controlled • Wildlife conservation and habitat national	• Forestry research institutes, sustainable wood processing industries (e.g., paper mills), eco-tourism facilities (lodges, visitor centers), and community-based forest management activities.	• Urban development (residential, commercial, industrial), large-scale agriculture (e.g., crop farming), mining activities, infrastructure projects (e.g., roads, buildings), land clearing for non-forest related uses.

parks, nature restoration, reserves	• Educational and training centers focused on environmental conservation sustainable and forestry practices	• Any activities that lead to deforestation, illegal logging, or degradation of forest ecosystems

8.7 Institutional Zone (Health, Education, and Civic Amenities)

Permitted Use	Permissible Use	Prohibited Use
• Permitted Uses • Large Scale education zone • General education universities • Scientific research institutes • IT and Media institutes • City Level libraries, book banks, data information centers and • Large Scale Health Institutions; Hospitals, • Scientific research institutes, • Clinics, • Clinical Laboratory, • BHUs and RHCS, • Maternity Care Centres • Government government or semi-offices (District Secretariat, Town Hall etc.	• Staff residences (teaching and non-teaching, health workers, employees) • Separate hostels for Boys and Girls • Auditoriums, seminar halls, workshop spaces, • Community facilities (Parks, Playgrounds, neighbourhood commercial) • Athletic club, gymnasium, Sports facilities, fitness center or indoor sport facility, • Banks or Automated Teller • Machine (ATM), • Departmental Store, • Taxi or bus stand. • Hotel or Motel, • Guest house,	

• Social welfare institution such as a community centre, art gallery, • museum and auditorium • • Local and zonal municipal • office • • Police station, fire station • or post office • • Shelter home, • • Pannahgahh, • • Convention Centre		

8.8 Recreational Zone

Permitted Use	Permissible Use	Prohibited Use
• Public parks, • playgrounds, green • spaces • Sports facilities (fields, courts, pools) • Community/recreation • centers • Nature preserves • Accessory uses (parking, restrooms) • Educational facilities • (nature centres	• Commercial amenities (e.g., cafés) • Event venues (festivals, concerts) • Campgrounds/RV parks • Private recreational facilities (marinas) • Small-scale lodging (eco-lodges) • Temporary uses (farmers' markets	Industrial activities (factories) • Heavy commercial (malls) • Residential housing (high density • High-impact infrastructure (highways) • Polluting uses (landfills) • Intensive agriculture (livestock farming) • Waste disposal facilities • Transport depots/terminals

8.9 Mixed Land Uses Zone

Permitted Use	Permissible Use	Prohibited Use
• Detached/semi-detached homes • Residential apartments • Social institutions (schools, places of worship) • Retail shops, cafes, local businesses, offices for professionals (doctors, lawyers) • Schools, • Clinics, • Community centers, • Public parks, • Transportation hubs (bus stations and public transport terminals) • Small workshops, • Artisan businesses, • Local food production, local manufacturing units • Libraries, post offices,	• Additional developments, Schemes, housing societies and residential apartments • Hotels, motels, restaurants, specialized retail outlets. • Day-care centers, health centers, cultural centers. • Cottage industries, home-based businesses, small-scale production units. • Public sports complexes, recreation centers.	• Large-scale housing projects incompatible with zoning. • Hazardous goods stores, large malls, or heavy industry shops. • Large hospitals, forensic labs, military facilities. • Large factories producing hazardous materials, heavy industrial operations. • Sewage plants, waste disposal sites, power plants

9 CHAPTER IX: MONITORING AND EVALUATION FRAMEWORK

The Monitoring and Evaluation (M&E) Framework for District Khyber aims to provide a structured system for tracking progress, ensuring accountability, and guiding sustainable development across all key sectors of the district. By setting clear goals, indicators, and responsibilities, the framework will help decision-makers, local authorities, and communities measure achievements and identify gaps to refine policies and improve service delivery.

Education

In the education sector, monitoring focuses on improving access, quality, and equity for all children, with special attention to girls' education. Key indicators include the number of schools constructed or rehabilitated, teacher student ratios, enrollment and dropout rates disaggregated by gender, and the availability of essential facilities such as toilets, drinking water, and electricity. Progress will be verified through school inspections, Education Department reports, and household surveys. The District Education Department, in coordination with local government and partner NGOs, will be responsible for monitoring, with evaluations carried out annually and biannual field inspections to ensure sustained improvements.

Residential Development

The housing sector requires close monitoring to ensure safe, affordable, and sustainable residential growth. Indicators include the number of new housing units built or regularized, the proportion of the population with access to clean drinking water and sanitation, and compliance with building codes. Field surveys and housing authority records will be used to verify progress. The Municipal Administration will lead these efforts, with annual progress reviews to track trends in residential development and service delivery.

Commercial Development

Commercial activity is vital for local economic growth and requires effective oversight. Monitoring will assess the number of commercial units registered, growth in local business licenses, and increases in retail and wholesale trade volumes. These will be verified through district commerce records and data from local chambers of commerce. The Trade and Commerce Department will take responsibility, with quarterly monitoring and annual reporting to evaluate commercial growth and identify emerging challenges.

Health

In the health sector, the framework focuses on expanding accessibility and improving service quality. Key indicators include the number of health facilities constructed or upgraded, the doctor–patient, vaccination coverage rates, and improvements in maternal and child health indicators such as infant and maternal mortality rates. Verification will rely on District Health Information Systems (DHIS), health department records, and surveys. The District Health Department and Provincial Health Ministry will lead, supported by NGOs where relevant. Quarter monitoring and annual evaluations will ensure that health services remain aligned with population needs.

Forests and Environment

Environmental monitoring is crucial to maintaining ecological balance and natural resource sustainability in Khyber. Indicators include changes in forest cover, the number of trees planted and their survival rate, the extent of protected areas maintained, and the incidence of illegal logging. Satellite imagery, Forest Department reports, and community monitoring initiatives will be used for verification. The Forest Department, supported by the Environmental Protection Agency and local councils, will be responsible for this sector, with bi-annual monitoring and annual reviews to ensure conservation objectives are met.

Industrial Development

Industrial growth must be balanced with sustainability to benefit the local economy. Monitoring will track the number of industrial units established or upgraded, employment generated, and compliance with environmental regulations related to emissions and waste disposal. Verification will come from Industrial Department records, labor force surveys, and environmental reports. The Provincial Industrial Department and District Government will lead monitoring, with quarterly reviews and annual reporting to assess industrial performance and impacts.

Tourism

Tourism has the potential to boost economic growth but needs structured monitoring to realize its full benefits. Indicators will include annual tourist arrivals (both domestic and international), revenue from tourism, the number of heritage sites and recreational facilities upgraded, and the installation of waste management systems at key tourist locations. Verification will depend on Tourism Department data, visitor surveys, and independent evaluations. The Tourism Department, working with local authorities and the private sector, will oversee the monitoring process. Progress will be reviewed quarterly, with in-depth evaluations every five years to measure tourism's impact on the economy.

Infrastructure

Monitoring infrastructure will improve accessibility, mobility, and utilities. Indicators include the kilometers of roads built or fixed, the percentage of people with access to electricity and clean water, and the coverage of internet and mobile services. Verification will come from Public Works Department records, utility provider data, and surveys. The District Works Department, PESCO, WASA, and PTA will share responsibilities, with quarterly progress updates and yearly reviews to evaluate connectivity and service quality.

Disaster Risk Reduction (DRR) and Emergency Management

Khyber's vulnerability to natural and man-made hazards requires robust monitoring of disaster risk reduction initiatives. Indicators include the number of disaster management plans prepared or updated, the operational status of early warning systems, and the frequency of community training and awareness programs. Verification will rely on PDMA reports and feedback from local disaster committees. PDMA KP and the District Disaster Management Unit will lead these activities, supported by NGOs, with annual drills and bi-annual reporting to strengthen preparedness.

Cross-Sectoral Governance and Accountability

Good governance and accountability form the foundation of effective monitoring. Indicators include the number of community participation forums held annually, the rate of development budget utilization, and results of citizen satisfaction surveys. Verification will be carried out through district administration records and independent evaluations. The District Government, civil society organizations, and independent auditors will play key roles. Annual reviews and mid-term as well as end-term evaluations will ensure transparency, inclusiveness, and responsiveness in governance.

Conclusion

This comprehensive M&E framework provides District Khyber with a robust system to track development across education, housing, commerce, health, environment, industry, tourism, infrastructure, disaster management, and governance. Through clear indicators, transparent verification methods, and defined responsibilities, it ensures that progress is measurable, accountability is upheld, and corrective actions can be taken promptly. By institutionalizing this framework, District Khyber can achieve sustainable growth while balancing social, economic, cultural, and environmental priorities.