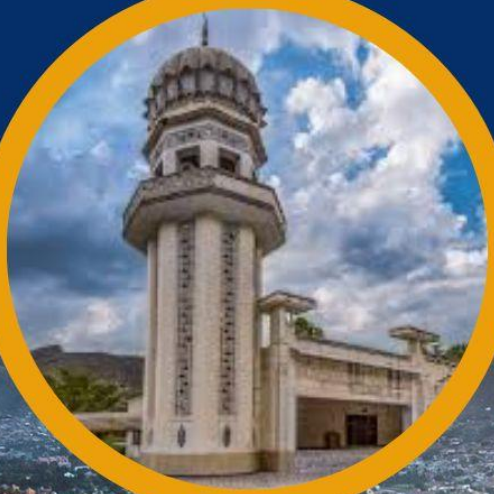
MINGORA-SAIDU SHARIF CITY MASTER PLAN, 2024-42

VOLUME I



MASTER PLAN PROJECT (MPP)
URBAN POLICY AND PLANNING UNIT

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URBAN POLICY UNIT
Planning and Development Department
GOVERNMENT OF KHYBERPAKHTUNKHWA

PEPAC PVT LTD & Associate

Reviewed by:
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Creating Places For People

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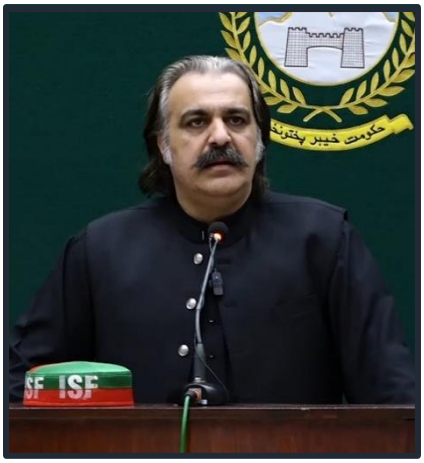
MESSAGE FROM CHIEF MINISTER KHYBER PAKHTUNKHWA



Khyber Pakhtunkhwa, the third most populated province of Pakistan, is experiencing rapid urbanization due to various push and pull factors. Lack of proper planning has resulted in overcrowding of all major urban centers coupled with traffic congestion, environmental pollution and ribbon development along main roads. Insufficient investment in urban infrastructure, lack of trained human resource and poor management of key infrastructure are the causes of weak coverage and low service quality. A significant proportion of the urban population continues to live in dilapidated environment and urban slums. The current provincial government has introduced a policy shift from "containing urbanization" to "managing urbanization", adopting an integrated approach that capitalizes on the potential of cities and that can convert this constraint into an opportunity and transform the cities to be engines of economic growth.

The provincial government is aware of these challenges for which it has prioritized an innovative planning approach that would bridge the gap between urban and rural development. Through coordinated efforts, district land use plans for districts and master plans for urban centers across the province have been developed. These master plans are designed to address core urban issues such as traffic congestion, provision of affordable housing, traffic & transportation problems, unemployment, lack of education and healthcare facilities and environmental degradation. These plans provide clear and actionable road maps for decision-makers to guide them towards sustainable development ensuring that both urban and rural areas can meet the needs of growing populations while safeguarding natural resources for future generations.

These achievements wouldn't have been possible without the dedicated and untiring efforts of the Master Plan Project, Urban Policy and Planning Unit of the Planning and Development Department, Government of Khyber Pakhtunkhwa. I would like to extend my gratitude to all stakeholders, community members and local government officials whose contributions have been instrumental in shaping these comprehensive plans.

Looking ahead, these master plans stand as a testament to our government's unwavering commitment to fostering sustainable, inclusive and resilient urban development. Together, we will ensure that Khyber Pakhtunkhwa's cities and towns continue to thrive as hubs of economic activity, cultural heritage and community well-being, securing a prosperous future for all generations to come.

Mr. Ali Amin Gandapur
Chief Minister
Government of Khyber Pakhtunkhwa

MESSAGE FROM THE MINISTER LOCAL GOVERNMENT, ELECTIONS, AND RURAL DEVELOPMENT DEPARTMENT, GoKP

The Government of Khyber Pakhtunkhwa is committed to fostering a well-planned, resilient, and sustainable urban future for our cities. Recognizing the rapid pace of urbanization and its associated challenges, we have taken a proactive approach to urban planning and development that aligns with national priorities and international commitments, including the Sustainable Development Goals (SDGs).

Through the Master Plans for Cities, we are laying the foundation for balanced regional development, economic growth, and environmental sustainability. These plans will guide future investments in infrastructure, housing, transportation, and public services to ensure that our cities remain inclusive, competitive, and climate-resilient. Our focus is to bridge the urban-rural divide by ensuring equitable resource allocation and extending modern infrastructure.

The Master Plans represent a vision for progress, prosperity, and sustainability. With strong political will, coordinated action, and community participation, we are determined to transform our cities into hubs of opportunity, innovation, and well-being for all.

The Urban Policy and Planning Unit of the Planning and Development department played a pivotal role in preparing these master plans. These master plans truly reflect the collaborative efforts of a wide range of stakeholders including provincial line departments, district administration, NGOs, local political leadership, and the public at large. I extend my sincere gratitude to UPU and all those who have contributed their expertise and efforts toward creating plans that will not only tackle present challenges but also lay the foundation for a sustainable urban future.

Mr. Arshad Ayub Khan
Minister LGE & RD Department
Government of Khyber Pakhtunkhwa

MESSAGE FROM ADDITIONAL CHIEF SECRETARY, PLANNING AND DEVELOPMENT DEPARTMENT, GOVERNMENT OF KHYBER PAKHTUNKHWA

The rapid urbanization across Khyber Pakhtunkhwa has created both opportunities and challenges. On the one hand, urbanization is transforming the socio-economic landscape of the province while on the other, it has caused economic issues such as unplanned expansion, inadequate infrastructure, traffic congestion and increased pressure on public resources. To enhance the economic vitality of urbanization and reduce its negative impacts, there is an urgent need of structured and sustainable urban planning to fully realize the potential of our urban centers.

The formulation of master plans for the towns and cities is a crucial step toward achieving this goal. These plans will provide comprehensive frameworks to guide towards the planning of towns and cities, optimize land use, improving economic productivity and ensuring the equitable distribution of resources. Sustainability remains a key priority in the plans emphasizing environmental protection while aligning resources to meet the growing needs of the urban population. The master plans will serve as structured guidelines for local authorities, district administrations and municipalities to systematically undertake and implement future development initiatives. These plans support the achievements of core urban needs such as housing for all, transportation and public facilities ensuring that cities evolve into resilient, liveable and economically viable centers that can meet the aspirations of residents.

The Urban Policy and Planning Unit (UPU) of the Planning and Development department played a pivotal role in preparing these master plans. The plans truly reflect the collaborative efforts of a wide range of stakeholders including line departments, district administration, NGOs, local political leadership and the community. I extend my sincere gratitude to UPU and all those who have contributed their expertise towards developing master plans that will not only tackle present challenges but would also lay the foundation for a sustainable urban growth.

As we move forward with implementation, I am pleased to announce that the projects identified in these master plans shall be included in the upcoming Annual Development Programmes (ADPs) to ensure their timely execution and alignment with provincial priorities. I am confident that these master plans will serve as benchmarks for urban development. They are testament to the government's commitment to foster well-planned and thriving urban centers that support the prosperity and well-being of citizens for all the times.

Mr. Ikram Ullah Khan
Additional Chief Secretary
Planning and Development Department
Government of Khyber Pakhtunkhwa

MESSAGE FROM THE SECRETARY LOCAL GOVERNMENT, KHYBER PAKHTUNKHWA

The Mingora-Saidu Sharif Master Plan of 2024-2044 represents a significant milestone in our efforts to foster sustainable urban development and shape the future of the city. As Mingora-Saidu Sharif continues to grow, there is an increasing need for structured, sustainable and visionary planning to accommodate rising population, promote economic growth and ensure equitable access of all citizens to essential services and resources.

At the Local Government Election & Rural Development (LGE&RD) Department, we are committed to undertake initiatives that contribute to the overall prosperity of Khyber Pakhtunkhwa. The aim is to ensure that each part of the province shall benefit from development strategies. This master plan is a reflection of that vision — offering a comprehensive framework that addresses immediate urban challenges while laying the foundation for a long-term resilient growth.

The Mingora-Saidu Sharif Master Plan of 2024-2044 has been designed to maintain an equilibrium between urban expansion and the preservation of valuable cultural heritage and environmental resources including prime agricultural land in the peri urban limits. The plan will create investment and employment opportunities and will generate revenue for further development and enhance the overall quality of life for the people of Mingora-Saidu Sharif. Moreover, it underscores the importance of collaboration among public institutions, stakeholders and residents in shaping an inclusive, sustainable and prosperous urban centers.

I would like to commend the Urban Policy & Planning Unit (UPPU) of the Planning and Development Department and all stakeholders for their dedication and hard work in developing this master plan. The successful implementation of the plan will not only transform Mingora-Saidu Sharif but would also serve as a model for other cities throughout the province.

We resolve our commitment to fostering inclusive growth, ensuring that development opportunities are accessible to all and contributing to a brighter and more prosperous future for the people of Khyber Pakhtunkhwa.

Dr. Amber Ali Khan
Secretary LGE & RD Department
Government of Khyber Pakhtunkhwa

ACKNOWLEDGMENTS

First of all, I am extremely grateful to almighty Allah who enable me and my team to successfully complete this gigantic work of the preparation of Master Plan of Mingora-Saidu Sharif City. The preparation of the Mingora-Saidu Sharif City Master Plan 2024-2044 has been a collaborative and dedicated effort aimed at ensuring the sustainable development of Mingora-Saidu Sharif, the vibrant capital of Khyber Pakhtunkhwa. This report reflects the collective commitment of all stakeholders toward a rational, balanced, and systematic use of resources to address the city's unique challenges and guide its future growth and development. This Master Plan forms an integral part of the Government of Khyber Pakhtunkhwa broader initiative to promote sustainable urban development across the province. It addresses critical aspects of urban management, including housing, transportation, socio-economic development, and environmental sustainability, providing a comprehensive framework for sustainable growth of Mingora-Saidu Sharif City.

I extend my sincere gratitude to the worth Additional Chief Secretary P & DD, Secretary, P & DD a Government of KP for entrusting me and my team with this significant initiative. Special thanks to my existing and former Executive Directors, UPU including Mr. Zubair Asghar Qurashi, Mr. Adeel Shah (current Secretary, P and DD), Mr. Inayatullah Waseem, Mr. Shah Mehmud, Mr. Abdul Basit, Mr. Ifthikhar, and Mr. Fazal Khaliq (current ED, UPU) for their insightful leadership and support throughout the planning process. I am also thankful to all my colleagues in UPU and MPP especially Dr. Muhammad whose expertise and efforts during the conceptualization, data collection, analysis, and review phases were instrumental in shaping this detailed master plan. I am deeply thankful to the officials of the District Administration, including Commissioner Mingora-Saidu Sharif Division, Deputy Commissioner Mingora-Saidu Sharif, and other key officials for their cooperation, guidance, and active involvement during the course plan making. Their local insights, support, and valuable feedback have greatly enriched the plan, ensuring its relevance to the unique context of Mingora-Saidu Sharif.

Special recognition is due to PEPAC Pvt Ltd & Associates for their dedicated efforts in preparing this report. The team's technical expertise, unwavering commitment, and hard work were instrumental in successful completion of this master plan. I am also thankful to Mr. Khurram Farid, (Sheher Saaz Pvt. Ltd) and his team for reviewing various drafts of the MASTER PLAN. Their valuable inputs have greatly enhanced quality of the plan. Finally, I express my appreciation to everyone who contributed to this plan in various capacities. This Plan represents a shared vision for a sustainable, prosperous, and resilient future Mingora-Saidu Sharif city.

As this master plan is the first of its kind and will not be free from errors, however, I am fully optimistic about the successful implementation of this plan. In due course of time the plan be reviewed and necessary changes will be made in future revisions. Together, let us work toward building a thriving and sustainable Mingora-Saidu Sharif for generations to come.

Adnan Salim,
Project Director, Master Plan Project
Urban Policy Unit, P & DD

Executive Summary

Located in the north-west, Khyber Pakhtunkhwa (KP) is the third-largest province of Pakistan by population. It has an average annual growth rate of 2.89% that is relatively higher than the national average of 2.40% estimated by the Pakistan Bureau of Statistics in 2017 whilst the urban population stood at 5.7 million. Khyber Pakhtunkhwa (KP) is the third most populous province in Pakistan with a population of 30.5 million people as of 2017 census report with land cover of 74,521 km^2. But in 2018, the province underwent significant changes when the Federally Administered Tribal Areas (FATA) region merged with KP through the 25^{th} Constitutional Amendment approved in the National Assembly. This pivotal event of mergence expanded the total area of KP to 101,741 km^2 and increased the total population of the province to approximately 35 million people[1].

Considering the challenging scenario, then Prime Minister of Pakistan (Mr. Imran Khan) has directed the provincial and local governments to prepare Master Plans of cities and towns that would inform and direct the urban growth, encourage high-density development while protecting the prime agricultural and environmentally significant land. The Urban Policy & Planning Unit of the Planning and Development Department, Government of KP has commissioned the preparation of Master Plans of Provincial, Divisional and District Headquarters of KP province. This initiative includes the preparation of Mingora- Saidu Sharif City Master Plan 2042 that would inform and direct the future growth of Mingora- Saidu Sharif city in a sustainable way to efficiently enhance its productivity and functioning whilst improving the quality of life of its residents. The PEPAC Pvt Ltd & Associates has been hired as the Consultant by UPPU to carry out the extensive exercise of the preparation of the Mingora- Saidu Sharif City Master Plan 2042. The basic objective of the Mingora- Saidu Sharif City Master Plan 2042 is to suggest sustainable, compact and environment friendly proposals for the future development of Mingora- Saidu Sharif City.

The project study area boundary comprises of twenty-five Neighborhood Councils (NCs) and three Village Councils (VCs), occupying a total area of 50.68 km^2. The neighborhood councils formulate the existing urban area boundary covering an area of 22.37 km^2 while the village councils are the proposed future boundary of the city, with the anticipation that these areas will be converted into neighborhood councils in the near future The vacant areas in village councils, excluding built-up areas, orchards and prime agriculture land have been taken as "proposed areas" for future development and expansion of the existing urban area of city.

According to the 2017 census, the population of Mingora MC is 322,861 people. The projected population for 2017 study area; including NCs and VCs population, is around 392,864 people which is projected to be 446,425 people in 2022 while for the year 2042 it is estimated to increase up to 730,366 people with an average growth rate of 2.29% from the year 2022 to 2042. The report outlines proposals for different sectors to achieve the stated objectives and their summaries are given below;

[1] About Khyber Pakhtunkhwa, accessed on 07-08-2023. https://kp.gov.pk/page_type/message/page/welcome#:~:text=The%20total%20area%20of%20the,11.9%25%20of%20Pakistan's%20total%20population.

The city's residential development follows a horizontal growth pattern, covering 11.75 km². To optimize land use, 352.73 acres have been designated for infill development from 2022 to 2027, utilizing available vacant land. Additionally, 360.13 acres within the project boundary are proposed for residential zones to accommodate population growth from 2027 to 2042. Due to limited vacant land and stakeholder recommendations, 25.86 acres near the PHA housing scheme, outside the study area, have also been allocated. Two housing scenarios were evaluated: Scenario 1 (90% horizontal, 10% vertical) and Scenario 2 (70% horizontal, 30% vertical). Based on local trends and global best practices, Scenario 2 has been recommended for sustainable development.

The Commercial Zone section outlines the economic landscape of Mingora-Saidu Sharif, emphasizing the region's reliance on tourism and the potential in agriculture, handicrafts, and mining. The proposed Hospitality Zone, covering 459.85 acres along the River Swat, aims to enhance tourism infrastructure with hotels, resorts, and recreational facilities, thereby boosting economic growth. Existing commercial activities, currently spread across 889.71 acres, will be optimized through targeted mixed use infill commercial development (34.93 acres) and mixed use linear commercial development (81.12 acres) along main roads, alongside a new commerce and trade zone (30.18 acres).

Mingora-Saidu Sharif's existing health facilities are inadequate, with only two BHUs, one civil dispensary, one MCH, and one DHQ serving a population of 392,864 in 2017. To bridge this gap, 34.29 acres have been designated for new health zones, ensuring facilities are within a 10-minute drive or a 1 km walk. By 2042, the city will require 4 additional BHUs, 1 RHC/MCH, and 6 dispensaries to meet growing demand.

To accommodate future needs, 24.95 acres have been allocated for new schools and colleges, including 13 primary schools, 6 middle schools, 1 high school, and 1 college by 2042. This expansion also emphasizes quality improvements through modern teaching methods, vocational training, and skill development programs. Additionally, the proposed institutional and civic zones will strengthen public services. A 6.19-acre institutional zone will host research centres, libraries, and vocational training centres, while a 0.74-acre civic zone near King International Hospital will provide essential public services. Moreover, a 9.19-acre judicial complex outside the project area will centralize legal proceedings, improving administrative efficiency and regional liveability.

Various zones have been proposed within and outside of the study area boundary for the betterment of social living of the residents while promoting tourism and the environment. These include a Waterfront Park, central park, theme parks, and forest trekking zones to cater to various recreational needs. Additionally, proposals for a Government Women's Gymnasium, a walking track, and several parks within each NC/VC emphasize community health and social interaction.

The environmental assessment of Mingora-Saidu Sharif highlights concerns related to water quality, air pollution, noise, and soil degradation. To address these challenges, the Master Plan emphasizes sustainable development through afforestation, ecological corridors, biodiversity conservation, and climate resilience strategies. Key initiatives include habitat preservation,

urban wildlife planning, community awareness programs, stricter environmental regulations, and the establishment of protected areas.

To promote responsible environmental management, the plan advocates for green infrastructure, floodplain conservation, improved waste management, water conservation, renewable energy adoption, and sustainable transportation. Additionally, disaster resilience is a core focus, given the city's vulnerability to urban flooding, windstorms, smog, flash floods, glacial lake outburst floods (GLOFs), and landslides. Proposed measures include establishing air quality monitoring stations, upgrading brick kilns to green technology, and enforcing air pollution control laws. The plan also recommends the development of flood-resistant infrastructure, heat-absorbing green spaces, and earthquake- and wind-resistant buildings to enhance disaster preparedness. By integrating these measures, the Master Plan aims to create a safer, more resilient, and environmentally sustainable future for Mingora-Saidu Sharif.

The mobility plan for Mingora-Saidu Sharif is designed to enhance accessibility and connectivity by integrating land use with a well-structured transportation network. To improve traffic flow and reduce congestion, the plan proposes the removal of encroachments, widening of primary roads, and the addition of footpaths to accommodate both pedestrians and motorized traffic. Lane marking at a standard 10-foot width, along with dedicated lanes for bicycles, motorcycles, cars, and public transport, is recommended to improve traffic discipline and ensure smoother mobility. Pedestrian connectivity is a key focus, with footpaths proposed along all primary and secondary roads to improve access to commercial hubs, educational institutions, and public transport stops. A structured public transport system is also planned, with minibuses such as Coasters or Hiaces operating on fixed routes with designated stops, catering to major commercial, industrial, and educational areas.

Pakistan faces significant environmental challenges, particularly in solid waste management, with much of the waste being improperly burned, dumped, or buried, causing environmental and health risks. To address this, five waste management scenarios were analyzed for Mingora-Saidu Sharif. Scenario 5 incorporating RDF, recycling, dry anaerobic digestion, composting, and landfilling was identified as the most effective and sustainable solution. Successful implementation will require strong institutional arrangements, an operational plan, and a viable business model. Creating an enabling environment is essential for adopting this advanced waste management system.

The study area has a rich cultural heritage including Buddhist Cultural sites which makes Mingora-Saidu Sharif one of the most unique places in regard to its tourism. The few of the famous sites of Mingora-Saidu Sharif are Saidu Sharif Stupa, Barama Archeological site, Gogdara Rock Craving, Panr Archeological Site, Butkara I, II & III, Swat Museum and Mingora Bazaar. These sites attract tourism activities resulting in the development of study area economy to a greater extent. A comprehensive set of various proposals are provided to preserve the heritage sites and to upgrade the existing conditions of these areas.

The water supply and sanitation master plan project are aimed at providing a comprehensive and sustainable plan for the management and delivery of water and sanitation services in a city. The project aims to analyze the existing infrastructure and service delivery systems to identify gaps and opportunities for improvement. The project will involve a thorough assessment of the

current water supply and sanitation systems in the city, including the availability and quality of water sources, treatment facilities, distribution networks, and wastewater treatment facilities. The project team will also conduct a needs assessment to identify the future demand for water and sanitation services and assess the capacity of the current systems to meet these needs.

Based on the findings of the assessments, the project team will develop a comprehensive water supply and sanitation master plan that outlines short-term and long-term strategies to improve the city's water and sanitation systems. The plan will include recommendations for the expansion and rehabilitation of existing infrastructure, the development of new infrastructure, and the adoption of new technologies and practices to improve efficiency and sustainability. The ultimate goal of the water supply and sanitation master plan project is to improve access to safe and reliable water and sanitation services, promote public health and environmental sustainability, and enhance the overall quality of life for the city's residents.

The Mingora-Saidu Sharif City Master Plan provides a strategic framework for sustainable growth, balancing development with environmental preservation. Due to limited vacant land within the study area, some proposals extend to nearby parcels to ensure a structured and compact urban expansion. The plan prioritizes infrastructure improvements, better living conditions, and sustainable economic growth while maintaining the region’s natural beauty. Designed to align with the Sustainable Development Goals (SDGs), it outlines key initiatives for the next 20 years, along with an implementation framework to guide execution.

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List of Abbreviations

AGR	Average Growth Rate
BHU	Basic Health Unit
CBD	Central Business District
CD	Civil Dispensary
CP	Cordon Point
DHQ	District Headquarter
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GoKP	Government of Khyber Pakhtunkhwa
HIS	Household Information Survey
ITE	Institute of Transportation Engineers
KP	Khyber Pakhtunkhwa
LOS	Level of Service
LSA	Land Suitability Analysis
MCC	Manual Classified Count
NC	Neighborhood Council
NEQs	National Environmental Quality Standards
NGO	Non-Governmental Organizations
NRM	National Reference Manual
PPA	Persons Per acre
PPH	Persons Per Hectare
ROW	Right of Way
STP	Sewerage Treatment Plant
TORs	Terms of Reference
TDS	Total Dissolved Solids
TMA	Tehsil Municipal Authority
TMC	Turning Movement Count
UN	United Nations
UPPU	Urban Policy & Planning Unit
USEPA	United States Environmental Protection Agency
VC	Village Council
WHO	World Health Organization
WWTP	Wastewater Treatment Plan

Chapter 1: Background and Introduction

1.1. Project Scope

The Province of Khyber Pakhtunkhwa (KP) is located in the northwest region of Pakistan with a an area of 101,741 km² . It is the third most populous province, with a population of 35 million with 52% males and 48% females, comprising of 11.9% of Pakistan's total population. In 1998, its population was 17.7 million, showing an annual growth rate of 2.89%, which exceeds the national average of 2.40%. Factors such as a high fertility rate and both temporary and permanent internal migration have contributed to this population growth.

The province of Khyber Pakhtunkhwa is strategically located and has the third-largest provincial economy in Pakistan. The province contributes 10% of Pakistan’ s GDP and 20% in mining output. The major sectors contributing to the national and provincial economy are hydel electricity, mining, forestry and agriculture by generating sufficient revenue.

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.

In Khyber Pakhtunkhwa the process of urban development is being carried out with no proper planning mechanism and is confronted with various basic hurdles. The urban areas of the province are lacking integrated urban planning that has resulted in tremendous strain on urban land, civic infrastructure and services. Lack of proper planning has been raising several issues in every urban center including divisional headquarters; such as urban sprawl, lack of institutional reforms, unregulated and unplanned growth, traffic congestion, air pollution, poor investment and weak management of key infrastructure.

Encroachment is one of the many serious issues in almost all cities and towns causing severe congestion on roads, bazaars and streets. Vendors and shopkeepers place products in front of their shops on footpaths and pavements. These encroachments on major sites of the cities need to be removed through effective enforcement. On the other hand, the trend of road-widening and constructing under/overhead passes is only a short-term plan to fix the problem. To overcome such problems there should be long term Master Plans that technically cover all aspects of urban planning in major cities under the supervision of a single government entity.

Another critical feature of our cities is the lack of proper city limits or boundaries. Our cities are continuously growing in all directions causing the emergence of slums and squatter settlements. The formation of slums is one of the biggest challenges faced by urban centers of Khyber Pakhtunkhwa. The slums are usually characterized with the lack of services, narrow streets, illiteracy, unemployment, high rates of poverty, and low socioeconomic status of its inhabitants. These slums are commonly seen as “breeding grounds” for social problems such as crime, drug addiction, alcoholism, high rates of mental illness and extremism.

For resolving issues in the urban areas of Khyber Pakhtunkhwa, the Urban Policy Unit has taken important steps to tackle the problems of inefficient land-use planning, lack of zoning regulations, ineffective building bylaws, growth of urban sprawl, lack of institutional reforms,

identification and up-gradation of slums, encroachment, lack of clear urban boundaries, unavailability of civic facilities and ineffective urban legislation & enforcement. The most significant initiative of the Urban Policy Unit is to prepare 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 Provincial Working Development Party (PDWP) has recently revised the ADP Scheme for the Master Planning with a total cost of Rs. 537.051 million. The Master Plan is vital for the integrated and sustainable urban development of the province.

The overall objective of the Master Plan is to ensure equity and social inclusion, economic productivity, quality of life, environmental sustainability and finally infrastructure provision. Collectively these objectives will create a perception of a prosperous city. Other important features of the study are building urban growth centers, high rise development areas within the cities and new expanding areas. The Master Plan is a futuristic plan containing the best model of urban planning in the world. Beside the seven divisional headquarters (Peshawar, Mardan, Mingora, Abbottabad, Kohat, Bannu and DI Khan), the Project will also prepare Master Plans for major urban centers of NMDs of KP.

For the Mingora-Saidu Sharif City Master Plan 2044, the services of the PEPAC Pvt Ltd & Associates consultant have been hired through a competitive bidding process. This master plan was completed under the following TORs:

Land-use/land Suitability Analysis

a. Mapping of the historical growth trends of the city:

To understand the pattern and direction of the spatial growth of Mingora-Saidu Sharif city the consultants conducted extensive research on the historical urban growth trends and drivers of urban growth over the period of last twenty years. To identify trends and direction of spatial growth the consultant used various sources for mapping the trends over the last 20 years period including municipal records, population census, libraries and archives, Arial photographs satellite images and other published and unpublished data and records. Latest GIS techniques were used for plotting historical growth trends on GIS maps of the city-region and articulating the drivers of urbanization and urban spatial growth.

b. Housing trends and needs assessment through projected population growth estimates:

The provision of housing for all is a basic objective of the Mingora-Saidu Sharif City Master Plan, therefore, the growth pattern and projected growth needs over the next 20 years (2044) were properly analysed and mapped**.**

c. Density Maps

The conservation of prime agriculture land located around the city is another important aspect of the Mingora-Saidu Sharif City Master Plan. Therefore, to reduce urban sprawl and horizontal development, there is a need to promote high-density mixed-use development. To achieve this objective the master plan devised policy guidelines for the establishment of high-density

mixed-use development within the existing urban boundaries including the future growth areas. he consultants carried out an extensive mapping exercise to showing the existing and proposed high-density mixed-use development.

d. Development of land use Base map

For all kind of spatial planning including master plans the preparation of a comprehensive base map is a pre-requisite. Beside other mapping techniques the consultants also used open-source satellite imageries (fresh and archives) to develop an up to date map of Mingora-Saidu Sharif city including its surrounding areas in order to support suitability analysis of existing and proposed land uses for urban development and other ancillary uses. After preparation of land cover map then extensive field surveys were carried out to identify the specific use of each parcel of land. The consultants prepared Base map with the following details:

a. Counter lines drawn at counter interval of 5 meters.
b. Boundaries (District, Tehsil, City, Neighborhood, UC, Ward)
c. All major and minor streets, roads, railway lines and airports (including encroachments)
d. Water supply, sanitation, sewer, SNGPL and telephone networks
e. Water bodies (spring, streams, river and other water bodies)
f. Residential (planned and un-planned areas, sprawl, building heights – single, double or multi story, density)
g. Commercial and Mixed Areas (heights – single, double or multi story and type retail, wholesale and warehouses)
h. Industrial (all types)
i. Amenities (education, health, religious, banks, police stations, libraries, and community halls etc.)
j. Parks and playgrounds
k. Brown fields (for re-development)
l. Open spaces (agriculture all types, vacant, and graveyards etc.).
m. Land Management

e. Taxation and Revenue Generation

It is of key importance that urban planning and associated work should be sustainable over long time. To ensure that the entities (Land Use and Building Control Authority, Development Authorities and TMAs etc) responsible for implementation of the Mingora-Saidu Sharif City Master Plan the consultant conducted a detailed study of the current urban taxation structure and sources including property tax, land tax, capital value tax, stamp duty and proposed suggestions for improvement. Implementation of the MASTER PLAN proposals regarding municipal taxation will increase revenue of LU&BCA and TMAs many folds and will ensure sustainability of these organizations**.**

f. Governance and Institutions

Good governance and efficient institutions is a key to the successful implementation of polies and plans. To ensure that for implantation of the Mingora-Saidu Sharif City Master Plan required legal and institutional framework are in placed the consultants objectively analyzed and assessed the existing relevant laws/byelaws and institutional capacity of relevant

organization responsible for implementation and monitoring of the Master Plan. The consultant also proposed improvements in the existing laws & byelaws and institutional structure(s) for better implementation of the Master Plan.

g. Land-use Regulations and Plans

The consultants also studied and analysed all existing urban planning, development and environment-related national, provincial laws and regulations (byelaws) and proposed a new set of zoning regulations for each land use zone. The consultants provide extensive input in formulation of Building Regulation 2024 and Housing Schemes Regulations 2024.

h. Environment

To reduce pollution and create healthy living environment for the residents of Mingora-Saidu Sharif city the consultant studied various sources of air, noise, soil and water pollution. The consultants use state of the art techniques and equipment for identification of the level of air, water and noise pollution at various points of the city. The consultant carried out the following surveys:

a. Air quality survey at various points of the city Water quality analysis (drinking water supply and water courses)
b. Soil contamination surveys
c. Soil and geological survey/data
d. Analysis of Noise level at various points of the city
e. Identification of environmentally sensitive areas

On the basis of scientific analysis of these surveys the consultant proposed various policy measures for enhancing environmental quality of the city.

i. Demography, livelihood and housing

The successful implementation of the master plan proposals mainly lies on accurate assessment of the city's demographic pattern, livelihood sources and housing conditions. For the purpose of analysis the consultants divided the city into various zones, calculated its population densities, identified major economic activities and studies housing and related facilities in each zone. Based on these assessments the consultant formulated proposals to revitalize the existing economic base and socioeconomic structure of the city. The consultant conducted the following surveys:

a) Housing surveys including house age, height, occupancy and condition surveys.
b) Accessibility surveys for emergencies and other vehicles
c) Household economic conditions/Livelihood surveys,

The consultants also identified areas with lack of municipal services (slums) and formulated proposals for its rehabilitation/up-gradation.

j. Urban Transportation, Mobility & Accessibility

One of the major issue of Mingora-Saidu Sharif city is traffic congestion and lack of reliable public transport. To resolve the urban transport, mobility and accessibility issues of the city the consultants thoroughly studied the existing traffic and transportation system of the city. To have better understanding of the existing situation the consultant conducted various

transportation surveys explored the possible constraints and available opportunities and proposed viable solutions for easing traffic and transportation issues within the city the consultant conducted the fallowing surveys:

i. Developed a detailed roads and parking inventory
ii. Origin, Destination, and Cordon Surveys
iii. Traffic counts at various roads and junctions of the city and identified the bottleneck areas to determine roads and junction capacities
iv. Conducted Public Transport User Interview Surveys and Household Interview Survey (HIS)
v. To improve internal accessibility in the city the consultant carried-out a comprehensive Traffic Signage Survey The consultant also conducted a detail study on the parking issues of the city and identified suitable areas for the development of on-street and Off-street parking lots.
vi. Through mobility surveys the consultant devised strategies for the establishment of synergy between land-use and urban transport. Further, identified areas suitable for Transit Oriented Development (TOD)

J. Historical/Social/Culture Heritage Development

Mingora-Saidu Sharif is renowned for its rich history, busy & colourful bazaars, and rich cultural heritage, making it a popular destination for local and foreign tourists alike. It's also known as a gateway to the historic Khyber Pass, a melting pot of cultures, and a centre for traditional cuisine. One of the basic objectives of the Mingora-Saidu Sharif City Master Plan is to preserve the historical and cultural land scape of Mingora-Saidu Sharif. Therefore, the thoroughly studied and mapped all existing historical monuments/places, socio-cultural heritage of the city and proposed appropriate guidelines for the development of these localities and to capitalize the cityscape to create social, cultural hubs and identify opportunities within and of the city.

k. Urban Design, Public Realm Quality of Life

Urban Design and Public Realm is an integral part of the MASTER PLAN. Through various surveys and techniques, the consultant analysed the existing building lines, identified all public spaces, studied in detail vistas, sidewalks, street lighting, monuments, and parks etc. and formulated actionable proposals for improvements. and identified potential areas for new parks, playgrounds and public open spaces. To make the city more attractive and beautify the consultants proposed various urban beatification projects.

l. Water Supply, Sanitation and Solid Waste Management

In Mingora-Saidu Sharif city WSSP is responsible for the provision of water supply, sanitation and solid waste management services. To provide municipal services to the local residents in a systematic and informed manner the WSSP prepared the Water Supply and Sanitation Master Plan in 2014 and revised it in 2017. However, the MASTER PLAN will further complement the WSSP services particularly through the identification of un-served areas, areas located beyond the WSSP current master plan and also areas where new development will take place. The consultants in close coordination with the consultant with the support of WSSP and other

relevant stakeholders (TMAs and PHED) did profiling of all Municipal services including the identification of new and existing sources of water supply. Analysed the existing solid waste management practices and jointly identified land areas for development Sanitary Land Fill Sites and Sewerage Treatment Plants (STP).

m. Citizens Behaviour Communication (BCC)

BCC is the strategic use of communication approaches to promote changes in knowledge, attitudes, norms, beliefs, and behaviorsThe provision of physical infrastructure without associated BCC strategies may not be able to achieve the desirable goal of sustainable development. For the development of the BCC strategies to ensure that the master plan will be sustainable for the long runthe consultants conducted Perception and Behavioural Surveys of local population focusing on issues of urban responsibility using Knowledge, Attitude, and Practice (KAP) methodology based on a valid statistical sample. The purpose of the KAP surveys was to investigate the reasons for and incentives and disincentives of citizens to behave responsibly while utilizing municipal services especially their behaviour towards solid waste management, public transport usage (BRT), use of public spaces and other social services.

n. National and international best practice (references)

The preparation and implantation of master plans in Pakistan, especially in Khyber Pakhtunkhwa is not common. In the past various types of spatial plans including structure plan and master plans were prepared for Mingora-Saidu Sharif but these plans were never implemented. Therefore, to prepare a rational comprehensive master plan for Mingora-Saidu Sharif review of the international best practices was included the study Terms of Reference (ToRs). The consultants reviewed planning laws and master plans of various countries having similar socio-economic condition similar to Pakistan including India, Sari Lanka and Malysia and based on the lesson learned developed the MASTER PLAN proposals. Studies for the fringe areas were specifically conducted to discouraged sprawl and ensure conversation of prime agriculture land in the vicinity of Mingora-Saidu Sharif city.

Task C – Master Plan Strategic Scenario Development/Mapping

a. Identified suitable land parcels based on multi criteria analysis for various activities through viable projections for housing of all income groups, space required for commercial and industrial activities and other necessary component of the city.
b. Mapped existing Land use pattern and provided options for future development;
c. Identified areas having a potential for mix use development (residential, work, leisure, services etc.)
d. Identified areas suitable for infilling, intensification and redevelopment
e. Mapped the natural eco-system and environmental resources of Mingora-Saidu Sharif city
f. A map with detail inventory of existing features including topographical and natural constraints was developed,
g. Mapped all the wetlands, agricultural lands, aggregate resources, groundwater recharge areas, floodplains, fisheries, wildlife and environmental conservation areas.

h. Mapped the existing road and transportation network including railways and airports.
i. Prepared a detail inventory of the allied infrastructure of the Mingora-Saidu Sharif city to support Master Plan proposals.

Task D – Preparation of Master Plan Proposals (Action Plans)

For successful implementation of the Master Plan, the consultant developed detailed and comprehensive Master Plan proposals (action plans) for various sectors of the master plan, including the following:

i) Action Plan for zoning, intensification/densification and land management.
ii) Action Plan for future housing of all income groups.
iii) Action Plan for slum up gradation/informal settlements.
iv) Action plan for health facilities
v) Action plan for educational facilities
vi) Action Plan for Quality of Life
vii) Action Plan for WATSAN and Solid Waste Management (SWM).
viii) Action Plan for Transportation and Traffic Management as well as Parking Lots
ix) Action Plan for Municipal Services.
x) Action Plan for Environmental Management, ii. Disaster Risk Reduction and iii. Emergency Planning.
xi) Action Plan for Rural Urban Fringe and Regional Development.
xii) Action Plan for Tourism Development, Cultural and Heritage Conservation /preservation
xiii) Action Plan for Economic Development, ii. Commercialization, iii. Industrialization and investment attraction.
xiv) Action Plan for Security Measures of the city
xv) Action Plan for Legal/Regulatory and Institutional Framework implementing MASTER PLAN
xvi) Action Plan for Behavioral Change Communication (BCC)Structure composition of the Report

The Mingora-Saidu Sharif City Master Plan report is structured into three volumes along with a separate detailed report:

Volume I: Master Plan – Offers a comprehensive overview of the core strategies, proposals, and planning framework for Mingora-Saidu Sharif City.

Volume II: Scenario/Sectoral Maps – Presents a collection of maps illustrating zoning, infrastructure networks, environmental factors, and other key spatial elements essential for urban planning.

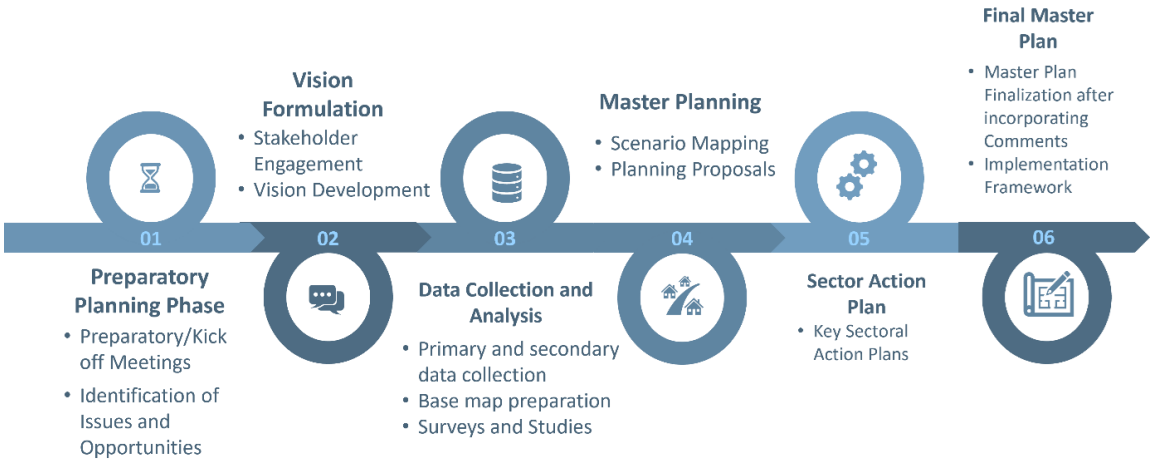
Volume III: Action Plans – Details implementation strategies, key initiatives, and step-by-step execution plans for proposed developments.

In addition, a separate Detailed Master Plan Report provides in-depth background studies, analyses, methodologies, and insights from Task C, along with relevant information from Task B.

The Mingora-Saidu Sharif City Master Plan was developed through the following Five (05) phases:

- Preparatory Planning Phase
- Vision Formulation
- Data Collection & Analysis
- Master Planning/zoning
- Action Plans

Figure 1: Master Plan Methodology - Mingora-Saidu Sharif Study Area



Source: Devised by Consultant

1.1.1. Methodology for Data Collection

Data was gathered from both primary and secondary sources. For Primary data collection various surveys, including Household Information Survey (HIS), Traffic and Transportation Surveys, Environmental Surveys were conducted with a structured questionnaire for each survey, and data was collected by well-trained enumerators using Android-based software. The surveys conducted for the Mingora-Saidu Sharif City Master Plan encompassed various aspects, providing a comprehensive assessment of the city's socio-economic conditions, land use, transportation, and environmental factors. The details of each survey are as below:

- **Household Information Survey (HIS)**

A structured questionnaire was used to collect The Household Information through a structured questionnaire consisted of various aspect of the household, including household demographics, educational status, health status, employment and income, household facilities (availability and access), and access to and utilization of services and amenities (refer to the Inception Report for details). As per the Terms of Reference (ToR), data was collected from 1% of the total households, amounting to 2,360 households. The sample size was proportionally allocated to each Neighbourhood Council (NC) and Village Council (VC) to ensure a fair representation of

the population. A systematic random sampling approach was used within each NC/VC, ensuring a 95% confidence interval with a 5% margin of error, making the sample more representative and statistically reliable.[2]

- **Land Use Survey:** A GIS-based base map (1:2000 scale) was created by digitizing a raster map from Google's satellite imagery and dividing it into grids. Android-based software was used for the detailed land use survey, conducted by trained local surveyors. The survey documented land uses, administrative boundaries, contour lines (10-meter intervals), road networks, infrastructure, civic amenities, and brownfields. To ensure accuracy, the base map integrated historical maps and remote sensing imagery and was divided into sheets for ground truthing through on-site verification. Each built-up parcel was assessed for land use, building conditions, and stories, with spatial and attribute data processed in GIS labs for analysis.

- **Transportation Survey:** Various transportation surveys, including the Origin & Destination (O&D) Survey, Traffic Count Survey, Parking Inventory Survey, and Intersection Survey, were conducted across the city. The detailed methodology, maps, and questionnaires for each survey are provided in the Background Study and Analysis Report (Volume III).

- **Environmental Survey:** Various environmental surveys, including drinking water quality, noise, air, and soil assessments, were conducted at multiple locations across the city with an EPA-approved laboratory. The detailed methodology, maps, and results of each survey are provided in the Background Study and Analysis Report (Volume – III).

i. Secondary Data Collection

Secondary data was gathered from both published and unpublished government departmental data and reports, Census data, government publications, public records, historical and statistical documents, business reports, journals, and research papers, among others.

1.2. Introduction to Project Area

1.2.1. Physical Background

Mingora and Saidu Sharif, located in Swat district, Khyber Pakhtunkhwa, are historically and culturally significant cities. Saidu Sharif serves as the administrative hub, while Mingora is the commercial centre. Mingora is known for its bustling bazaars, traditional handicrafts, and scenic surroundings, including the Swat River. Saidu Sharif is home to archaeological treasures

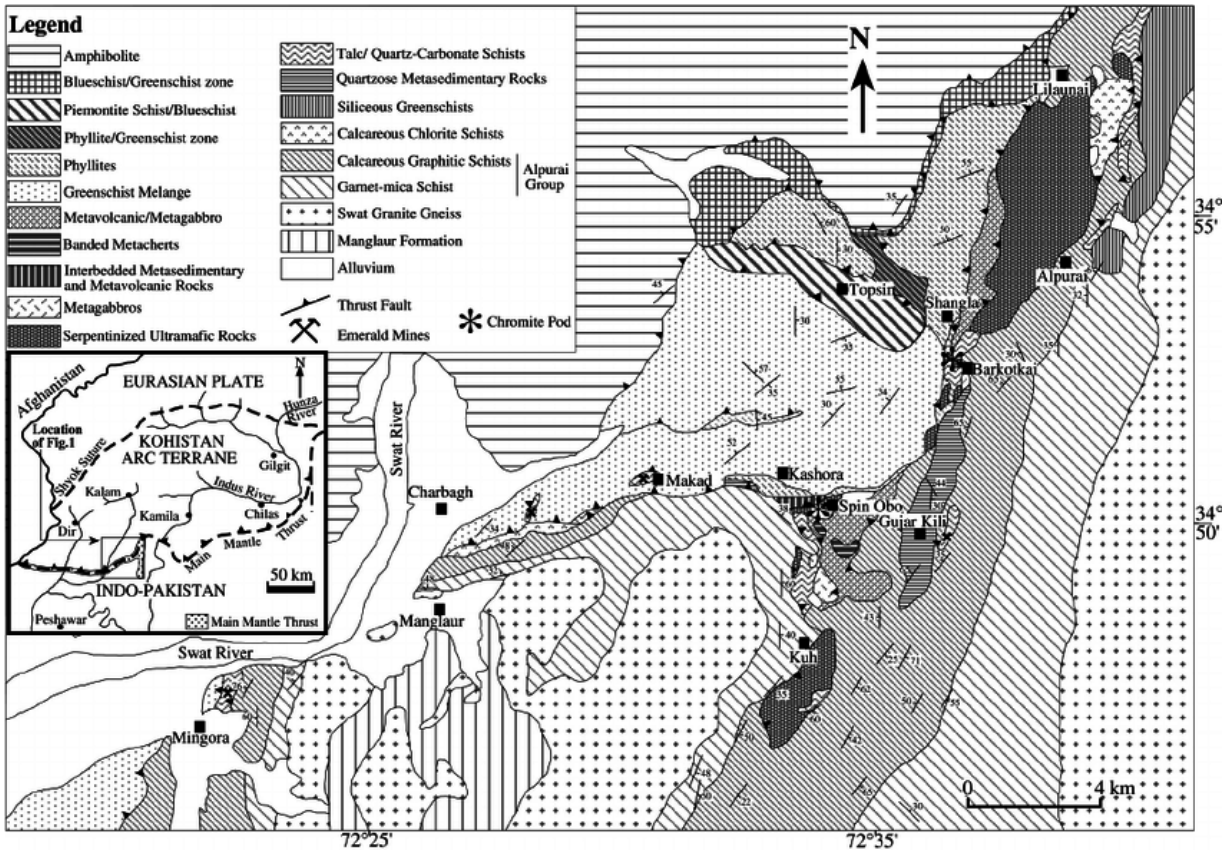
[2] Let there are N Neighborhood councils, where data should be collected from the field. Then N=N1+N2+N3+N4……Nh=∑Ni
A total of 'n' sample should be studied for analysis. The size of total sample is:
n=n1+n2+n3+……. nh=∑ni
The sample size of each Neighborhood Ccouncil is:
ni =n*Ni/N
Where: ni=sample selected from each NC, n=Total sample size, Ni=population of each NC and N=Total population of all NCs

like the Butkara ruins and the Swat Museum, along with scenic parks such as Wadudia Hall Park and Fizagat Park. Together, these cities blend cultural heritage with economic vibrancy.

1.2.2. Geographical Settings

The Mingora Hindu Kush located along the Swat River is covered with un-consolidated deposits of silt, sands and gravels. The surface soil materials are less deposits, residual mantle on sandstones and shale bedrocks, or narrow strips of silty/loam alleviation along major streams. The soil characteristics vary within the area depending upon the parent material and the soil age. Inseptisols, Entisols and Ardisols are the dominant soil types. The geological Map is shown hereunder:

Figure 2: Geological Map - Urban Mingora-Saidu Sharif



Source: Geological Survey of Pakistan

1.2.3. Temperature

The average annual temperature in Mingora is 19.3°C | 66.7°F. With an average of 29.2°C | 84.6 °F, June is the warmest month. January has the lowest average temperature of the year. It is 7.5°C | 45.5°F. The average temperatures vary 21.7°C. The mean temperature reveals an increase of 0.9°C, maximum temperature 0.4°C and mean minimum temperature 0.5°Celsius (Kalam station, district Swat). The warm season lasts from May to August with an average daily maximum temperature of above 36°C. The cold season lasts from October to April with an average daily minimum temperature below 20°C.

1.2.4. Project Area Profile

The proposed area of the Master Plan of Mingora-Saidu Sharif City is 50.68 sq. km, encompassing twenty-five neighborhood councils and five village councils with a total population of 392,864 persons (2017 pop census). The projected population of the project area for the plan period (2042) is 730,366 persons, assuming a growth rate of 2.29 %.

Table 1: Project Area Profile

Major Profile Elements	District (Swat)	Tehsil (Babuzai)	Project Area
Area	5,337 km^2	297 km^2	50.68 km^2
Population 2023 (PBS Census)	2,687,384 persons	696,697 persons	392,864 persons
Population 2023 (NC's) (PBS Census)	794,368 persons	361,112 persons	322,861 Persons
Population 2023 (VC's) (PBS Census)	1,893,016 persons	335,585 persons	70,003 Persons
Population 2022 *(Base Year projection for Project Area)*	-	-	446,425 persons
Population 2042	-	-	730,366 persons
Existing Growth Rate 2017-2023	2.57 %	2.55%	3.45%
Projected Growth Rate 2042	-	-	2.29%
No. of NC's	44 NCs	25 NCs	25 NCs
No. of VC's	170 VCs	24 VCs	05 VCs

The map and table of the NC's/VC's situated within the study area are given below:

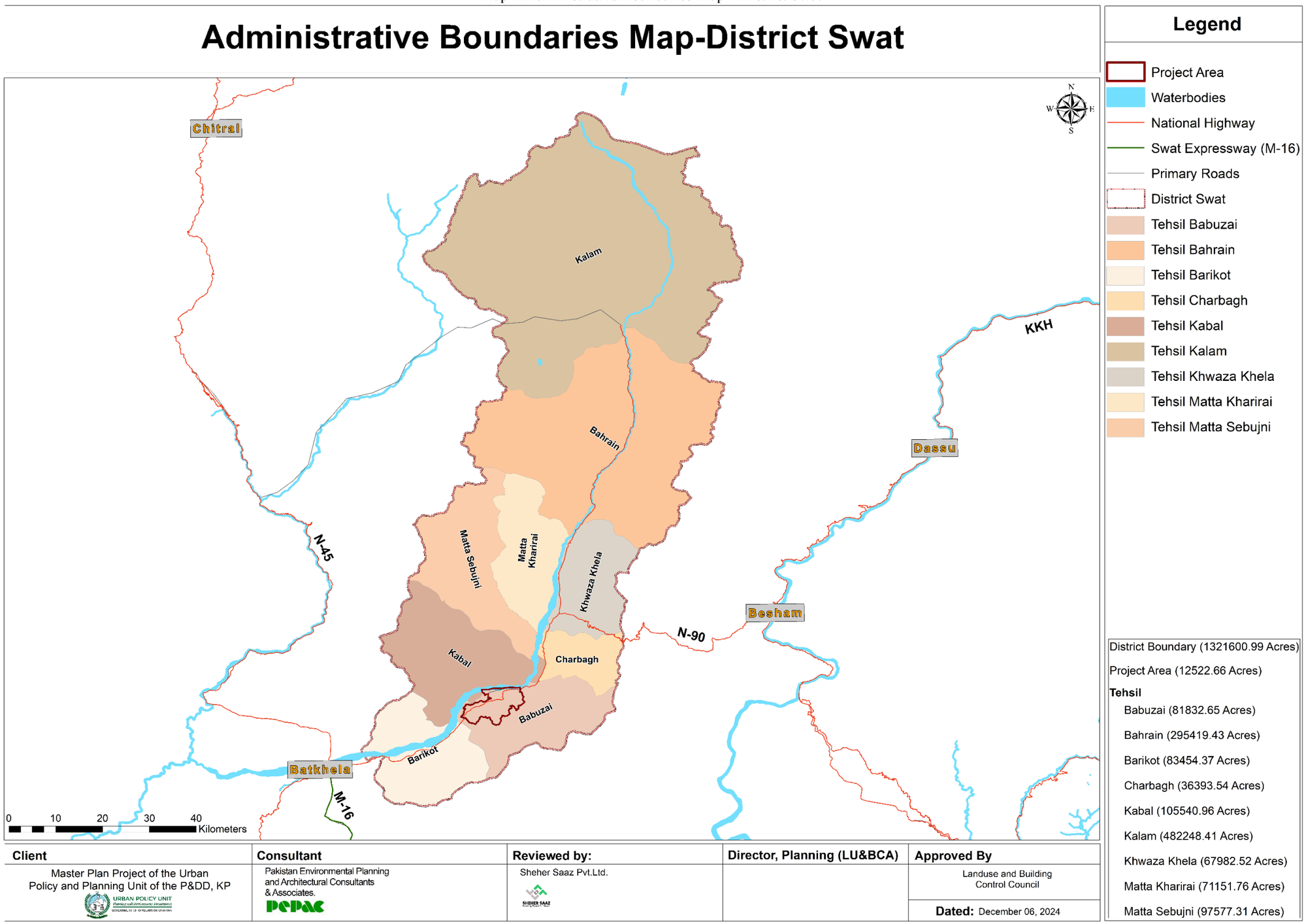
Table 2: Details of the NC's/VC's in Study Area

Sr. No	Name of Administrative Unit	Status	Area (Acres)	Population 2017
1	Amankot No.1	Neighborhood Councils	161.07	11,603
2	Amankot No.2		75.75	9,694
3	Amankot/Faizabad		195.96	9,998
4	Banr		157.17	13,806
5	Banr Nawakilli		117.12	14,435
6	College Colony		359.34	7,646
7	Gulkada		347.96	14,600
8	Gumbat Maira No.1		43.47	12,359
9	Gumbat Maira No.2		966.20	8,603
10	Ihengaro Dehrai		769.39	18,551
11	Landikass		92.91	9,943
12	Malakanan		139.72	11,596
13	Malook Abad No.1		54.50	9,785
14	Malook Abad No.2		99.66	13,872

Sr. No	Name of Administrative Unit	Status	Area (Acres)	Population 2017
15	Nawakili N0.1		298.34	14,810
16	Panr		904.40	18,979
17	Rahimabad/Amankot		245.61	18,174
18	Rahimabad/Rahmanabad		320.19	25,596
19	Rangmuhalla No.1		48.03	10,519
20	Rangmuhalla No.2		41.42	5,537
21	Saidu Sharif No.1		476.61	11,181
22	Saidu Sharif No.2		1,394.93	21,530
23	Saidu Sharif No.3		454.78	7,277
24	Shahdara No.1		967.22	13,552
25	Shahdara No.2		153.52	16,587
26	Balogram	Village Councils	473.71	12,998
27	Gogdara		950.71	10,892
28	Odigram No.1		1,096.23	14,731
29	Odigram No.2		345.45	8,550
30	Qambar No.2		771.29	15,460
Total			**12,522.66**	**392,864**

Source: Secondary Data Collected from Field Surveys

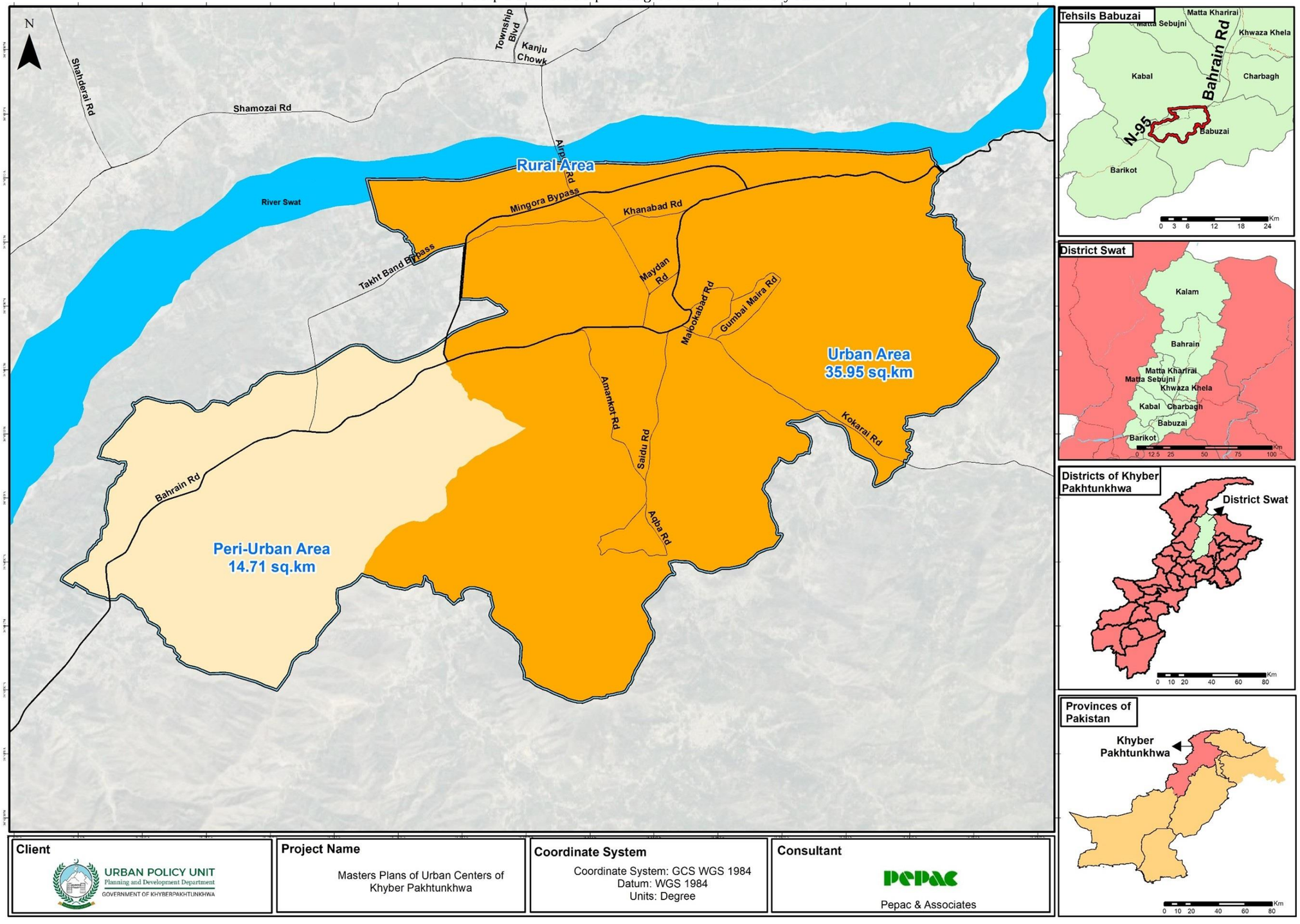
Map 1:Administrative Boundaries Map – District Swat



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP	Pakistan Environmental Planning and Architectural Consultants & Associates.	Sheher Saaz Pvt.Ltd.		Landuse and Building Control Council
				Dated: December 06, 2024

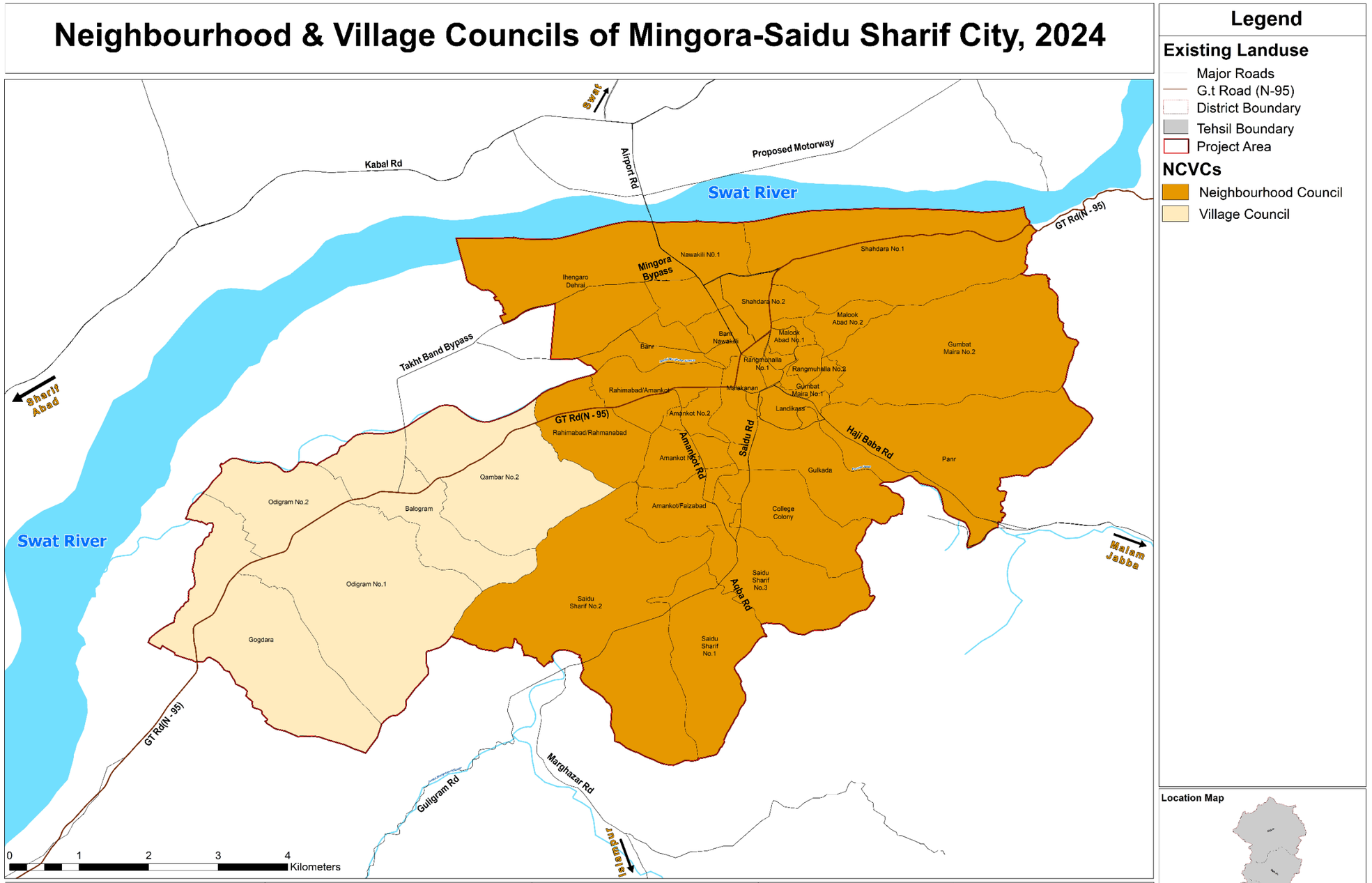
Source: Devised by Consultant

Map 2:Location Map – Mingora-Saidu Sharif Study Area



Source: Devised by Consultant

Map 3: Neighbourhood & Village Councils – Mingora-Saidu Sharif



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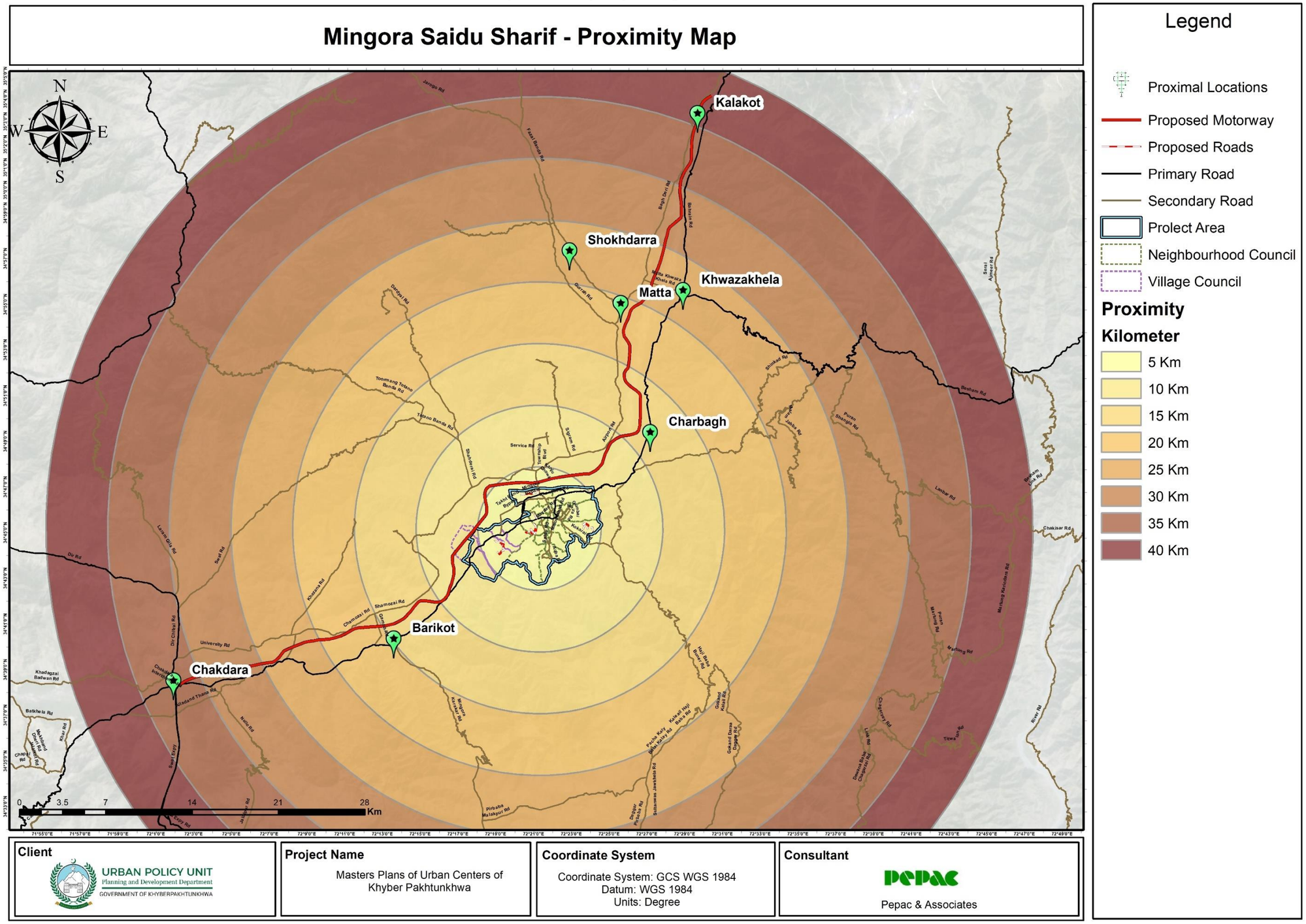
URBAN POLICY UNIT	PEPAC	SHEHER SAAZ		**Dated:** December 06, 2024

Source: Devised by Consultant

Map 4: Proximity Map – Mingora-Saidu Sharif 2022



Source: Devised by Consultant

1.2.5. Population Density

Since every city and country has different populations and areas, each will have a distinct population density. There is no one scale that fits all criteria to define population density. However, population density has been divided into three classes, i.e., low, medium, and high based on the criteria given in KP Urban Policy 2022, according to which medium density is defined as 20,000 persons per square kilometer or 200 people per hectare. Therefore, low density refers to the minimum number of people living in per unit area, which is 100-200 people per hectare, and high refers to maximum number of people living in per unit area which is 301-400 people per hectare. This should be noted, however, that the criteria adopted in KP Urban Policy is solely based on distance from transit areas and it does not take into account other socio-economic factors.

Table 3: Density Criteria Given in KP Urban Policy

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

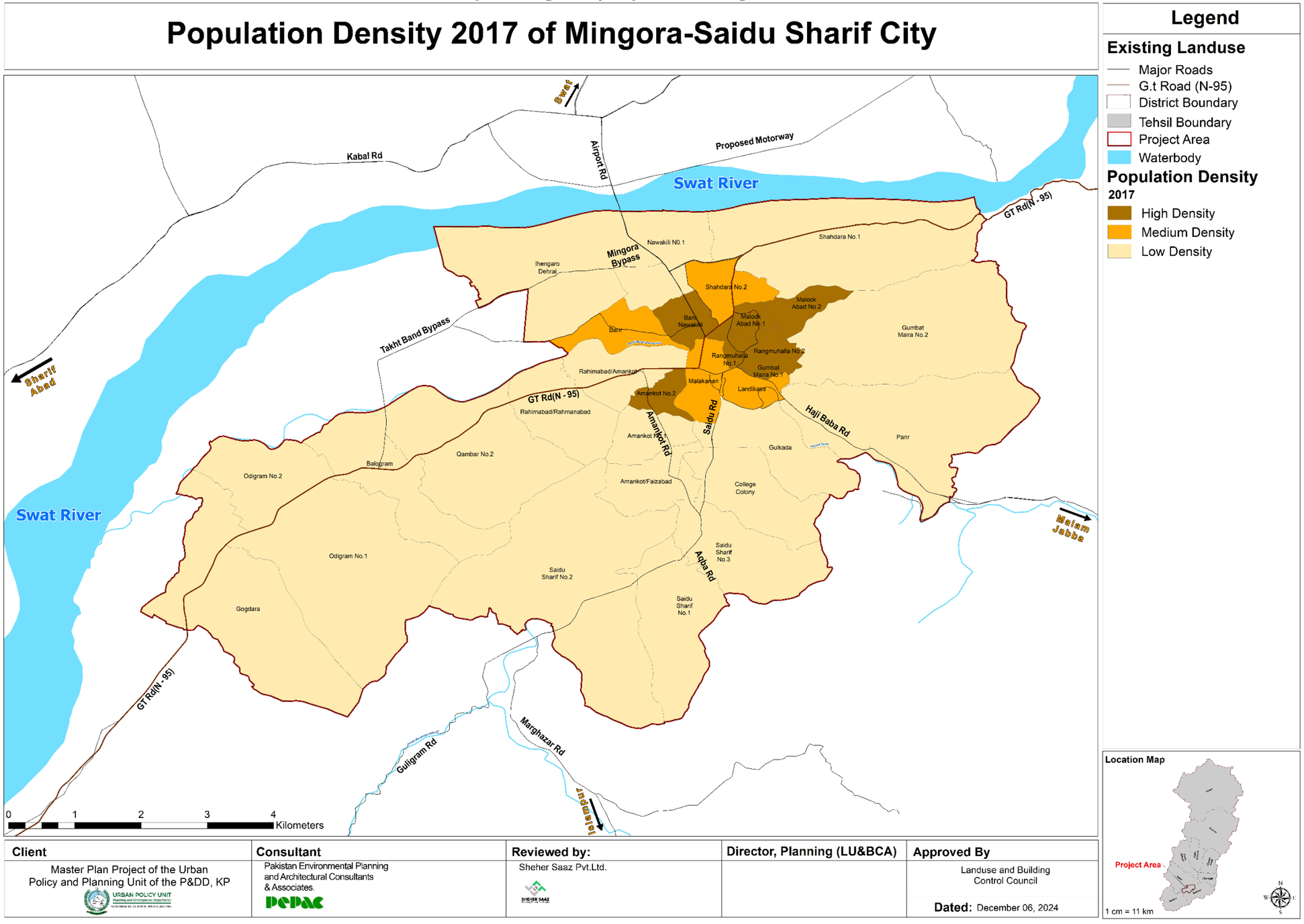
Source: KP Urban Policy, 2022 to 2030

- **Mingora-Saidu Sharif Existing & Current Population Density by NC/VC**

The density analysis performed for the Mingora-Saidu Sharif revealed that most of the areas have low density. As per existing population for the year 2017 and current projected population for the year 2022, in neighbourhood councils, the high-density neighbourhood councils include Amankot No.02 NC with 376 people per hectare, Landikass with 314 PPH, Malookabad 1 and 2 with 527 and 409 PPH, while low density NCs are eleven in numbers including Faizabad NC, Nawakili NC and others. The remaining NCs have an average population density. In regard to village councils, the VC with low population density is Gogdara VC with 34 people per hectares.

The detailed population density for various neighborhood and village councils of Mingora-Saidu Sharif is provided in Volume III (Annexures).

Map 5:Existing Density Map for 2017 - Mingora-Saidu Sharif



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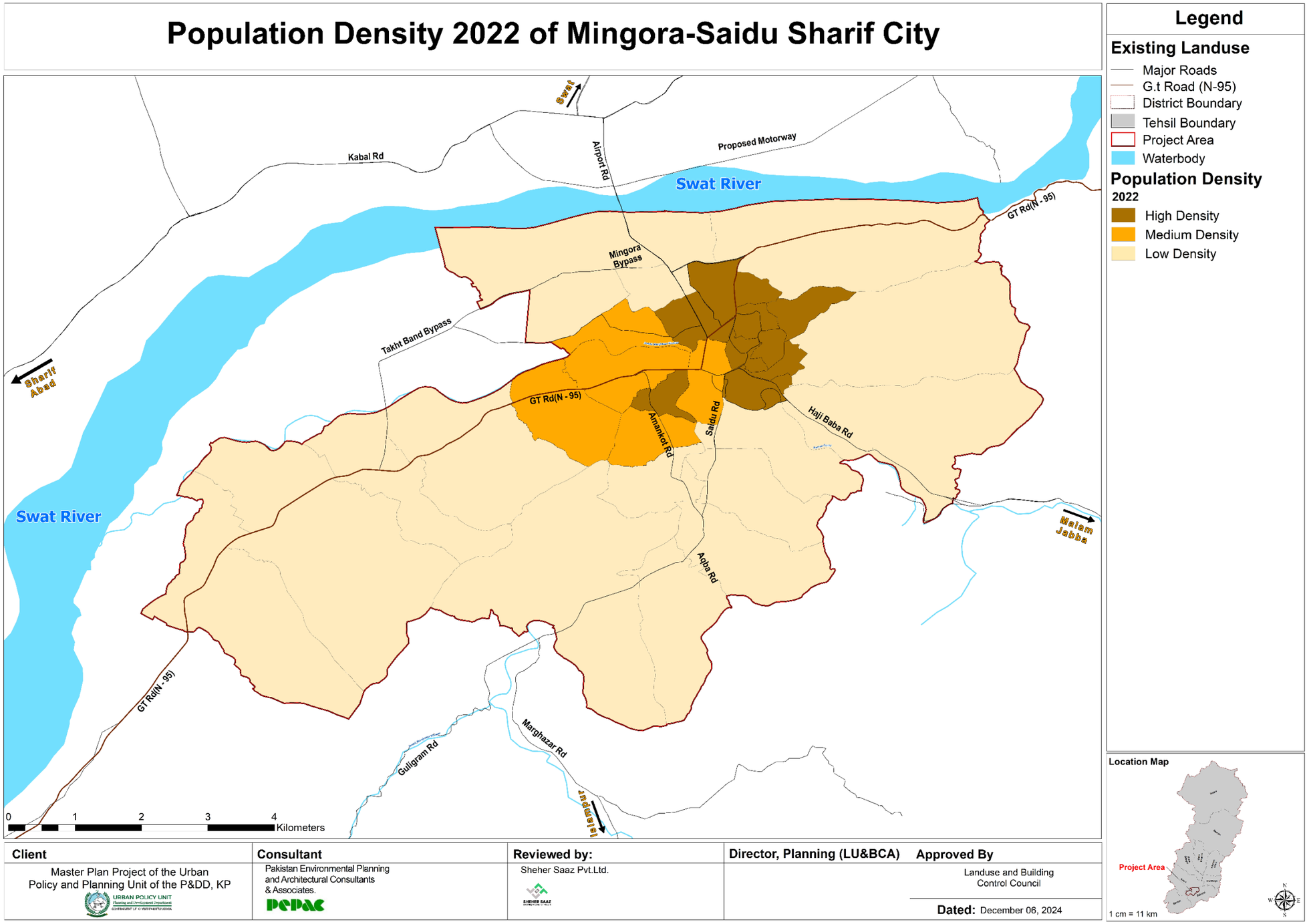
Source: Devised by Consultant

Map 6: Current Population Density Map of 2022 - Mingora-Saidu Sharif



Source: Devised by Consultant

- **Projected Population Density for 2042**

On the basis of projected population for each Neighborhood Council and Village Council, the projected population density for each NC, VC has been calculated for the year 2042. Among the NCs, high-density areas include Gumbat Maira No.1 with 1,320 people per hectare, Rangmuhalla No.1 with 1,017 PPH, Malook Abad No.1 with 833 PPH, and Malook Abad No.2 with 646 PPH. Medium-density NCs include Amankot/Faizabad with 237 PPH and Nawakili No.1 with 230 PPH. In contrast, low-density NCs, numbering nine, include areas such as College Colony with 99 PPH, Gulkada with 195 PPH, and others. The remaining NCs have medium population density. Regarding the VCs, the area with the lowest population density is Gogdara VC with 53 people per hectare. This distribution assists in urban planning and policy formulation by highlighting areas with varying population density trends.

The following table shows the projected population density for each NC and VC for the year 2042;

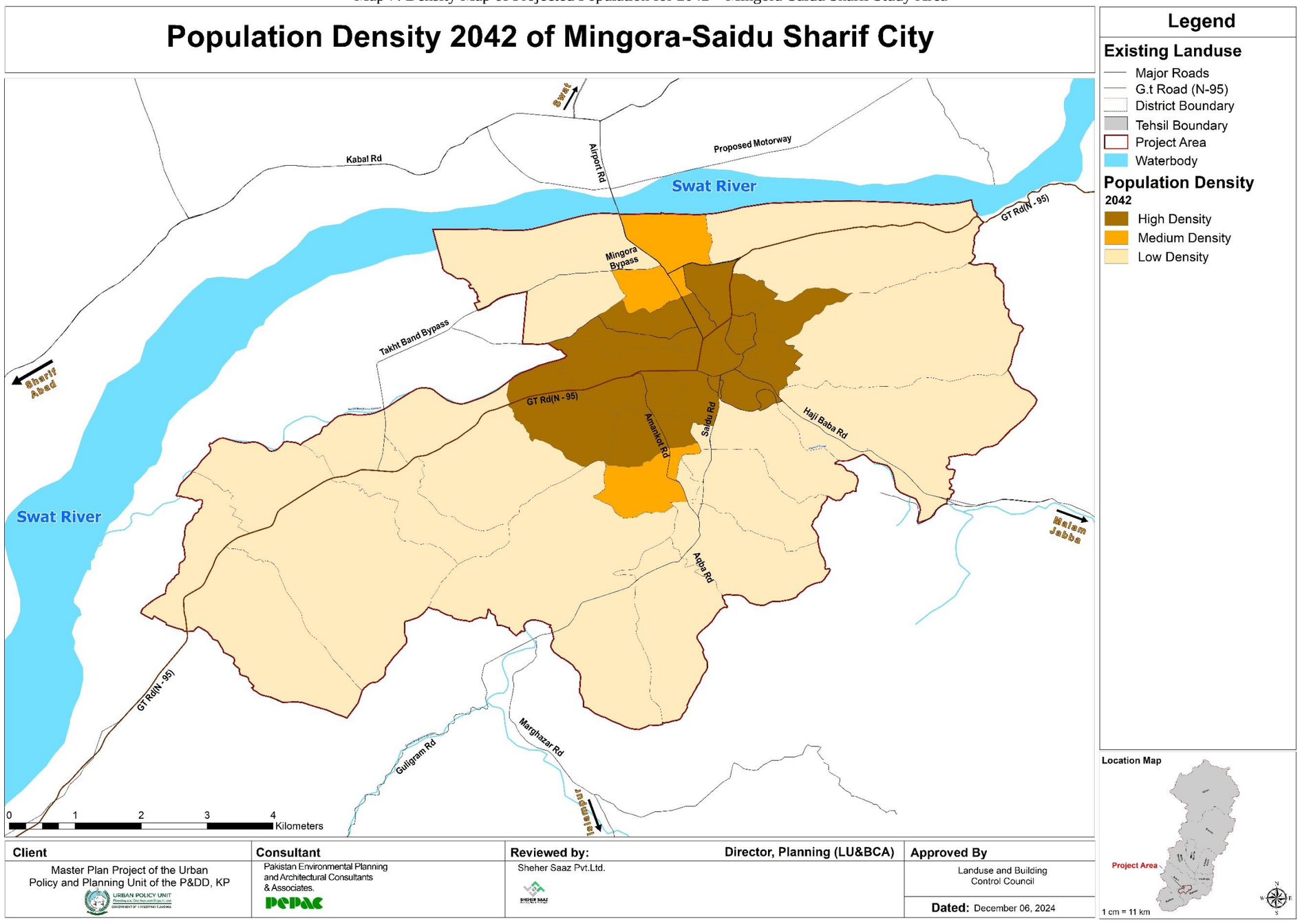
Table 4: Projected Population Density of NC/VC for 2042 - Mingora-Saidu Sharif

Name of Administrative Unit	Area (Acre)	Area (Hectares)	Projected Population 2042	Density 2042 (PPH)	Density Scale (KP Urban Policy
Amankot No.1 NC	161.07	65.18	21,797	334	High
Amankot No.2 NC	75.75	30.66	18,211	594	High
Amankot/ Faizabad NC	195.96	79.30	18,782	237	Medium
Balogram VC	473.71	191.70	24,417	127	Low
Banr NC	157.17	63.61	25,935	408	High
Banr Nawakilli NC	117.12	47.40	27,117	572	High
College Colony NC	359.34	145.42	14,363	99	Low
Gogdara VC	950.71	384.74	20,461	53	Low
Gulkada NC	347.96	140.81	27,427	195	Low
Gumbat Maira No.1 NC	43.47	17.59	23,217	1,320	High
Gumbat Maira No.2 NC	966.20	391.01	16,161	41	Low
Ihengaro Dehrai NC	769.39	311.36	34,849	112	Low
Landikass NC	92.91	37.60	18,678	497	High
Malakanan NC	139.72	56.54	21,784	385	High
Malook Abad No.1 NC	54.50	22.06	18,382	833	High
Malook Abad No.2 NC	99.66	40.33	26,059	646	High
Nawakili No.1	298.34	120.73	27,821	230	Medium

Name of Administrative Unit	Area (Acre)	Area (Hectares)	Projected Population 2042	Density 2042 (PPH)	Density Scale (KP Urban Policy
NC					
Odigram No.1 VC	1096.23	443.63	27,673	62	Low
Odigram No.2 VC	345.45	139.80	16,062	115	Low
Panr NC	904.40	366.00	35,653	97	Low
Qambar No.2 VC	771.29	312.13	29,042	93	Low
Rahimabad/ Amankot NC	245.61	99.40	34,141	343	High
Rahimabad/ Rahmanabad NC	320.19	129.58	48,083	371	High
Rangmuhalla No.1 NC	48.03	19.44	19,760	1,017	High
Rangmuhalla No.2 NC	41.42	16.76	10,402	621	High
Saidu Sharif No.1 NC	476.61	192.88	21,004	109	Low
Saidu Sharif No.2 NC	1394.93	564.51	40,445	72	Low
Saidu Sharif No.3 NC	454.78	184.04	13,670	74	Low
Shahdara No.1 NC	967.22	391.42	25,458	65	Low
Shahdara No.2 NC	153.52	62.13	31,160	502	High
	12522.66		**738,015**		

Source Devised by Consultant

Map 7: Density Map of Projected Population for 2042 – Mingora-Saidu Sharif Study Area



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			Dated: December 06, 2024

Source: Devised by Consultant

1.2.6. Urban Growth Trend of Mingora/ Saidu Sharif City

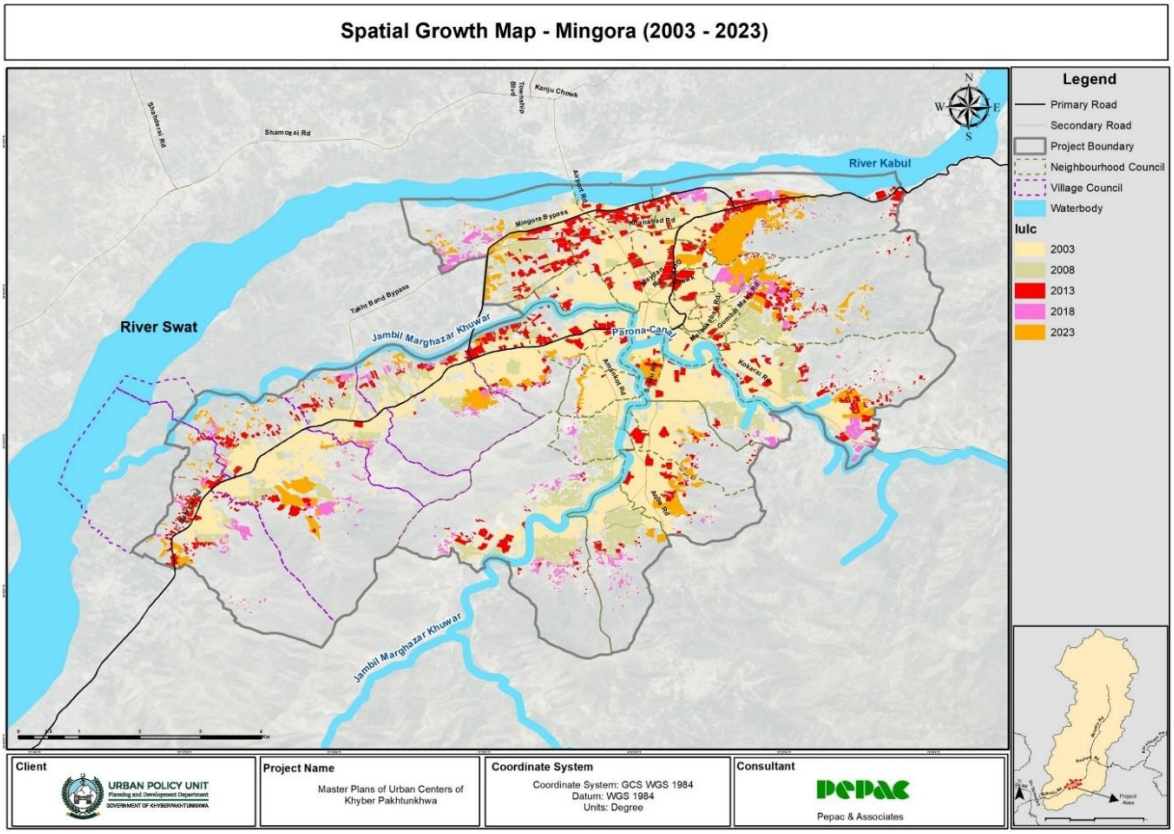
The urban expansion of Mingora-Saidu Sharif is influenced by population growth, migration rate, and growth poles such as commercial areas and industrial estates. The city's annual population growth rate is 3.45%, surpassing the provincial capital, driving urban growth. The migration rate remains relatively low at 1.29%, with 1% intra-migration and 0.29% inter-migration. Urban expansion analysis over four intervals (2002–2021) showed growth rates of 2.45%, 2.56%, 2.64%, and 2.29%, with an average built-up area increase of 25% over 25 years. The table below details land use changes from 2002 to 2022.

Table 5: Change in Land Cover in Mingora-Saidu Sharif Study Area

Land Type	2002 (km^2)	2006 (km^2)	2012 (km^2)	2017 (km^2)	2022 (km^2)
Vegetation	7.34 (24.85%)	7.91 (26.76%)	6.81 (23.07%)	5.85 (19.80%)	6.11 (20.68%)
Barren Land	15.65 (52.98%)	13.25 (44.82%)	11.85 (40.14%)	10.75 (36.38%)	8.4 (28.43%)
Built-up	3.85 (13.03%)	6.3 (21.31%)	8.86 (30.01%)	11.15 (37.73%)	13.44 (45.48%)
Water	2.7 (9.14%)	2.1 (7.10%)	2 (6.78%)	1.8 (6.09%)	1.6 (5.41%)
All Area	**29.5**	**29.5**	**29.5**	**29.5**	**29.5**

Source: Primary Data Collected from Field Survey

Map 8: Spatio-Temporal Land Cover Analysis 2023



Source: Developed by Consultant Using GIS

1.2.7. Population Projection

The population of Mingora-Saidu Sharif was projected using Geometric Growth, Exponential Growth, and Declining Growth methods, averaging a 2.29% annual growth rate. In 2017, the study area's population was 392,864, including 330,233 from neighborhood councils and 62,631 from village councils. Projections indicate the population will reach 730,366 by 2042. Detailed methodology is provided in the Detailed Master Plan Report.

Table 6: Population Projection – (2022 – 2042)

Population Projection Method	Base Year	Projection Years				
	2017	2022	2027	2032	2037	2042
Geometric	392,864	465,473	551,502	653,431	774,198	917,286
Exponential	392,864	449,599	506,333	563,068	619,803	676,538
ETS	392,864	424,203	467,472	510,740	554,008	597,276
Average	**392,864**	**446,425**	**508,436**	**575,746**	**649,336**	**730,366**

Source: Devised by Consultant

Chapter 2: Comparative Analysis of Existing Land Use

2.1 Existing Land Use Distribution

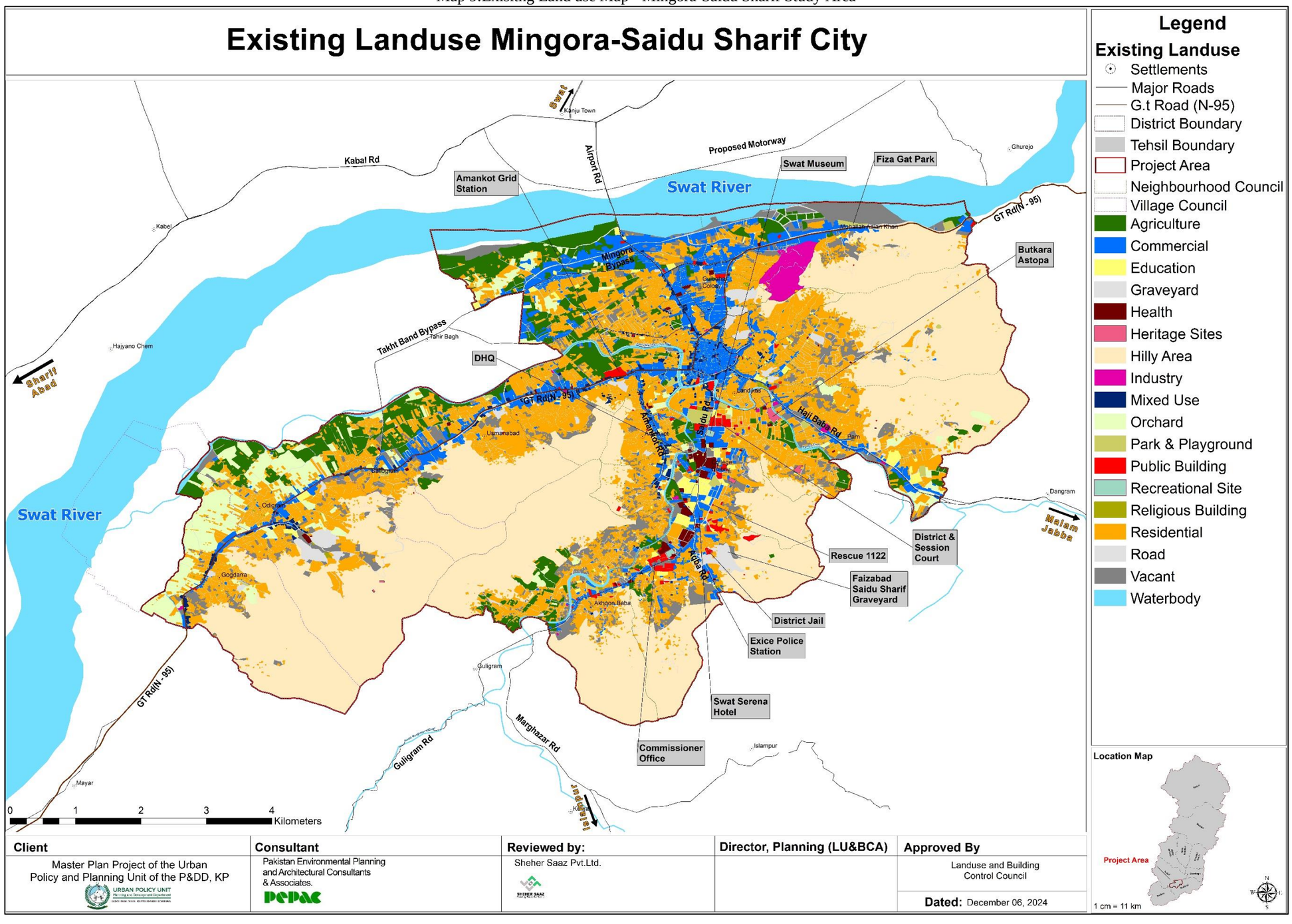
The major land use categories have been developed using the classes given in Khyber Pakhtunkhwa Land Use and Building Control Act 2021. Furthermore, the major classes have been divided into sub-classes based on the city's dynamics. The detailed land use distribution is given in the table below;

Table 7: Detailed Existing Land Use - Mingora-Saidu Sharif

Main Category (As Per KP LUBCA 2021)	Sub-Category	Area (Acre)	Area (Km^2)	Percentage (%)
Residential Area	Planned	97.06	0.39	0.78%
	Unplanned	2,805.74	11.35	22.41%
	Total	**2,902.80**	**11.75**	**23.18%**
Commercial Area	**Total**	**889.71**	**3.60**	**7.10%**
Industrial Area	Industry	95.39	0.39	**0.76%**
Forest, Range Land and Other Related Areas	Hilly Area	5,019.47	20.31	40.08%
	Orchard	481.51	1.95	3.85%
	Total	**5,500.98**	**22.26**	**43.93%**
Agriculture Area	Agriculture	825.31	3.34	**6.59%**
Concentrated Public Sector Area	Public Building	74.11	0.30	0.59%
	Religious Building	23.05	0.09	0.18%
	Total	**97.16**	**0.39**	**0.78%**
Recreational Area	Recreational Site	4.81	0.02	0.04%
	Park& playground	46.83	0.19	0.37%
	Heritage sites	9.35	0.04	0.07%
	Total	**60.99**	**0.25**	**0.49%**
Barren and Vacant	Vacant	841.10	3.40	**6.72%**
Waterbodies	Waterbody	356.58	1.44	**2.85%**
Amenities (Any Other Identified During Survey)	Mixed use	83.16	0.34	0.66%
	Education	127.77	0.52	1.02%
	Graveyard	137.38	0.56	1.10%
	Health	53.78	0.22	0.43%
	Roads	550.56	2.23	4.40%
	Total	**952.64**	**3.86**	**7.61%**
Total		**12,522.66**	**50.68**	**100.0%**

Source: Primary Data Collected from Field Survey

Map 9:Exisitng Land use Map - Mingora-Saidu Sharif Study Area



Source: Devised by Consultant

2.2. Comparison of Existing Land Use with Standards

The existing land use has been compared with the National Reference Manual (NRM) standards for land use distribution in Pakistan. The table below presents the comparison for a city with a population exceeding 500,000.

Table 8: Land use Comparison with NRM Standards

Sr. No.	Land Use	Area (Km^2)	Land Use Percentages (%)	NRM Standards for city of 500,00+ people
1	**Residential**	11.747	23.180%	24-32%
2	**Commercial**	3.601	7.105%	1-2%
3	**Community Facilities (Health, Education, Mixed Use, Religious, Public etc)**	1.464	2.890%	3-8%
4	**Green/Recreational/ Open Spaces**	0.247	0.487%	2-5%
5	**Graveyard**	0.556	1.097%	0.5-3.5%
6	**Vacant**	3.404	6.717%	8-26%
7	**Roads**	2.228	4.396%	12-20%
8	**Industry**	0.386	0.762%	2-10%
9	**Other/Reserved (agriculture, etc)**	27.045	53.366%	9-45%
Total		**50.68**	**100.00%**	

Source: Devised by Consultant

Chapter 3: Housing/ Residential Zone

3.1. Land Suitability Analysis (LSA) Criteria for Residential Land Use

LSA is one of the methods for estimating suitable land parcels for a particular land use. For residential land use, different parameters were applied to identify suitable land parcels. The proposals were made on the selected land parcels, considering the planning techniques, standards, local requirements, ground realities, and natural trends. The applied parameters included proximity of land to major roads network, existing planned residential areas, water bodies, and land cover. The detailed maps generated as a result of LSA for residential land uses are attached in Volume II.

3.2. Existing Situation

Between the 1998 and 2017 censuses, the population of Mingora-Saidu Sharif grew from 173,868 to 331,377, reflecting an average annual growth rate of 3.45%. These residents were housed in 40,850 units, with an average household size of 8.01, significantly higher than the national average of 6.16. The current housing situation of Mingora-Saidu Sharif is given in the subsequent sections.

3.2.1. Existing Housing Societies

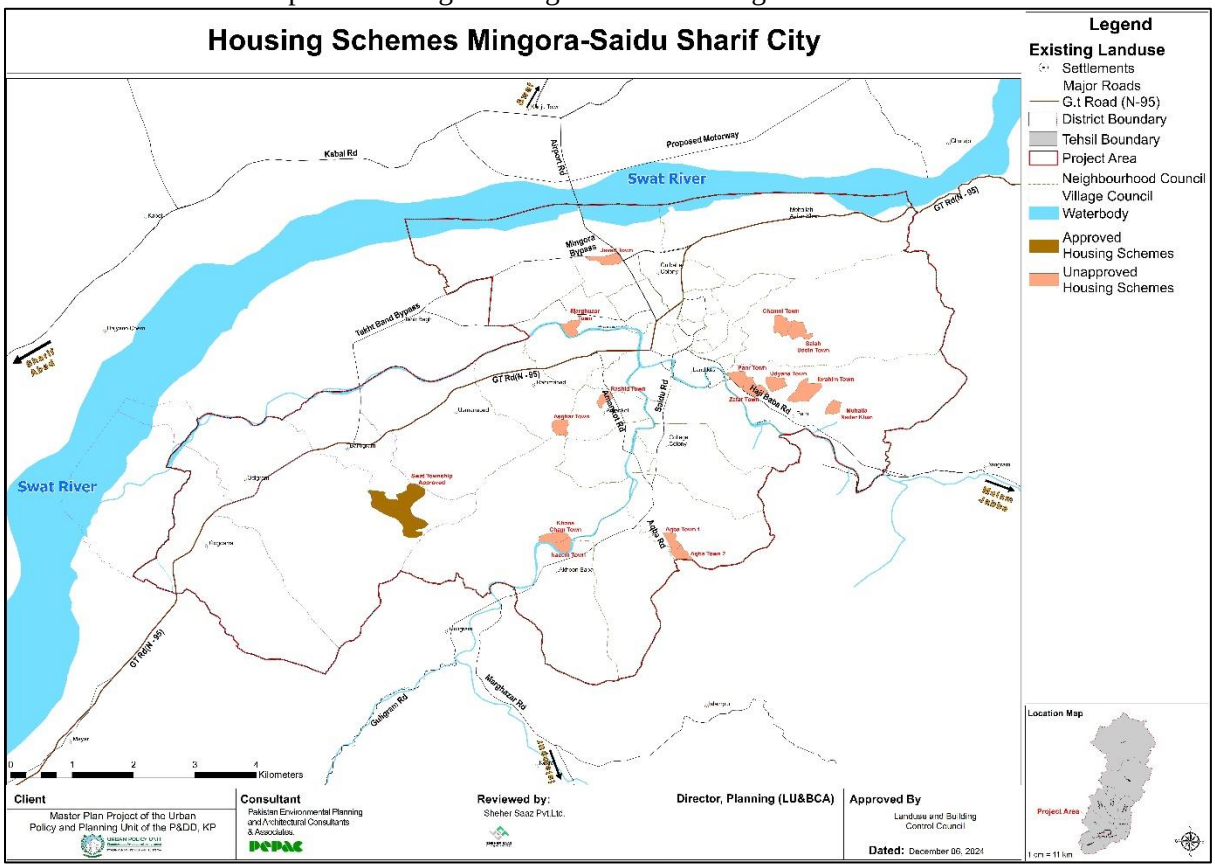
The district administration was consulted regarding the data for the existing housing schemes. As per the provided data of Tehsil Babuzai, there are a total of 17 societies. Further details are given in the following table.

Table 9: List of Housing Schemes

Sr. No.	Name	Area	Status
1.	Aqba Town 1	8.56	Unapproved
2.	Aqba Town 2	10.31	Unapproved
3.	Asghar Town	11.96	Unapproved
4.	Chamni Town	15.17	Unapproved
5.	Guli Gram Town	7.98	Unapproved
6.	Ibrahim Town	23.88	Unapproved
7.	Javed Town	13.72	Unapproved
8.	Khona Cham Town	13.26	Unapproved
9.	Marghuzar Town	11.36	Unapproved
10.	Muhalla Nadar Khan	8.81	Unapproved
11.	Naeem Town	9.53	Unapproved
12.	Panr Town	10.55	Unapproved
13.	Rashid Town	7.08	Unapproved
14.	Salah Uddin Town	14.72	Unapproved
15.	Swat Township Approved	80.97	Approved
16.	Udyana Town	12.16	Unapproved
17.	Zafar Town	15.41	Unapproved
18.	Total	**275.44**	

Source: Secondary data Data obtained from TMA, Swat

Map 10: Existing Housing Societies – Mingora-Saidu Sharif



Source: Devised by Consultant

3.2.2. Existing Housing Shortage/Backlog

The total population in 2017 was 392,864 with 48,876 units. To assess the housing shortage in Mingora-Saidu Sharif , the 2022 population and housing units were estimated based on population projections and land use survey. Between 2017 and 2022, the population increased by 53,561 persons, reaching 446,425. The total housing requirement for this population, including backlog and replacement demand, was 7,783 units. The housing backlog turns out to be 171 units in 2022.

The detailed housing requirements for 2022 are presented in the table below.

Table 10: Housing Backlog for Year 2022 - Mingora-Saidu Sharif Study Area

Year	Population	Household size	Required housing units	Existing housing units	Backlog	Replacement Demand	Total Requirement
2017	392,864	8.01	49,047	48,876 *(census 2017)*	171	6,696 *(Census 2017)*	6,867
2022	446,425	8.01	55,733	55,562	171	7,612 *(Primary Survey)*	7,783

Source: Calculated by consultant through census data

As per the field survey, most of the housing units in Mingora-Saidu Sharif were built by using basic construction material including tin, stone and mud etc. Almost 87.40% of the houses are

built using lintel roof and only 1.01% were built using T-Iron/Girders for roofing[4]. Most of the dilapidating housing units which require replacement are calculated to be 13.7% and the housing units are calculated to be 7,612 units in 2022.

3.2.3. Existing Housing Supply

The housing supply analysis for Mingora-Saidu Sharif , based on Tehsil Municipal Administration data, identifies 17 housing societies, with only one officially approved and 16 unapproved. These societies contribute in meeting future housing demand by 2042.

The vacant area available in these societies is 112 acres. Out of this area, 50-60% area has been designated for the residential development. Using an average plot size of 10 Marlas (calculated from primary survey), the tentative number of housing units were estimated. The number of housing units and population has been calculated using the projected household size of 7.29 (by 2042).

Table 11: Housing Supply analysis

Housing Societies (available area)	Residential Area (60%)		Housing supply	Pop to be accommodated
(Acre)	Acres	Marla	Residential Plots	
112	67.2	10,752	1,075	7,838

Source: Calculated by Consultant

The housing supply analysis from the housing societies in Mingora-Saidu Sharif underscores a substantial contribution, with a total of 1,075 residential units capable of accommodating a population of 7,838 individuals.

3.2.4. Future Demand Estimation

The demand for housing accommodation will increase accordingly with the increased population of Mingora-Saidu Sharif. From the year 2022 to 2042, the population of Mingora-Saidu Sharif is likely to increase by approximately 282,941 people. The projected population in parallel to the required housing and household size in the city is as follows:

Table 12: Future Population Increase – urban Mingora-Saidu Sharif

Year	2027	2032	2037	2042
Population	508,436	575,746	649,336	730,366
Proposed Household Size	7.72	7.44	7.15	6.86
Increase in Population	62,011	67,311	73,590	81,030

Source: Calculated by Consultant through primary data

Considering the administrative setup and construction timelines, it is estimated that 50% of the 2022 housing demand and replacement demand will be met by 2027, with the remaining backlog carried forward. Similarly, the backlogs of 2032, 2037, and 2042 will be addressed within their respective periods. Given the primary construction materials used (wood, stone,

[4] TASK-B-Background study report (survey analysis)

girder iron, and R.C.C.), houses aged 11-20 years will require replacement every five years. The future housing demand estimation for Mingora up to 2042 is outlined in the table.

Table 13: Future Housing Demand Estimation Till 2042 - Mingora-Saidu Sharif

Year	Population	Proposed Household size	Increase in Population	Existing Housing Units	Housing Backlog	Replacement Demand	Future Requirement	Total Requirement
2027	508,436	7.72	62,011	55,562	1,946	7,612	8,029	9,975
2032	575,746	7.44	67,311	65,537	1,946	8,979	9,052	10,997
2037	649,336	7.15	73,590	76,535		10,485	10,293	10,293
2042	730,366	6.86	81,030	86,828		11,895	11,807	11,807

Source: Calculated by Consultant

The projected housing demand for Mingora-Saidu Sharif is 9,975 units (2027), 10,997 units (2032), 10,293 units (2037), and 11,807 units (2042), resulting in a cumulative demand of 38,209 units over the next 20 years. To manage this, 25% of the backlog will be addressed in Phase-I and another 25% in Phase-II. The total requirement for each phase is determined by adding the housing backlog and future demand. Additionally, existing supply, as discussed in Section 10.5, has been factored in. The actual housing demand to be addressed in the Mingora-Saidu Sharif Master Plan 2042 is detailed in the following table.

Table 14: Actual Housing Demand Estimation by 2042

Projected Population for 2022	**A**	446,425
Projected Population for 2042	**B**	730,366
Increase in Population	**C = B-A**	283,941
Average Household Size from 2022 till 2042	**D**	7.29
Future Requirements Housing Units for 2042	**E = C/D**	38,949
Backlog carry forward	**F**	171
Total Requirement till 2042	**G = E+F**	39,121
Total Population to be accommodation till 2042	**H = G*D**	285,189
Housing Supply (Housing Societies)	**I**	1,075 Units
Population accommodated in Housing Supply	**J**	7,838
Actual Future Housing Requirement by 2042	**K = G - I**	**38,045 Units**
Actual Population to be catered in Proposed Zones till 2042	**L = H - J**	**277,351**

Source: Calculated by Consultants

By 2042, Mingora City's population is projected to reach 730,366, reflecting an increase of 283,941 individuals from 2022. With an average household size of 7.29, the total housing requirement is calculated at 39,121 units, including a backlog of 171 units. The existing housing supply from societies is 1,075 units, accommodating 7,838 people. Consequently, the actual housing demand to be met through the proposed zones in the Master Plan is 38,045 units, ensuring housing for 277,351 individuals by 2042.

3.3. Proposals

The housing development is proposed based on 70% horizontal and 30% vertical development in Mingora-Saidu Sharif. The primary motivation for introducing vertical development is to increase the standard of living and to deal with scarcity of vacant land for future development. For the horizontal residential development, the different plot sizes from 3 Marla to 1 kanal have been given percentages based on the existing trend of the plot sizes assessed from the primary survey. The following table shows percentages allotted each plot size and apartments for both vertical and horizontal development of Mingora-Saidu Sharif City for Scenario II.

Table 15: Allocated Percentages for Plots and Apartment Size

Sr. No.	Horizontal Development	
	Plot Size	%
1	**3 Marla**	15%
2	**5 Marla**	15%
3	**7 Marla**	20%
4	**10 Marla**	10%
5	**1 kanal**	10%
6	**Total**	70%
Vertical Compact Development		
Sr. No.	**Apartment Type**	**%**
1	**1 bedroom**	10%
2	**2 bedrooms**	15%
3	**3 bedrooms**	5%
4	**Total**	30%

Source: Calculated by Consultant

For vertical development, 40% of each floor area will be allocated to circulation spaces (corridors, staircases, elevators). Each three-story apartment building will house four units per floor, with 70% ground coverage and 30% reserved for mandatory spaces. The total plot size is determined by adding the building area to mandatory spaces. Parking will be accommodated through common or on-street options. The detailed methodology for area calculation of apartment is given in Volume III.

3.3.1. Phase wise Area Requirement

The master plan proposals for housing development in the Mingora-Saidu Sharif has a 20-year timeframe, starting from the current year of 2022. The proposals are divided into four distinct phases, each catering to the housing needs of the population increase during that period. The segregation of phases for incorporating housing needs are as follows.

- Housing Phase I (2022-2027)
- Housing Phase II (2027-2032)
- Housing Phase III (2032-2037)
- Housing Phase IV (2037-2042)

Phase 1

The total population to be accommodated in phase-I has been calculated through the increase in population from the year 2022 till 2027 and the housing backlog of the previous year. The total housing backlog to be accommodated in this phase turns out to be 171 units, whilst the total requirement till 2027 is identified to be 7,932 units for the population of 61,373 people.

Table 16: Phase 1 – Housing Demand Calculation (Till 2027 - PHASE-I)

Mingora-Saidu Sharif - Housing Demand Calculation for City (Till 2027 - PHASE-I)		
Projections	Calculations	Results
Projected Population for 2027	A	446,425
Projected Population for 2022	B	508,436
Increase in Population	C = B-A	62,011
Household Size from 2022 till 2027	D	7.72
Future Requirements Housing Units for 2027	E = C/D	8,029
Backlog carry forward	F	171
Total Requirement till 2027	G = E+F	8,200
Total Population to be accommodated till 2027	H = G*D	63,332
Housing Supply (Housing Societies)	I	267
Population accommodated in Housing Supply	J	1,960
Actual Future Housing Requirement by 2027	**K = G - I**	7,932
Actual Population to be catered in Proposed Zones till 2027	**L = H - J**	61,373

Source: Calculated by Consultant

For this housing scenario, horizontal development of housing accounts for 70% of the total residential development which will require more land for housing. The following table shows the calculations of horizontal development for phase I (2022-2027):

Table 17:Adapted Scenario- Area Calculation for Horizontal Housing Demand – Phase I

Detailed Calculations for Horizontal Development							
Plot and Apartment Size / Type	**%age**	**Population**	**Housing Units**	**Area Required (Marla)**	**Area into Acres**	**Area Required for Allied Uses**	**Total Area Required**
3 Marla	**15%**	9,206	1,190	3,569	22.3	10.0	32.3
5 Marla	**15%**	9,206	1,190	5,949	37.2	16.7	53.9
7 Marla	**20%**	12,275	1,586	11,104	69.4	31.2	100.6
10 Marla	**10%**	6,137	793	7,932	49.6	22.3	71.9
1 Kanal	**10%**	6,137	793	15,863	99.1	44.6	143.8
Total	**70%**	42,961	5,552	44,417	278	125	**402.53**

Source: Calculated by Consultant

Thus, the area required for the horizontal residential development turns out to be 403 acres. Furthermore, the area required for 30% vertical development has been calculated below as;

Table 18: Adapted Scenario- Area Calculation for Vertical Housing Demand - Phase I

Apartment Type	Percentage	Population	Housing Units	Number of Storeys	Housing units Accommodated in one	Area Required Marla	Area into Acres	Area Required for Allied Uses	Total Area Required
	F	Pop*F	HU*F	G	H B*G	I (F2/H)*A	D I*0.00625001	I2 I1 *0.45	J
1 bedroom	10%	6137	793.15	7	28	757	4.7	2.1	6.9
2 bedrooms	15%	9206	1189.7	7	28	1363	8.5	3.8	12.4
3 bedrooms	5%	3069	396.58	7	28	606	3.8	1.7	5.5

Source: Calculated by Consultant

The results show that the area requirement for 30% vertical development in Phase I is 25 acres inclusive of the area for allied uses (45%) similar to horizontal development. Hence the total area required for 70% horizontal and 30% vertical and compact development in phase I is 427 acres. Further calculations for area requirement of each phase based on the allocated percentages have been carried out in the similar way as mentioned above for phase I, which is mentioned below as follows;

Table 19: Adapted Scenario Area Calculation Scenario II

Scenario - II (70% Horizontal & 30% Vertical)				
Phases	Duration	Area		Total
		Horizontal - 70%	Vertical 30%	
Phase -1	2022-2027	402.53	24.71	427.24
Phase -2	2027-2032	552.01	33.89	585.90
Phase -3	2032-2037	508.73	31.23	539.97
Phase -4	2037-2042	585.5868	35.951	621.54
Total area required	2022-2042	**2048.86**	**125.78**	**2174.65**

Source: Calculated by Consultant

The above table depicts that a total of 2,174.66 acres of the total residential area is required to accommodate projected incremental population as per the adapted scenario for housing.

3.3.2. Allied Uses for Selected Scenario

Allied uses will support the growing population from 2022-2042. As per KP Urban Policy 2023, residential zones allocate 10-20% for civic amenities and 30-50% for housing. The consultant has adjusted these percentages to suit the study area, setting public amenities at 10%, covering schools and healthcare centers. Dedicated zones for health, education, and civic facilities are proposed separately. In private housing schemes, 45% of the total area is typically

allocated to allied uses. The following table outlines the categories of allied uses, including commercial, civic, health, education, parks, and roads.

Table 20:Allied Uses Categorization for Selected Scenario- Mingora Saidu Sharif Study Area[5]

Sr. No.	Allied Uses	Land use Percentages (%)	Categorization
1.	**Health**	4.5%	Dispensaries, Clinics
2.	**Education**	5%	Primary School, Secondary School, High School
3.	**Commercial**	5.5%	Convenience shop, demand shops, impulse shop, Departmental stores
4.	**Civic Amenities**	3%	Mosques, Libraries, Madrassah, parking space, Day Cares
5.	**Parks and Playground**	13%	Parks, playfields, pocket parks, community parks
6.	**Arterial Roads**	12%	Secondary Roads, Tertiary Roads
7.	**Graveyard**	2%	
8.	**Total Allied uses**	45%	
Total Area percentage for Proposed Housing Facility			
9.	**Total Allied uses %**	**45%**	
10.	**Total Housing %**	**55%**	
11.	**Grand Total**	**100%**	

Source: Calculated by Consultants

Further detail of the Proposals will be discussed in Task D- Action Plan.

3.3.3. Proposed Residential Zone for selected Scenario

The housing requirements for the growing population have been determined through land suitability analysis, city growth trends, and housing scheme influx. Based on stakeholder input, major residential zones are proposed both within and outside the project boundary.

Infill residential development is planned on vacant parcels (1-4 acres) within the boundary, emphasizing vertical development for efficient land use. Additionally, a new residential zone near the PHA housing scheme outside the boundary will leverage existing infrastructure. Proposed zones within the boundary align with nearby housing societies, ensuring sustainable growth while preserving community character and environmental quality. The following table outlines the proposed residential development areas.

[5] Private Housing Scheme Rules 2020

Table 21: Proposed Residential Zones for Master Plan

Phases	Proposed Zones	Area (Area)	Population to be accommodated in each zone	Housing Units in each zone
Phase 1 (2022-2027)	Infill Residential	352.73	83,948	10,855
Phase 2,3 (2027-2037)	Residential Zones	318	220,231	30,823
Phase 4 (2037-2042)	Residential Zones (Outside boundary)	25.86	17,038	2,385
Total		**738.72**	**321,217**	**44,063**

Source: Devised by Consultant

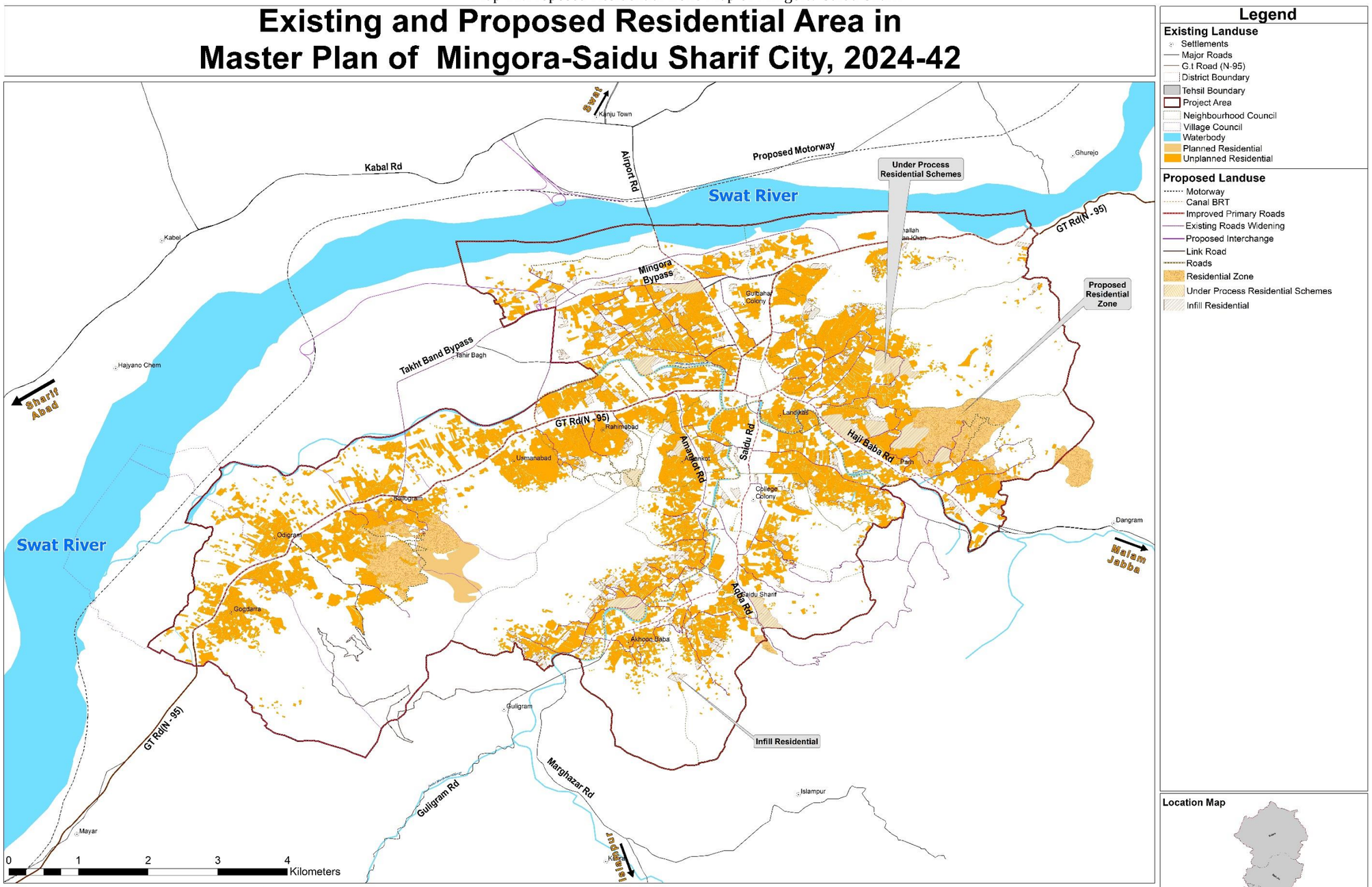
3.4. Zoning Regulations for Housing/Residential

Table 22:Regulations for Residential Zone

Land use Zone	Permitted Land Uses	Permitted on appeal Land Uses
Residential	• Detached/semi-detached dwellings • Apartment Buildings / Multi-family • dwellings • Mosques • Primary/High Schools • Clinics/Dispensaries • Social/Cultural Institutions • Local Shopping Areas/Retail Shops • Offices of Professionals with adequate parking facilities • Parks and Playgrounds • Local Recreational Uses • Colleges and Research Institutions • Hostels, Guest Houses • Offices of TMAs/other tiers of Local • Govt. • Commercial on lower ground/basement • Taxi and Rickshaw Stands Non-commercial vegetable gardens and nurseries	• Commercial Offices and Service • Shops of Local Character • Raising poultry for non-commercial purposes • Petrol pump, gas filling station. • Taxi/rickshaw stand • Restaurants and hotels Hospitals • Indoor sports facility • Dispensary • Place of worship or prayer or mosque • Parking plaza or parking Site Petrol and Gas filling stations

Source: Devised by Consultant

Map 11:Proposed Residential Zone Map of Mingora/ Saidu Sharif



Source: Devised by Consultant

Chapter 4: Commercial Zone

4.1. Existing Commercial

The commercial land use in Mingora-Saidu Sharif is currently scattered, covering 889.71 acres, which accounts for 7.31% of the total area. According to NRM standards, a city with a population exceeding 500,000 requires only 1-2% of its area for commercial development, indicating no immediate shortage of commercial space. However, to support economic growth and meet the needs of a growing population, additional commercial zones have been proposed in the master plan.

4.2. Proposed Commercial Zones

The commercial proposals in the Mingora city master plan are given in the form of;

- Mixed use commercial
- Infill Commercial (mixed use)
- Commerce and trade zone

The following table provides details on the areas of the proposed commercial zones in Mingora-Saidu Sharif;

Table 23: Proposed Commercial Zone

Existing Commercial Area	Proposed Zones	Proposed Zone Area (acres)
644.47	**Infill Commercial (Mixed Use)**	34.93
	Mixed use Commercial	787.21
	Commerce & Trade zone	30.18
Total		**146.23**

Source: Calculated by Consultant

*T*able 24:Regulations for Commercial Zones

Permitted Uses	Permitted on appeal Land Uses
• Woodcraft market • Handicraft market • Public and religious buildings • Service industries and firefighting arrangements governed by the building and space regulations	• Petrol filling stations, • Hospitals, • Residences, • Transport terminals, • Cinemas, • Clubs and all sort of storage.

Source: Devised by Consultant

4.3. Proposed Hospitality Zone

The proposed Hospitality Zone in Mingora-Saidu Sharif holds tremendous potential to harness the city's abundant tourism opportunities, thereby significantly boosting economic factors.

Around 459.85 acres of land has been proposed serving as hospitality zone, dedicated to catering to the growing demands of the tourism industry. The following table provides details on the areas and locations of the proposed Hospitality Zone;

Table 25:Proposed Hospitality Zone

Proposed Zone	Proposed Zone Area (acres)	Area Available for Development
Hospitality Zone	459.85	North-eastern side (along River Swat)

Source: Calculated by Consultant

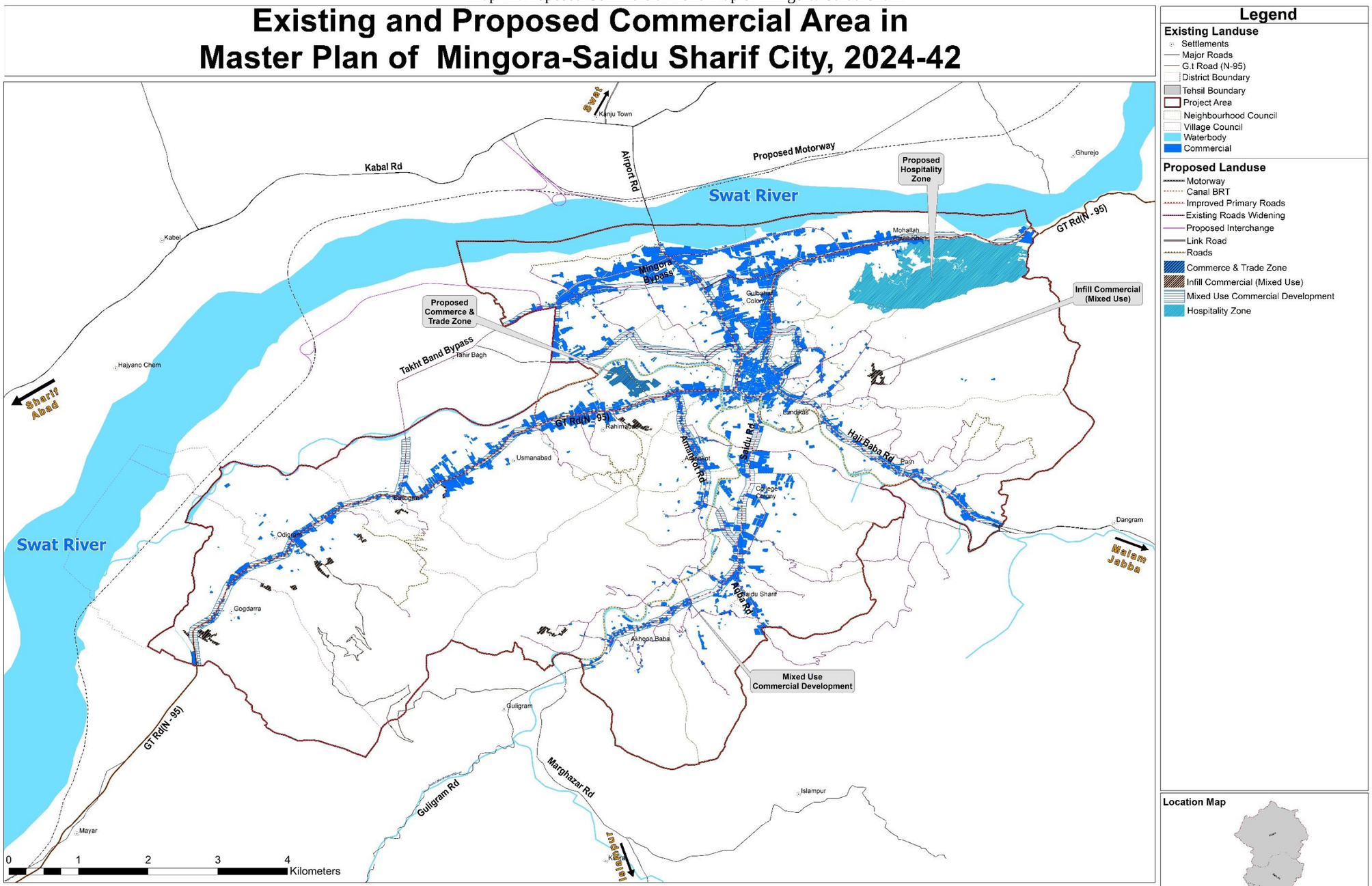
The following table provides details on zoning regulations for the development of hospitality zone in the study area;

Table 26:Regulations for Hospitality Zone

Permitted Uses	Permitted on appeal Uses
• Restaurant • Hostel or guest house • Bakery or confectionery • Parking plaza or parking site • Theater, auditorium • Cinema • Tours guide company • Mosque • Recreational places • Exhibition center • Retail and Souvenir Shops (for local selling products)	• Banks • Petrol filling stations • Hospitals • Parks and open spaces • Shopping plazas • Shops and commercial centers • Transport terminals • Service industries and firefighting • Departmental stores • Pharmacies • Stadium

Source: Devised by Consultant

Map 12:Proposed Commercial Zone Map of Mingora/ Saidu Sharif



Source: Devised by Consultant

Chapter 5: Industrial Sector

5.1. Existing Industries

Nearly 37% of Swat's economy relies on tourism, [6]while the sectors of agriculture, forestry, handicraft, mining and gemstone make the rest of the contribution. In the Mingora study area, 95.39 acres of land are already allocated for industrial use, including facilities for mines, minerals, and the marble industry, notably within the Salampur handicraft industrial estate. Due to limited land availability and other suitability factors, additional industrial zones have been proposed outside the project boundary to accommodate future growth and development.

5.2. Proposals

A 67.78-acre industrial zone is proposed south of the project area, near the motorway. This location was selected based on district administration feedback and stakeholder consultations, considering land availability, connectivity, and accessibility. Its proximity to the motorway ensures efficient transportation of raw materials and finished products, supporting industrial operations while minimizing logistical challenges.

To further diversify the industrial base, a food processing industry zone spanning 66.47 acres is proposed in the eastern direction outside the project area boundary. An additional 22.4 acres are designated for the handicraft industry, also situated in the eastern direction outside the project area boundary. This zone aims to support and expand the local handicraft sector, which is a significant contributor to Swat's cultural and economic landscape.

In total, 156.65 acres of new industrial zones have been proposed outside the project boundary to accommodate the growing industrial needs of Mingora and the surrounding areas. These zones are strategically located to optimize land use, enhance economic diversification, and support local industries.

Table 27: Proposed Industrial Zone

Proposed Industrial Zone		
Proposed Zones	**Area (Acres)**	**Location**
Proposed Industrial Zone	67.78	Outside Project Area Boundary (In the South direction near motorway
Proposed Food Processing Industry	66.47	Outside Project Area Boundary (In the Eastern Direction)
Proposed Handicraft Industry	22.4	Outside Project Area Boundary (In the Eastern Direction)
Total	**156.65**	

Source: Devised by Consultant

The details of the existing and proposed industrial location are given below in the Map 13.

[6] KP – BOIT – SWAT district, KPK

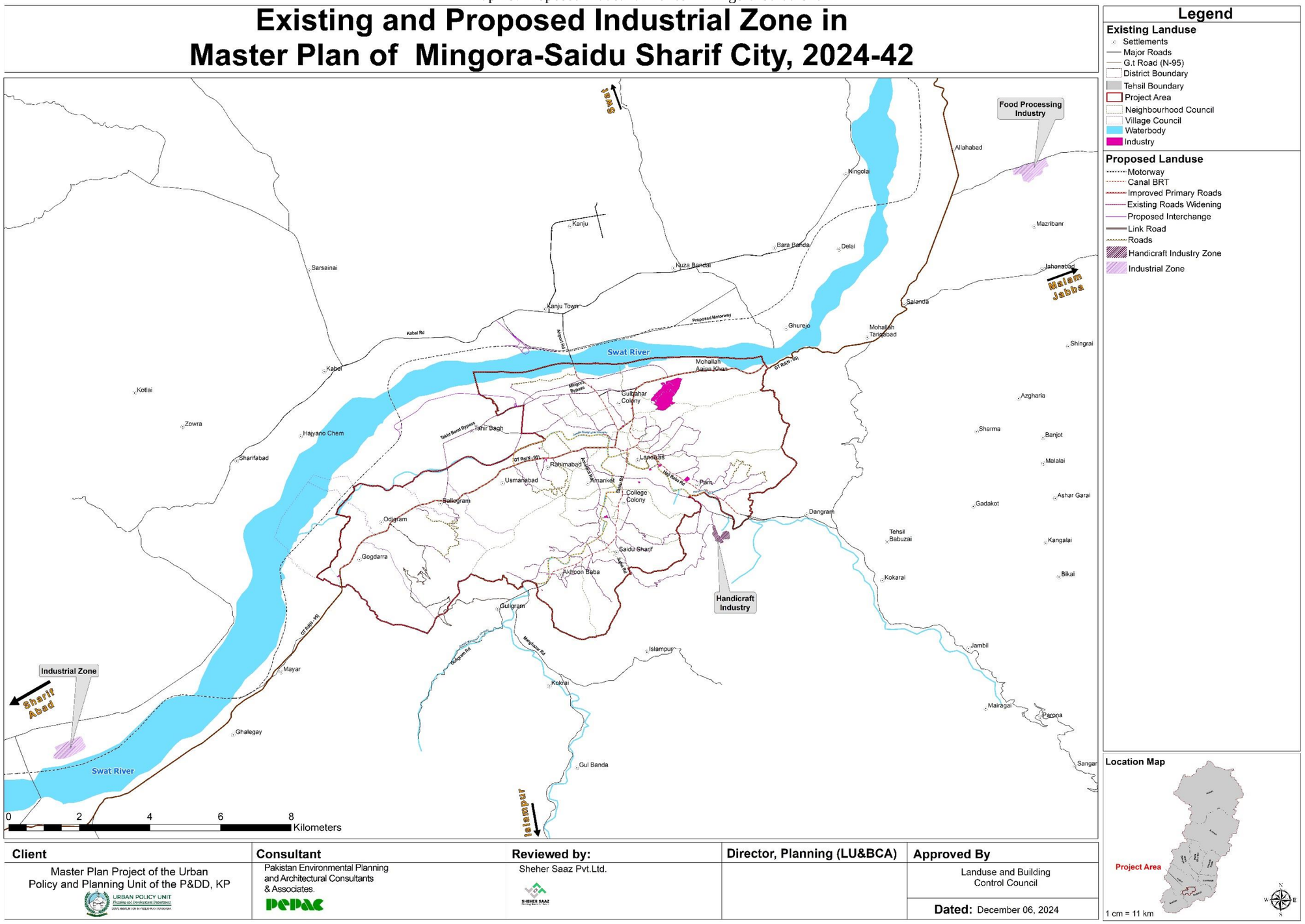
5.2.1. Zoning Regulation for Industrial Land Use

Table 28: Zoning Regulations for Industrial Land Use – Mingora-Saidu Sharif

Land use Zone	Permitted Land Uses	Permitted on appeal Land Uses	Prohibited Land Uses
Light medium Industrial	• Auto-Mechanic Shops/Yards • Research and Development (R&D) Centers • Small Industrial Units • Warehouses and Storage • Business Incubators and Accelerators • Public Utilities and Buildings Canteens • Agriculture (until the area is required for development) • Approved Parking • Loading and Unloading Provisions • Dwellings for watch and ward staff	• Bus and Truck Terminals • Railway passenger and freight terminals • Petrol and gas filling stations • Taxi stands • Recreational facilities for employees.	• Storing, packing, pursing, cleaning, preparing, and manufacturing of blasting powder, ammunition, fireworks, gun powder, sulphur, mercury, gases, nitro-compounds, phosphorous, dynamite, explosives, bombs or any other obnoxious or hazardous material
Medium Industrial	• All categories permitted in the light-medium industrial zone. • Training and Education Centers • Research and Development (R&D) Centers • Business Incubators and Accelerators • Logistics and Distribution Centers • Warehousing, storage depots and incidental uses. • Approved Parking • Loading and unloading provisions. • Dwellings for labor and watch and ward staff.	• All categories permissible in special appeal in Light-Medium industrial zone.	

Source: Devised by Consultant

Map 13: Proposed *Industrial Zones* – Mingora-Saidu Sharif



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Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP URBAN POLICY UNIT	Pakistan Environmental Planning and Architectural Consultants & Associates. PEPAC	Sheher Saaz Pvt.Ltd. SHEHER SAAZ		Landuse and Building Control Council **Dated:** December 06, 2024

Source: Devised by Consultant

Chapter 6: Health, Education and Civic Facilities

6.1. Existing Health Facilities

The city has two Basic Health Units with areas of 0.608 acres and 0.402 acres, serving a population of 331,377 (only MC) in 2017. Additionally, Mingora-Saidu Sharif contains one civil dispensary, one MHC of 0.879 acres, and a DHQ measuring 2.05 acres. As a Basic Health Unit serves up to 25,000 people and an MCH serves a population of 75000, the city should have at least 20 BHUs and 7 MCHs to accommodate such a population. In Mingora-Saidu Sharif, there ought to be at least 33 dispensaries, yet there is only one.

Future healthcare requirements for the city of Mingora-Saidu Sharif were calculated using population requirement criteria from the National Reference Manual. The table below provides future specifications for healthcare facilities.

Table 29:Future requirements of healthcare facilities– Mingora-Saidu Sharif

Year	Projected Population	Population Increase	Required			
			BHU	RHC/MCH	Dispensary	DHQ Hospital
2017	359,465	-	-	-	-	-
2022	399,549	40,084	16	5	27	0
2027	430,333	30,784	1	0	2	0
2032	455,331	24,998	1	0	2	0
2037	476,808	21,477	1	0	1	0
2042	496,171	19,363	1	0	1	0
(2017-42)	Total Increase	96,622	4	1	6	0

Source: Devised by Consultant

6.2. Proposed Health Zones

The health facilities would take up around 15.69 acres of land according to NRM standards. The following table depicts the area requirement for health institutions for Mingora /Saidu Sharif with phases. These amenities will be proposed within the existing NCs and VCs to enable community accessibility. These facilities must be within a 10-minute driving distance or a 1-kilometer walk.

Table 30: Area requirement for Health Institutions – Mingora-Saidu Sharif

Type of Health Facility	Existing (2022)	Minimum Requirement (2022)	Existing GAP (2022)	Minimum Requirement	GAP	Min. Area Standards (Acres)	Area Required (Acres)	Standard
Basic Health Unit (BHU)	2	16	14	4	18	0.3	5.4	1 BHU per 25,000 people
Rural Health Centre (RHC)	1	5	4	1	6	2.47	14.3	1 RHC per 75,000 people

Type of Health Facility	Existing (2022)	Minimum Requirement (2022)	Existing GAP (2022)	Minimum Requirement	GAP	Min. Area Standards (Acres)	Area Required (Acres)	Standard
Dispensary (CD)	1	27	26	6	32	0.02	0.6	1 CD per 15,000 people

Source: Devised by Consultant

Table 31: Proposed Areas for Health care Zones – Mingora /Saidu Sharif

Existing Zones Area (Acres)	Proposed Zone	Proposed Zones Area (Acres)
53.12	Health	34.29

Source: Calculated by Consultant

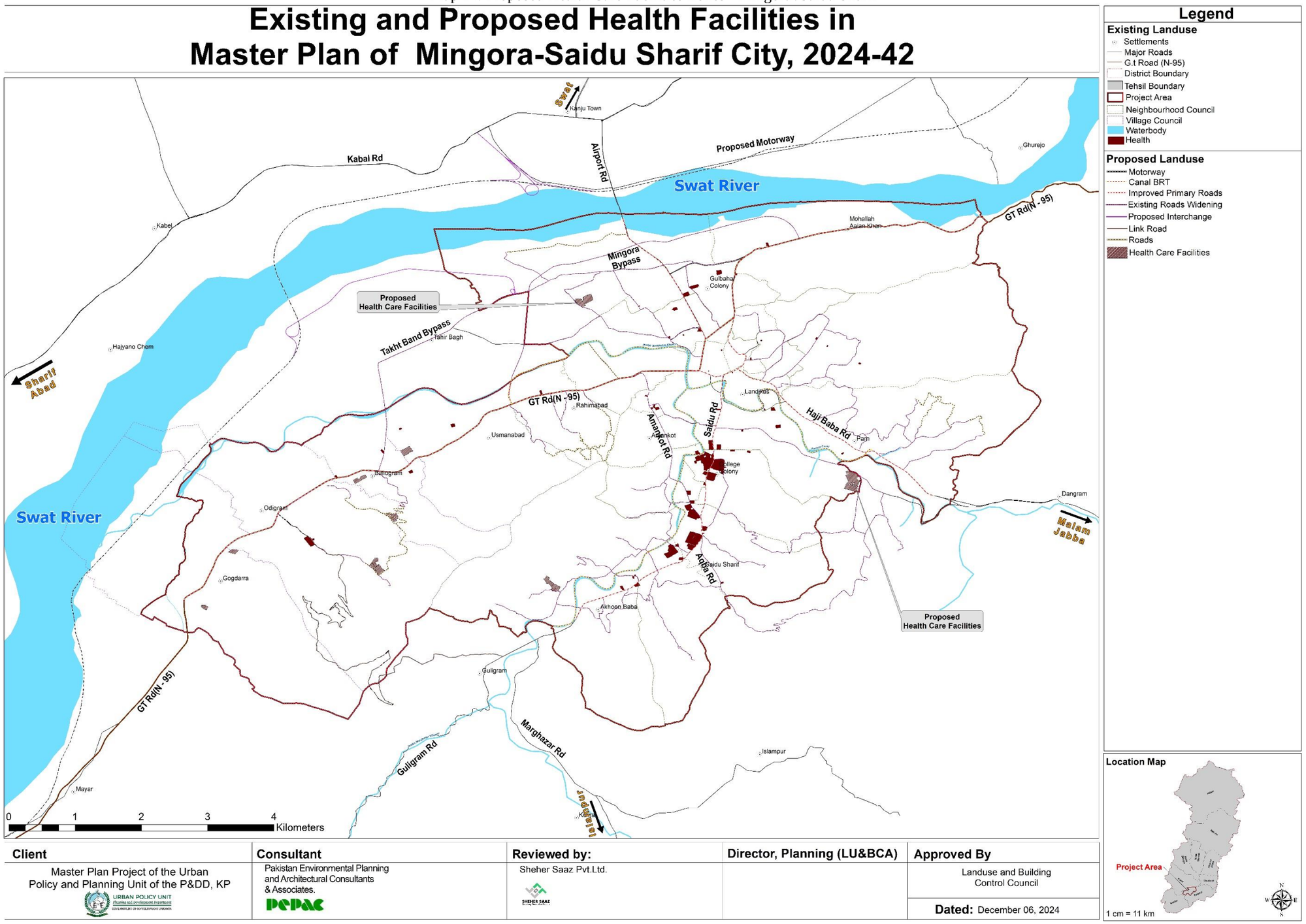
The following table provides details on zoning regulations for the development of health zone in the study area;

Table 32: 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 open spaces)	• Playlands & Amusement Parks • Hostels • Hotels & Restaurants • Banks • Gymnasiums & Clubs • Cinema • Petrol Pumps • Banks

Source: Devised by Consultant

Map 14: Proposed Health Care Facilities Zones - Mingora /Saidu Sharif



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				Dated: December 06, 2024

Source: Devised by Consultant

6.3. Existing Education Facilities

There are 34 primary schools, 9 middle schools (boys and girls), 13 high schools (girls) and 12 boys, 26 colleges and a university that is University of Swat, in the study area. 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. These are the minimum requirements mentioned in the National Reference Manual.

The future educational institutions requirement for the city of Mingora-Saidu Sharif were calculated using population requirement criteria from the National Reference Manual. The table below provides future specifications for education facilities.

Table 33: Future Requirement of Educational facilities– Mingora-Saidu Sharif

Year	Population	Population Increase	Required			
			Primary	Middle	High	College
2017	359,465	-	-	-	-	-
2022	399,549	40,084	53	24	5	2
2027	430,333	30,784	4	2	0	0
2032	455,331	24,998	3	1	0	0
2037	476,808	21,477	3	1	0	0
2042	496,171	19,363	3	1	0	0
(2017-42)	**Total Increase**	**96,622**	**13**	**6**	**1**	**1**

Source: Calculated by Consultant based on NRM Standards

Table 34: Area requirement for Educational Institutions – Mingora-Saidu Sharif

Type of education facility	Existing (2022)	Minimum Requirement (2022)	Existing GAP (2022)	Minimum Requirement (2027-42)	GAP	Min. area Standards	Area Required (Acres)
Primary	6	53	47	13	60	1.48	89.0
Middle	7	24	17	6	22	3.7	82.1
High	9	5	0	1	0	4.9	0.0
College	20	2	0	1	0	11.1	0.0

Source: Devised by Consultant

6.4. Proposed Educational Zones

The consultant has proposed the establishment of educational facilities on 24.95 acres of land within the project area to address the increasing demand for quality education driven by population growth. However, the establishment of these facilities alone is not enough to ensure quality education. The proposal emphasizes the importance of improving educational standards by focusing on teacher training, modern technology integration, and the availability of learning resources.

Table 35: Proposed Areas for Educational Facilities – Mingora /Saidu Sharif

Existing Area (Acres)	Proposed Zone	Proposed Zones Area (Acres)
127.77	Institution and Research Zone	24.95

Source: Calculated by Consultant

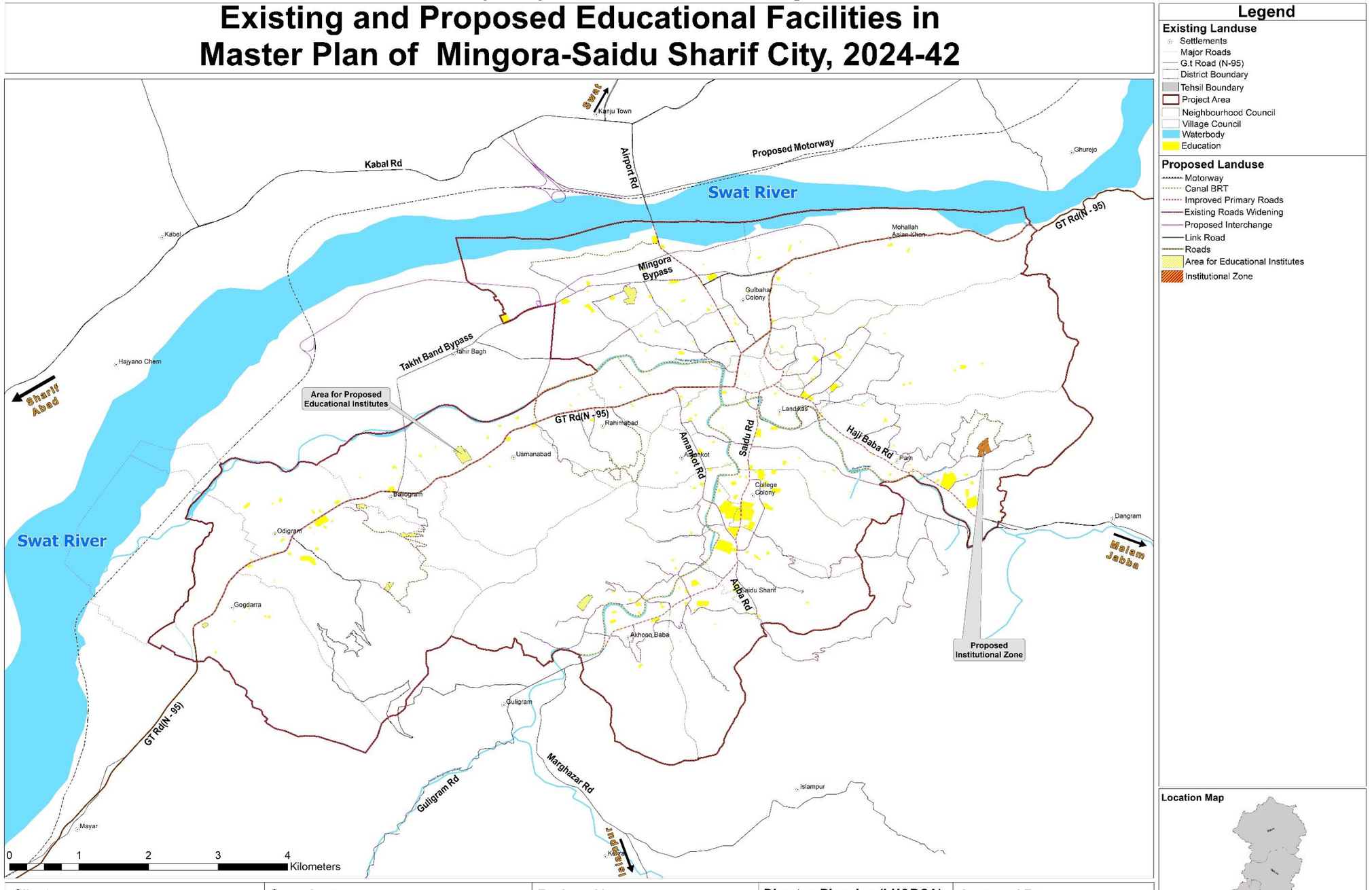
The following table provides details on zoning regulations for the development of Institution and Research Zone;

Table 36: Regulations for Institution and Research Zone

Permitted Uses	Permitted on appeal uses
• Educational and Research Institutions • Offices of Social and Cultural Organizations • Public Utilities and Buildings • Taxi Stands, Bus Halts • Approved Parking Provisions • Day Cares • Research centers • Libraries	• Food courts • Religious Institutions • Petrol and gas filling Station • Parks, Memorials and Monuments

Source: Devised by Consultant

Map 15:Proposed Education Facilities Zones - Mingora /Saidu Sharif



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Source: Devised by Consultant

6.5. Proposed Institutional and Civic Zones

To enhance education, public services, and legal infrastructure, the consultant has proposed the following zones:

- **Institutional Zone**– Dedicated to research centres, libraries, and vocational training centres to support education, skill development, and workforce growth.
- **Civic Zone** – Located near King International Hospital, this zone will provide essential public services, improve community engagement, and boost tourism and economic activity.
- **Judicial Complex** – Proposed near Dara ul Qaza, this facility will house district, sessions, and specialized courts, along with associated legal offices, ensuring efficient judicial services.

Table 37: Proposed Areas for Institutional *and Civic* Zones – Mingora-Saidu Sharif

Proposed Zones	Proposed Zones Area (Acres)
Institutional Zone	6.19
Civic Zone	0.74
Judicial Complex	1.58

Source: Calculated by Consultant

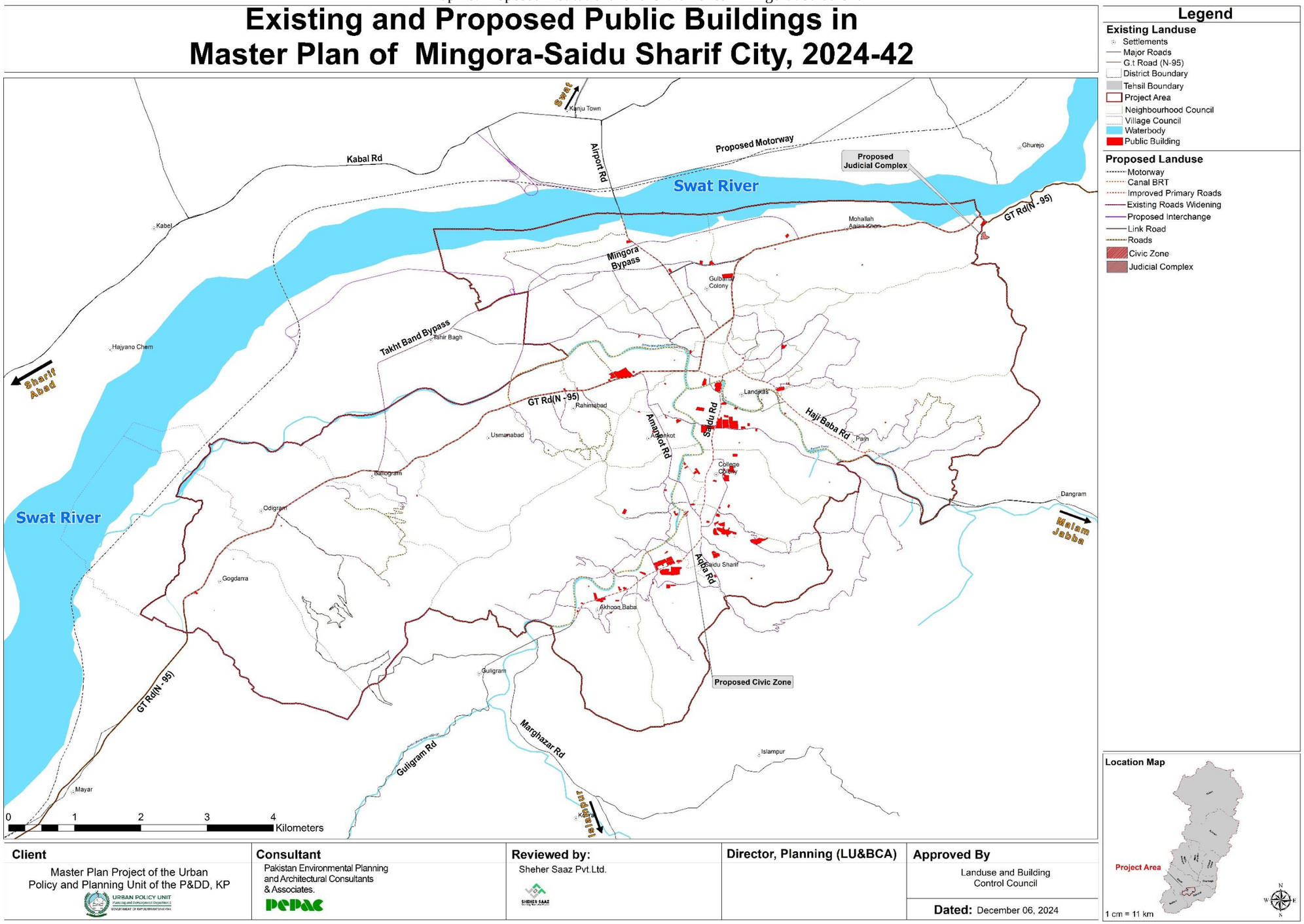
The following table provides details on zoning regulations for the development of Civic Zone;

Table 38: Regulations for Institutional and Civic Zone

Permitted Uses	Permitted on appeal Land uses
• Research centers • Offices of Social and Cultural Organizations • Parks • Public Utilities and Offices (electric supply,etc) • Post Office • Government Offices • Museum • Approved Parking Provisions • Emergency Facilities (fire station) • Libraries • Municipal office • Social welfare institutions • Police station • Mosque • Park, memorial and monument	• Vocational Training institutes • Recreational Uses • Offices of Commercial Institutions • Theatre halls • Arts Councils and Auditoriums • Convention Center • Restaurants • Limited Retail Shopping • Laboratory • Taxi Stands, Bus Halts

Source: Devised by Consultant

Map 16: Proposed Institutional and Civic Zones - Mingora /Saidu Sharif



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				Dated: December 06, 2024

Source: Devised by Consultant

6.6. Proposed Mixed-Use Development

For Mingora-Saidu Sharif City, a specific mixed-use zone has been proposed in the study area facilitating the mixed-use development in the area. Details of the area allocated for this purpose is given in the table below:

Table 39: Proposed Zone for Mixed Use Development

Existing Area (Acres)	Proposed Zone	Proposed Zones Area (Acres)
83.16	Mixed Use Development zone	2147.48

Source: Calculated by Consultant

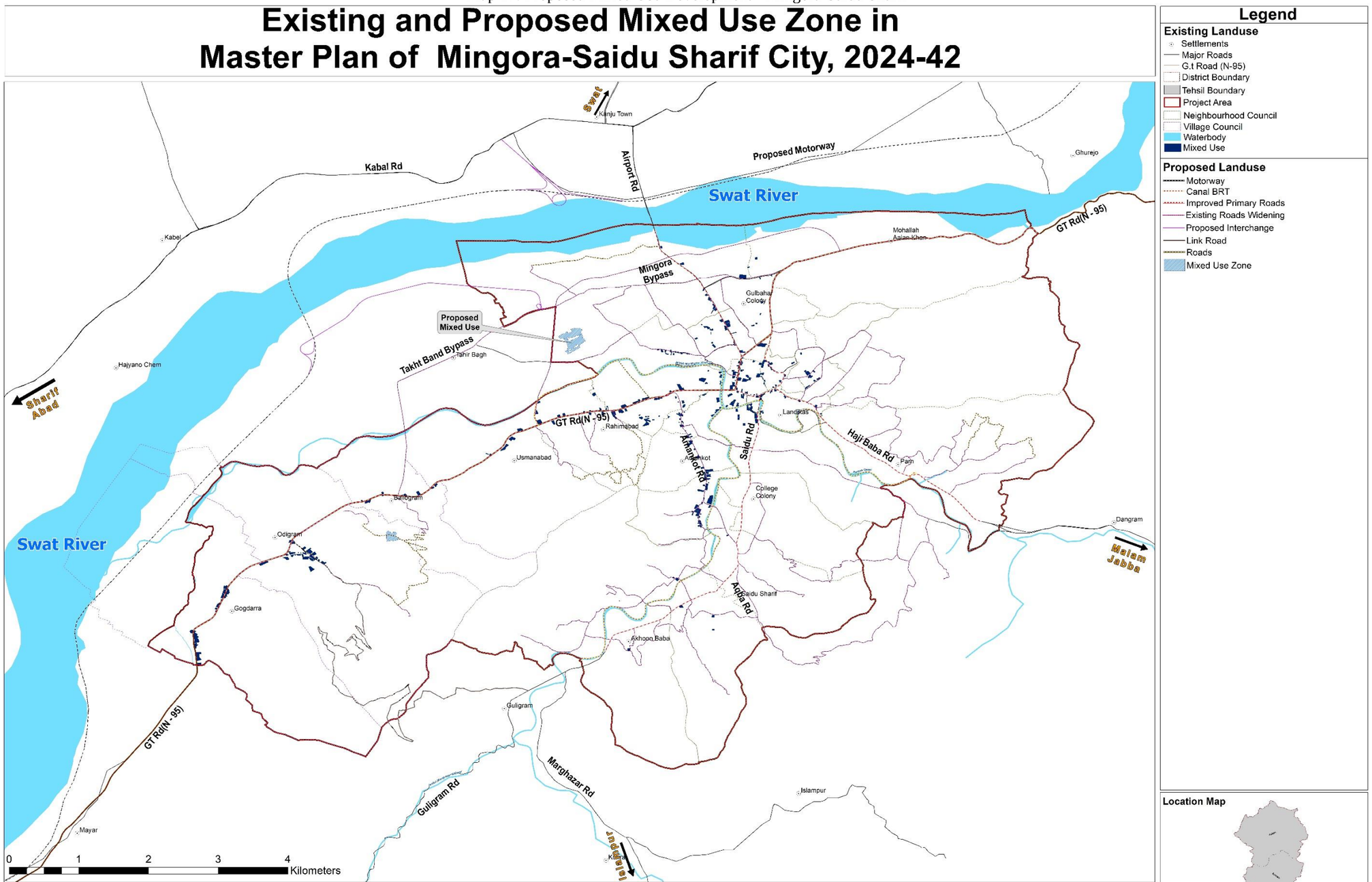
The following table provides details on zoning regulations for the development of Mixed use zone;

Table 40: Regulations for Mixed use Zone

Permitted Uses	Permitted on appeal land uses
• Research centers • Offices of Social and Cultural Organizations • Parks • Public Utilities and Offices (electric supply, etc.) • Post Office • Government Offices • Museum • Approved Parking Provisions • Emergency Facilities (fire station) • Libraries • Municipal office • Social welfare institutions • Police station • Mosque • Park, memorial and monument	• Vocational Training institutes • Recreational Uses • Offices of Commercial Institutions • Theatre halls • Arts Councils and Auditoriums • Convention Center • Restaurants • Limited Retail Shopping • Laboratory • Taxi Stands, Bus Halts

Source: Devised by Consultant

Map 17: Proposed Mixed Use Development - Mingora-Saidu Sharif



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Source: Devised by Consultant

Chapter 7: Parks & Recreational Facilities

Recreational and open spaces are vital for sustainable development, offering social, economic, and environmental benefits. The Mingora-Saidu Sharif study area currently has 60.99 acres of recreational facilities, including parks and playgrounds.

7.1. Proposed Parks and recreational facilities

The consultant has proposed multiple recreational zones, with three located outside the study area due to land constraints. These include a sports complex, linear park, and gymnasium complex. The total recreational area spans 1,529.03 acres.

- **Waterfront Park** – Designed for water sports like swimming and surfing.
- **Parks in NC/VC** – Dedicated to passive recreation.
- **Recreational Zone** – Includes theme parks and arenas for active recreation.
- **Central Park** – A major green space for leisure and relaxation.
- **Walking Track** – Incorporated based on stakeholder input.
- **Government Women's Gymnasium** – Already in progress and included in the master plan.

Further categorization of playgrounds and passive spaces is detailed in the table below.

Table 41: Proposed Recreational Zones

Proposed Zones	Area (Acres)
Proposed Government Women Gymnasium	1.40
Walking Track - Phase 1	5.3
Proposed Parks	82.45
Central Park	78.78
Forest Trekking Zone	1091.57
Water Front Park	22.41
Recreational Zone	114.57
Proposed Sports Complex	20.32
Proposed Linear Park	105.66
Proposed Gymnasium Complex	7.33
Total	**1,529.79**

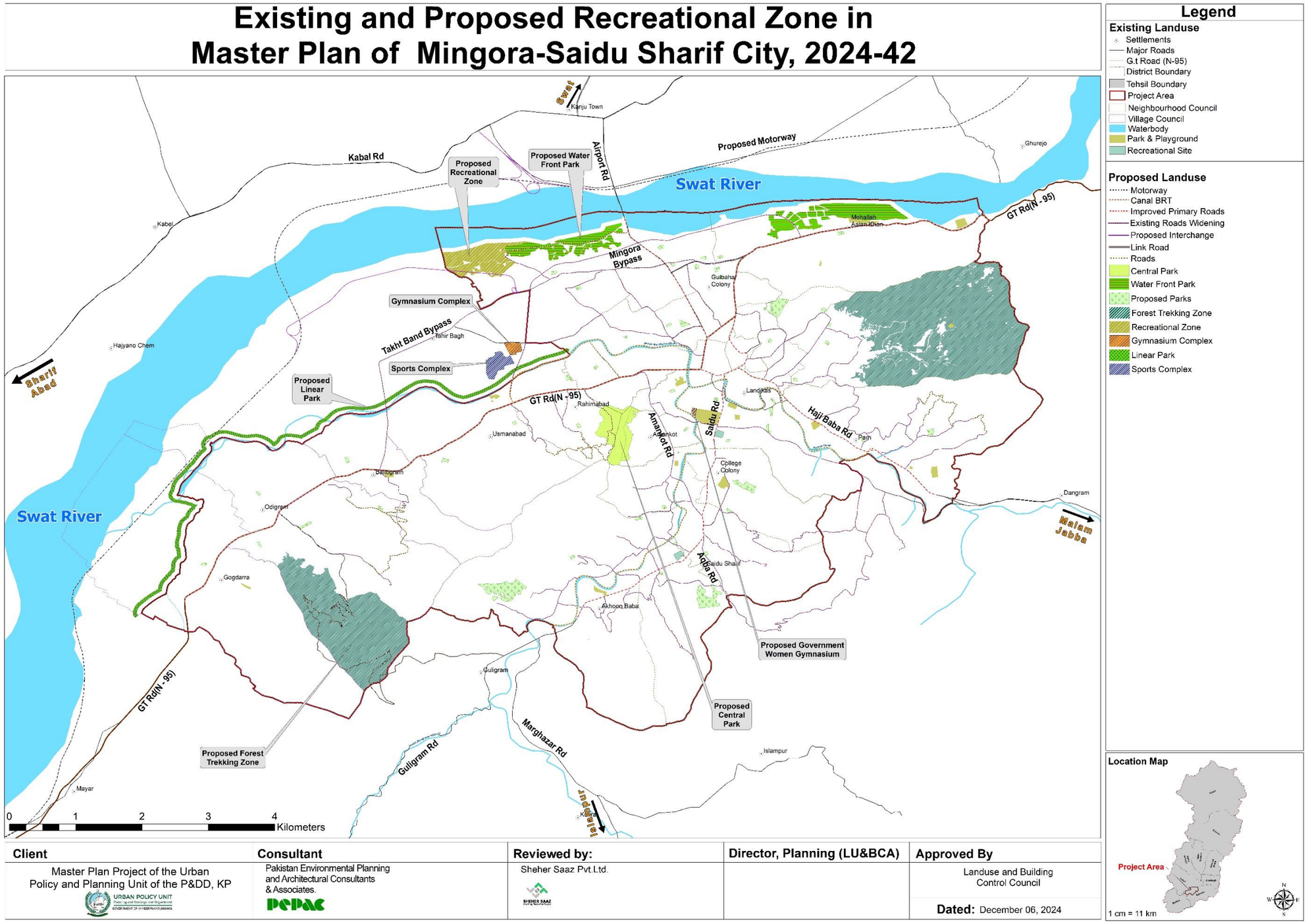
Source: Devised by Consultant

Table 42: Regulations for Recreational Zone

Permitted Uses	Permitted on appeal Land Uses
• Recreational areas include parks, playgrounds and related uses. • Amusement Parks and Playlands • Youth hostels and clubs • Bus halts and car parking areas. • Dwellings for watch and ward staff. • Urban Forest • Orchard • Plant Nurseries • Botanical Garden • Swimming Pool • Picnic Hut • Shooting Range • Botanical Garden • Public utilities and municipal facilities.	• Restaurants and establishments selling eatables • Incidental recreational uses. • Graveyards • Guest house

Source: Devised by Consultant

Map 18: Proposed Recreational Facilities – Mingora-Saidu Sharif



Source: Devised by Consultant

Chapter 8: Agriculture and Livestock

The existing agricultural land in the study area covers 825.31 acres, with an additional 481.51 acres dedicated to orchards. To enhance agricultural sustainability and productivity, the Master Plan proposes a total of 985.51 acres for designated agricultural zones. This includes 62.2 acres for a Reserve Agriculture Zone to protect vital farmland, 196.01 acres for a Proposed Orchard Zone to expand fruit cultivation, 698.24 acres for a Terracing Farming Zone to optimize hilly terrain for sustainable farming, and 29.06 acres for a Livestock & Poultry Farming Zone to support livestock and poultry production.

Table 43: Proposed Agricultural Zones

Existing Agricultural Area (Acres)	825.31
Existing Orchards	481.51
Reserve Agriculture	62.2
Proposed Orchard	196.01
Terracing Farming Zone	698.24
Livestock and Poultry Farming Zone	29.06
Total Proposed Area (acres)	**985.51**

Source: Devised by Consultant

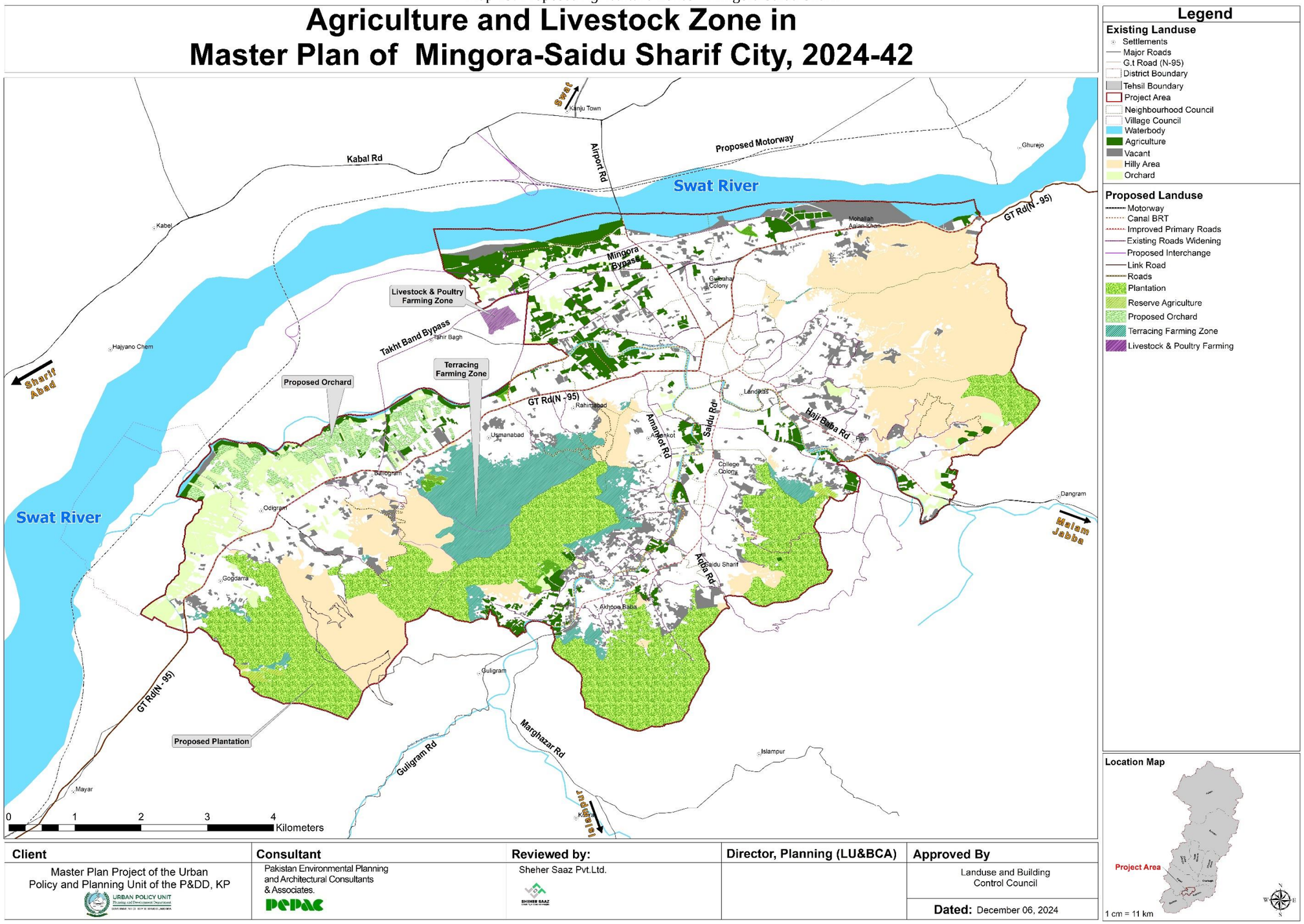
8.1. Zoning Regulation for Agriculture Land Use

Here are the guidelines developed for agricultural zone development:

Permitted Uses	Allied Permitted Uses	Prohibited Uses
• Develop land use for proposed agriculture in designated areas and prohibit the conversion of agricultural lands to non-agricultural uses. • Incentives for farmers to adopt modern technologies and improve their productivity. • Development of farmer's markets and direct marketing of agricultural products to consumers. • Agricultural research and development.	• Related land activities with respect to its rules and regulations • Agro-processing industries (e.g., food processing, textile manufacturing, etc.) • Renewable energy generation (e.g., solar panels on farms) • Rural tourism (e.g., farm stays, guided tours, etc.) • Forestry and agroforestry • Accommodation for farmers and labor in associations with MC.	• Conversion of agricultural land to non-agricultural uses, e.g. residential, commercial, or industrial development. • Use of harmful agrochemicals or practices that degrade soil quality or pollute water sources. • Cultivation of crops or raising of livestock that are not appropriate for the region or that require excessive amounts of water or other resources. • Any activities that are illegal or harmful to the environment or public health.

Source: Devised by Consultant

Map 19: Proposed *Agriculture Zones* - Mingora Saidu Sharif



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				Dated: December 06, 2024

Source: Devised by Consultant

Chapter 9: Environment & Urban Forestation

Mingora faces significant environmental challenges, including water pollution, deforestation, air pollution, and poor waste management due to rapid urbanization. While initiatives such as tree plantation campaigns and waste management projects have been introduced, sustained efforts are needed to address these concerns effectively.

9.1. Groundwater Quality

A total of nine groundwater samples were collected from different locations in Mingora. The results indicated high Total Dissolved Solids (TDS) in all samples, with five locations experiencing a salty taste and one sample showing excessive total hardness. While pH, heavy metals, and other chemical parameters remained within National Environmental Quality Standards (NEQS), the overall water quality was not satisfactory. The high TDS and salinity levels highlight the need for immediate interventions to ensure safe drinking water.

9.2. Surface Water Quality

Twelve surface water samples were analyzed from upstream, midstream, and downstream locations. The results confirmed that the water quality met FAO standards, with no contamination detected. However, potential risks such as industrial waste, sewage discharge, and increasing tourism could threaten water quality in the future. Strict monitoring and preventive measures are necessary to maintain safe surface water conditions.

9.3. Ambient Air Quality

Air quality monitoring was conducted at 15 locations, revealing contamination in 13 areas. Pollutants such as SO_2, NO, NO_2, and NOx exceeded NEQS limits, while O_3, PM_{10}, and TSP remained within permissible levels. The primary sources of air pollution include vehicular emissions, industrial activities, and agricultural practices. The findings indicate a need for effective pollution control measures, such as emission regulations and afforestation efforts, to improve air quality.

9.4. Recommendations

To address groundwater contamination, water treatment systems, improved sanitation infrastructure, and regular monitoring programs should be implemented. Protecting surface water quality requires preventing industrial and sewage discharge while enforcing environmental regulations. For air quality improvement, controlling vehicular emissions, regulating industries, and promoting tree plantation initiatives are essential steps toward a healthier environment in Mingora.

For detailed data, analysis, and findings, please refer to Volume III of this report.

9.5. Environmental Proposals

This section outlines the proposed environmental measures for agriculture, wildlife, fisheries, plantations, wetlands, and overall resources in Mingora. These proposals were developed with the relevant terms of reference (TORs) in mind and aim to address the necessary environmental criteria for the region.

9.5.1. Agriculture

To increase agriculture productivity and promote sustainable agriculture in Mingora city, the following objectives have been identified: enhance market access, strengthen agriculture research, reduce environmental impacts, promote organic farming, conserve biodiversity, mitigate climate change impacts, and increase food production and quality.

Proposed solutions include strict compliance, subsidies on agricultural products, community gardening and farming, allocation of spaces for agriculture through public-private partnerships, mandatory urban agriculture in new developments, conversion of barren land to agriculture land, establishment of parks through native species plantation, and promotion of research-academia linkages.[8]

9.5.2. Urban Forestation & Ecological Corridors

Mingora city faces challenges in expanding urban forestation due to limited land, water shortages, lack of awareness, and inadequate institutional support. To promote tree plantation and ecological corridors, strategies such as sustainable development, urban horticulture, green building codes, and government initiatives must be adopted. Community engagement, private-sector investment, and collaboration with academic institutions can further enhance efforts.

Key constraints include land scarcity, water limitations, and resource shortages. Solutions involve identifying suitable areas like parks for plantation, implementing sustainable irrigation techniques such as rainwater harvesting, and raising awareness through education campaigns. Resource mobilization from government agencies, NGOs, and local communities is essential, along with strong institutional support from relevant departments.

To increase green cover and improve the urban environment, authorities should regulate development by banning illegal housing schemes, reducing parking requirements, and promoting urban forest management. Governments must allocate budgets, offer tax incentives, and enforce green cover regulations. Public participation in tree-planting events and private-sector involvement can ensure long-term sustainability. Collaboration with academic institutions can further support research and training for ecological conservation.

The area wise details of urban forestation zone are given in the table below;

Table 44: Proposed Urban Forestation Zone

Urban Forestation Zones	
Proposed Zones	**Area (Acres)**
Forestation & Tree Plantation	2147.8
Landfill Site Buffer (300 m)	105.71
Riparian Zone (61m)	247.29
Total	**2500.8**

Source: Devised by Consultant

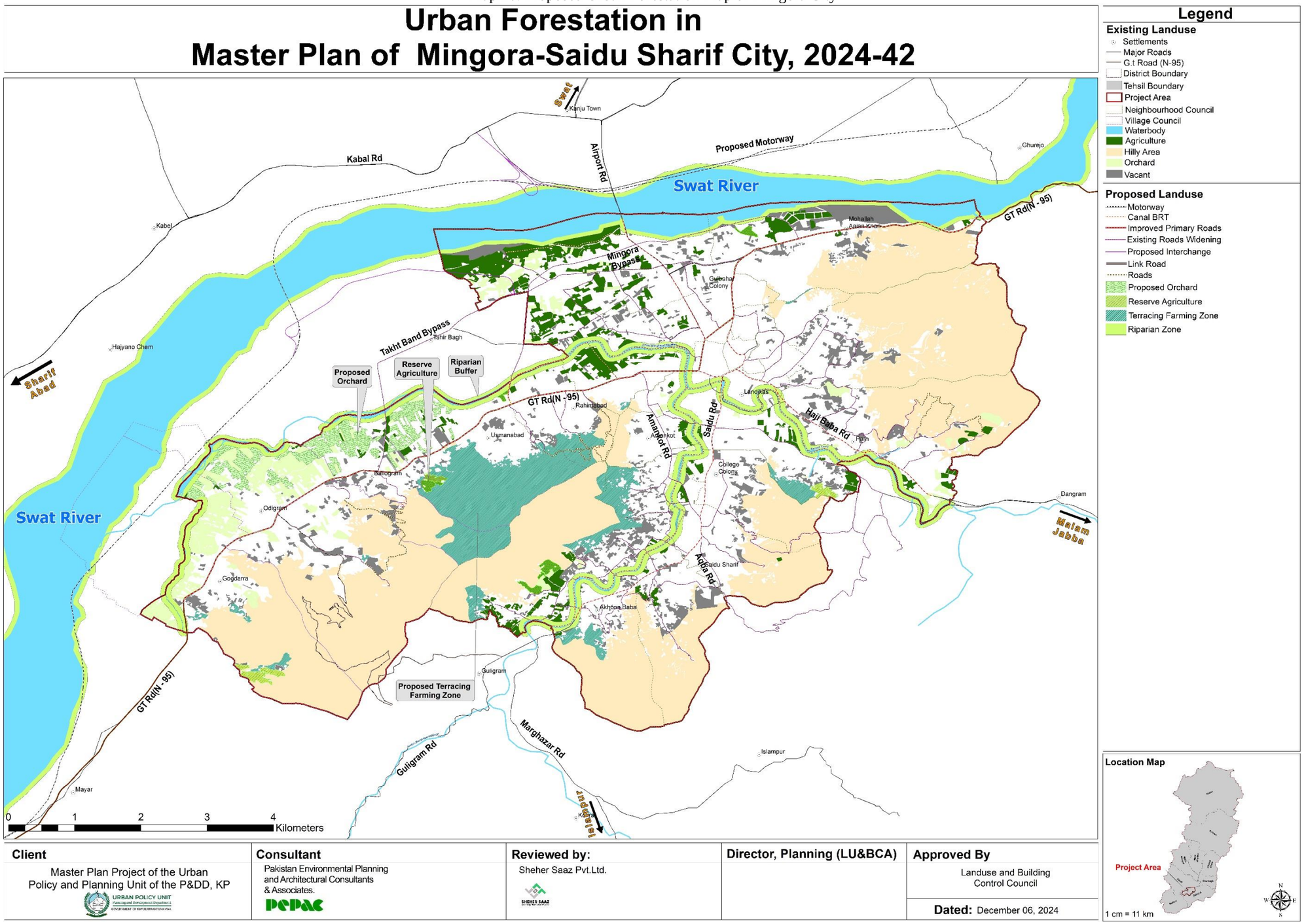
Here are the guidelines developed for Urban Forestation zone development in case of Mingora-Saidu Sharif;

[8] Directorate of Agriculture Research, KPK

Permitted Uses	Allied Permitted Uses	Prohibited Uses
• Land is used for horticulture, landscaping, plantation, green belt, forestation. • Development of walking and cycling trails, picnic areas, and other recreational facilities that are compatible with the preservation of the natural environment. • Implementation of stormwater management practices that use vegetation to mitigate runoff and improve water quality. • Installation of green infrastructure, such as green roofs or walls, that contribute to urban forestation and the conservation of natural resources. • Agricultural research and development.	• Temporary accommodation for labor and security persons • Specific parking area for any accident and unplanned incident Forestry and agroforestry. • Accommodation for farmers and labor in associations with MC. • Eco-tourism and recreation activities, such as guided nature walks, bird-watching, and photography, that promote the conservation of natural resources and the benefits of urban forestation. • Installation of renewable energy systems, such as solar panels or wind turbines, that are compatible with the preservation of the natural environment.	• Conversion of the urban forestation zone to non-forest uses, such as commercial, industrial, or residential development. • Use harmful agrochemicals or practices that degrade soil quality or pollute water sources. • Use of the urban forestation zone as a dumping ground for waste materials, including construction debris or hazardous waste. • Establishment of any activities that are illegal or harmful to the environment or public health.

Source: Devised by Consultant

Map 20: Proposed Urban Forestation Map of Mingora City



Source: Devised by Consultant

9.5.3. Fisheries

Swat Valley has a long tradition of fish culture, and Mingora's freshwater bodies offer opportunities for fisheries and aquaculture development. To support sustainable growth, the plan suggests education and training for fishers, research in aquaculture technologies, and improved marketing and distribution of fish products. Proposed measures include investment in aquaculture, regulatory frameworks, technology transfer, and infrastructure support. Ensuring responsible fishing practices and industry development can enhance local production while maintaining environmental sustainability.

9.5.4. Wildlife

Wildlife conservation is crucial for maintaining a healthy environment and preventing natural disasters. Unfortunately, the rapid urbanization and human activities in Mingora, Pakistan have led to a decline in local species. To protect the city's diverse range of wildlife, there is a need for practical measures to conserve and safeguard them. These measures include banning all forms of hunting of endangered animals, sustainable wildlife management, creating more green spaces and protected areas, and controlling invasive species through education and awareness. [9]

To achieve these goals, it is necessary to implement strict laws against illegal hunting, promote sustainable tourism, restore habitats, and monitor biodiversity. Additionally, the prohibition of new construction in natural wildlife zones and the development of community-based conservation can be effective in protecting wildlife. To reduce local communities' reliance on hunting and woods, alternative sources of income must be improved and offered. By implementing these measures, the city can protect its wildlife and promote sustainable living.[10]

9.5.5. Aggregate Resources

Aggregate resources, including minerals, such as sand, gravel, and precious gemstones, are vital for construction and other industries in Mingora. To protect these resources and ensure their sustainable use, a resource assessment should be conducted, and land use planning should incorporate designated areas for extraction. Environmental impact assessments should be carried out, and best management practices should be implemented, including monitoring and enforcement. Reclamation and restoration is needed of the hour, and community engagement should be prioritized.

To meet the goals of preserving aggregate resources sustainably, proposals such as regulatory compliance, resource management planning, and community engagement should be considered. Additionally, health and safety procedures for workers, sustainable management, reuse and recycling, and a ban on deforestation of materials should be put in place. Pursuing these proposals would support the needs of wildlife, the environment, and local communities while ensuring that resources are managed responsibly.

The proposed plan for sustainable management of aggregate resources in Mingora will result in numerous positive impacts on air, water, noise, and soil pollution. By regulating and

[9] Forestry, Environment & Wildlife Department Govt of Khyber Pakhtunkhwa
[10] https://en.wikipedia.org/

managing these resources responsibly, wildlife, the environment, and local communities will be protected, and the resources themselves will be preserved for long-term use.

9.5.6. Environmental Conservation Areas and Floodplains

To promote environmental conservation and floodplain management, it is essential for the local authorities and community to work together. The objectives are to be focused on biodiversity conservation, ecosystem health, flood management, water quality improvement, community engagement and education, and sustainable use of resources. By pursuing these goals, the local environment can be protected, preserved, and used in a sustainable manner for the benefit of present and future generations.

To implement these goals, several proposals are recommended. The establishment of protected areas is necessary to set aside areas for the conservation of wildlife, forests, and other sensitive habitats, and manage these areas through the creation of management plans and monitoring programs. Developing a comprehensive floodplain management plan and regulating land use in floodplains are also important. Promoting sustainable water use, engaging the community, monitoring and evaluating progress, and fostering partnerships and collaboration are essential steps towards achieving the goals for environmental conservation and floodplain management in Mingora city.

The area for environmental conservation zone is shown in the following table:

Table 45: Environmental Conservation Areas

Sr.	Zone	Area (Acre)
1	Existing Orchards	481.51
2	Reserve Agriculture	62.2
3	Proposed Orchard	196.01

Source: Devised by Consultant

As the local authorities and community work together to achieve the goals of environmental conservation and floodplain management, the city of Mingora can look forward to a cleaner, healthier, and more sustainable environment that fosters a higher quality of life for its residents. The proposal for environmental conservation entails the implementation of water recharge zones within the existing parks. A portion of 2% of the total park area has been designated for water recharge purposes.

Here are the guidelines developed for Environmental Conservation zone development:

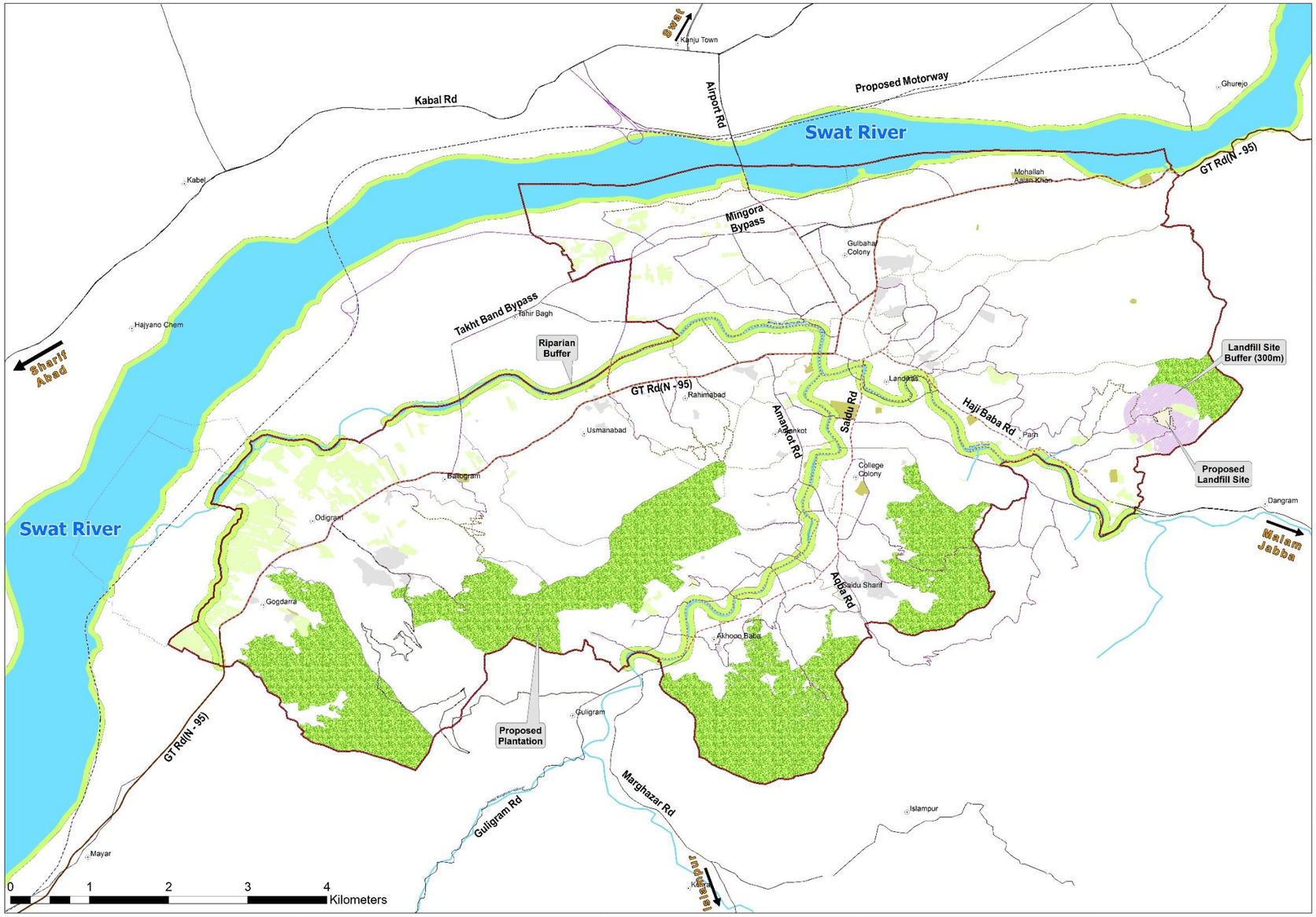
Table 46: Guidelines for Environmental Conservation Zone

Permitted Uses	Allied Permitted Uses	Prohibited Uses
• Non-destructive recreational activities, such as hiking, birdwatching, and camping, that don't harm the natural ecosystem and cause	• The construction of hiking trails or campgrounds to support non-destructive recreational activities • The construction of research facilities or	• Industrial activities that produce pollution or degrade the environment and floodplain • Mining, logging, or other extractive

Permitted Uses	Allied Permitted Uses	Prohibited Uses
no damage to the floodplain. • Low-impact agricultural practices, such as organic farming and agroforestry. • Agricultural practices that are designed to be flood-resistant, such as using contour farming techniques or raising crops that are adapted to wet conditions • Flood control and prevention activities, such as constructing flood control structures or planting vegetation that helps stabilize river banks and reduce erosion. • Ecotourism and nature-based tourism that does not harm the environment. • Research and education activities related to environmental conservation and floodplain management.	education centers to support research and education activities related to environmental conservation and floodplain management. • The construction of eco-lodges or other tourist accommodations to support ecotourism and nature-based tourism. • The construction of flood control structures or planting of vegetation that helps stabilize river banks and reduce erosion to support flood control and prevention activities.	activities that damage ecosystems and cause soil erosion • Development of large-scale commercial or residential buildings that disrupt natural habitats and increase the risk of flooding. • Activities that damage the floodplain, such as filling, grading, or excavation.

Map 21: Proposed Environmental Conservation Area Map of Mingora City

Enviromental Conservation Area in Master Plan of Mingora-Saidu Sharif City, 2024-42



Legend

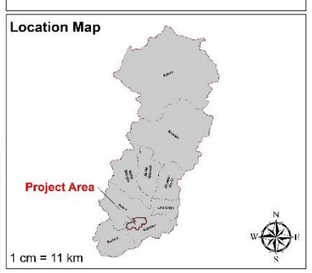
Existing Landuse

- Settlements
- Major Roads
- G.t Road (N-95)
- District Boundary
- Tehsil Boundary
- Project Area
- Neighbourhood Council
- Village Council
- Waterbody
- Graveyard
- Park & Playground
- Orchard

Proposed Landuse

- Motorway
- Canal BRT
- Improved Primary Roads
- Existing Roads Widening
- Proposed Interchange
- Link Road
- Roads
- Plantation
- Landfill Site
- Landfill Site Buffer (300 m)
- Riparian Zone

Location Map



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP	Pakistan Environmental Planning and Architectural Consultants & Associates.	Sheher Saaz Pvt.Ltd.		Landuse and Building Control Council **Dated:** December 06, 2024

9.6. Conclusion

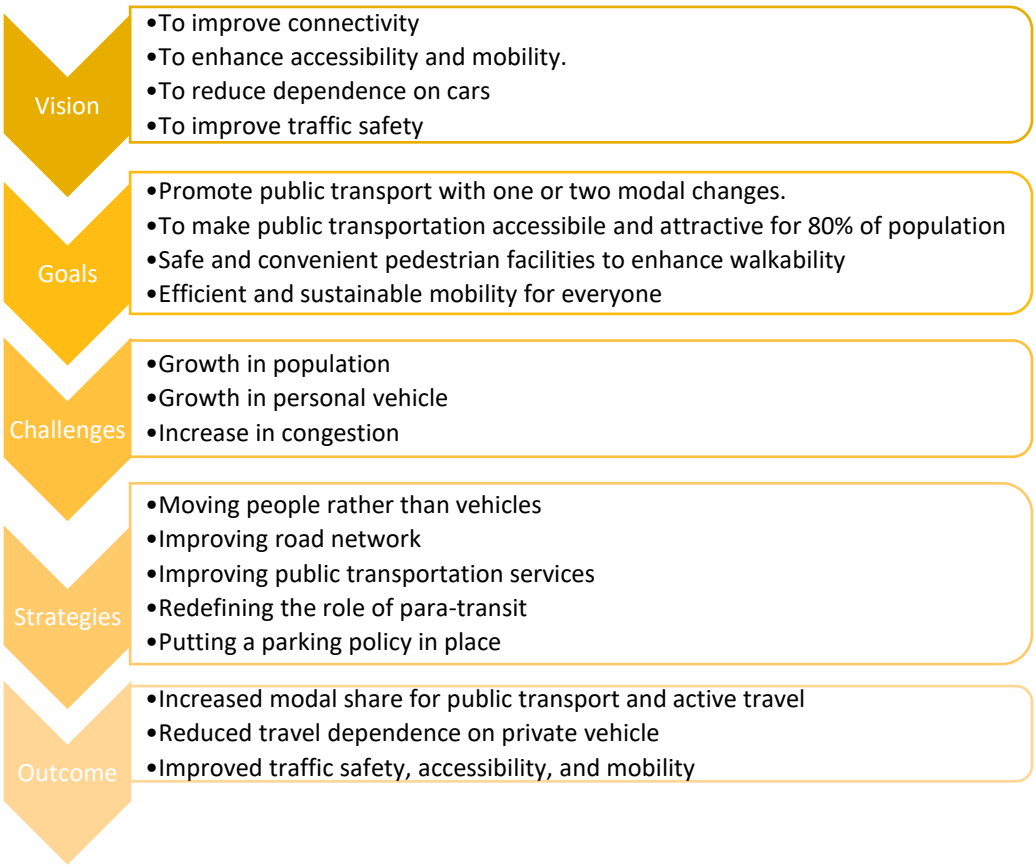
To sustain and enhance the quality of life in Mingora city, urbanization and climate change necessitate innovative solutions. Public green infrastructure benefits the environment, human health, and air quality. In order to lessen air pollution, improve air quality, and safeguard natural resources, a sustainable city design for Mingora will integrate eco-friendly activities, green areas, and supporting technologies into the urban environment. Modern sustainable cities have multiple benefits e.g., cleanliness and efficiency. Moreover, Sustainable communities are resilient to social, economic, and natural shocks. They are well prepared for natural disasters, which are increasing in intensity and frequency due to climate change. In a nutshell, the above-stated proposals for a sustainable and state-of-the-art green environment would prove to be a game changer for Mingora city and its residents if implemented in a true spirit.

10. Urban Transportation, Mobility & Accessibility

10.1. Existing Conditions

Mingora City is currently experiencing severe traffic congestion, particularly in the city center, due to high traffic volumes on major corridors such as GT Road (N-95), Haji Baba Road, Saidu Sharif Road, and Umar Farooq Road. These roads converge at key intersections, including Naway Kalay Chowk, Sohrab Khan Chowk, Green Chowk, and Nishat Chowk, which are heavily congested during peak hours. The vehicle mixes on these corridors primarily consists of cars, motorcycles, rickshaws, freight trucks, and a limited number of public transport vehicles such as Suzuki and Hiace. The existing road network lacks essential features such as service lanes, footpaths, and adequate capacity to handle current traffic demands. Additionally, the absence of traffic signage, lane markings, and pedestrian facilities exacerbates the problem. Encroachments by hawkers and vendors, along with illegal parking, further reduce the effective Right of Way (ROW) and hinder smooth traffic flow. Public transport services are inadequate, with limited coverage and no last-mile connectivity, forcing residents to rely on private vehicles. These issues are compounded by poor enforcement of traffic bylaws and a lack of parking management strategies. The approach to achieve a comprehensive mobility plan addressing all transportation needs of Mingora city is comprised of five steps. Key components of this five-step methodology are summarized below:

Figure 3: Comprehensive Mobility Plan Approach



Source: Developed by Consultant

10.2. Proposed Interventions

The Comprehensive Mobility Plan for Mingora City aims to address these challenges by implementing a People-Centric Urban Transportation System. The proposed interventions are based on detailed studies, including Traffic Volume Counts, Level of Service (LOS) Analysis, Trip Generation Calculations, and Parking Demand Surveys. The details of these studies and calculations are provided in Volume 3 of the report. Below are the specific proposals:

10.2.1. Road Network Improvements

10.2.1.1. Existing Roads

The primary roads in Mingora, including GT Road (N-95), Haji Baba Road, Saidu Sharif Road, and Umar Farooq Road, are critical for intra-city and intercity connectivity. However, these roads lack essential features such as service lanes, footpaths, and adequate capacity to handle future traffic demands. Secondary roads, such as Amankot Road, Gunbad Maira Road, Kanrha Baba Road, and Kass Road (New Airport Road), also require improvements to support multimodal transportation

10.2.1.2. Proposed Improvements

Encroachment Removal: All mobile and permanent encroachments along major commercial activity centers will be removed to restore the designed capacity of the roads. This includes encroachments by shop owners, hawkers, and vendors.

Footpath Provision: Footpaths will be constructed near the building line on both sides of primary and secondary roads to ensure safe pedestrian access to adjacent land uses.

Lane Markings: Lanes will be marked throughout the running length of the roads to avoid weaving conflicts among drivers. The lane width will be set at 10 feet for secondary roads to control operating speed and instill cautiousness in driving behavior.

Parking Management: Paid on-street parking will be allowed on only one side of the road to manage parking demand. Temporary parking fees will be introduced to discourage long-term on-street parking.

Public Transport Promotion: Public transportation, cycling, and walking will be heavily promoted to reduce reliance on private vehicles.

Traffic Law Enforcement: Strict enforcement of traffic bylaws and parking policies will be implemented, including increased police patrols and the use of smart cameras.

Missing Link Road: The completion of the Odigram to Saidu Sharif missing link road will enhance connectivity and reduce congestion in the city center.

Utility Relocation: All utilities (electricity, gas, sewage, and water supply pipes) will be shifted underground to create unobstructed space for pedestrians and vehicles.

Access Control: GT Road (N-95) will be converted into a partially access-controlled road, with access provided only through secondary link roads. This will reduce traffic load on the GT Road section from Sohrab Khan Chowk to Madyan Road Intersection.

Road Widening: The existing roads will be widened to enhance capacity. The proposed Right of Way (ROW) for GT Road and Airport Road will be 120 feet, while Haji Baba Road and Saidu Sharif Road will have ROWs of 80 feet and 90 feet, respectively. Tentative cross-sections for these widened roads are provided in Volume III of the report.

10.2.2. Junction Geometry Improvements

10.2.2.1. Existing Conditions

Major intersections in Mingora, including Shahdara Chowk, Nishat Chowk, Sohrab Khan Chowk, Green Chowk, and Naway Kalay Chowk, are highly congested due to illegal parking, lack of footpaths, and poor traffic management. These intersections currently operate at Level of Service (LOS) F during peak hours, causing significant travel time delays.

10.2.2.2. Proposed Improvements

Signalization: Traffic signals will be installed at major junctions to regulate the movement of vehicles and pedestrians.

Lane Markings: Clearly marked lanes, turning lanes, and lane arrows will be added to guide traffic flow and reduce conflicts.

Pedestrian Crossings: Safe and accessible pedestrian crossings will be provided at all major intersections.

Signage: Clear and visible signage will be installed to direct drivers and reduce confusion.

Additional Lanes: Approach and exit lanes will be added at major intersections to improve capacity. For example, Shahdara Chowk will have one additional lane on Bahrain Road and Post Office Road, while Nishat Chowk will have three additional lanes on GT Road.

Slip Lanes: Slip lanes of 60 feet will be introduced at low angles to allow smooth passage of traffic in one direction.

Underpass Construction: An underpass with two lanes will be constructed at Green Chowk to accommodate two-way traffic on Airport Road.

The proposals of additional and slip lanes as well as underpass for through movement was passed on analysis which was done on SIDRA for each junction detail of which is present in Volume III of the report.

10.2.3. Public Transportation Improvements

10.2.3.1. Existing Conditions

Public transport in Mingora is currently limited to Suzuki and Hiace vehicles operating on GT Road, Haji Baba Road, and Airport Road. These vehicles operate on random routes and lack fixed stops, leading to inefficiencies. Remote areas have no access to public transport, forcing residents to rely on private vehicles.

10.2.3.2. Proposed Improvements

Fixed Routes: Public transport vehicles will operate on fixed routes along primary roads, with designated stops near major commercial and business centers.

Feeder Services: Flexible transit services such as qinqchi and rickshaws will operate on secondary roads to provide last-mile connectivity.

Policy Enforcement: Strict policies for vehicle fitness certificates and high parking fees will be implemented to discourage private vehicle use.

Bus Services: Public transport buses will be introduced on all primary roads, operating on dedicated bus lanes to avoid congestion delays.

BRT System: An elevated Bus Rapid Transit (BRT) system will be constructed over Jambil & Marghazar Khawr and Saidu Khawar to provide efficient public transport for commuters to the city center. This system will bypass congestion, reduce traffic, and lower emissions.

10.2.4. Parking Management

10.2.4.1. Existing Conditions

Illegal parking on primary roads reduces the effective ROW and causes congestion. There is currently no organized parking system in Mingora.

10.2.4.2. Proposed Improvements

Time-Limited Parking: Maximum time limits will be set for parking in high-demand areas such as GT Road and Airport Road.

Paid On-Street Parking: Parking fees will be charged in commercial areas to manage demand and generate revenue.

Signage: Improved signage will be installed to guide drivers to available parking spots.

Parking Plazas: Vacant land along primary roads will be converted into parking plazas to accommodate parking demand. Proposed locations include:

Table 47: Proposed Parking Plazas Locations

Plaza ID	Latitude	Longitude
Parking Plaza 01	34°46'53.54"N	72°21'43.78"E
Parking Plaza 02	34°47'19.85"N	72°21'1.01"E
Parking Plaza 03	34°46'26.33"N	72°21'22.16"E
Parking Plaza 04	34°46'14.46"N	72°21'37.26"E
Parking Plaza 05	34°44'50.20"N	72°21'15.16"E
Parking Plaza 06	34°46'18.59"N	72°21'8.71"E

Smart Parking Systems: Parking sensors and license plate recognition cameras will be installed to monitor and enforce parking regulations.

10.2.5. Traffic Signage and Non-Motorized Transport

10.2.5.1. Existing Conditions

The lack of traffic signs, signals, and road markings leads to confusion and accidents. Pedestrian facilities are virtually non-existent.

10.2.5.2. Proposed Improvements

Traffic Signage: Directional, informational, and regulatory signage will be installed at key locations:

Table 48: Proposed Signage

	
Directional Signage: At Haji Baba Chowk **Coordinates:** 34°46’25” N, 72°25’43” E	**Informational Signage:** At Shagai Road **Coordinates:** 34°44’34’’N,72°20’49’’E
	
Informational Signage: At Saidu Road **Coordinates:** 34°45’40’’N, 72°21’32’’E	**Directional, Informational & Regulatory Signage (slow speed, no parking):** At Main Bazar Chowk **Coordinates:** 34°46’18” N, 72°21’41” E
	
Directional, Informational & Regulatory Signage (slow speed, no parking): At Nishat Chowk **Coordinates:** 34°46’18” N, 72°21’37” E	**Directional Signage:** At Saidu Stop **Coordinates:** 34°44’47” N, 72°21’16” E

	
Directional Signage: At Sohrab Khan Chowk **Coordinates:** 34°46’13’’N, 72°21’28’’E	**Directional Signage:** At Taj Chowk **Coordinates:** 34°46’34’’N, 72°21’39” E

Source: Developed by Consultant

Footpaths: Footpaths will be constructed along all primary and secondary roads to ensure safe pedestrian access to commercial markets, retail shops, and educational centers.

10.3. Conclusion

The Comprehensive Mobility Plan for Mingora City is designed to address existing traffic challenges and improve overall mobility by promoting multimodal transportation, enhancing public transport services, managing parking demand, and improving road infrastructure. Detailed studies, including Traffic Volume Counts, LOS Analysis, Trip Generation Calculations, and Parking Demand Surveys, were conducted to support these proposals. The details of these studies and calculations are provided in Volume 3 of the report. The proposed interventions will create a more efficient, sustainable, and people-centric transportation system for Mingora City.

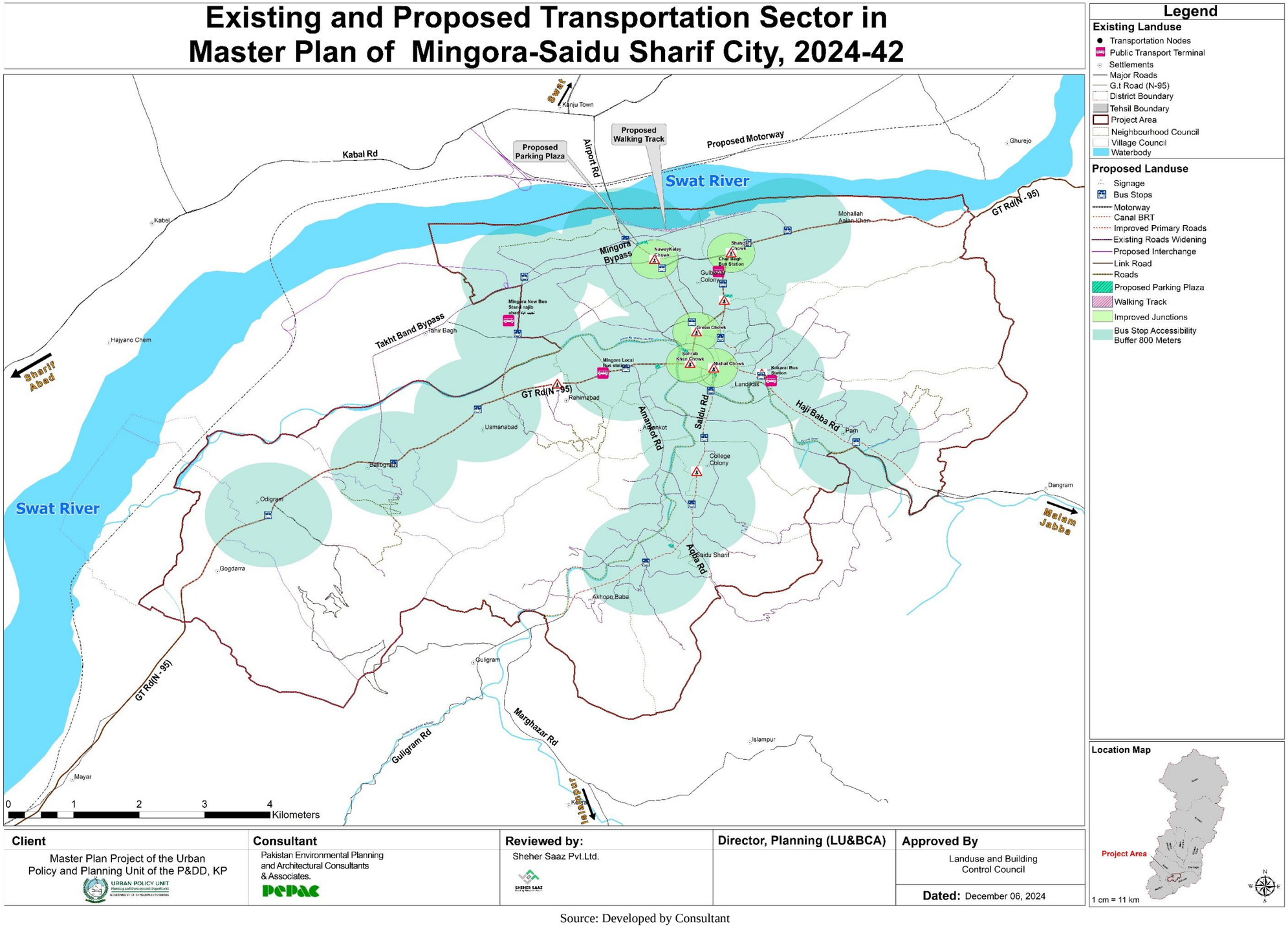
10.4. Improved Traffic Mobility

Comprehensive mobility planning in Mingora aims to enhance accessibility through a well-balanced roadway network. Key strategies include removing encroachments, widening primary roads, and adding footpaths to support both motorized and active transportation. Dedicated lanes for cyclists, motorcyclists, cars, and public transport will improve traffic flow and safety. Footpaths on primary and secondary roads will enhance pedestrian connectivity, particularly commercial and educational hubs.

To further improve mobility, forced turns at intersections and designated U-turns at major junctions are proposed. A structured public transport system with local wagons feeding into minibuses on major corridors will enhance efficiency. For parking management, vacant land along GT Road (N-95) is identified for a parking plaza, encouraging walkability, while paid temporary parking on primary roads will discourage illegal roadside parking.

Traffic signage installation, including speed limits and directional signs, will guide commuters and enhance road safety. Overall, these improvements aim to reduce congestion, shorten travel times, and promote multimodal transportation in Mingora.

Map 22: Proposed Improvements in Traffic Mobility – Comprehensive Mobility Plan



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP	Pakistan Environmental Planning and Architectural Consultants & Associates.	Sheher Saaz Pvt.Ltd.		Landuse and Building Control Council
				Dated: December 06, 2024

Source: Developed by Consultant

Chapter 11: Solid Waste Management

Town/Tehsil municipal Administration (TMA) is responsible for dealing with solid waste problems according to promulgation of Local Governments Ordinance 2000. Despite of this, up to 31% to 49% waste lies haphazard in open areas, roads and streets in Pakistan, while various municipal authorities have the waste efficiency between 51 to 69%[11].

Solid Waste Management is one of the core areas identified in the National Environmental Action Plan. It presents a major challenge in Pakistan as the planning lack a systematic, comprehensive and integrated approach for municipal solid waste management. Solid waste generation rate in Pakistan ranges between 0.6 to 0.8 kg/capita/day and the waste generation growth rate is 2.4 % per year.[12]

Mingora city lacks a properly engineered landfill site, the solid waste generated in Mingora is either dumped in open areas or burned, causing environmental pollution and health hazards. The lack of proper infrastructure for solid waste collection and transportation also exacerbates the problem. The city needs an integrated solid waste management system that includes waste segregation at source, proper collection, transportation, and disposal. A landfill site with proper engineering and facilities like a leachate treatment plant and waste-to-energy plant can ensure safe and efficient disposal of the city's solid waste. Additionally, investments in machinery and equipment like waste collection trucks, compactors, and sweepers will help in improving the efficiency of the waste management system. The implementation of such a system can led to a cleaner and healthier environment for the citizens of Mingora.[13]Caple of reducing waste, reusing and recycling resources and products is often called the “3Rs”. Waste minimization can be achieved in an efficient way by focusing primarily on the first of the 3Rs, “reduce” followed by “reuse” and then “recycle”.

11.1Existing Situation and Analysis

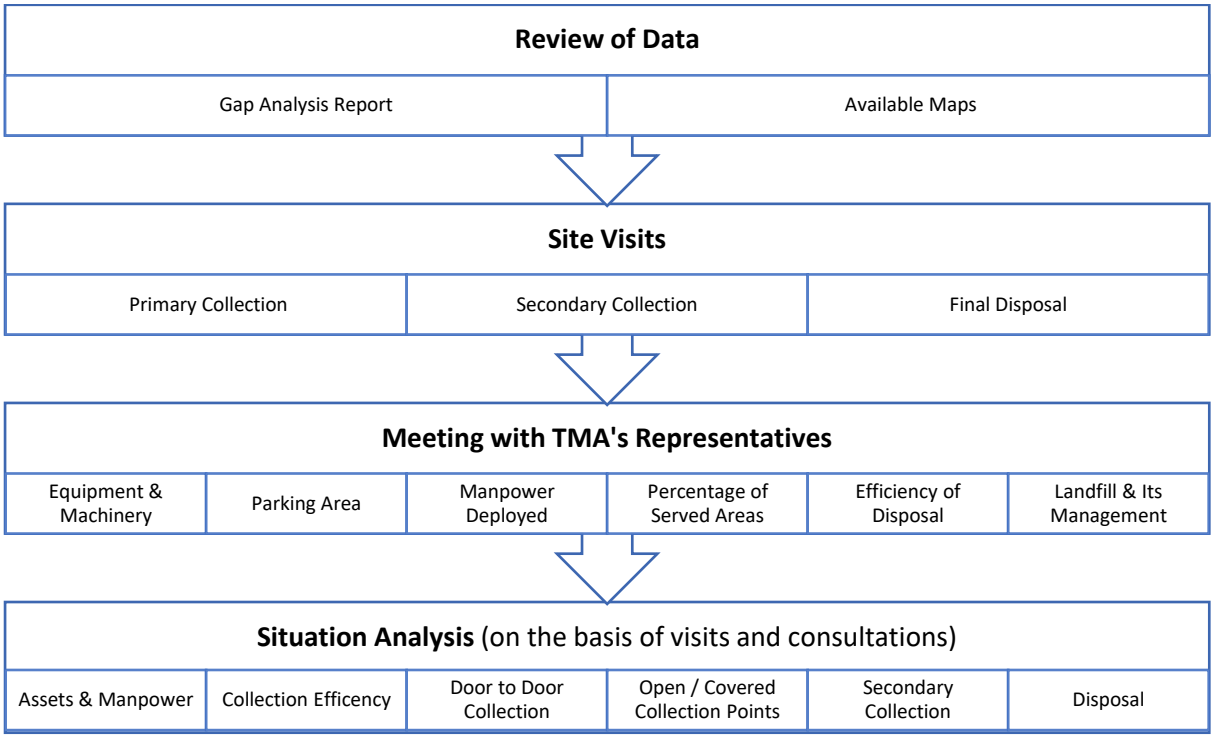
In **2018**, the Tehsil Municipal Administration (TMA) acquired a barren/unproductive land measuring **8.02 acres** for a garbage disposal site near the village Kawtaro Mera, approximately **3 km** from Mingora City using the urgency clause of the Land Acquisition Act (LAA). The land was handed over to the Water Sewerage and Sanitation Company **(WSSC)** in **2018** and has been used as an open waste dumping site since then. [14] WSSC Swat has acquired around **60 Kanal** lands at Kawtaro Maira, Panr tobe used as land fill site for waste disposal. The details of the proposed landfill sites are shown below.[15]

[11] Government of Pakistan, 2005. Draft Guideline for Solid Waste Management. Pakistan Environment Protection Agency (PEPA). Available at: http://www.environment.gov.pk/eaglines/swmglinesdraft.pdf
[12] http://kp.gov.pk/uploads/2015/10/Solid_Waste_Management.pdf
[13] ADB, Solid Waste Management Study in Mingora City (2022)
[14] WSSC, Swat.
[15] Data Obtained from WSSC, Swat (2022).

Landfill/ Transfer site	Coordinates	Area (Kanal)	Distance from Transfer Station	Avg. distance from City per trip	Dumping Procedure
Kawtaro Mira Dumping Site	34.7645, 72.3956	60	4.8 Kms	4 Kms	Operational (yet to develop Landfill site)
Transfer Station	34.7655, 72.3543	6	N/A	2.2 Kms	Transfer point

The total amount of waste generated is 143.838 Tons/day, considering 80% storage in 7m^3 containers and 20% in 0.8 m^3 capacity containers and the density of loose waste as 250 kg/m^3, 45 and 98 containers of 7 and 0.8 m^3 respectively are required for storage of waste while WSSC Swat company has already 70 & 140 storage containers of volumetric capacity of 7 m^3 and 0.8 m^3 for storage purpose which is already sufficient for storage. However, their placement needs to be done according to the waste generation in a particular area as well as the time and motion analysis of secondary collection vehicles.[16]

Methodology for situational analysis is given below:



[16] Secondary data provided by WSSC, 2022

11.1.1. Classification of Solid Waste

11.1.2. Main Economic Activities

11.1.3. Solid Waste Generation

Waste generation encompasses activities in which materials no longer considered of value (refuse from households, farms, non-hazardous solid waste from industrial, commercial and institutional establishments including hospitals, market waste and garden waste as well as street sweepings) are either thrown away or gathered together for disposal. The current population along with waste generation are given below:

Table 49:Solid Waste Generation

Sr. No.	Year	Rate of waste generation per kg/capita/day	Population (2022)	Tons/day
1	2022	0.36	399,549	143.838

kg = kilogram.

** WSSC Swat (2022).*

11.1.4. Collection & Transportation

WSSC Swat have currently deployed its full resources to collect and dispose of the waste generated on a daily basis. This system is less efficient since it requires more time and more manpower to function. The innovation of rickshaws and mini dumpers helps to improve reach and efficiency.

Currently, the WSSC Swat has a collection fleet with an overall capacity of 57 tons/day. The fleet includes 2 tractor trollies, 3 dumpers, 4 multiloaders and 02 hino compactors. Total daily solid waste collection and disposal by WSSC Swat is 57 Tons, whereas the total daily waste generation for the year 2021 is 223 tons, there is a significant lifting lapse of approx. 161 tons per day due to the insufficient number and type of vehicles. (WSSC Swat, 2022).

Waste collected by collected vehicles is taken directly to the dumping site at Katwaro Maira. Smaller vehicles dump their waste at open collection points and this waste is lifted into bigger dump trucks etc.

11.1.5. Machinery and Equipment

Details of secondary collection and transportation machinery are provided in Table below.

Table 50:SWM Waste Carrying Equipment/Machinery Procurement

Sr. No.	Proposed Vehicles	Number of Vehicles	Model/Manufacturing Year	Average Wt. per Trip (Tons)	Average Trips/ Vehicles/day	Total Wt. per Day (Tons)
1	Dumper Trucks	3	1 x 1983 2 x 1984	6	2	36
2	Tractor Trolley	2	2 x 2012	3	2	12
3	Front End Tractor Shovel (MF 385)	2	2 x 2012	0	1	-
4	Tractor Mounted Mechanical Sweeper	1	1 x 2018	-	-	-
5	Multi-loaders	8	4 x 2018, 2 x 2014 2 x 1990	3.5	3	84
6	Compactors (2 x 5m³ & 2 x 7 m³)	4	2 x 2018, 1 x 2014 1 x 2013	4	1	16
7	Mini Dumpers (Suzuki Pick up)	7	All in 2017	0.8	5	0
	Total	**27**	**-**	**-**	**9**	**148**

Source: Secondary data provided by WSSC Swat

Due to their lower efficiency, older transportation vehicles are not recommended for the transportation of trash. These vehicles need to be properly maintained and cared for in order to boost their efficiency and make them more environmentally friendly. Total available machinery for collection and transportation purpose is far less compared to the amount of waste generated.

Table 51: Modes of Waste Collection

Waste GenerationArea	Mode of Collection	Existing Practice
Residential Areas	• Door to door collection using hand carts and garbage dumper, dependingon accessibility.	• Some areas have good service delivery level whereas others have less attention and gets poor service.
Commercial Areas	• Placing communal bins or containers for largecommercial area. • Door to door collection for business in residential area.	• Optimized timing of waste collection in respect to commercial activities.
Construction and Demolition Waste	• Construction wasteis collected through use of special vehicles usually dump trucks along with loader	• MC is collecting waste free of charge.
Industrial Waste	Management of Industrial Solid Waste (ISW) is not the responsibility of the municipal committee. Industries	

Waste GenerationArea	Mode of Collection	Existing Practice
	generating solid waste have to manage such waste by themselves and are required to seek authorizations from respective Environment Protection Agency (EPA) under relevant rules.	
Institutional Waste	• Communal storage outside premises	• MC is collecting waste from communalcontainers.
Hospital Waste	• Communal storage within premises	• Non-hazardous municipal waste is being collected by MC. • Infectious waste is being mixed with municipal waste by healthcare facilities.

Figure 4 :Open Dumping Observed During Field Survey

Buner Road Mingora

Mohallah Usmanabad, Swat

Mamoon Khan Colony Rahimabad, Mingora

Goligram Saidu Sharif

Nawakalay, Mingora

Saidu Sharif

Source: Primary Data Collected from Field Survey

11.1.6. Final disposal / Proposed Landfill sites

WSSC Swat has acquired around 60 Kanal lands at Kawtaro Maira, Panr tobe used as land fill site for waste disposal. The details of the proposed landfill sites are shown below.[17]

Table 52 - Dumping Sites, Distance from City (Km) And Disposal Method

Landfill/ Transfer site	Coordinates	Area (Kanal)	Distance from Transfer Station	Avg. distance from City per trip	Dumping Procedure
Kawtaro Mira Dumping Site	34.7645, 72.3956	60	4.8 Kms	4 Kms	Operational (yet to develop Landfill site)
Transfer Station	34.7655, 72.3543	6	N/A	2.2 Kms	Transfer point

11.2. Gap Identification

Various gaps have been identified from the existing situational analysis, in managing the solid waste such as inefficient collection of waste is varying from area to area where the door-to-door collecting is not done and due to the poor management of the waste, inadequate collection and unsuitable disposal of waste; such as waste collection, transport and disposal such as:

Table 53 Gap identification

Areas	Gaps
Waste Generation	• According to 0.36 kg/capita/day, 143.838 tons/day waste is being generated as per 2022 population whereas for 2042 the estimated waste generation would be **171.583 tons/day**. This shows that about **27.745 tons/day** waste would increase in next 20 years.
Collection	• According to 2022, the total waste collection

[17] Data Obtained from WSSC, Swat (2022).

Areas	Gaps
	efficiency is not satisfactory due to inefficient waste collection system. • Inefficient collection of waste which may vary from area to area where the door-to-door collecting is not done. • Lack of hand carts/motorbike/rikshaws for primary collection of waste from congested areas. • Insufficient Tractor Trolley for secondary waste collection and hance collected waste is not being disposed-off at designated dump sites.
Transportation (Equipment and Machinery)	• Due to low efficiency of equipment and machinery, there is large consumption of time and money in its operation. • Survey showed that there is a need of mechanical instruments for proper management of waste. • The tractors trolleys are slow moving and consuming large fuel & time but carry only one third of the waste to dumping sites as compared to the compactor trucks. • The proposition of continued use of this equipment with enhanced number of manpower will not cure the problem. Rather it will increase the operation and maintenance cost with very little improvement of the service delivery level.
Manpower	• Presently, Mingora city is short of manpower required for the collection and disposal of waste because of the ban imposed on the recruitment of staff since long. The population has increased whereas the manpower has been reduced because of death and retirement of number of skilled and unskilled workers. There is a need of training of officers and workers for operation and maintenance of the machinery.
Disposal	• After conducting survey of dumping site, it was determined that the existing one dumping sites are poorly managed. • Mingora city has a small but covered built-up parking area at present and the vehicles are parked in this area. This space is required to be converted into proper parking area by

Areas	Gaps
	construction of parking sheds, vehicles washing and service arrangements and other allied facilities.

Table 54- Total Estimated HR Requirement

HR	Additional Requirements				
	2022	2027	2032	2037	2042
Sanitary Workers	400	430	455	477	496
Driver	15	5	5	6	6
Sanitary Supervisor	7	2	2	2	2
Sanitary Inspector	1	1	2	2	2

Source: Projection by Consultant

Table 55- Total Estimated Machinery Requirement

HR	Additional Requirements				
	2022	2027	2032	2037	2042
Containers 0.8 m3	158	232	265	298	330
Handcarts Tripping Trolley 0.25 m3	506	742	848	953	1057
Mini Tipper 01 m3	127	186	212	238	264
Arm Roll Containers 5.0 m3	25	37	42	48	53
Garbage Compactor 8.0 m3	16	23	27	30	33

Source: Projection by Consultant

11.3. Disposal of Solid Waste Management

11.3.1. Transfer Stations

Currently, most waste collected by collected vehicles is taken to the dumping site directly. Smaller vehicles dump their waste at open collection points and this waste is lifted in bigger dump trucks etc. In order to improve the overall waste management system and urban environment, depending upon the waste generation rate, location of landfill and collection vehicles, mini waste transfer stations can be proposed at suitable area.

11.3.2. Landfill Site Requirement

A landfill requirement is calculated based on 2017 census, per capita waste generated and percentage of collection efficiency. Population Projection is calculated through the following Model:

Per capita waste generation criteria are given below:

Table 56 - Waste Generation Estimation Criteria

Criteria	Description
SWM Planning Horizon (2022-2042)	20 Years
Population	Projections based on 2017 Census
Per Capita Waste Generation	0.36 Kg/ca/person
Waste Reduction by percentage after every	1%

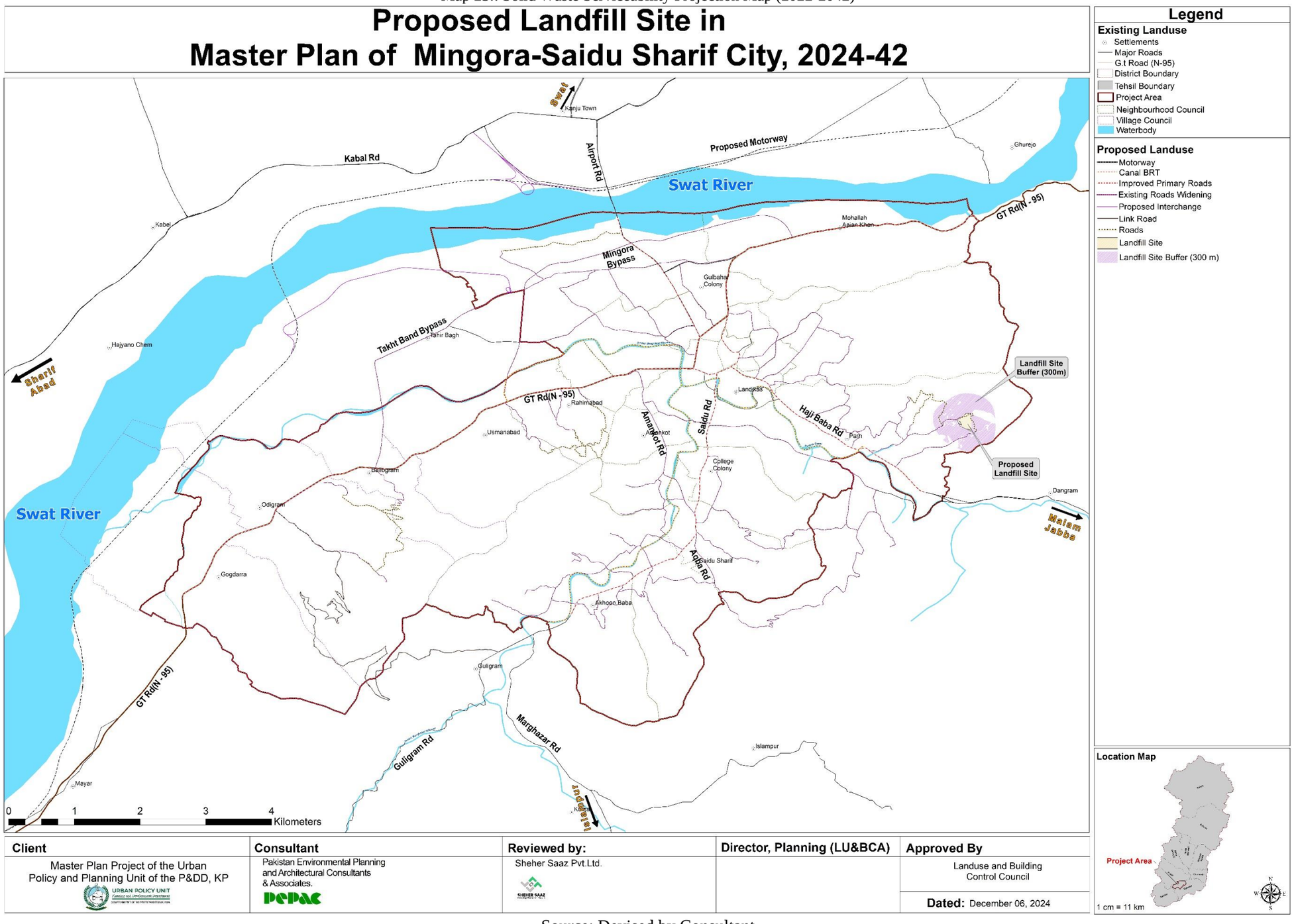
5 years	
Additional allowance (%)	25%
Loose waste density (kg/m^3)	500

For waste projection in the future, a decrease of 1 % to per capita waste generation after every 5 years is applied to current waste generation of 0.36 kg/ca/d. Mingora has a total waste generation rate of 147.63 tons per day in 2022. Keeping in view the infrastructure investment required for landfill, 10 years useful life of landfill is considered for design.

Table 57-Landfill Requirement Over the Year

Year	Population	Generation		Impact of 4Rs: reduction, reuse, recycling and recovery (20%)	Collection			Disposal		Landfill site requirement in acres
		Per Capita (Kg)	Total (Kgs)		Collection Efficiency %	Total Weight kg (W_T)	Total Volume, m3	Yearly volume m3	Accumulative volume m3	
2022	446,425	0.36	160713	128570.4	64	82285	164.57	60068.09	45953.84	1.13
2027	508,436	0.4	203374.4	162699.52	70	142362	284.72	103924.32	149878.16	3.7
2032	575,746	0.44	253328.24	202662.59	75	189996	379.99	138697.21	288575.37	7.12
2037	649,336	0.48	311681.28	249345.02	80	249345	498.69	182021.87	470597.24	11.61
2042	730,366	0.52	379790.32	303832.26	85	322822	645.64	235659.89	706257.13	17.43

Map 23:: Solid Waste Serviceability Projection Map (2022-2042)



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP	Pakistan Environmental Planning and Architectural Consultants & Associates.	Sheher Saaz Pvt.Ltd.		Landuse and Building Control Council
				Dated: December 06, 2024

Source: Devised by Consultant

11.3.3. Criteria for Site Selection

The landfill site will be selected on the basis that it must comply with basic KP government regulations and EPA guidelines for waste management facilities. The proposed selection of this site must take into account impacts from leachate, litter, dust, vector and odour on surrounding environment. The various factors that have been kept in focus while selecting the proposed landfill site are provided below.

Table 58 - Criteria for Site Selection

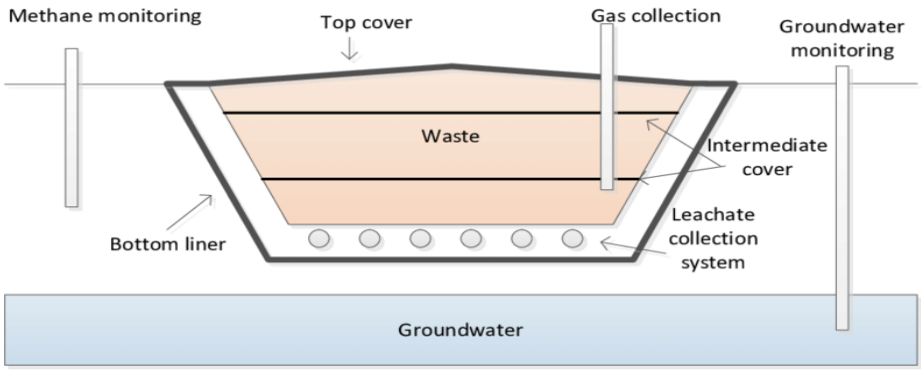
Factors considered for site selection	Rational for Site Selection
Landfill area and capacity to meet requirement of landfill site	Approximately 6 acres of land is required for next 05 years solid waste landfilling and 25 acres of land is required till 2042.
Accessibility of landfill site	Site should be accessible through main road.
Site Stability	Site must be located outside areas susceptible to natural or human-induced events or forces capable of impairing the integrity of landfill components. Examples of unstable areas are those with poor foundation conditions, areas susceptible to mass movements (landslides, rock falls, etc.) and areas with karst terrains (sinkholes).
Land Use	Land use of the site must only be for dumping site, not for other purposes.
CriticalHabitat/SensitiveEcosystem	Site must be falling outside of critical habitats of plants, wildlifeand sensitive ecosystems.
Restricted Zone, Wildlife/ForestProtected areas	Site must be falling outside of restricted zone/wildlife/forestprotected areas.
Site should be located outside of the 10-year groundwater recharge area for existing or pending water supplydevelopment	Site must be located outside of the 10-year groundwater recharge area for existing or pending water supplydevelopment. However, the area naturally may cause the subsoil water recharge during the high rainy seasons.
Perennial stream	No perennial stream should be available within 300 meters down gradient of the proposed landfill cell development. Further bottom lining of each landfill cell and leachate collection system must ensure that no contamination is entering to perennial streams. Surface drainage network has been provided in detail design to avoid risk of surface runoff and contamination.
Topography	The landfill site must be located in a flat, alluvial plain topography.
Ground Water Table	The proposed depth of landfill cell is 10 meter

	(approximately 33 feet), so ground water table must below this limit for no impact on ground water.
Flood plain & other climate risks	A site outside of flood plain is recommended. To avoid surface runoff and contamination, surface drainage network should be provided in detail design of landfill site.
Seismic Risk/Fault lines	Seismic Features should be considered before the development of landfill site. No fault lines or significantly fractured geologic structure should be present within 500 meters of the perimeter of the proposed landfill cell development that may allow unpredictable movement of gas or leachate.
Sensitive Receptors	No sensitive receptors.

11.3.4. Proposed Design Considerations for Landfill

Design selection has a major influence on the construction, operation and restoration of the facility. The design concept depends on the ground conditions, the geology and hydrogeology of the site, the potential environmental impacts and the location of the waste disposal site. In order to incorporate advancement in technology and changes, a periodic review of the design should be carried out, as the lifespan of a disposal site from commencement to completion is long compared to other construction projects. Aspects that have been considered in the design are briefly discussed below:

Table 59 - Landfill Design



11.3.5. Nature and Quantity of the Waste

The nature of waste that will be landfilled at Vehari would be only MSW. It is regarded as waste generated by households and waste of similar nature generated by commercial and industrial premises, institutions such as schools, hospitals and other facilities inhabited by people, construction and demolition of buildings, and from public spaces such as streets, markets, slaughterhouses, public toilets, bus stops, parks and gardens.

As per the estimates, the city generates about 169 tons of waste per day in 2022. For the purpose of calculation of useful life of landfill, if 25% extra waste generated from all other sources is factored-in, total waste reaching the landfill is considered.

Further details are mentioned in Volume III.

11.4. Conclusion

In low-income developing countries, municipalities allocate a significant portion of their budgets to Solid Waste Management (SWM), yet the level of service provided remains low and many disposal methods are unsafe. This problem is only expected to worsen with population growth and urbanization. Pakistan is no exception to these environmental challenges, with a large amount of municipal waste being burned, dumped, or buried in an unsanitary manner, causing significant harm to the environment and human health. Additionally, there are no systems in place to handle hazardous waste, including medical waste. Urgent solutions are needed to address these issues.

This sectoral plan offers a practical and effective solution to the long-standing problem faced by municipalities with limited resources and a shortage of trained personnel. It outlines a detailed strategy for transforming the SWM sector in Mingora city, aiming to create a fully functional, sustainable system with a waste efficiency potential by 2042. This plan is guided by the following principles:

a) administrative and functional changes are vital
b) documentation & evaluation is essential
c) peoples' participation - including women and youths – is imperative
d) stakeholder's partnerships need to be developed
e) the informal sector needs to be recognised as a vital partner
f) 'waste'should not be wasted
g) people need affordable solutions
h) free services are less sustainable
i) lack of financial resources is not the main issue
j) SWM must be seen in a wider context
k) landfill should be gradually minimised.

Chapter 12: Water Supply, Sewerage & Solid Waste

In Mingora city, the water supply system mainly relies on groundwater sources. Water and Sanitation Services Company (WSSC), Swat is mainly responsible for providing municipal water in urban areas of Mingora while Public Health Engineering Department (PHED) is responsible for supplying water services in the rural/ village councils. The following Union Councils in Mingora are under the jurisdiction of WSSC.

- Nawakalay/ Shadara
- Banr/ Usmanabad
- Malook Abad
- Rang Mohallah / Gumbat Maira
- Malakanan Landy Kass
- Rahimabad
- Amankot/ Faizabad
- Panr / Gulkada

In Mingora city, there are 64 tube wells out of which three are non-functional and 67 storage reservoirs which include 48 existing and 19 proposed surface water tanks and OHR. For the current population, the tube wells are unable to meet the demand of all nine Union councils. The existing water supply system has an approximate capacity of 2,380,000 GPD. The distribution network comprises of almost 140 km long pipes which are in fairly good condition and range in diameter from 3-10 inches. The city cannot provide 24/7 water supply due to high energy cost incurred by pumping. The current distribution network is divided into 66 independent pressure zones or catchment areas and covers a large area with an elevation difference of 920 to 1100 meters. Each pressure zone includes tube wells which are installed to pump water to storage reservoirs and distribute it under gravity fed pipelines. In a few cases, direct pumping from source to distribution network is also done. Major part of the existing water supply is wasted by leakages, illegal connections, and around 60% non-revenue water. In this report, the existing situation of water supply, drainage, sewerage and sanitation is discussed in detail.

12.1. Existing Water Supply and Sanitation Situation

12.1.1. Existing Water Supply

Water is a basic facility for the survival of mankind living in any part of the world. In Mingora city, the satisfaction level of the area residents with the provided water facility was analyzed with help of primarily collected data. The results represented that about 54.26% of the surveyed population was satisfied with the current water facilities provided in the area. However, 23.88% of the population posed dissatisfaction with the water facility.

Households are the largest consumers of the public water supply. The existing situation of water supply is not very good in the city as only 71% of the people are supplied municipal tap water as shown in the figure below. On the other hand, 26% of the people use borehole water

for their domestic needs. The other 3% of people use water from common sources such as open dug well, spring, river, tank water, or bottled water. Moreover, most of the people are provided with municipal tap water only once a day. While 14% of the people are provided with tap water twice each day. Similarly, only 2% of people are provided with the municipal tap water service more than three times a day.

12.1.1.1. Existing Water Supply Distribution System

The existing water supply distribution system contains 48 Water tanks and 64 tube wells. The tank locations, coordinates, houses and population served, demand and capacity are listed in the table below. The water is supplied to the nearest population through main distribution HDPE pipes with diameter ranging from 3 to 10 inches. The individual household connection is provided from the main distribution line through pipes of 2" or 1.5". The location of water tanks, capacity, and main distribution pipelines are shown on water supply network map.

12.1.2. Existing Drainage System

A drainage system allows the safe disposal of wastewater from house or even an entire area. Thus, it is important to have a sufficient and satisfactory drainage system, from single dwelling to urban level. A proper drainage system is lacking in most areas of Mingora city. There is no sewerage treatment plant available in the project area and the wastewater is discharged into the Swat River without any treatment. Key issues related to the Drainage system of Mingora are:

- • unavailability of proper sewerage system,
- • discharge of sewage in open drains which is causing odour, sanitation & health issue,
- • degradation of water quality of the receiving bodies due to sewage discharge and risk for ground water contamination.

For the case of Mingora city, the satisfaction of population with the provided drainage facilities in the area is shown in figure below. The gathered data showed that 56% of the surveyed population was satisfied with the current drainage provision in the area. Similarly, 15% of this sample responded in negative terms with respect to said provision. Furthermore, 86% of people have their house connected with drainage system. On the other hand, 14% do not have any connection of drainage system.

As for 86% of the people with drainage system connection in their house, the washroom, kitchen and laundry waste disposal are done mostly through open drains (kacchi and pakki). Only 7% of people have septic tanks or soakage pits which also disposes into open drains and ultimately discharge into open fields, water courses, canals and pollutes the environment. The houses connected with open drains (31%) of rectangular cross-section create blockage and unhygienic environment. Meanwhile 25% of people have connection to covered drains. On the other hand, 37% of people have their houses connected with underground drains.

12.2. Design Criteria of Water Supply and Sanitation services

This section provides the minimum design criteria and standards required for the water supply network, sewerage collection, disposal and treatment systems. Major aspects will include:

- To design water supply and sewerage systems, these can be operated with minimum operation and maintenance cost up to the planning horizon;
- Hydraulically the system should be capable of handling anticipated water demand and sewage load up to the planning horizon;
- The proposed wastewater treatment plant should deliver an effluent that will meet the National Environmental Quality Standard (NEQS) and WHO standards for reuse for irrigation purpose; and
- The entire system would be designed in a cost-effective manner.

12.2.1. Design Criteria Water Supply System

The design criteria for the water supply system have been based on "Technical and Service Delivery Standards for Water Supply and Sanitation Sectors" by PHED KPK guidelines. Design criteria for major components of the water supply system are described in this section.

a. Design Period

As per PHED KPK guidelines design life/period of different components of water supply are as follows:

- ***The design period adopted for civil works is 25 years***
- ***Mechanical works will be designed for a design period of 10 years.***

b. Water Demand

Sufficient potable water is required to fulfill the requirement of domestic and various non-domestic consumptions. Water is also required for the purpose of firefighting and horticulture requirement. Therefore, water demands for various usages in the project area (Mingora) is described here.

Water demand of the project area has been established to fulfill the water requirements up to horizon year of 2042. This section discusses the computation of water demand for Mingora City.

c. Water Demand

Population projection has been performed considering growth rate trend and calculated as below:

Table 60: Water Demand Projection over the Year

Projection Using Different Methods	Base Year	Projection					
	2017	*2022*	*2027*	*2032*	*2037*	*2042*	*Average*
Average Population Increase	392,864	446,425	508,436	575,746	649,336	730,336	N/A
Average Growth Rate Increase	3.45%	2.60%	2.07%	1.96%	1.87%	1.80%	2.29%

Design population (2042) of Mingora is 730,336 persons. The water demand for the design population will be calculated using 35 gpcd as unit water demand. The unit water demand, in addition to residential demand, will include commercial, firefighting, horticulture and unaccounted water as well. Year-wise water demand of Mingora City is given below:

Table 61: Water Demand over the Years

Sr. No.	Year	Population	Unit Water Demand (GPCD)	Average Water Demand (GPD)
1	**2022**	446,425	35	15,624,875
2	**2027**	508,436	35	17,795,260
3	**2032**	575,746	35	20,151,110
4	**2037**	649,336	35	22,726,760
5	**2042**	730,336	35	25,561,760

Source: Calculated by Consultant

d. Water Supply Source

The water in Mingora City will be supplied by installing tube wells. The location of tube wells will be finalized as per computer hydraulic modelling of water supply system. However, preference of location will be near the canals, green areas and government owned land etc. in the project area and considering the land available with Mingora administration.

e. Demand Fluctuation Factors

As per PHED KPK, demand fluctuation factors i.e., Maximum day demand is 1.5 times the average day demand and Peak hour demand will be calculated as 1.5 times the maximum day demand.

f. Design Flows

The distribution network will be analyzed against the following design flows:

- Peak Flows
- Diurnal Flows
- Peak Flows + Fire
- Night Flows

g. Pressure in the Network

The pressure in the distribution network shall be at least 12 m (40 ft.) as per PHED KPK in all parts of the network including the remotest and highest points, to deliver sufficient quantities of water. In case of fire, pressure in the network shall be maintained as a minimum positive value, i.e., negative pressure shall not be developed in the network.

h. Tube wells

Tube well plays a pivotal role in catering the water requirement of the area. Wells must be properly located to avoid the drawdown of groundwater. According to the Groundwater Study

Report, a distance of 1500ft shall be maintained between proposed 0.10 cusecs (4500 gph) tube wells. A tube well typically consists of a pump, bowl assembly, strainer, blind pipe and electrical panel. Pump is a major part of tube well. There are four basic types of pumps commonly installed which include:

- Submersible Pump
- Centrifugal Pump
- Jet Pump
- Progressive Cavity Pump

In most cases, the type of pump selected for a particular installation depends on the cost and site conditions. However, in many instances the physical limitations of the well may restrict the type of pump that can be considered. Regardless of which type of pump is selected, it should be capable of delivering the required daily demands at adequate pressures. However, pump capacity should not be greater than the yield capability of the well.

The following general factors will be considered in selecting a pump for maximum performance and service life.

The pump should be capable of producing water at the "desired flow" and "total head" while operating near its peak efficiency. The total head includes the vertical distance from the lowest pumping water level to the highest point in the distribution system, anticipated friction losses in the piping, and the desired minimum pressure at the highest outlet or faucet.

- Water quality should be considered.
- The initial cost, operating expense, and expected maintenance costs should be considered.

Table 62: Comparison of Different Types of Pumps - Mingora

Pump Type	Operation	Head (m)	Cost	Efficiency	Size	Maintenance	Suction Lift
Submersible Pump	Continuous	200	Medium to High	Medium to High	Medium to Large	Difficult	Yes
Jet Pump	Continuous	20	Medium	Low to Medium	Medium to Large	Difficult	No
Centrifugal Pump	Continuous	200	Medium to High	Medium to High	Medium to Large	Easy	Yes
Progressive Cavity Pump	Cyclic	45	Low	Low to Medium	Small	Easy	No

Source: Market Survey Conducted by Consultant

Centrifugal pumps provide high head and maintenance is relatively easy. Therefore, centrifugal pumps (Vertical Turbine Pumps) are recommended.

i. Elevated Water Reservoirs

- Overhead Reservoirs (OHRs) are key component of water distribution system. In the water supply system OHRs serve the following functions:
- Store water for use during electric load-shedding and during maintenance works of tube-wells/pumps.
- Provide balance of flow and pressure during peak hours. They are elevated enough to provide the required pressure for the end-user. According to Punjab Devolved Social Services Programme (PHED KPK) criteria, OHRs are sized to store about a 1/10th of water demand. One of the advantages of an OHR is that it helps to optimize the performance of pumps by avoiding pump overloading, which will increase the life of pumps. It also helps during load shedding hours.

According to PHED KPK criteria, overhead storage of 1/10th based on diurnal water demand will be provided for balancing the reservoir.

j. Pipe Materials

The following pipe materials, commonly used in service connection, distribution systems and pumping mains, have been considered.

i. Galvanized Iron (GI)
ii. High Density Polyethylene (HDPE)
iii. Unplasticized Polyvinyl Chloride (uPVC)
iv. Asbestos Cement (AC)
v. Ductile Iron (DI)
vi. Mild Steel (MS)/Glass Reinforced Pipe (GRP)

Table 63: Different Pipe Materials							
Description	**Galvanized Iron (GI)**	**High Density Polyethylene (HDPE)**	**Unplasticized Polyvinyl Chloride (U-PVC)**	**Asbestos Cement (AC)**	**Ductile Iron (DI)**	**Mild Steel (MS)**	**Glass Reinforced Plastic (GRP)**
Technical Considerations							
1. Range of availablediameters	25-300 mm	20-1200 mm	20-250 mm	80-1000 mm	100-1000 mm	80-1000 mm	350-2400 mm
2. Operating Pressures Availability to withstand hammer	12-30 bar	3.2-40 bar	6-15 bar	6-14 bar	12-51 bar	12-30 bar	1-32 bar
3. Inside lining requirement	Required	Not Required	Not Required	Not Required	Required	Required	Required
4. Outside coating /Wrapping requirement	Not Required	Not Required	Not Required	Not Required	Not Required	Required	Not Required
5. Cathodic protection requirement	Required	Not Required	Not Required	Not Required	Not Required	Required	Not Required
6. Coefficient of friction in 10years for William Hazen Formula	120	150	150 140	140	130	120	150
General Structural Design Considerations							
1. Minimum cover required	1.0 m	1.0 m	1.0m	1.0 m	1.0 m	1.0 m	1.0 m
2. Flexible / Brittle/ 3. Bedding requirement	Brittle	Flexible pipe	Flexible pipe	Brittle	Brittle	Brittle	Brittle
	Sand Bedding Required	Sand Bedding Required	Sand Bedding Required	Granular Bedding Required	Sand Bedding Required	Sand Bedding Required	Sand Bedding Required
Ground / Soil Considerations							

1. Type of terrain suitable 2. Stability of ground requirement	Plain, rolling and mountain	Plain, rolling and mountain	Plain and rolling	Plain	Plain and rolling	Plain and rolling	Plain and rolling
	Not required	Not required	Required	Required	Not required	Not required	Required
Cost Considerations							
1. Carriage cost	High	Low	Low	Low	High	High	Low
2. Laying procedure	Skilled	Simple	Simple	Simple	Simple	Skilled	Simple
3. Jointing procedure	Skilled	Skilled	Simple	Simple	Simple	Skilled	Simple
4. Testing procedure	Skilled	Skilled	Skilled	Skilled	Skilled	Skilled	Skilled
5. Repairing procedure	Skilled	Skilled	Simple	Simple	Skilled	Skilled	Skilled
6. Life	40-50 years	>50 years	>50 years	50 years	20-40 years	40- 50 years	50 years
Operational Considerations							
1. Compatibility with existing network	No	Yes	Yes	Yes	Yes	Yes	No
2. Compatibility with repair procedures	No	Yes	Yes	Yes	Yes	Yes	No
3. Past operational and maintenance experience	Satisfactory	Good	Good	Satisfactory	Good	Good	Satisfactory

Source: Market Survey Conducted by Consultant

k. Velocity of Flow

Velocity of 0.5 to 2 m/s (1.65 ft/s to 6.5ft/s) will be used for design of water distribution network and 0.3 to 1.5 m/s (0.98 ft/s to 4.92 ft/s) for design of transmission mains as per PHED KPK criteria.

l. Transmission Main

According to PHED KPK criteria, water transmission mains will be designed on Maximum Day Demand.

m. Distribution Pipelines

According to PHED KPK criteria, water distribution lines will be designed on peak hourly demand.

n. Minimum Pipe Size

According to PHED KPK criteria, the minimum pipe size for distribution network pipe will be Ø3".

o. Water quality

The proposed water supply source to be used for water of domestic needs should be of acceptable quality in accordance with the guidelines of World Health Organization (WHO) which is presently being followed in Pakistan. Following table**Error! Reference source not found.** shows the WHO Guidelines for Potable Water Quality.

Table 64: WHO Guidelines for Portable Water Quality

Sr. No	Parameter	W.H.O. Desirable levels	W.H.O Maximum permissible levels
1	Temperature o C	-	-
2	pH	7.0-8.0	6.5-8.5
3	Odour	Unobjectionable	Unobjectionable
4	Colour	5 Units	50 Units
5	Taste	Unobjectionable	Unobjectionable
6	Turbidity N.T.U.	5 Units	25 Units
7	Total dissolved solids	500	1500
8	Calcium	75	200
9	Magnesium	50	150
10	Total Hardness mg/l as CaCO3	100	500
11	Sulphates	200	400
12	Chlorides	200	250
13	Iron	0.1	0.3

Source: World Health Organisation (WHO)

12.2.2. Water Disinfection and Treatment System

Water treatment or disinfection varies depending on the source and quality of water. Municipal water supplies need to be treated to make the water potable (safe to drink) and palatable (aesthetically pleasing) and to ensure an adequate supply of water to meet the needs of the community at a reasonable cost.

12.2.3. Design Criteria Sewerage & Disposal System

i. Minimum Pipe Size

A minimum diameter for sanitary sewers is usually specified in order to avoid clogging by large objects. In conventional systems in the United States, the house connections are usually 6 inches in diameter, but smaller sizes have been used. As per PHED criteria, for conventional sewage, the minimum diameter commonly specified for street sewers in many countries is 8-9 inches. In the simplified system, smaller sizes are recommended because, in the upper reaches of a system where flow is low, the use of smaller-diameter sewers results in greater depths off low and higher velocities and improves cleansing.

The minimum pipe size will be as below:

- RCC Pipe 9”
- Plastic Pipe 8”

ii. Peaking Factor

Multiply the average daily flow by the Peak factor to calculate the peak flow. The Peak Factor depends upon the population; it decreases with an increase in population. The following table has been provided in PHED KPK criteria to decide peak factor for calculating peak flow.

Table 65: Variation in Peak Factors - Mingora

Population	Peak Factor
5000	4.5
5000-10,000	4
10,000-25,000	3.5
25,000-50,000	3
50,000-100,000	2.5
More than 100,000	2

Source: Punjab Devolved Social Services Program (PHED KPK)

iii. Infiltration Rate

Infiltration rate into the sewerage depends upon size of the pipeline, rainfall in the area, situation of sub soil water table and others. The manufacturing of pipes under local situation does not meet the required norms and standards for joining; the grooves are invariably not in the true form line and shape.

Accounting for the local situation, the following criteria is suggested, which is in sequence with engineering practices:

- Above sub-soil water level 350 gallons/day/inch dia/mile
- Below sub-soil water level 700 gallons/day/inch dia/mile

A more rational approach is to relate infiltration with pie size / quantity of follow which is usually taken 10% of the flow. However, if plastic pipe is adopted, this allowance may be taken as zero.

iv. Wastewater Flow Estimation / Average Daily Flow

Normally about 80% to 90% of water supplied is received in sewers. As per standards and guidelines, the minimum per capita consumption shall be 17 gallons per day. The sewage quantity will be taken as 85% of average water consumption. The sewage quantity thus calculated will cover domestic & commercial use including infiltration. The average sewage flow in the design will be based on 80% of water consumption as above.

v. Trench Width

The trench widths for laying of pipes of various sizes in the network is shown in the

Table 66: Proposed Trench Width - Mingora

Pipe Diameter (mm)	Trench width (mm)
150	650
200	700
250	750
300	850
350	900
400	950
450	1050
500	1100
600	1250
700	1400

Source: Design Criteria as per Public Health & Engineering Department (PHED)

vi. Design Flow

Design flow is equal to the sum of peak flow and storm water allowance.

vii. Friction Formula and Minimum Gradients

Hydraulic design of pipes mainly concerns; resistance to flow in relation to available and required pressure/head and required and allowable velocity of flow.

Manning's formulae in the following form are the usual hydraulic tool:

$$V = 1 / n \times R\ 2 / 3 \times S\ 1 / 2$$

Where,

V = Velocity, ft/sec

R = Hydraulic Radius, D/4 (In case of circular x-section)

n = Friction co-efficient which is 0.013, when flowing full

The co-efficient of friction varies with internal surface of pipe, diameter of pipe and velocity.

For the project area, Manning's formula will be practiced. The minimum adopted slopes to lay the sewer are mentioned in , given below:

Table 67: Minimum Slope Requirements

Size of Sewer (Inches)	Minimum Slope
9	0.00150
12	0.00095
15	0.00070
18	0.00054
21	0.00044
24	0.00037
27	0.00032
30	0.00028
33	0.000243
36	0.000215

Source: Design Criteria as per Public Health & Engineering Department (PHED)

viii. Velocity of Flow

Gravity sewer has been designed for a minimum velocity of 2.0 feet/sec and where falls are available; the velocity may be increased with maximum velocity of 7 feet/sec, when running full.

The design velocity of flow in the sewerage system as per PHED criteria is:

- Minimum (in difficult situations) 2.0 feet/second,
- Desirable minimum 2.5 feet/second
- Maximum in hilly area 7.0 feet/second (for plastic pipes, may be more than this velocity)

ix. Minimum Cover over Sewer

Pipes will be laid at a depth to give a minimum cover of 3.0 ft over top of the pipe as per PHED criteria. Where minimum pipe cover is not available, the pipe shall be encased in cement concrete so as to provide adequate structural strength against load impacts. However, for a street where traffic load is not so significant and a shallow sewer is the requirement, this minimum cover shall be reduced to 2 ft.

The suggested cover over pipes is as under:

- Narrow streets with remote possibility of heavy traffic 2 ft
- Other locations 3 ft

x. Pipe Roughness Coefficient

The pipe roughness coefficient shall be as under:

RCC Pipes

- New Lines 0.013
- Old Lines 0.015

Plastic Pipes

- New Lines 0.009
- Old Lines 0.009

The roughness coefficient varies with the depth of flow whereas in the criteria it is stated to be constant. More practical approach is to vary the coefficient with the depth of flow.

Following are the recommendations for roughness coefficient:

- New Lines, RCC 0.013, when flowing full
- New Lines, Plastic 0.009, when flowing full
- Old Lines, RCC 0.015, when flowing full

xi. Class of Pipe

The applicable criteria will be as under:

Reinforced Cement Concrete: Pipes manufactured according to ASTM pipes Class II (C-76) are used locally. Higher classes are specified only for locations where excessive backfill and live loads are expected.

Plastic Pipe: Pipes manufactured as per applicable specifications i.e., polyethylene pipe shall be of high density and uPVC conforming to Class-B.

xii. Permissible Loads on Sewers

Permissible loads on different classes of sewers for various types of bedding are essentially should be part of the criteria so as to provide guidance to engineers for selection of certain class of pipe for a particular situation and for a type of bedding. As per depth of laying pipeline and type of bedding, the class of pipe to be used will be decided.

xiii. Bedding for Sewers

Usually, above sub-soil water level and for sewers 9-12 inches diameter, sand bedding is adopted whereas for larger sewer sizes crushed stone bedding is used. The bedding is to be decided as per individual case taking into account the depth of sewer, traffic loads, soil condition, and class of pipe. Normally, following types of sewer bedding are in practice:

Type of Bedding	Load Factor
Shaped Bedding	1.5
Sand Bedding	1.7

Gravel Bedding	1.7
Crushed Stone Bedding	1.9

xiv. Jointing of Pipes

Usual practice for RCC sewer pipe jointing is either by bell and spigot or tongue and groove with rubber ring. This practice has successfully performed in the sewerage schemes since decades. Present practice of covering of joint with cement concrete is not favored.

The recommendation is as under:

a. RCC Pipes

Up to 24" dia Bell and Spigot with Rubber Ring Beyond 24" dia Tongue and Groove with Rubber Ring

b. Plastic Pipes

As per recommendation of the manufacturer/applicable specifications.

xv. Design Depth of Flow

Sewers will be designed to flow at 0.75 of full depth under peak flow conditions to provide requisite air gap under which condition the sewer will flow up to 90% capacity at peak flow. Thus, the design flow will be calculated by multiplying peak flow with a factor of 2.0.

xvi. Manholes

General

Manholes are an expensive component. They are now among the most familiar features of a sewer system, but they were not widely used in early sewers. They came into wide use with combined systems where they facilitated removal of grit. The criteria for manhole use have gradually become more conservative and have contributed significantly to the high cost of sewerage. The cost of manholes is a function of depth, spacing, and strength of design. The use of shallower depths is one way to reduce these costs.

Cement concrete manholes are usually adopted in the location and will be proposed for the project area. Following design criteria for manhole spacing is suggested: Not over 100' - For sewer up to 8" size.

Not over 200' - For sewers 12" size and above.

Pipe connections to Manholes

To allow for limited differential settlement between manholes and the connecting pipelines, there will be a flexible pipe joint located at the external face of the manhole and a second flexible joint approximately 30 inches from the face of the manhole.

Adjustment for Height of Manholes

Manholes will be constructed with a minimum of two and maximum of three courses of concrete blocks between the manhole cover slab and manhole cover to allow for future adjustment of the top level to suit changes in final road or ground level but manhole neck will not exceed 30 inches.

Change in Sewer Diameter at Manholes

To minimize the risk of blockage in sewers, the diameter of the outgoing sewer must not be less than the diameter of the largest incoming sewer. The top of smaller sewers entering a manhole will normally be at the same level as that of the outgoing sewer.

Slope of Pipe Channel within Manholes

All manhole invert levels used in the sewer calculations will be the centre of the manhole and all distances and gradients will be calculated between centres of manholes. Where the incoming and outgoing pipes are of the same gradient and diameter the pipe gradient will be continued through the channel in manhole.

Drop Connections to Manholes

The drop connections to manholes will be provided if the difference in pipe invert elevation is greater than 2 ft otherwise no drop connection will be provided.

Manholes Material

Manholes will be constructed in Brick Masonry in general, whereas for special conditions it will be of reinforcement cement concrete.

Ventilation

Ventilation of sewers is necessary to avoid the build-up of noxious gasses and to minimize septicity. In developed areas sewers will naturally ventilate through the ventilation stacks provided as part of each building sanitary system. Therefore, there is no need of additional ventilation stacks. If necessary, ventilated cases will be provided.

Sewer and Water Main Separation

Water mains and water service lines shall be protected from sanitary sewers, storm sewers, combined sewers, house sewer service connections, drains, and sanitary sewer force main.

In unavoidable circumstances, concrete encasement of the water lines will be adopted.

Horizontal Separation

Water mains shall be laid at least 3 ft horizontally from any existing or proposed drain, storm sewer, sanitary sewer, combined sewer or sewer service connection.

Water mains may be laid closer than 3 feet to a sewer line when:

- Local conditions prevent a lateral separation of ten feet.
- The water main invert is at least 18 inches above the crown of the sewer.

- The water main is either in a separate trench or in the same trench on an undisturbed earth shelf located to one side of the sewer.

When it is impossible to meet the conditions above, the drain or sewer shall be constructed of slip-on mechanical joint cast or ductile iron pipe, or PVC pipe meeting the requirements for water main. The drain or sewer shall be pressure tested to the maximum expected surcharge head before backfilling with no leakage allowed in the area of required water main protection.

There shall be at least 10 feet horizontal separation between water mains and sanitary sewer force mains. Water mains must be separated at least 25 feet from septic tanks, disposal fields, seepage beds, and sewage lift stations.

Vertical Separation

A water main shall be laid so that its invert is 18 inches above the crown of the drain or sewer whenever water mains cross storm sewers or sewer service connections. The vertical separation shall be maintained for that portion of the water main located within 10 ft horizontally or any sewer or drain crossed. The length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain. The sewer shall be constructed of slip-on or mechanical joint cast or ductile iron pipe, or PVC pipe, meeting the requirements for water main when:

- It is impossible to obtain the proper vertical separation as described above; or
- The water main passes under a sewer or drain.

A vertical separation of 12 inches between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking of the water main. If the invert of the water main is not 12 inches above the crown of the sewer when the pipes cross, a casing pipe can be installed around either the water main or sewer in lieu of constructing the sewer with water main equivalent pipe. The casing pipe must be a material that is approved for use as water main. The casing must extend on each side of the crossing at least 10 feet as measured at right angles from the outside edge of water main pipe to the outside edge of the sewer pipe.

Pipe support shall be provided within the casing pipe and ends of the casing shall be filled with an approved non-shrink grout.

At crossings when the invert of the water main is not 18 inches above the crown of the storm sewer, and the sewer crossed the water main at right angles, the storm sewer can be constructed with reinforced concrete pipe using flexible gasket joints meeting ASTM C- 361 or ASTM C-443 instead of providing a casing pipe or constructing the storm sewer with water main equivalent pipe. If casketed storm sewer piping is proposed, it shall be installed between adjacent storm structures. The drain or sewer shall be pressure tested to the maximum expected surcharge head before backfilling with no leakage allowed in the area within 10 feet of the water main.

Construction shall extend on each side of the crossing until the distance from the water main to the sewer or drain line is at least 10 feet as measured at right angles from the outside edge

of the water main pipe to the outside edge of the sewer pipe. Where a water main passes over an existing or proposed force main, an 18- inch vertical separation shall be provided at the crossing; a forced main shall not be allowed to be above the water main at the crossing. The further details regarding the materials and design considerations are provided in the Volume III.

12.3. Water Supply and Sewerage Proposal

12.3.1. Water Supply

Water Supply demand of Mingora is being satisfactory fulfilled by local springs and surface tanks in the past. But recently some springs have shown reduced discharge which is causing discomfort especially in winter season. So, it is recommended to install tubewells in the vicinity of water stream and also to look for reliable surface water from nearby dam or spring.

- **Unit Demand**

The water supply and sanitation facility for each person must be continuous and sufficient for personal and domestic uses. These uses ordinarily include drinking, personal sanitation, washing of clothes, food preparation and personal and household hygiene. According to the World Health Organization (WHO), between 50 and 100 litres of water per person per day are needed to ensure that most basic needs are met and few health concerns arise. The current unit water demand as used by PHED for Mingora project area is 15 Gals/Capita/Day or 68 liter /capita/day. It is expected that in future Mingora city will get more developed and lifestyle of people living in the city will be upgraded. In light of this assumption, per capita water demand of Mingora is increased to 35 Gals/capita/day. This demand will be used to calculate existing as well as future demand of Mingora project area.

Current Water Demand = 35 x 446,425

= 15,624,875 gallons per day

- **Design Flow for 2042**

Average Design Flow = 730,336 x 35

= 25,561,760 gallons per day

Max. Design Flow = 25,561,760 x 1.5

= 38,342,640 gallons per day

Peak Design Flow = 38,342,640 x 1.5

= 57,513,960 gallons per day

12.3.1.1. Water Supply Proposal for 2022 Scenario

The existing water supplies have been checked against the current population demand and the gap has been identified. To overcome this gap a proposal to improve the existing water supplies has been prepared considering better unit demand and 100% serviceability to the existing population.

- **No. of Water Tanks for 2022 scenario**

The Water Tanks will be provided in Mingora city as per population density and based on natural topography. The source for these water tanks would be nearby passing nallah or spring. In case there is not enough water or due to climate changes water discharges reduces to a level to affect water availability to the residents of Mingora, tubewells along river Mingora where strata favours to bore a tubewell, will be installed and water will be pumped to the water tanks in need of a additional water. The location of tubewells will be marked after proper survey and detail investigation.

For the design of water tanks 12 hours storage capacity is considered for the capacity calculation of water tanks. Detail calculation for number of water tanks for the 2022 scenario has been shown in Table.

Table 68:Number of Water Tanks for 2022 Scenario

Sr. No.	Name of Administration Unit	NC/VC	Area (Acre)	Population 2022	Per Capita Water Demand (Gallons/ Capita / Day)	Avg. Water Demand (Gallons/ Day)	Water Tank Capacity (12hrs of storage) (Gallons)	No. of Water Tank Capacity (x 50,000) (Gallons)
Existing Urban Boundary								
1	Amankot 1	NC	114.84	16,363	35	572,711	286,355	6
2	Amankot 2	NC	54.82	7,174	35	251,078	125,539	3
3	Amankot/Faiz Abad	NC	116.34	11,998	35	419,921	209,960	5
4	Banr	NC	124.06	19,416	35	679,547	339,774	7
5	Banr Naway Kalay	NC	148.38	11,795	35	412,842	206,421	5
6	College Colony	NC	291.51	4,275	35	149,618	74,809	2
7	Gulkada	NC	221.42	20,311	35	710,879	355,440	8
8	Gumbat Maira 1	NC	145.09	6,627	35	231,931	115,966	3
9	Gumbat Maira 2	NC	354.70	21,235	35	743,216	371,608	8
10	Ingaro Dherai	NC	566.68	21,951	35	768,282	384,141	8
11	Landikass	NC	81.94	12,413	35	434,465	217,232	5
12	Malakanan	NC	143.95	12,816	35	448,545	224,272	5
13	Malook Abad 1	NC	69.67	11,337	35	396,790	198,395	4

Sr. No.	Name of Administration Unit	NC/VC	Area (Acre)	Population 2022	Per Capita Water Demand (Gallons/ Capita / Day)	Avg. Water Demand (Gallons/ Day)	Water Tank Capacity (12hrs of storage) (Gallons)	No. of Water Tank Capacity (x 50,000) (Gallons)
14	Malook Abad 2	NC	85.82	15,331	35	536,583	268,291	6
15	Naway Kalay	NC	234.75	14,919	35	522,155	261,077	6
16	Panr	NC	340.68	20,975	35	734,126	367,063	8
17	Rahim Abad	NC	243.77	17,655	35	617,929	308,964	7
18	Rahman Abad	NC	262.23	19,394	35	678,774	339,387	7
19	Rang Mohallah 1	NC	73.98	5,201	35	182,033	91,016	2
20	Rang Mohallah 2	NC	40.04	5,902	35	206,556	103,278	3
21	Saidu Sharif 1	NC	419.29	12,357	35	432,492	216,246	5
22	Saidu Sharif 2	NC	476.33	23,794	35	832,802	416,401	9
23	Saidu Sharif 3	NC	156.35	8,042	35	281,482	140,741	3
24	Shahdara 1	NC	636.67	16,614	35	581,491	290,746	6
25	Shahdara 2	NC	124.30	16,695	35	584,315	292,157	6
Total of NCs			5,528	354,587		12,410,561	6,205,281	137
Proposed Urban Boundary for Year 2042								
26	Odigram	VC	742.54	16,280	35	569,810	284,905	6
27	Gogdara	VC	413.52	12,038	35	421,313	210,657	5
28	Balogram	VC	614.11	14,365	35	502,775	251,388	6
Total of VCs			1,770	42,683		1,493,898	746,949	17
Total						**13,904,459.2**	**6,952,229.6**	**154.0**

There are 12 existing water tanks operational in the Mingora project area. So, to meet the water demands of Mingora City, in the 2022 scenario, we need to install 154 – 12= 142 new water tanks with capacity of each water tank not less than 50,000 gallons.

12.3.1.2. Water Supply Proposal for 2042 Scenario

For future two residential zones have been proposed namely Infill and zone-1. It is predicted that all vacant lands available in NC will accommodate an increase in population in NC areas. While further increase of population and increase of population of all VCs will be accommodated in Zone-1.

In these residential zones private housing schemes will be unlikely to develop in the study area. So, in this proposal only 100% of the projected future population will be considered for the water supply proposal.

No. of water tanks for 2042 scenario

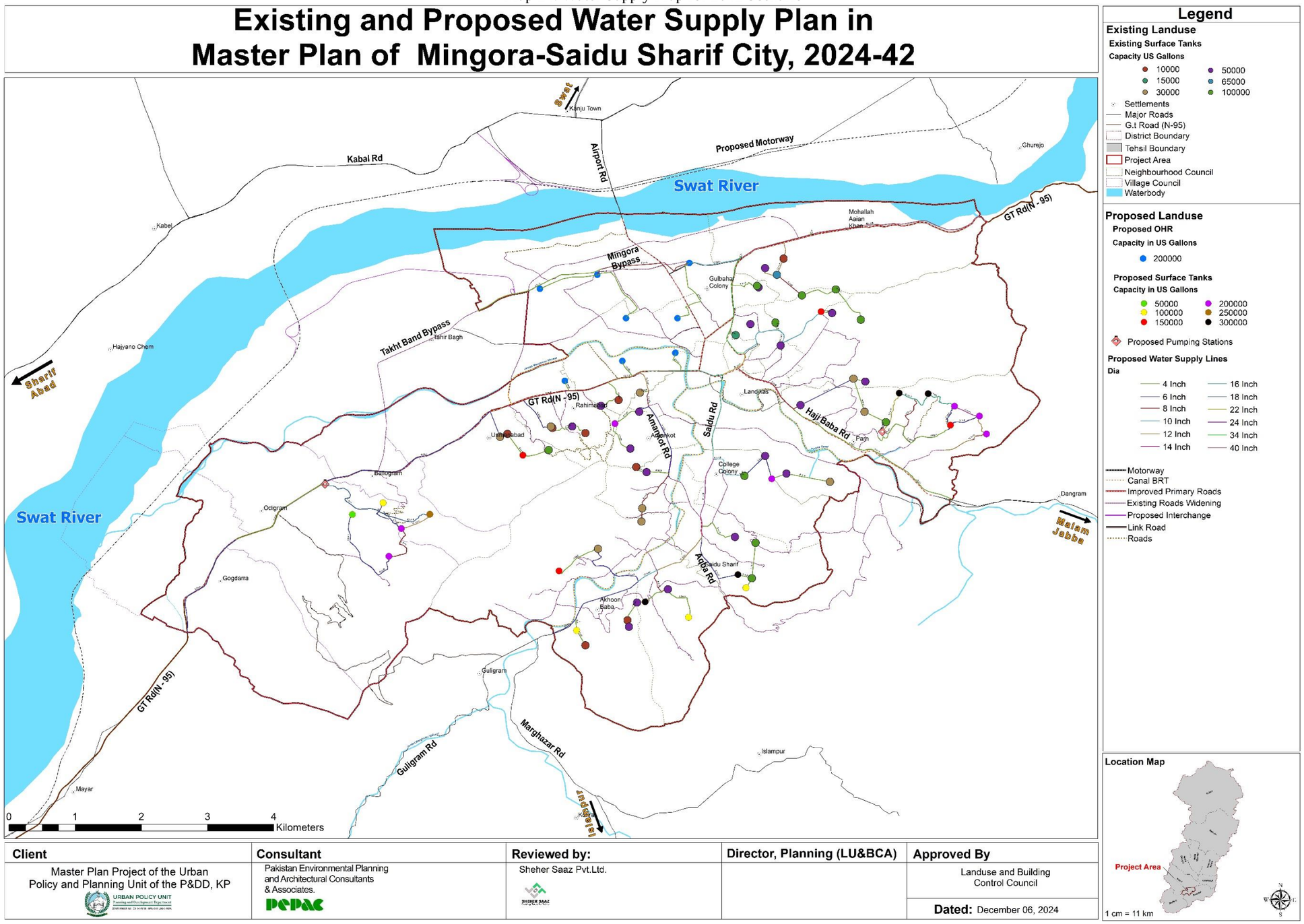
For the design of water tanks 6 hours storage capacity is considered for the capacity calculation of water tanks. Detail calculation for number of water tanks for the 2022 scenario has been shown below.

Table 69:Number of Water Tanks for 2042 Scenario

Sr. No.	Name of Administration Unit	Area (Acre)	Population 2042	Per Capita Water Demand (Gallons/ Capita/ Day)	Avg. Water Demand (Gallons/ Day)	Water Tank Capacity (6 hrs of storage) (Gallons)	No. of Water Tank Capacity (x 50,000) (Gallons)
Existing Urban Boundary							
1	Infill Residential	352.73	83,948	35	2,938,191	734,548	15
2	Residential Zones	360.13	220,231	35	7,708,088	1,927,022	39
3	Residential Zones (Outside boundary)	25.86	,038	35	596,318	149,079	3
Total					**10,646,278.9**	**2,661,569.7**	**54.0**

In order to meet the future demand of water supply of Mingora project area further 54 water tanks of about 50,000 gallons that need to be installed in the proposed residential zones. Water Supply proposal for 2042 scenario is shown in Map below. A comprehensive map combining both proposals has shown in Map

Map 24: Water Supply Map for 2042 Scenario



Source: Devised by Consultant

12.3.2. Sewerage System

As currently no piped sewerage system exists in the Mingora project area it is recommended to lay RCC pipes in the entire area and take all sewage to a feasible treatment plant nearby water body before outfall.

- **Unit Flow**

Unit demand for sewerage is considered as 85% of unit water demand (35 gals/capita/day). So, unit sewerage flow considered as 30 gals/capita/day.

- **Design Flow**

Current Sewerage Flow = 30 x 446,425

= 13,392,750 gallons per day

Proposed Average Design Flow = 730,336 x 30

= 21,910,080 gallons per day

Take 100% for stormwater and based on population peak factor of 2.0, the total design flow is:

Total Design Flow = 21,910,080 x 2.0 x 2.0

= 87,640,320 gallons per day

Sewage flows for 2022 scenario and 2042 scenarios has been calculated in Table.

Table 70: Sewage Flows for 2022 Scenario

Sr. No.	Name of Administration Unit	NC/ VC	Area (Acre)	Population 2022	Per Capita Wastewater Gen. (Gallons/Capita/ Day)	Avg. Wastewater Discharge (Gallons/Day)	Peak Water Demand (P.F. = 2.0 + 100% Stormwater) (Gallons/ Day)	(Cusecs)
Existing Urban Boundary								
1	Amankot 1	NC	114.84	16,363	30	490,895	1,963,579	3.65
2	Amankot 2	NC	54.82	7,174	30	215,210	860,840	1.60
3	Amankot/Faiz Abad	NC	116.34	11,998	30	359,932	1,439,728	2.68
4	Banr	NC	124.06	19,416	30	582,469	2,329,877	4.33
5	Banr Naway Kalay	NC	148.38	11,795	30	353,865	1,415,459	2.63
6	College Colony	NC	291.51	4,275	30	128,244	512,976	0.95
7	Gulkada	NC	221.42	20,311	30	609,325	2,437,300	4.53
8	Gumbat Maira 1	NC	145.09	6,627	30	198,798	795,193	1.48
9	Gumbat Maira 2	NC	354.70	21,235	30	637,043	2,548,170	4.73
10	Ingaro Dherai	NC	566.68	21,951	30	658,527	2,634,109	4.89
11	Landikass	NC	81.94	12,413	30	372,398	1,489,594	2.77
12	Malakanan	NC	143.95	12,816	30	384,467	1,537,867	2.86
13	Malook Abad 1	NC	69.67	11,337	30	340,105	1,360,421	2.53
14	Malook Abad 2	NC	85.82	15,331	30	459,928	1,839,712	3.42
15	Naway Kalay	NC	234.75	14,919	30	447,561	1,790,244	3.33
16	Panr	NC	340.68	20,975	30	629,251	2,517,005	4.68
17	Rahim Abad	NC	243.77	17,655	30	529,653	2,118,613	3.94
18	Rahman Abad	NC	262.23	19,394	30	581,806	2,327,225	4.32
19	Rang Mohallah 1	NC	73.98	5,201	30	156,028	624,112	1.16
20	Rang Mohallah 2	NC	40.04	5,902	30	177,048	708,194	1.32
21	Saidu Sharif 1	NC	419.29	12,357	30	370,707	1,482,830	2.76
22	Saidu Sharif 2	NC	476.33	23,794	30	713,830	2,855,320	5.31
23	Saidu Sharif 3	NC	156.35	8,042	30	241,270	965,079	1.79
24	Shahdara 1	NC	636.67	16,614	30	498,421	1,993,684	3.70
25	Shahdara 2	NC	124.30	16,695	30	500,841	2,003,365	3.72

Total of NCs			5,528	354,587		10,637,624	42,550,495	79.06
Proposed Urban Boundary for Year 2042								
26	Odigram	VC	742.54	16,280	30	488,408	1,953,633	3.63
27	Gogdara	VC	413.52	12,038	30	361,126	1,444,503	2.68
28	Balogram	VC	614.11	14,365	30	430,950	1,723,801	3.20
Total of VCs			1,770	42,683		1,280,484	5,121,937	9.5
Total						**11,918,107.9**	**47,672,431.7**	**88.6**

Table 71: Sewage Flows for 2042 Scenario

Sr. No.	Name of Administration Unit	Area (Acre)	Population 2042	Per Capita Wastewater Gen. (Gallons/Capita/ Day)	Avg. Wastewater Discharge (Gallons/ Day)	Peak Water Demand (P.F. = 2.0 + 100% Stormwater) (Gallons/ Day)	(Cusecs)
Existing Urban Boundary							
1	Infill Residential	352.73	83,948	30	2,518,449	10,073,797	18.72
2	Residential Zones	360.13	220,231	30	6,606,933	26,427,730	49.11
3	Residential Zones (Outside boundary)	25.86	17,038	30	511,130	2,044,518	3.80
Total					**9,125,381.9**	**36,501,527.6**	**67.8**

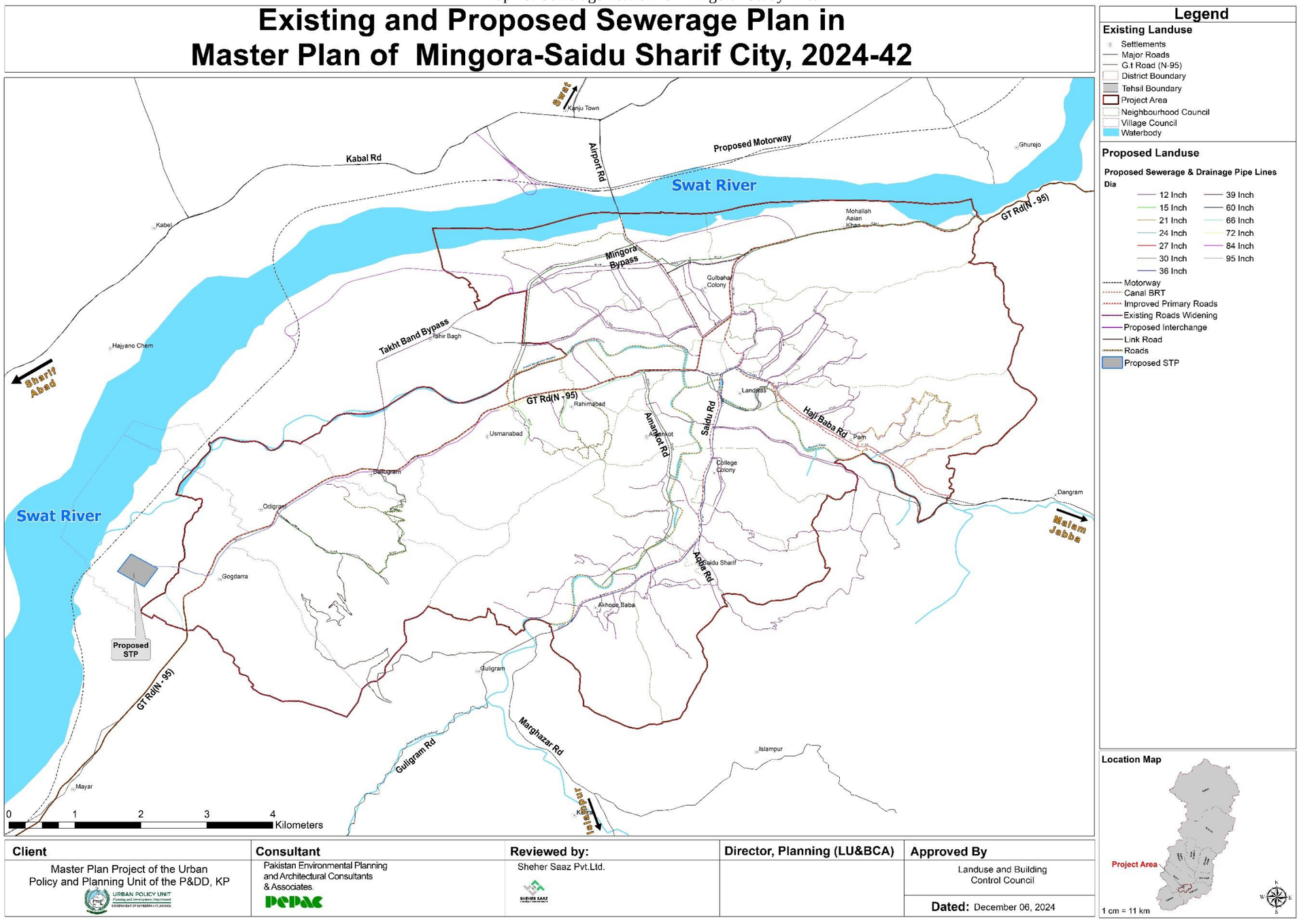
Map for sewerage system proposal for 2042 scenario has been prepared and shown in Figure.

Wastewater Treatment Plant

Two wastewater treatment plants (WWTP) would be required for the whole of Mingora City. Each having capacity of:

WWTP -1 Design Capacity = 39.10 cusecs

Map 25: Sewerage network of Mingora- Study Area

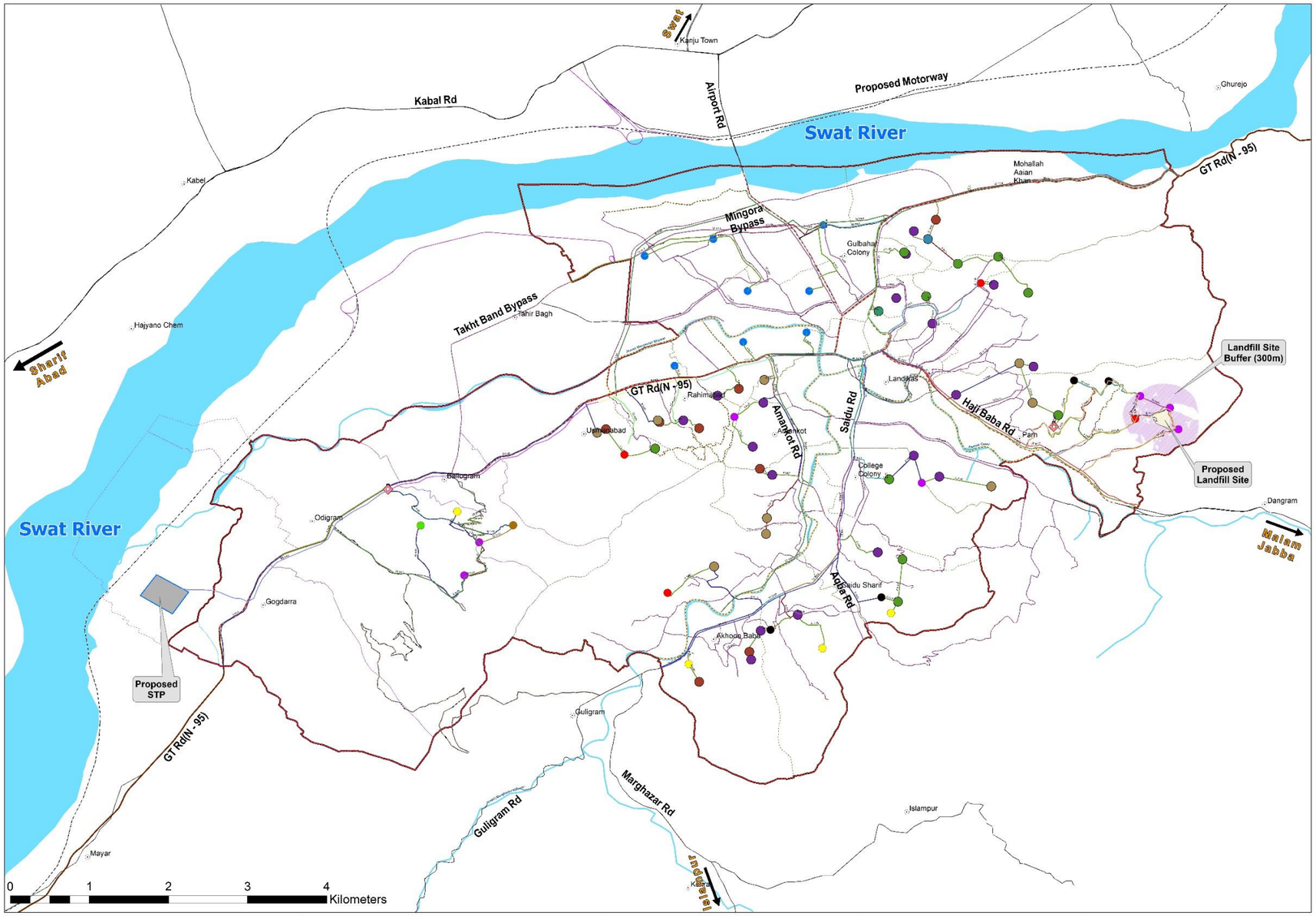


Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP	Pakistan Environmental Planning and Architectural Consultants & Associates.	Sheher Saaz Pvt.Ltd.		Landuse and Building Control Council
				Dated: December 06, 2024

Source: Devised by Consultant

Map 26: Combined WATSAN Proposals - Mingora-Saidu Sharif

Existing and Proposed WATSAN Sector in Master Plan of Mingora-Saidu Sharif City, 2024-42



Legend

Existing Landuse

Existing Surface Tanks

Capacity US Gallons

- 10000
- 15000
- 30000
- 50000
- 65000
- 100000

- Settlements
- Major Roads
- G.t Road (N-95)
- District Boundary
- Tehsil Boundary
- Project Area
- Neighbourhood Council
- Village Council
- Waterbody

Proposed Landuse

Proposed OHR

Capacity in US Gallons

- 200000

Proposed Surface Tanks

Capacity in US Gallons

- 50000
- 100000
- 150000
- 200000
- 250000
- 300000

- Proposed Pumping Stations

Proposed Sewerage & Drainage Pipe Lines

Dia

- 12 Inch
- 15 Inch
- 21 Inch
- 24 Inch
- 27 Inch
- 30 Inch
- 36 Inch
- 39 Inch
- 60 Inch
- 66 Inch
- 72 Inch
- 84 Inch
- 95 Inch

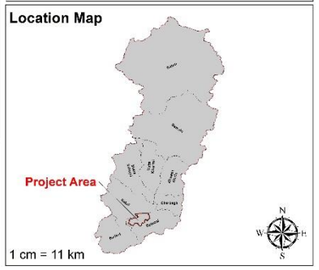
Proposed Water Supply Lines

Dia

- 4 Inch
- 6 Inch
- 8 Inch
- 10 Inch
- 12 Inch
- 14 Inch
- 16 Inch
- 18 Inch
- 22 Inch
- 24 Inch
- 34 Inch
- 40 Inch

- Motorway
- Canal BRT
- Improved Primary Roads
- Existing Roads Widening
- Proposed Interchange
- Link Road
- Roads
- Proposed STP
- Landfill Site
- Landfill Site Buffer (300 m)

Location Map



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP URBAN POLICY UNIT	Pakistan Environmental Planning and Architectural Consultants & Associates. PEPAC	Sheher Saaz Pvt.Ltd. SHEHER SAAZ		Landuse and Building Control Council **Dated:** December 06, 2024

Chapter 13: Land Management

13.1. Existing Situation of Land Management

In recent past, the Wesh Garzinda system was enforced in Mingora-Saidu Sharif for Land management. Where the land was distributed among different tribes of the district, however the land was not allotted permanently, and was not a permanent settlement. Till 1970, the land was rotated (Re-allotted/Interchanged) among various families and clans for tenures of fixed term i-e; 5, 10, 15, and 20 years. The proper land ownership program was started after the 1970s, and proper surveys and record system was started in 1980 (Potwari System). The modus operandi for land management in Mingora is mainly carried out through federal and provincial regulatory framework in the shape of policies, rules, and laws[18].

The Local government, Elections and rural development department, and the Government of KPK play their role with the Revenue and Estate Department for the land management system in Mingora. The Land management practices in Mingora-Saidu Sharif follow federal and provincial regulatory frameworks through various policies, rules, and laws.

13.2. Land Management Challenges in Mingora-Saidu Sharif

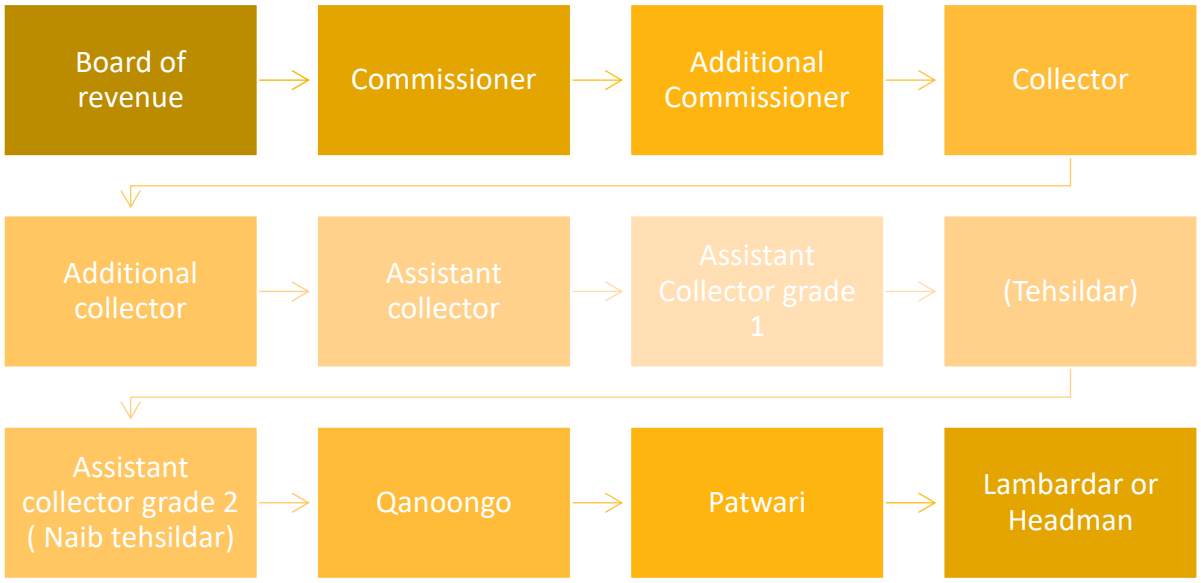
The following are the major challenges of land management in Mingora/ Saidu Sharif:

- **Rapid urbanization:** The study area is experiencing rapid urbanization, which is putting pressure on land resources. Urbanization is leading to the conversion of agricultural land into urban areas, negatively impacting the environment and food security.
- **Population growth:** The population of study area is projecting rapidly leading to increased demand for land for housing, infrastructure, and commercial activities. This is putting pressure on land resources and leading to conflicts between different land uses. As well as land scarcity issues.
- **Illegal land grabbing:** There have been cases of illegal land grabbing in Mingora-Saidu Sharif, where powerful individuals or groups seize land without legal authority.
- **Weak enforcement of regulations:** The enforcement of land use regulations is weak, leading to illegal land use practices, environmental degradation, and conflicts between different land users.

The root causes of poor land management are related to issues with land titling, insecure land tenure, and improper land record maintenance, which have legal and regulatory dimensions. Additionally, the economic aspects of land use significantly contribute to the inaccessibility of affordable and adequately serviced land for urban dwellers, leading to a shortage of housing options. As a result, the local government is unable to provide affordable housing to low-income people, aggravating the situation and resulting in the development of slums and squatter settlements where occupants have limited or no legal claim to the land they occupy.

[18] Revenue and Estate Department, Government of Khyber Pakhtunkhwa. Available at https://revenue.kp.gov.pk/acts/, accessed on 19.09.2022

In Mingora-Saidu Sharif, the property includes both tangible and intangible items that can be "owned" by a person. The largest real estate asset in Mingora-Saidu Sharif is the land. The land record management in Mingora-Saidu Sharif, similar to the entire KP, is supervised by the provincial director of land record-revenue and estate department, while revenue matters are monitored by the board of revenue. Under the supervision of provincial land record department i.e., Board of Revenue, there are further administrators working at divisional, district, tehsil, and village level. The organizational structure is shown below.



Since 2013, the computerization of land records has been underway, with data being kept at the tehsil level. Mingora-Saidu Sharif is one of 18 districts in the province undergoing phase 2 of the computerization of land records to improve efficiency, transparency, and access to information on property ownership, including the maintenance of ShajraNasab, land registration, and other property-related matters.

In Mingora-Saidu Sharif, land is divided into three categories: state-owned, privately-owned, and common land. The Mingora-Saidu Sharif Municipal Corporation manages urban land management at the municipal level. Land revenue systems in Pakistan are divided into divisions, districts, tehsils, patwar circles, and qanugo halqas. There is an institutional system for land management exercises from the Commissioner's office to the office of Patwaris, but the Department of Local Government's institutional structure is constantly changing in compliance with Local Government Ordinances, with elected officials primarily leading the organizational structures at various levels.

13.3. Problems in the Existing System

- The policy framework and unfavorable procedures are harming the Mingora-Saidu Sharif land administration. It is crucial to protect citizens' privacy by reviewing current regulations and making the necessary adjustments with the cooperation of both the general public and experts

- There is no separate project for the land management of urban areas. It is necessary to create comprehensive rules for urban land management since new policy instruments must be developed, tried out, and implemented in place of the current system

- There is no focus on building the capacity of the institutions involved in land administration because the local government in the city is fragile and vulnerable. This does not allow for alignment, integration, and coordination of various land administration policies being implemented by various authorities

- Lack of coordination among key line departments such as tax, development authority, patwaris, and local government is resulting in inadequate controls to monitor illegal developments.
- The city lacks adequate administration and capacity building, as there is no development authority operational in the Study area.

- A proper information system involving base maps, land use maps, and other land management record information, is lacking at the local level within the departments. No standards are currently being followed in the city for the demarcation and updating of land use categories

- There is an urgent need for cooperation between key line departments like the tax department, development authority, patwaris, and local government. Poor controls are in place to keep an eye on illegal developments which are the result of the absence of coordination.

- Territorial conflicts caused by incorrect boundary markings, inaccurate or fraudulent land records, and multiple registrations of different parties to the same parcel of land are major contributors to land disputes.

13.4. Recommendations

The following are some recommendations made by the consultant based on existing land management issues in Mingora-Saidu Sharif;

- Local government should initiate a review of existing land regulations with the involvement of both experts and the public. The review should specifically focus on privacy protection concerns and make necessary adjustments to improve the overall land management system.
- Create comprehensive rules for managing urban land, which includes developing and implementing new policy instruments to replace the current system. This could be done by establishing a task force made up of representatives from various departments, including urban planning, development authorities, and tax departments, to help develop these policies.
- Initiate training programs for technical and non-technical staff and create a coordination mechanism to ensure alignment and integration of various land administration policies being implemented at different level.

- Establish a standardized digital information system that incorporates base maps, land use maps, and other relevant land management record information. This system can be developed in collaboration with local authorities and stakeholders to ensure it meets the specific needs of the city. The system can include protocols for demarcation and updating of land use categories, with clear guidelines and standards for data collection and maintenance.
- Strengthening enforcement mechanisms, such as by increasing penalties for illegal land occupations and encroachments, can act as a deterrent and discourage such activities.
- To address the lack of cooperation between key line departments like the tax department, development authority, patwaris, and local government, the city should establish a coordination mechanism to ensure proper communication and information sharing between all departments involved in land administration. This would help to keep an eye on illegal developments and reduce the negative impact of unregulated land use.

Chapter 14: Proposals for Quality of Life (QoL)

14.1. Existing QoL Situation

To highlight the prevailing quality of life conditions in the area regarding health, social criteria, environment, physical infrastructure, public health and municipal facilities assessments were made based on primary surveys in the study area. About 53.63% appeared to be satisfied with their current quality of life.

In regard to health facilities around 70.9% seemed to be satisfied and 23.4% found it normal or fair condition. But people do have concerns regarding the affordability of healthcare facilities and treatments, accessibility concerns, irresponsible behavior of doctors and staff, hygiene issues, unavailability of female doctors and staff, long waiting times and unavailability of medicines.

The further elements which were assessed include water quality, sewerage/drainage and solid waste management. Though 54.2% were satisfied with current water facilities but 23.8% have serious concerns to it. Similarly, 56% were satisfied with the sewerage and drainage amenities while 15% were unsatisfied. Mingora-Saidu Sharif has its own waste management authority still 26% were unsatisfied with their current works regarding collection services and 23% were dissatisfied with their waste management and cleanliness.

Quality assessment on parks and playgrounds revealed that, while there are parks and playgrounds in the study area, they are not inclusive or accessible to all age groups, genders, or persons with disabilities. The food outlets in terms of general stores and grocery stores were only accessible to adults, particularly men, inaccessible to disabled dwellers. The city has a single library for all the public, but the inaccessibility, poor management and cleanliness make it a luxury than a need.

While the majority of the population appears to be satisfied with their quality of life and the quality of amenities in their city, there are still notable issues that need to be addressed. These concerns by them were taken into account and for their improvement various proposals are made in the section below to enhance the satisfaction levels of the community.

14.1.1. Proposals for Enhancing the QoL

Based on the findings and analysis, the following proposals are made in the master plan report in their Part –D. The general improvements which are needed to enhance the QoL in the study area are as follows:

1. **Strengthening Healthcare Facilities:** The accessibility and affordability of healthcare facilities need to be improved. It can be achieved through the establishment of more health centers, clinics, and hospitals in the area. Furthermore, the quality of services provided by the doctors and staff should be improved, and adequate medicine supply should be ensured.
2. **Improving Water and Waste Management:** Water supply and waste management systems need to be upgraded to ensure that residents have access to clean and safe

drinking water, and proper waste disposal facilities. This can be achieved by investing in infrastructure and ensuring the implementation of effective policies.

3. **Ensuring Inclusive Parks and Playgrounds:** The existing parks and playgrounds need to be upgraded to ensure that they are inclusive and accessible to people of all ages, genders, and disabilities. This can be achieved by creating more open spaces, playgrounds, and recreational facilities.
4. **Encouraging Sustainable Transportation:** Encouraging sustainable transportation methods like cycling and walking can help reduce traffic congestion and improve air quality. The provision of safe and convenient pedestrian and bicycle pathways should be ensured.
5. **Promoting Education and Culture:** The city needs to invest in promoting education and culture by creating more educational and cultural institutions, promoting art and music events, and preserving historical sites. This will not only enhance the quality of life but also boost tourism and the local economy.

These proposals can be incorporated into the city's master plan and implemented through collaborative efforts between the local government, private sector, and civil society organizations. By prioritizing the well-being of its residents, Mingora can become a healthier, more livable, and sustainable city, in line with WHO standards and SDGs

14.2. Existing Security Situation

Cities around the world face challenges related to safety and security despite economic and social progress. Safety involves reducing risks from human, material, and environmental factors, while security aims to eliminate risks and create a safe living environment for all. Both require evidence-based urban initiatives to increase communities' resilience to various forms of crime and violence, such as theft, robbery, sexual violence, vandalism, and organized crime, and to protect vulnerable groups and minorities. The goal is to create a peaceful and safe environment for all.

There is a total of 3 police station in Mingora-Saidu Sharif. The study area crime rates are somewhat higher than many other similar areas in KPK. According to development statistics of KP 2021, a total of 118 murders in 2019 and 120 in 2020 were witnessed in the area not only that 4 abductions, 11 car theft and 27 motorcycle theft were reported in the study area[19].

The primary surveys analysis depicts that more than 50% of respondents believe that the area in which they are residing doesn’t face issues involving criminal activities. However, about 43.62% believed that such activities do prevail in their area of living. Further classifying the type of existing criminal activities, it was seen that major crimes that occur in the area include theft, robberies, harassment, and other similar crimes which show ratios of 15.96%, 15.01%, 11.58% and 0.83% respectively. Moreover, female participants were surveyed to determine if they encountered any form of harassment in their workplaces, markets, or educational institutions. The findings indicated a low incidence of harassment, highlighting the positive cultural and environmental factors within the study area.

[19] Development Statistics of Khyber Pakhtunkhwa, 2021

In regard to satisfaction level in terms of security forces repose and working of department, it shows more than 77 % is satisfied with the current responses from security departments in the study area.

14.2.1. Proposals to Improve Security Situations

In order to improve safety and security in Mingora, there is a need to incorporate the following interventions:

- Increasing police presence through hiring more officers and establishing checkpoints.
- Enhancing surveillance by installing CCTV cameras in public spaces.
- Improving lighting in public areas by installing streetlights and creating well-lit pathways in parks.
- Ensuring availability and quick response of emergency response services like ambulance and fire services.
- Conducting public awareness campaigns to educate the community on the importance of safety and security measures.
- Establishing community watch groups to work with the police to identify potential security threats.
- Developing a well-planned emergency response plan that outlines the roles and responsibilities of emergency responders, evacuation procedures, and communication protocols.

Customizing and tailoring these measures to the specific situation in Mingora is essential and should be done in collaboration with local authorities and security experts.

14.3. Existing Safety Situation

Existing rescue facilities in Mingora-Saidu Sharif were assessed to identify the current numbers and level of service of rescue departments in the area. Currently, there are two rescue stations in Mingora-Saidu Sharif to deal with the emergency situation in overall study area which is quite alarming state.

14.3.1. Proposals to Improve Safety Situation

As per NRM standards, there should be one fire engine for an area having 25,000 to 75,000 people with a fire hydrant available next to the nearest overhead water reservoir. For the population of the city, only one fire station has been proposed in the study area to deal with the emergency situations certainly for fire hazards. The following table show the location and place for the proposed fire station in the Mingora-Saidu Sharif City.

For the projected population, the consultant has used average population standards i.e., one fire engine for 50,000 people, and the following are the number of fire engines proposed:

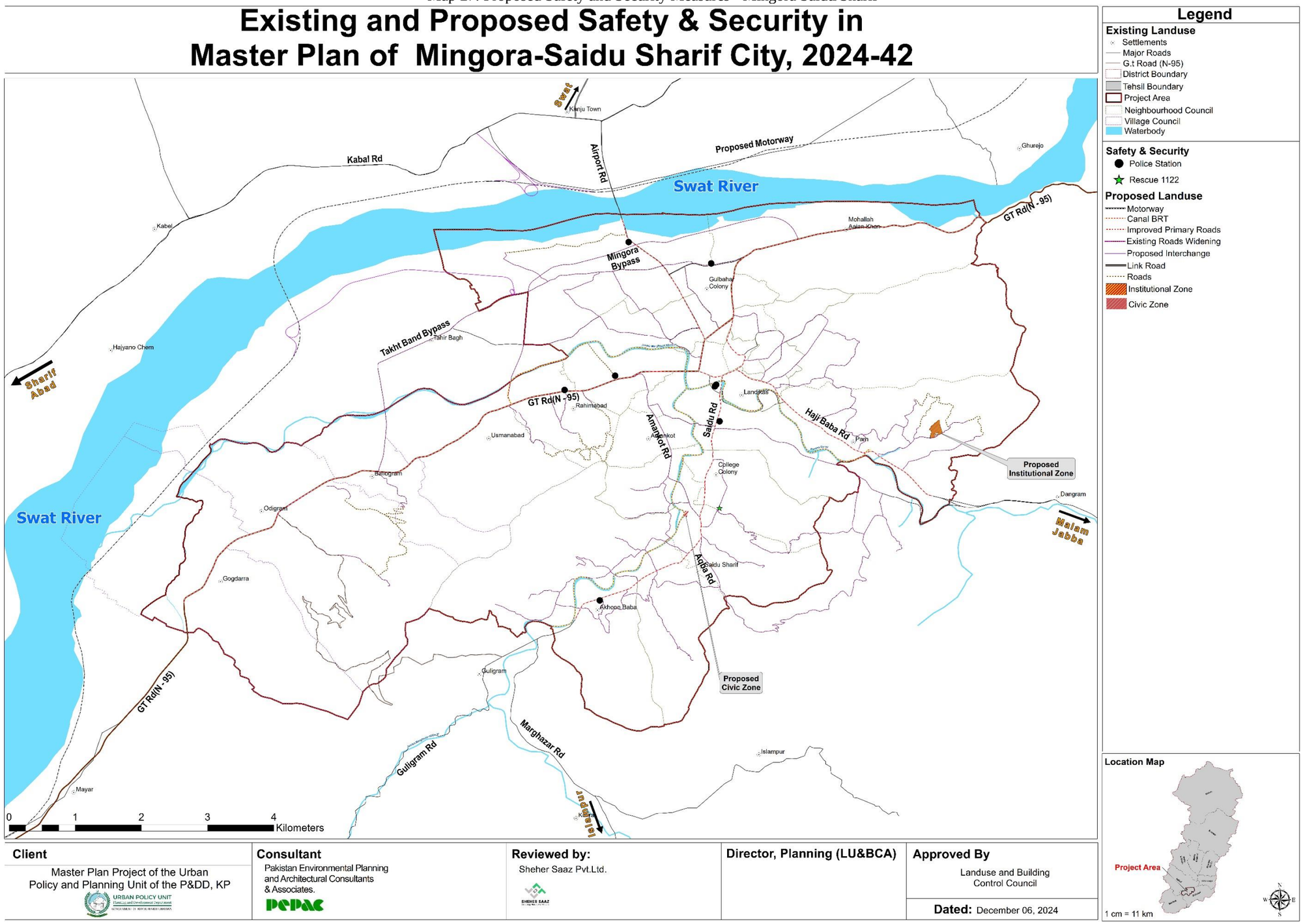
Table 72: Proposed Fire Engines

Year	Projected Population	Population Increase	Required Fire Engines
2017	**392,864**	-	7

2022	**446,425**		1
2027	508,436	62,011	1
2032	575,746	67,310	1
2037	649,336	73,590	1
2042	730,366	81,030	1
For population of 2042			**13**

Source: Calculated by Consultant using NRM Standards

Map 27: Proposed Safety and Security Measures - Mingora Saidu/Sharif



Source: Devised by Consultant

Chapter 15: Citizen Behavior

Citizen behavior refers to an individual's attitude towards owning or being a part of a social structure, through taking certain responsibilities voluntarily. Some of the core qualities of a responsible citizen include obedience of societal laws, respect towards others' rights, trustworthiness and contribution in performing various civic duties.[20]

The assessment of citizens' behavior in a city is crucial for planning and policy development, as it provides valuable information on their experiences, behavior, well-being, engagement, and participation in the local society. This information is especially pertinent for evaluating the state of welfare of society and developing projects to improve the citizens' living conditions.

For instance, in Mingora-Saidu Sharif, the people are well aware of the importance of disposing of solid waste properly and the types of solid waste generated to be recycled to some intends. In case of vandalizing/ damaging public spaces, people are well aware of public spaces even the soft and hard cape elements in the city. The people also have high responsibility towards protecting these facilities. Moreover, the majority of respondents expressed a willingness to promote tourism in the stud area, indicating a potential for economic development and agreed that the tourism sector should be promoted through enhanced tourism activities in the city. Overall, these findings emphasize the importance of engaging with citizens and taking their valuable insights into account in planning and policy development.

15.1. Proposals

The citizens of Mingora are aware of city management and government initiatives, making them valuable contributors to sustainable development. Their involvement can help promote tourism, create job opportunities, and support local businesses by showcasing the city's cultural and natural attractions.

A responsible approach to solid waste management is crucial, and public cooperation with the government can lead to a cleaner, healthier environment. Supporting government initiatives ensures effective implementation and long-term benefits for the city.

By working together, citizens and authorities can enhance Mingora's quality of life, preserve its heritage, and promote sustainable growth.

[20] https://medium.com/@ResilientBella/responsible-citizen-of-society-680790f3dc36

Chapter 16: Proposals for Urban Beautification

Urban design refers to the art of dealing with spatial arrangement of different elements and functions related to towns, suburbs and cities. The aim of the urban design process is to create such communities in which people can live, engage with each other, and interact with physical surroundings around them.

The analysis of various street scape and building elements including Main Bazar Mingora, Saidu Bazar Mingora, Nishat Chowk Mingora, College Colony Saidu Sharif, Fizagut Park, Wonder World and Amusement Park were made, and their results are provided in Volume: 03. For the provision of sustainable more upgraded infrastructure various proposals can be incorporated with the help of public private partnerships or with the local communities as well.

16.1. Proposals for Improved Urban Design

Some urban design proposals that can be incorporated in the study area to enhance its urban design.

1. **Improve pedestrian infrastructure**: Mingora has a high population density and heavy traffic, which makes it difficult for pedestrians to navigate the city safely. The master plan prioritizes the improvement of sidewalks, street crossings, and pedestrian bridges, creating a more walkable and accessible environment for residents.
2. **Develop green spaces:** Green spaces play a vital role in the urban environment, providing recreational areas, reducing pollution, and promoting biodiversity. A master plan for Mingora includes the development of parks, community gardens, and green belts, providing residents with access to natural spaces.
3. **Upgrade public transportation:** Mingora's transportation system is currently dominated by private vehicles, leading to traffic congestion and air pollution. A master plan prioritizes the improvement of public transportation systems providing residents with efficient and sustainable transportation options.
4. **Preserve cultural heritage:** Mingora has a rich cultural heritage, including historic buildings, archaeological sites, and traditional crafts. To preserve these cultural assets, such as adaptive reuse of historic buildings, promoting traditional crafts, and creating cultural tourism opportunities a specific zone is proposed in the Master Plan
5. **Promote mixed-use development:** A master plan could encourage mixed-use development, which combines residential, commercial, and recreational activities in a single area. This approach can create vibrant and diverse neighborhoods, reducing the need for car travel and promoting social interaction.

These proposals will be incorporated in Action Plans for urban design in Mingora taking into account the needs and desires of local residents, balancing economic, social, and environmental concerns to create a sustainable and livable city.

16.2. Proposals for Urban Beautification

- **Parks and Recreational Facilities**
    a. Preserve and redevelop existing parks and recreational facilities of the city.

b. Indulge softscape and hardscape elements in the existing dilapidated recreational areas.
c. Develop a connection between neighborhoods and recreational places/parks.
d. Walkways and open spaces should be connected with feasible paths with the parks and recreational sites.
e. For ensuring public safety, security equipment should be installed on every point in such areas.

- **Proposals for Street Furniture**

  For enhancing the public space character of streets and roads of Mingora city, certain guidelines have been proposed to alter the existing street scape through certain physical and social interventions which could possibly indulge the public space functions into existing street pattern.

  a. Placement of street furniture such as benches, bike racks, and public trash bins along sidewalks is recommended. Local craftsmanship and materials should be considered to add a unique touch to these elements. Provide shaded seating areas and public restrooms at strategic locations.
  b. The placement of street furniture should devote considerable attention to accessibility and visibility.
  c. Placement of public trash bins strategically at frequent intervals along sidewalks to encourage proper waste disposal and maintain cleanliness is recommended.
  d. Shaded seating areas in parks, plazas, or wider sidewalks should be created
  e. Provide spaces for temporary informal activities along the streets such as street art galleries, food stalls, etc. giving the public reason to spend a little more time on streets.

- **Skyline Improvement**

  a. Integrate public art installations into the skyline to add vibrancy and cultural significance. Sculptures, murals, and interactive art pieces can be strategically placed on rooftops, plazas, and along major thoroughfares. These installations can serve as landmarks and focal points, making the skyline more visually engaging.
  b. Promote the implementation of green roof initiatives on existing and new buildings. Green roofs not only improve the visual appeal of the skyline but also provide numerous environmental benefits. They help reduce the heat island effect, improve air quality, and provide habitat for birds and insects. Incentives can be provided to encourage building owners to incorporate green roofs.
  c. Develop a comprehensive skyline planning strategy that ensures new developments and renovations are coordinated to create a cohesive and harmonious skyline. Implement design guidelines and regulations to maintain a consistent architectural style, building height, and overall visual quality.

- **Enhancing Business Support Character of Streets**

  a. Improve pedestrian safety and comfort on the streets.
  b. Propose street layouts meanwhile designating spaces for temporary stalls, vendors, etc.
  c. Improve street pavements to ensure efficient business activities.

d. Ensure public transport connectivity and approach from and towards the secondary arteries to maximum

- **Enhancing Public Safety and Security**
  a. Provide shared spaces promoting social, economic and cultural exchange.
  b. Control accessibility towards and from the streets through certain physical interventions i.e., bollards placement, etc.
  c. Introducing security equipment on major and minor roads e.g., CCTV Cameras
  d. Introducing policy guidelines for limiting street use while utilizing at maximum
- **Conservation and Upgradation of buildings**
  a. Façade cleaning and restoration programs should be initiated to revitalize the exteriors of the building.
  b. Installation of architectural lighting on building facades to highlight their unique features and create a visually striking effect during the evening hours is suggested to improve urban design of study area.
  c. Decorative screens or sunshades should be added to building facades to add texture, depth and visual interest
  d. Walls of new buildings should be well designed, beautiful, highly valued, and worthy of preservation
  e. Through good design, Buildings should be allowed different uses to occur on different levels within the same building.
  f. Building identification signs will include the name of the building or tenant(s).

16.3. Reference Proposals

The consultant has selected a site on one of the tourist destination sites in Mingora-Saidu Sharif and made possible interventions that are recommended above to improve the urban design of study area. The images below show the comparison of existing and recommended proposal for the selected site;

- **Site 01: Existing Situation**

Figure 5: Existing Situation

Source: Taken by the consultant

- **Site 01: Proposals**

Figure 6: Proposed Situation

Source: Photoshop by Consultant

- **Site 02: Existing Situation**

Source: Derived from Google Maps

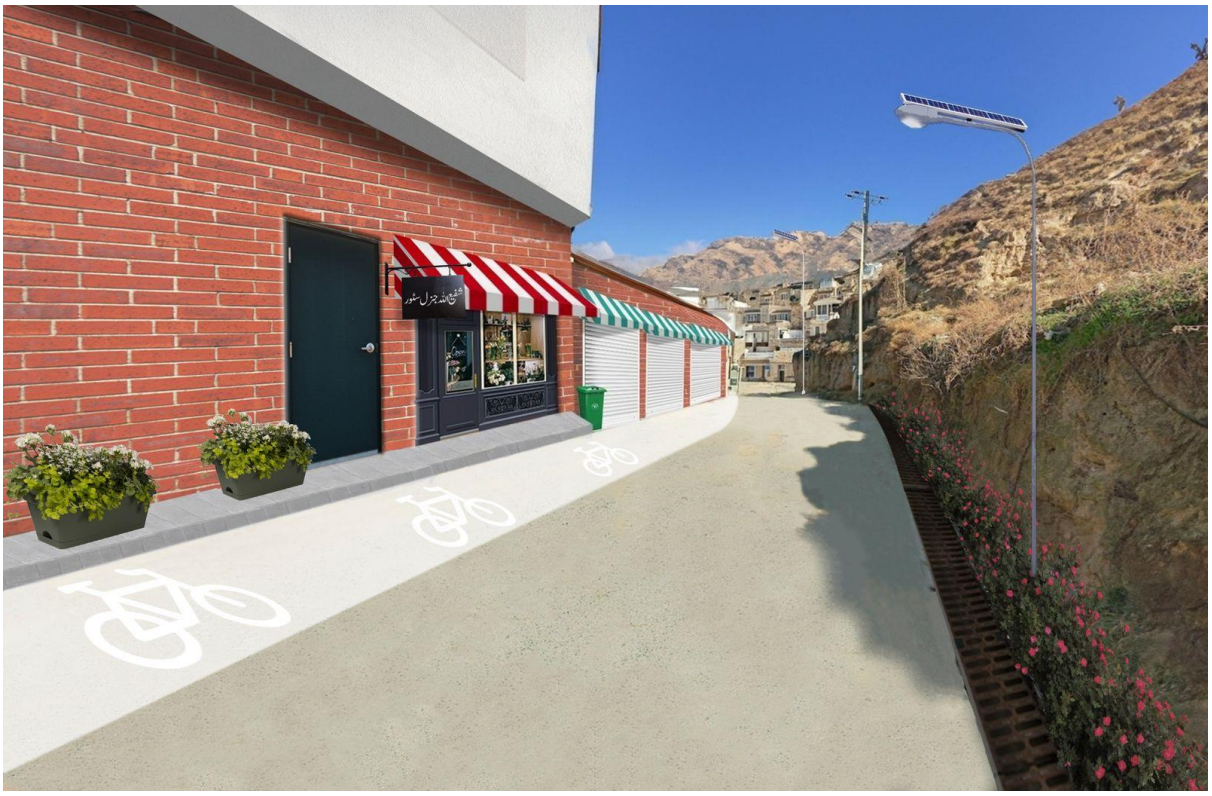
Site 02: Proposals

Source: Photoshop by Consultant

Site 03: Existing Situation

Source: Derived from Google Maps

Site 03: Proposals



Source: Photoshop by Consultant

Chapter 17: Preservation of Heritage Site

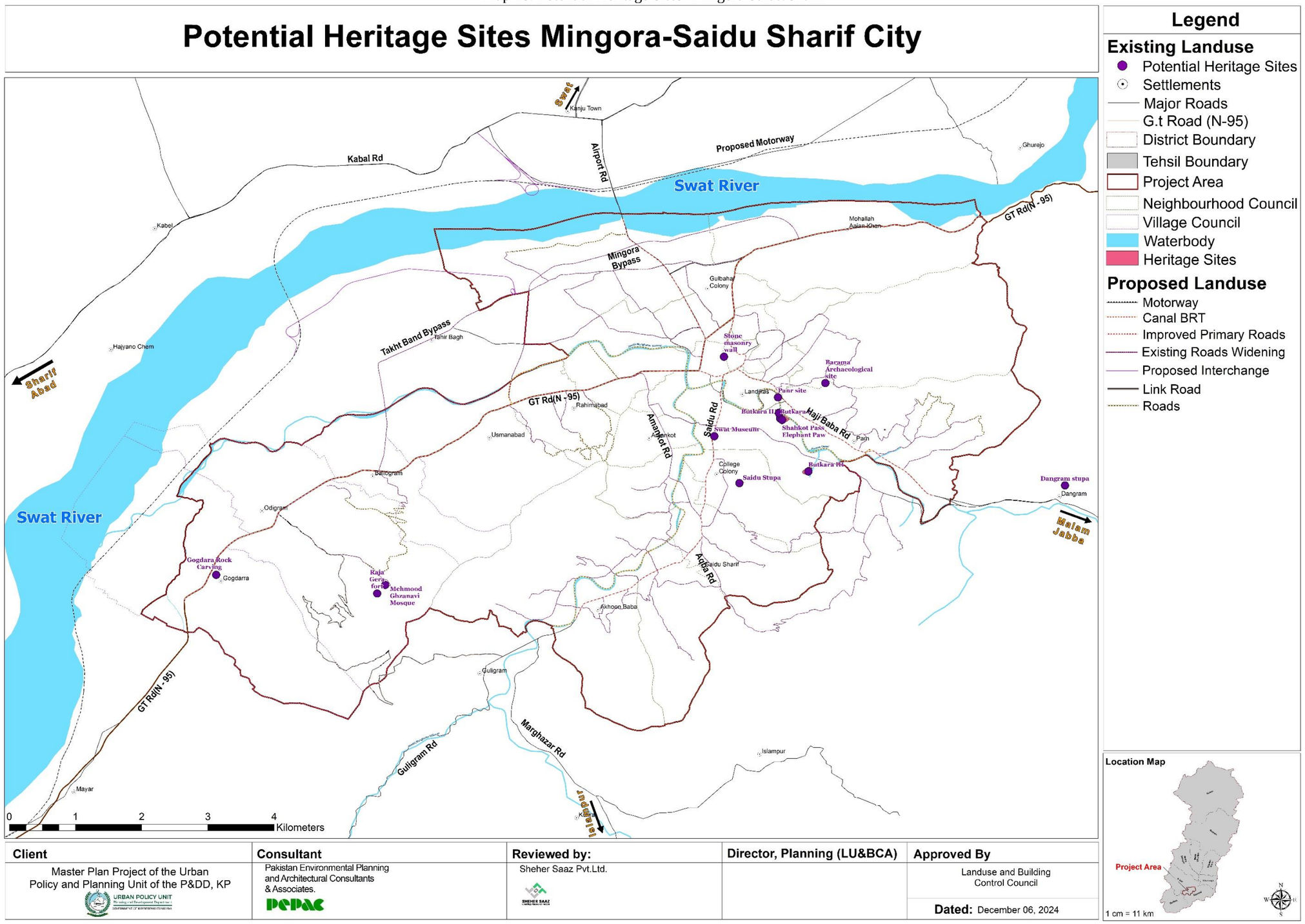
Mingora-Saidu Sharif City is a rich cultural heritage in Pakistan. The prominent heritage sites in the study area are the Buddhist Culture sites which makes Mingora one of the most unique places. Including Saidu Sharif Stupa, Barama Archeological site, Gogdara Rock Craving, Panr Archeological Site, Butkara I, II & III, Swat Museum and Mingora Bazaar these sits emphasize the tourism and development of study area economy to a greater extend.

The Buddhist stupa site dates back to the 2nd century BC. It is located on the outskirts of Mingora and is considered to be one of the most important historical sites in the region. The Mingora Bazaar is a bustling market which has been around for centuries. It is a great place to soak up the local culture and to shop for handicrafts and souvenirs. On the other hand, the Swat Museum is house to a collection of artifacts and exhibits showcasing the rich history and culture of the region.

17.1. Proposals for Heritage Sites Preservation

- **Restoration and Preservation:** The first step in enhancing the heritage sites in Mingora is to restore and preserve them. This can be done by using traditional building techniques and materials and by ensuring regular maintenance and repair work.
- **Interpretive Signage and Information Centers:** The installation of interpretive signage and information centers at heritage sites can help visitors to better understand the historical and cultural significance of the sites.
- **Improved Accessibility:** Making heritage sites more accessible to visitors can increase their use and enjoyment. This can be achieved through the provision of safe and easy-to-navigate footpaths, ramps and rails, and clear signage.
- **Cultural Events and Festivals:** Cultural events and festivals can help to promote the heritage sites in Mingora and attract more visitors. This can include music and dance performances, exhibitions, and guided tours.
- **Community Involvement:** Involving the local community in the management and promotion of heritage sites can help to foster a sense of ownership and pride. This can be done through the formation of local heritage committees, volunteer programs, and educational initiatives.

Map 28: Potential Heritage Sites- Mingora Saidu/Sharif



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP URBAN POLICY UNIT	Pakistan Environmental Planning and Architectural Consultants & Associates. PEPAC	Sheher Saaz Pvt.Ltd. SHEHER SAAZ		Landuse and Building Control Council **Dated:** December 06, 2024

Source: Devised by Consultant

Chapter 18: Master Plan Development Blueprint

18.1. Salient features of Proposed Master Plan

The Mingora-Saidu Sharif Master Plan 2042 follows the Compact City concept, promoting efficient land use, walkability, and mixed-use development while preserving agricultural land and natural areas. The plan encourages higher-density development along major roads and intersections, integrating commercial, residential, and public spaces with pedestrian-friendly infrastructure.

A star-shaped road network supports compact growth, reducing urban sprawl and enhancing accessibility. Infill development of vacant areas minimizes pressure on the outskirts, while vertical expansion provides diverse housing options.

The plan includes:

- **Residential zones** (70% horizontal, 30% vertical) to accommodate future growth.
- **Commercial zones** along key corridors, fostering business, trade, and tourism.
- **Recreational spaces**, including parks, sports complexes, and conservation areas.
- **Civic infrastructure** for public services and institutions.
- **Environmental preservation** through urban forestry, riparian afforestation, and flood conservation zones.
- **Mixed-use zones** integrating housing, commercial, and leisure spaces to reduce car dependency.
- **Sewerage treatment plants and security measures** for a safe and sustainable urban environment.

This master plan ensures **sustainable growth**, improved infrastructure, and balanced urban development for the future of **Mingora-Saidu Sharif**.

Map 29: Proposed Master Plan of Mingora Saidu Sharif - 2042

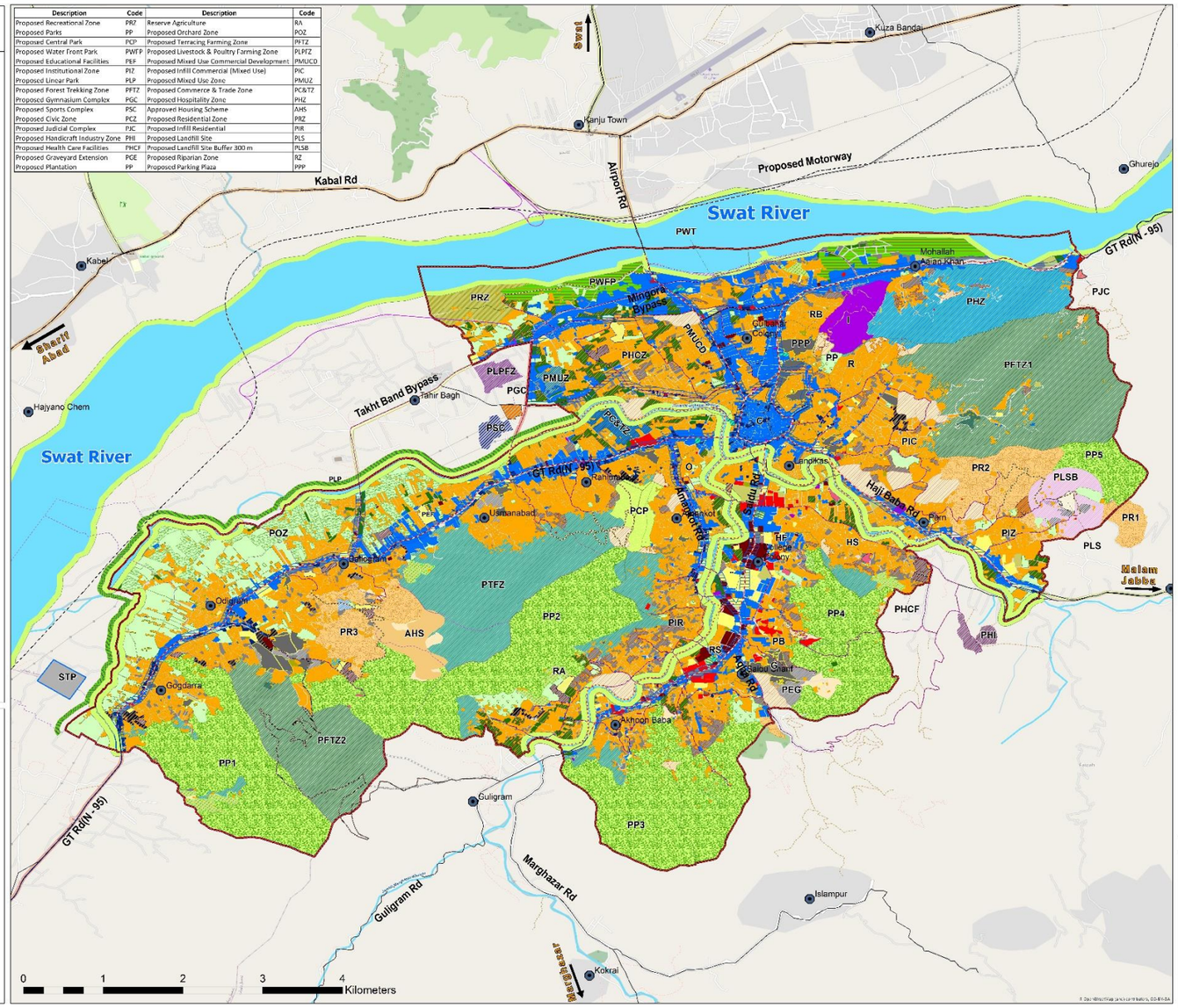
Proposed Master Plan of Mingora City, 2024-42

Existing Landuses

- Settlements
- G.t Road (N-95)
- Major Roads
- Project Area
- Planned Residential
- Unplanned Residential
- Heritage Sites
- Agriculture
- Commercial
- Mixed use
- Education
- Health
- Industries
- Graveyard
- Religious Building
- Public Building
- Recreational Area
- Parks and Playground
- Orchards
- Vacant Land
- Hilly Area
- Water Bodies

Description	Codes
Commercial	C
Education	E
Residential	R
Public Building	PB
Graveyard	G
Health	H
Industry	I
Recreational Site	RS
Religious Building	RB

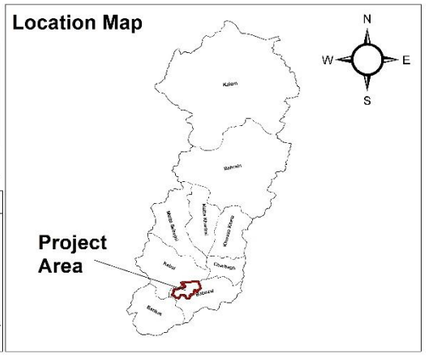
Description	Code	Description	Code
Proposed Recreational Zone	PRZ	Reserve Agriculture	RA
Proposed Parks	PP	Proposed Orchard Zone	POZ
Proposed Central Park	PCP	Proposed Terracing Farming Zone	PFTZ
Proposed Water Front Park	PWFP	Proposed Livestock & Poultry Farming Zone	PLPFZ
Proposed Educational Facilities	PEF	Proposed Mixed Use Commercial Development	PMUCD
Proposed Institutional Zone	PIZ	Proposed Infill Commercial (Mixed Use)	PIC
Proposed Linear Park	PLP	Proposed Mixed Use Zone	PMUZ
Proposed Forest Trekking Zone	PFTZ	Proposed Commerce & Trade Zone	PC&TZ
Proposed Gymnasium Complex	PGC	Proposed Hospitality Zone	PHZ
Proposed Sports Complex	PSC	Approved Housing Scheme	AHS
Proposed Civic Zone	PCZ	Proposed Residential Zone	PRZ
Proposed Judicial Complex	PJC	Proposed Infill Residential	PIR
Proposed Handicraft Industry Zone	PHI	Proposed Landfill Site	PLS
Proposed Health Care Facilities	PHCF	Proposed Landfill Site Buffer 300 m	PLSB
Proposed Graveyard Extension	PGE	Proposed Riparian Zone	RZ
Proposed Plantation	PP	Proposed Parking Plaza	PPP



Proposed Landuse

- Motorway
- Canal BRT
- Link Road
- Roads
- Proposed Interchange
- Proposed Parking Plaza
- Proposed STP
- Residential Zone
- Under Process Residential Schemes
- Infill Residential
- Commerce & Trade Zone
- Infill Commercial (Mixed Use)
- Mixed Use Zone
- Central Park
- Water Front Park
- Proposed Parks
- Mixed Use Commercial Development
- Handicraft Industry Zone
- Educational Facilities
- Institutional Zone
- Forest Trekking Zone
- Health Care Facilities
- Recreational Zone
- Gymnasium Complex
- Linear Park
- Civic Zone
- Judicial Complex
- Hospitality Zone
- Walking Track
- Graveyard Extension
- Plantation
- Reserve Agriculture
- Proposed Orchard
- Terracing Farming Zone
- Livestock & Poultry Farming
- Landfill Site
- Landfill Site Buffer (300 m)
- Riparian Zone

Location Map



Client	Consultant	Reviewed by:	Director, Planning (LU&BCA)	Approved By
Master Plan Project of the Urban Policy and Planning Unit of the P&DD, KP	Pakistan Environmental Planning and Architectural Consultants & Associates.	Sheher Saaz Pvt.Ltd.		Landuse and Building Control Council
				Dated: December 06, 2024

Source: Devised by Consultant

18.2. Implementation Framework

The consultant has proposed the best scenario for Mingora-Saidu Sharif study area for the purpose of accommodating the existing built-up, existing population, future proposed development, and future population in the best possible manner without compromising on the existing resources and existing agriculture, pasture, green and forest land falling within the study area boundary. The Proposed Master Plan for Mingora-Saidu Sharif is based upon the LSA and best scenario chosen in the previous section. For master plan implementation three distinguish timeframe intervals are proposed to make the masterplan implementation efficient and sustainable. Following are implementation phases for master plan.

Table 73:Proposed Phase Wise Development Works Implemented in Master Plan

Sr. No.	Population Served	Period	Development Phase	Type of Development
1.	129,321	10 - Years 2022 – 2032	Short Term	Infill Development/intensification -I
2.	202,911	15 - Years 2022 – 2037	Medium Term	New Development
3.	283,941	20 – Years 2022-2042	Long Term	New /Future Development

Source: Devised by Consultant

a. Phase 1: Short-term Implementation (2022-2032)

This section is further divided into two phases each having five intervals. The short-term phase focus will be on the immediate needs of the city, and the implementation will be carried out through quick-win projects. Following initiatives will be undertaken during this phase:

- Rehabilitation of existing infrastructure, including roads, water supply, and sewage system
- Identification of areas that require immediate attention, such as the provision of basic amenities, lighting, and sanitation facilities
- Development of new parks and green spaces
- Encouragement of private investment in the development of tourism, industry, and commerce
- Provision of Housing Facilities as per adopted scenario mentioned

b. Phase 2: Medium-term Implementation (2022-2037)

During this phase, the focus will be on developing a sustainable infrastructure that caters to the future growth of the city. The following initiatives will be undertaken during this phase:

- Expansion of the road network to accommodate the increase in traffic
- Establishment of new public transportation systems
- Development of new residential areas and commercial areas
- Promotion of tourism through the development of new attractions and facilities

c. Phase 3: Long-term Implementation (2022-2042)

During this phase, the focus will be on developing a sustainable and resilient city that can withstand future challenges. The following initiatives will be undertaken during this phase:

- Integration of new technologies to enhance the efficiency of the city's infrastructure
- Creation of a comprehensive disaster management plan
- Promotion of sustainable practices such as green energy and waste management
- Implementation of smart city solutions to improve the quality of life for citizens
- Establishment of new research and development centres to support innovation and growth.
- Development of new residential areas in the form of zone 1 outside of study area boundary accommodating housing.

Overall, the implementation of the proposed master plan of Mingora-Saidu Sharif will require a concerted effort from all stakeholders, including the government, private sector, and citizens. By following the above implementation phases, the city can achieve sustainable growth and development while maintaining its unique cultural and natural heritage.

The further detail of building guidelines will be provided in deliverable Task D - Action Plan.

18.3. Land Use Comparison of Proposed Master Plan

According to the NRM standards, Mingora-Saidu Sharif study area projected population falls within the category of more than 500,000, therefore is considered to be a medium sized urban city. The land demand estimates depicted in the above Chapter 4 uses a different criterion of NRM as the projected population of study area by 2022 falls within the category of 100,000 to 499,000. Because there is an increase of 283,941, the NRM criteria will differ. The maximum and minimum gap have been calculated by comparing existing land uses with maximum and minimum land use requirement of 2042.

The proposed land use for residential areas is 738.72 acres including the outside the boundary, which will be used for housing developments. These developments will cater to the increasing population of Mingora-Saidu Sharif, providing comfortable and sustainable housing options for its residents.

The hospitality zone has been proposed in the master plan with an area of around 459.84 acres. This zone will act as commercial zone where tourists' accommodations will be proposed and will provide opportunities for local businesses and contribute to the economic development of the city. It is anticipated that these areas will include a mix of retail, office, and service-oriented businesses.

The community facilities proposed in the master plan include health, education, mixed-use, religious, public, and other related facilities. These facilities will cover a total of 92.36 acres of land, with health zones covering, education zones and a civic zone. These zones will cater to the health, educational, and social needs of the community, providing necessary facilities and services. The master plan also includes 1529.03 acres of green, recreational, and open spaces, which will provide residents with areas for relaxation, exercise, and other recreational activities.

In conclusion, the Mingora-Saidu Sharif Master Plan 2042 is a well-thought-out plan that aims to ensure sustainable development and growth while preserving the environment. The proposed land uses, including residential areas, commercial areas, community facilities, green spaces, and protected reserves, within or outside of the study area boundary will together are able to cater the needs of the city's population while promoting economic growth and preserving the environment.

Further Proposed Land uses are mentioned in following table;

Table 74: Existing & Proposed Land Use Comparison

Sr. No.	Land Uses	Existing Areas (Acres)	Existing Area (Sq. Km)	Land Use Percentage %	NRM Standards Recommended Land Use Allocation Standard (For Population above 500,000)	Proposed Areas (Acres)	Sq. Km	Total Areas (Acres)	Proposed Areas Percentage %
1	Residential	2902.80	11.75	23.86%	**24-32%**	696.59	2.99	3599.39	**29.72%**
2	Commercial	889.71	3.60	7.31%	**1-2%**	903.68	2.45	1495.79	**12.29%**
3	Institutions	361.87	1.46	2.97%	**3-8%**	83.17	0.34	445.04	**3.66%**
4	Recreational Places	60.98	0.25	0.50%	**2-5%**	1395.72	5.65	1456.70	**11.97%**
5	Graveyard	137.38	0.56	1.13%	**0.5-3.5%**	39.73	0.16	177.11	**1.46%**
6	Vacant/Agriculture/Orchard/Buffer	7167.39	29.01	58.91%	**9-45%**	3457.25	13.99	4321.80	**35.52%**
7	Arterial Circulation	550.56	2.23	4.53%	**13-20%**	-	0.00	550.56	**4.53%**
8	Industry	95.39	0.39	0.78%	**2-15%**	(Outside the boundary)	0.00	95.39	**0.78%**
9	Landfill Site				-	8.03	0.03	8.03	**0.07%**
10	**Total Area for zoning**	**12166.08**	**49.23**	**100.00%**		**7254.82**	**25.47**	**12489.55**	**100.00%**
11	Waterbody	356.58	1.44	2.85%				356.58	
Total Study Area		**12522.66**	**50.68**					**12846.13**	

Source: Devised by Consultant

Note: Around 480.24 acres of area have been proposed outside the boundary which includes industries, recreational zones, livestock and dairy farming zone and a small chunk of residential zone.