



**Government of the People's Republic of Bangladesh**

Ministry of Housing and Public Works

Urban Development Directorate

82, Segunbagicha, Dhaka- 1000

## Interim Report

**WITH INTEGRATION OF ALL DATABASE CONDUCTED BY DIFFERENT SURVEYS FIRMS' AND DATA PROCESSING, ANALYSIS, INTERPRETATION, PRESENTATION, AND FORMULATION OF WORKING PAPERS** under

**Preparation of Development Plan for Meherpur Zilla Project**



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**Interim Report** with integration of all database conducted by different surveys firms’ and data processing, analysis, interpretation, presentation, and formulation of working papers.

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## CHAPTER 1: INTRODUCTION

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### 1.1 Background

The formulation of comprehensive development plans has become increasingly essential in guiding sustainable urban and rural growth, especially in rapidly evolving regions like Meherpur Zilla. Meherpur, located in the southwestern corner of Bangladesh under the Khulna Division, is bordered by India to the west and is characterized by a blend of rural landscapes, historical significance, and emerging urban centers. Despite its rich cultural heritage—being the site where the Provisional Government of Bangladesh took oath in 1971—Meherpur remains one of the less urbanized and less economically diversified districts in the country.

Over the years, the region has faced several structural challenges, including limited access to quality urban infrastructure, inadequate transportation and utility networks, fragmented land use, low levels of industrial activity, and environmental vulnerabilities such as river erosion and waterlogging. These issues are compounded by the absence of a coordinated and forward-looking spatial development framework, which has resulted in unplanned growth and inefficient resource allocation.

Recognizing the need for a structured, evidence-based, and inclusive planning approach, the Government of the People's Republic of Bangladesh, through the Ministry of Housing and Public Works and under the Urban Development Directorate (UDD), has initiated the “Preparation of Development Plan for Meherpur Zilla.” This strategic initiative aims to establish a holistic and spatially-integrated planning document that aligns with national development goals and regional aspirations.

The project also responds to broader policy imperatives, such as achieving the targets of Vision 2041, the Bangladesh Delta Plan 2100, and the Sustainable Development Goals (SDGs). These national and international frameworks emphasize the importance of balanced regional development, climate resilience, improved governance, and sustainable land management—all of which are deeply relevant to Meherpur’s context.

The present Interim Report, prepared by TILLER-GEOMARK Limited JV, marks a critical milestone in this planning journey. It serves as a baseline document that integrates findings from various surveys, spatial data analyses, and institutional consultations to create a shared understanding of the district's current conditions and development potential. By identifying key trends, opportunities, and challenges, the report sets the stage for crafting a comprehensive and actionable development roadmap for Meherpur Zilla.

### 1.2 Objective of the Development Plan

The principal objective of the project titled “**Preparation of Development Plan for Meherpur Zilla**” is to formulate an integrated and forward-looking planning framework that will guide the physical, socio-economic, and environmental development of the district in a sustainable manner. This objective aligns with national strategic development visions, including the **Delta Plan 2100**, **Vision 2041**, and the **Sustainable Development Goals (SDGs)**, and is designed to strengthen regional planning capacity and spatial governance at the district level.

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As articulated in the Terms of Reference, the specific objectives of the project are as follows:

- i. To prepare a long-term (20-year) integrated and sustainable development plan for Meherpur Zilla based on contemporary planning practices and inclusive stakeholder engagement.
- ii. To develop a multi-layered GIS-based spatial database and digital mapping system, covering physical features, land use, infrastructure, environmental elements, and administrative boundaries, which will serve as the technical foundation for planning decisions.
- iii. To conduct in-depth assessments of land use, demographic trends, environmental issues, economic activities, and social infrastructure, with an emphasis on identifying both constraints and potential areas for development.
- iv. To prepare a structure plan, urban area plan, and rural area plan for Meherpur district, ensuring appropriate zoning, connectivity, growth corridors, and conservation areas.
- v. To integrate disaster risk reduction and climate resilience principles into the development planning process, ensuring that vulnerable populations and ecologically sensitive zones are adequately protected.
- vi. To engage local communities, government institutions, and development stakeholders in a participatory planning process that builds local ownership, institutional capacity, and long-term implementation commitment.
- vii. To strengthen institutional linkages and decision-making frameworks through capacity-building initiatives, training programs, and the promotion of inter-agency coordination mechanisms.
- viii. To formulate policies and guidelines for land use management, urban growth, housing, rural transformation, heritage conservation, and environmental sustainability based on empirical findings and best practices.

### **1.3 Scope of the Report**

This Interim Report serves as a foundational milestone in the broader framework of the “Preparation of Development Plan for Meherpur Zilla” project. It outlines the progress made thus far, methodologies adopted, initial findings, and analytical insights that will shape the formulation of the final development plan. The report synthesizes survey outputs and establishes baseline spatial and sectoral information.

Key components include:

- Documentation of existing conditions
- Integration of field survey data (physical, land use, topographic, mouza digitization)
- Preliminary spatial analysis and problem identification
- Review of methodologies and planning approaches
- Preliminary recommendations and data-driven planning hypotheses
- Roadmap for the remaining planning stages

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The report consolidates the knowledge necessary to transition from diagnostic assessment to strategic intervention planning..

## 1.4 Methodology

The methodology followed in this **Interim Report** reflects the initial and integrative phase of the *Preparation of Development Plan for Meherpur Zilla*. In line with the Terms of Reference (ToR), the firm was assigned with following key technical responsibilities:

1. Execution of Physical Feature Survey
2. Execution of Land Use Survey
3. Topographic Survey using UAV-based mapping
4. Digitization and geo-referencing of Mouza maps

Additionally, the firm was entrusted with a crucial cross-cutting role: to receive and synthesize outputs from other thematic survey firms appointed by UDD, and prepare an integrated GIS-based spatial database and Interim Report reflecting a comprehensive development baseline for Meherpur Zilla.

### 1.4.1 Execution of Core Surveys

Tiller-GEOMARK Limited JV conducted the following surveys, each guided by technical formats, field protocols, and geo-referencing standards provided by UDD:

- **Physical Feature Survey:** Comprehensive GPS-based field mapping of built and natural features including roads, buildings, rivers, canals, educational institutions, religious sites, and utility infrastructure.
- **Land Use Survey:** On-site identification and classification of land into functional categories such as residential, agricultural, commercial, industrial, institutional, and mixed use.
- **Topographic Survey:** High-resolution (10m) elevation data was acquired using UAV (drone) technologies to generate Digital Elevation Models (DEMs), contour maps, and slope classifications useful for flood-risk analysis, drainage design, and terrain-sensitive planning.
- **Mouza Map Digitization:** Scanning, digitization, and geo-referencing of official mouza maps obtained from the respective land offices, forming the parcel-level base for land management and zoning proposals.

### 1.4.2 Collection and Integration of Third-Party Survey Outputs

As per ToR directives, the Urban Development Directorate (UDD) appointed multiple specialized firms to conduct other baseline surveys covering:

- Socioeconomic Survey
- Environmental assessment
- Geology and Hydrology assessments
- Flora and Fauna
- Transportation

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These datasets were **shared with Tiller-GEOMARK Limited JV** by the client (UDD) in processed form.

The JV firm’s responsibility was to prepare the interim report by integrating the outputs.

### 1.4.3 Mapping and Visualization for Interim Reporting

Thematic maps were prepared to:

- Depict existing land use and settlement patterns
- Identify coverage of physical features and topographic variation
- Illustrate road networks, growth zones, and environmentally sensitive areas

These maps, coupled with preliminary spatial analysis, were compiled into the **Interim Report**, providing a holistic view of Meherpur’s development landscape as of the survey date.

### 1.5 Significance of the Study

This study is significant as it represents the first attempt to prepare a coordinated, data-driven, and long-term development strategy for Meherpur Zilla. It provides a spatial foundation for planning those accounts for the district’s physical characteristics, socio-economic dynamics, and infrastructure needs.

Key contributions include:

- Establishing a technical foundation for Structure, Urban, and Rural Area Plans
- Providing a unified spatial database that enhances planning accuracy and transparency
- Aligning with national goals such as Delta Plan 2100, Vision 2041, and the SDGs
- Enabling data-driven governance and decision-making
- Identifying development gaps, environmental risks, and priority areas

This Interim Report serves as a baseline reference and planning tool that will inform the district’s sustainable growth for years to come.

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## CHAPTER 2: STUDY AREA

The Meherpur district gained its district status on 1984, and later on 2000, Meherpur Sadar Upazila was split to establish Mujibnagar Upazila. Presently, Meherpur district comprises 3 upazilas, 18 unions, 180 Mouzas, 285 villages, 2 paurashavas, 18 wards and 100 mahallas. The upazilas of Meherpur district are Meherpur Sadar, Gangni and Mujibnagar.

As we are in the Inception Phase of the project, we have gathered and reviewed all relevant plans and policies for the project area. Additionally, we have reviewed and detailed basic statistics of the study area using BBS reports, journals, and other secondary materials relate to Meherpur District.

These data sources provide insights into the demographic, economic, social, and environmental aspects of the district.

The following sections present the reviewed materials, offering a detailed overview of our findings and analysis. This information serves as a foundation for the subsequent phases of the project, ensuring a well-informed and strategic approach moving forward.

### 2.1 Location

Meherpur district, situated in Bangladesh, is bordered by Kushtia district to the north, Chuadanga district to the east and south, and India to the south and west. It covers a total area of **751.62 sq.km.** (290 sq.miles) and lies between 23°44' and 23°59' north latitude, and 88°34' and 88°53' east longitude. It is the border district of western part of Bangladesh. Before the partition (1947) Meherpur was a part of the Nadia district of India.

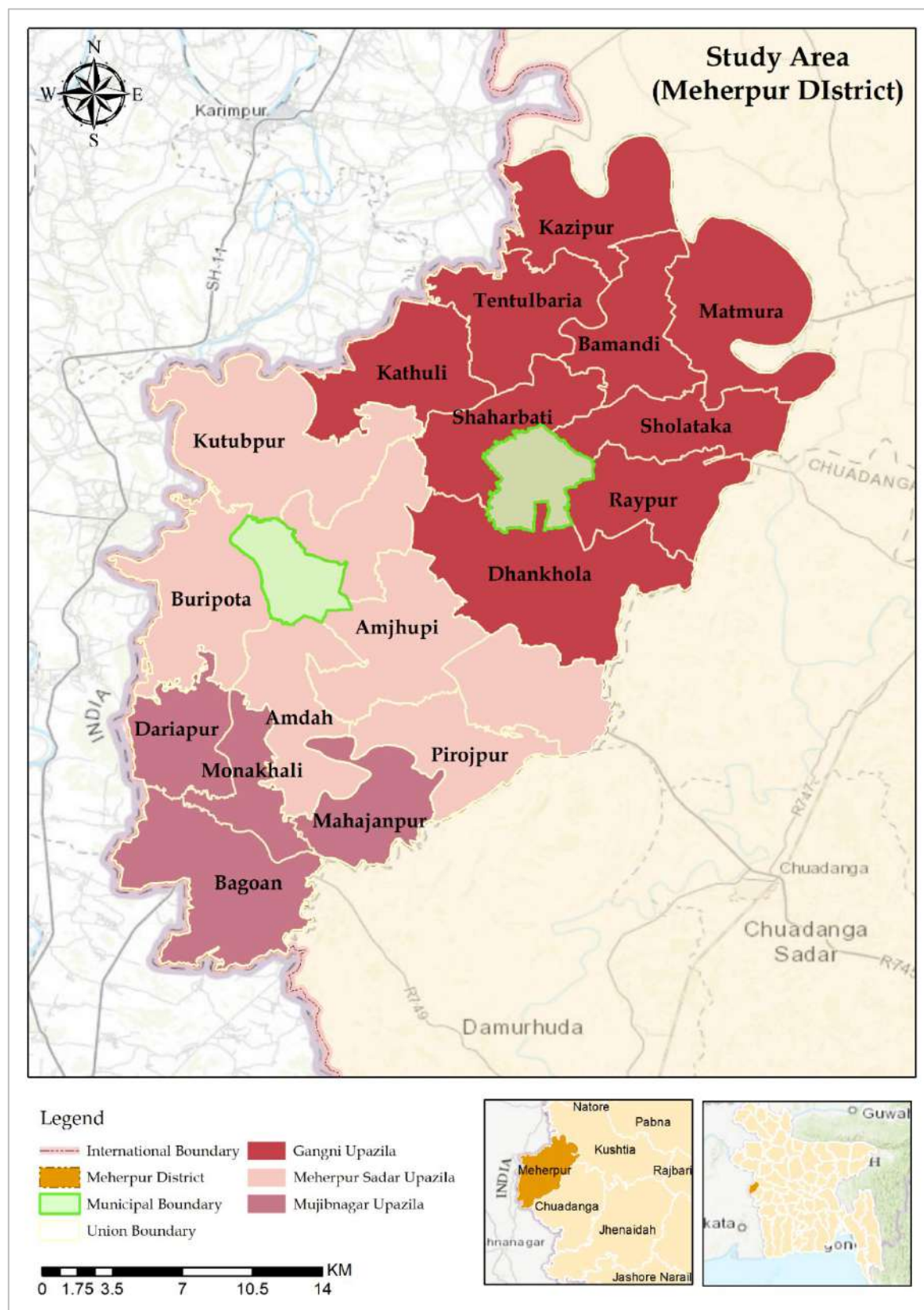
*Table 2-1: Meherpur District at a glance (Upazila, Union & Municipality)*

Sl. No.	Upazila (Area)	Union	Municipality (Area)
1	Meherpur Sadar (276.15 sq.km.)	Kutubpur, Buripota, Amjapi, Amdah, Pirojpur	Meherpur Municipality (17.60 sq.km.)
2	<b>Muiibnagar</b> (111.51 sq.km.)	Dariapur, Monkhali, Baguan, Mahajanpur.	-
3	Gangni (363.95 sq.km.)	Kathuli, Tetulbaria, Kazipur, Bamandi, Saharabati, Dhanakhola, Raipur, Matmura, Sholtaka.	Gangni Municipality (16.84 sq.km.)

Source: Bangladesh National Portal, 2024; Gangni Paurashava Master Plan: 2011-2031; Meherpur Paurashava Master Plan: 2017-2037



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## 2.2 Population & Growth rate

It is noted from the census data 2022, the total enumerated population is recorded as 705,330 and the household number, 195,322 in Meherpur district. The average household size in Meherpur district decreased from 3.94 in 2011 to 3.68 in 2022.

*Table 2-2: Basic Information of Meherpur District (Population & Household)*

Year	Population	Household	Household Size	Density
2011	655,392	166,312	3.94	884
2022	705,330	195,322	3.68	951

Source: Population and Housing Census 2022; Population and Housing Census 2011

The table depicts the figures of the enumerated population for Gangni, Mujibnagar, and Meherpur Sadar Upazilas as recorded in the Population and Housing Census 2022. Notably, Gangni Upazila had the highest enumerated population among the three Upazilas in Meherpur district, with a total of 92,768 residents.

*Table 2-3: Basic Information of the Project Area (Household, Population & Household Size)*

Area	Total Household	Population			Household Size (General)
		Total	Male	Female	
Meherpur District	195322	705330	340093	365237	3.59
Gangni	92768	322690	154479	168211	3.46
Mujibnagar	27675	105746	51380	54366	3.78
Meherpur Sadar	74879	276894	134234	142660	3.68

Source: Population and Housing Census 2022

The dependency ratio of 44.2 suggests that there are 44.2 dependents (children aged 0-14 and elderly aged 65+) for every 100 working-age individuals (15-64 years). This is important for economic planning, as a higher dependency ratio implies a greater burden on the working population to support the non-working population. The child-woman ratio of 249.19 (children aged 0-4 years per 1000 women of child-bearing age 15-49 years) provides insight into birth rates and future population growth. This is essential for planning maternal and child health services, and educational facilities.

The best-known and most widely available measure of mortality in early life is the Infant Mortality Rate (IMR). Infant mortality has a great impact on the age distribution of the population. As illustrated in the following table, infants are defined as individuals who have not yet reached their first birthday. This includes all children under the age of 1, whose ages are recorded as '0'. The infant mortality rate is determined by counting the deaths of infants who passed away before reaching one year of age. For the Meherpur District, the overall infant mortality rate is estimated to be 4.5 per 1,000 live births.

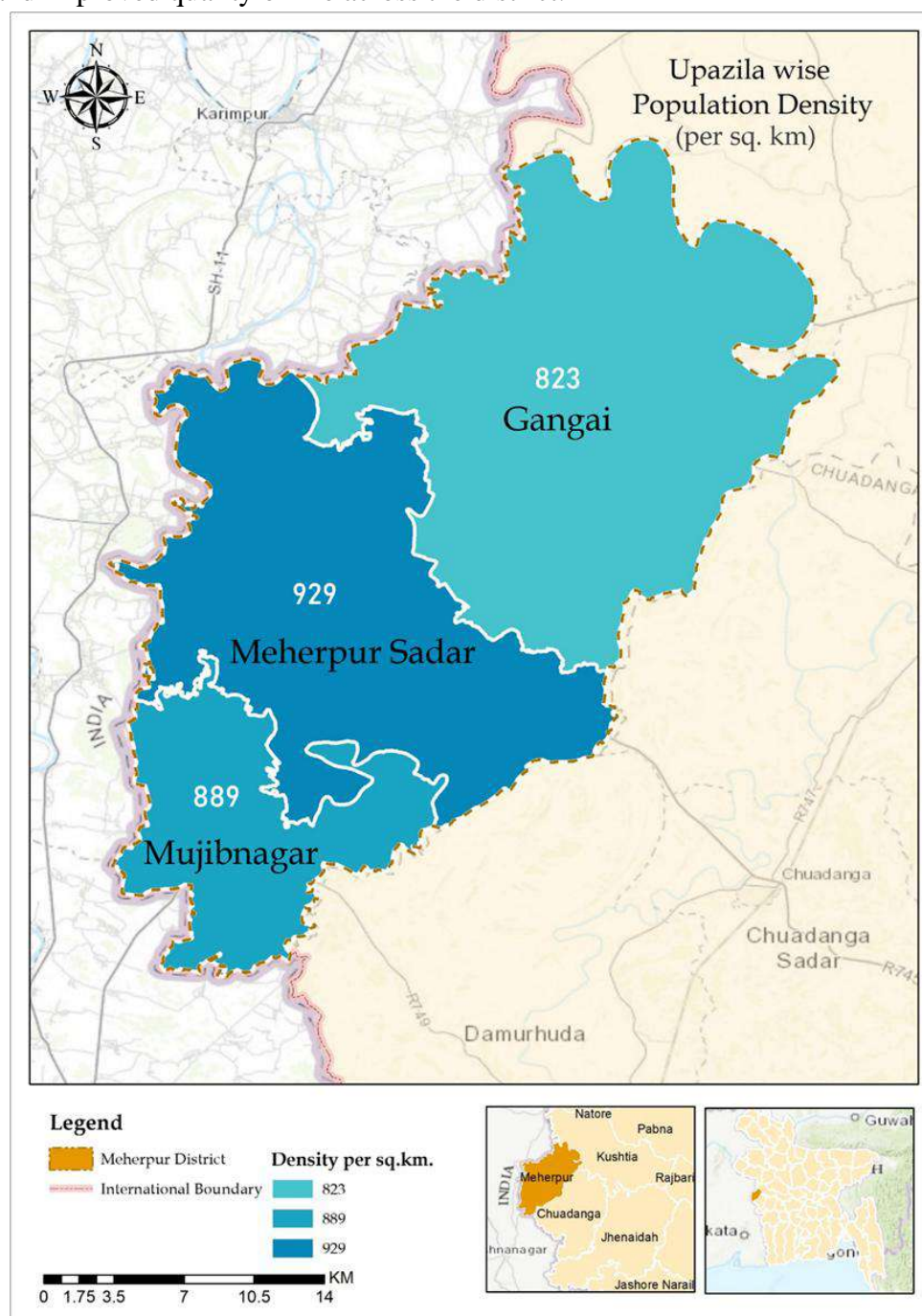
*Table 2-4: Growth rate, Sex ratio, Dependency ratio & Child-Woman ratio of Meherpur District*

Average Annual Population Growth Rate	Sex Ratio	Dependency Ratio	Child-Woman Ratio	Infant Mortality Rate, IMR
0.65	93.12	44.2	249.19	4.5

Source: Population and Housing Census 2022, Bangladesh Sample Vital Statistics 2022

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Population density, measured as the number of people per square kilometer, is vital for planning in Meherpur district. Meherpur Sadar has the highest density at 929 per sq.km., followed by Mujibnagar at 889 per sq.km, and Gangni at 823 per sq.km. Higher density areas like Meherpur Sadar require more infrastructure, housing, and public services to accommodate the larger population, while for lower density areas like Gangni, we should focus on connectivity and efficient service delivery. These densities guide resource allocation, urban and rural development, economic activities, and environmental planning, ensuring balanced growth and improved quality of life across the district.

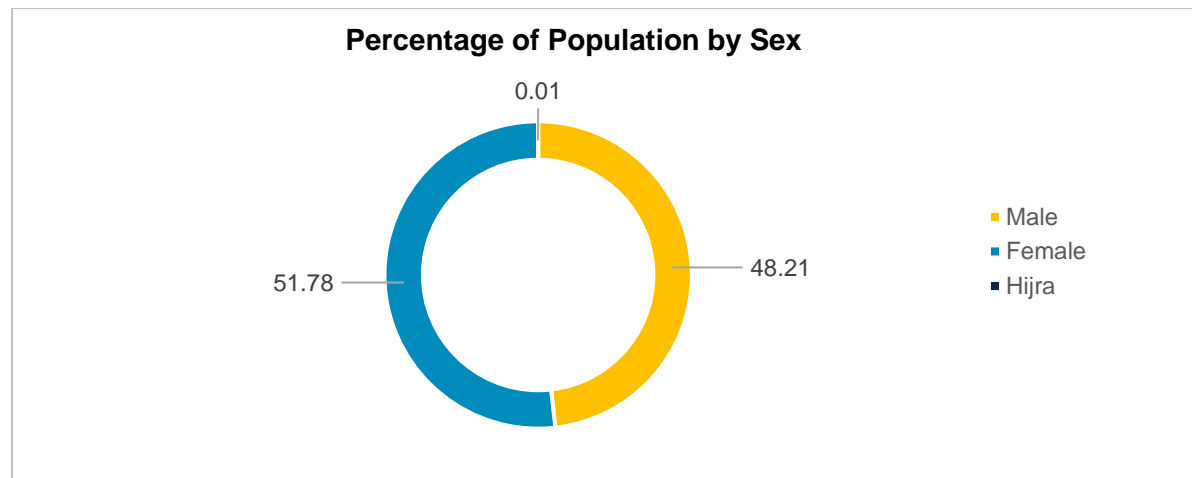


*Map 2-2: Upazila wise population density of Meherpur district*

Source: Population and Housing Census 2011

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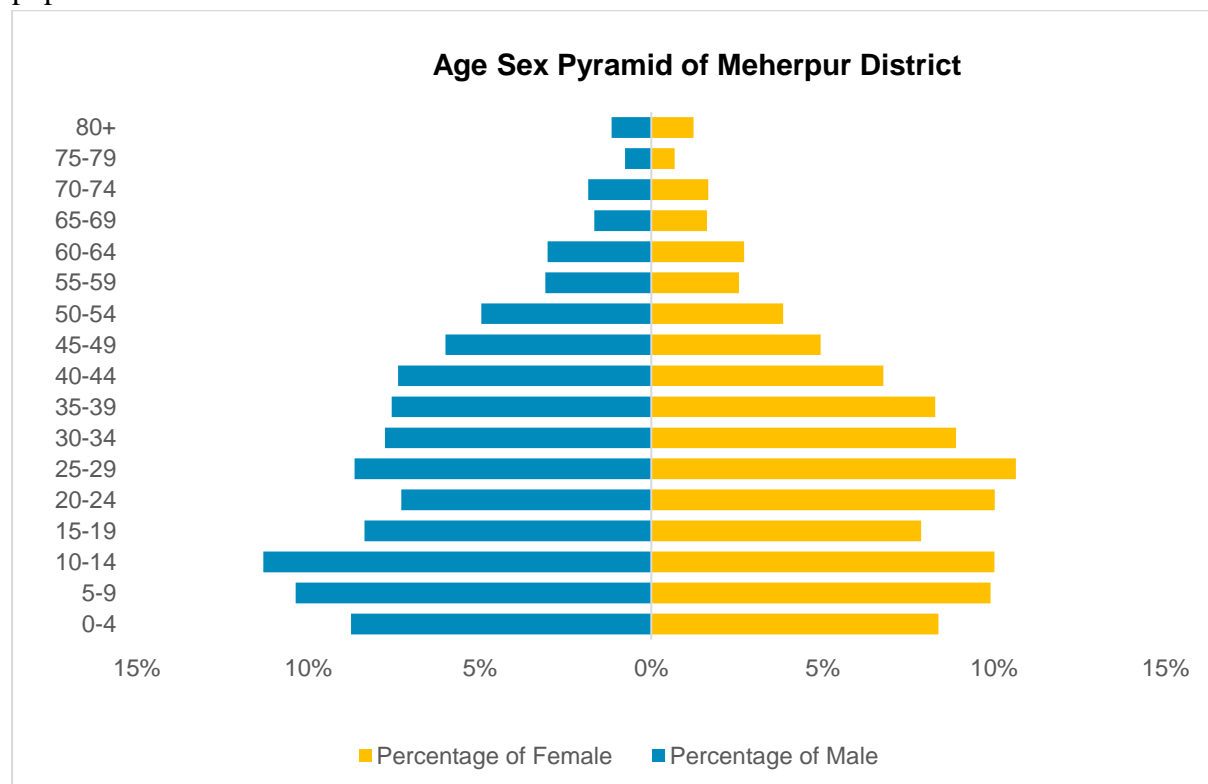
Out of the total enumerated population, 705356, male is 262943 (48.21%), female 365237 (51.78%), and hijra 26 (0.01%). The population density increases to 951 in 2022 from 884 in 2011.



*Figure 2-1: Percentage of population in Meherpur district by sex*

Source: Population and Housing Census 2022

This age-sex pyramid graphically displays the age and gender distribution of Meherpur district, typically showing a broad base that signifies a high population of young people and narrowing towards the top, indicating fewer older individuals. According to the 2011 Census figures, the highest population falls within the 10-14 age group, while the 75-79 age group has the lowest population.



*Figure 2-2: Age Sex Pyramid of Meherpur District*

Source: Population and Housing Census 2011



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## 2.3 Urbanization

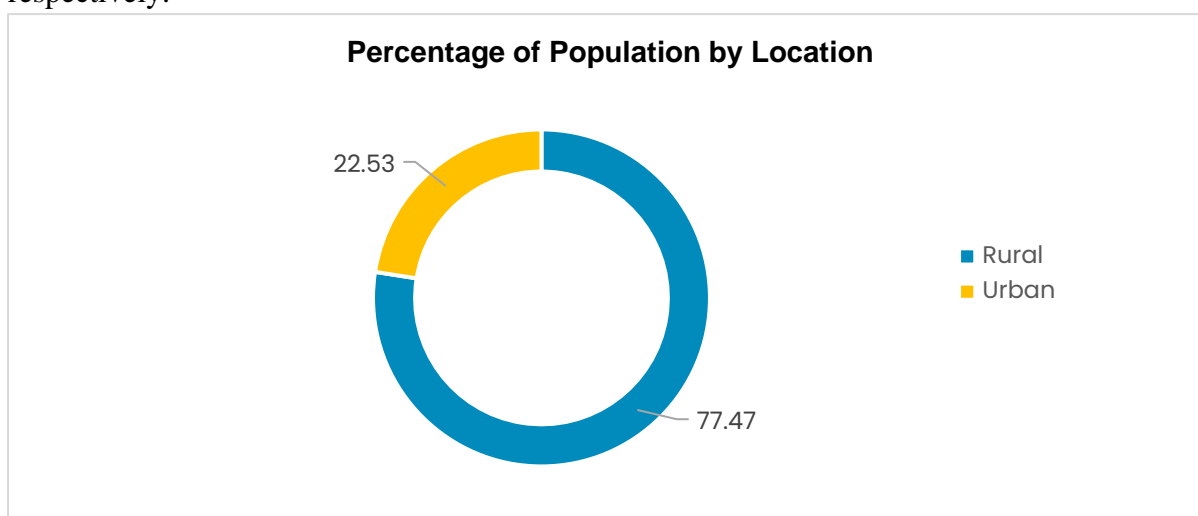
The urban area in Meherpur district has a total population of 158,885, with 48.56% being male, 51.43% female, and 0.001% Transgender. Notably, the proportion of females is higher in both urban and rural areas.

*Table 2-5: Population of Meherpur District by area and sex*

Area	Total	Male	Female	Transgender
Rural	546471	262943 (48.12%)	283516 (51.88%)	12 (0.002%)
Urban	158885	77150 (48.56%)	81721 (51.43%)	14 (0.01%)
Total	705356	340093	365237	26

Source: Population and Housing Census 2022

The percentages of population living in the rural and the urban areas are 77.47% and 22.53% respectively.



*Figure 2-3: Percentage of population in Meherpur district by location*

Source: Population and Housing Census 2022

## 2.4 Settlement Type

According to the definition of BBS 2022, a structure is defined as Kancha if its floor is made of soil or wood or any other material except brick/cement/ concrete and roof is made of bamboo/golpata/palm leaves/chhan/straw etc. is defined as Knacha structure.

Nevertheless, if the floor is made of cement/concrete/brick/terracotta etc., but the wall and roof are made of any other material except cement/concrete/ brick/terracotta.

*Table 2-6: Structure Type in Meherpur District*

District	Type of Structure				
	Total	Pucca	Semi-pucca	Kancha	Jhupri
Meherpur	Number				
	194749	78975	30071	85041	662
	Percent				
	100.00	40.55	15.44	43.67	0.34

Source: Population and Housing Census 2022

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In Meherpur district, it is evident from the figures that in the case of the main dwelling structure, kancha holds the highest share with 43.67% followed by pucca, 40.55%. and semi-pucca, 15.44%.

In the total general households of Meherpur District, the highest, 56.07% of the **floor of main dwellings** are made of cement/concrete/terracotta, followed by 41.24%, of soil/sand/mud. It is also evident that 75.8% of the households, have used cement/concrete/brick/terracotta as the **wall materials** of their main dwelling structure, followed by metal sheet/CI sheet/corrugated iron sheet, 13.32%. It is found that the highest 51.35% of the total households in the Meherpur district have used metal sheet/CI sheet/corrugated iron sheet as **roof materials** of main dwellings, followed by cement/concrete/tile, 47.49%.



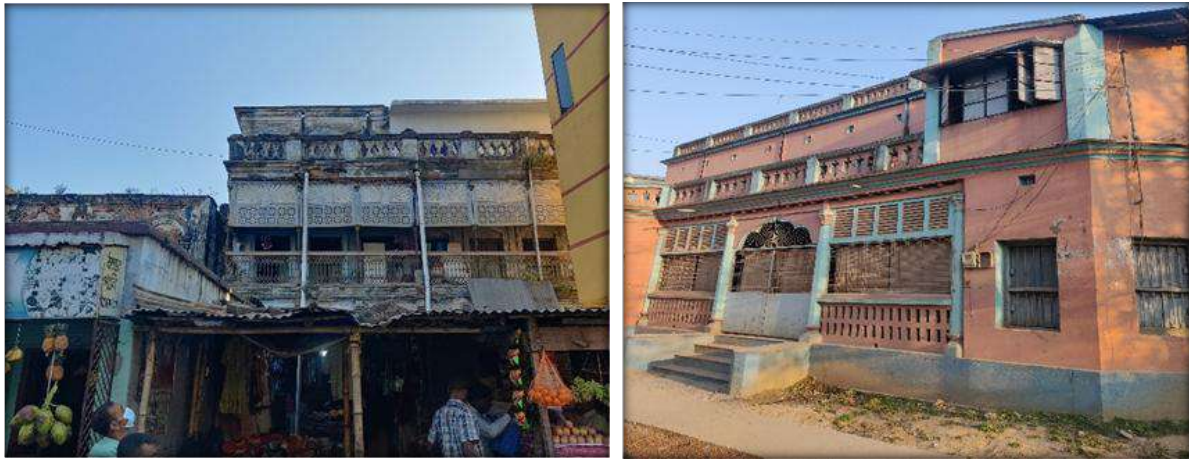
*Figure 2-4: Floor Material of Meherpur District*

Source: Population and Housing Census 2022

In Meherpur Sadar, most of the houses consist of Kancha structures, while scattered pucca houses are found across the upazila. However, within the Meherpur Paurashava, there is a commendable effort to maintain the historic buildings of the region as part of its cultural heritage, despite the prevalent housing conditions dominated by Kancha structures. The significant housing type in Gangni Upazila consists mainly of Kancha structures. In addition, there are semi pucca dwellings, while only a limited number of structures are considered Pucca, with a notable concentration in Gangni Paurashava.



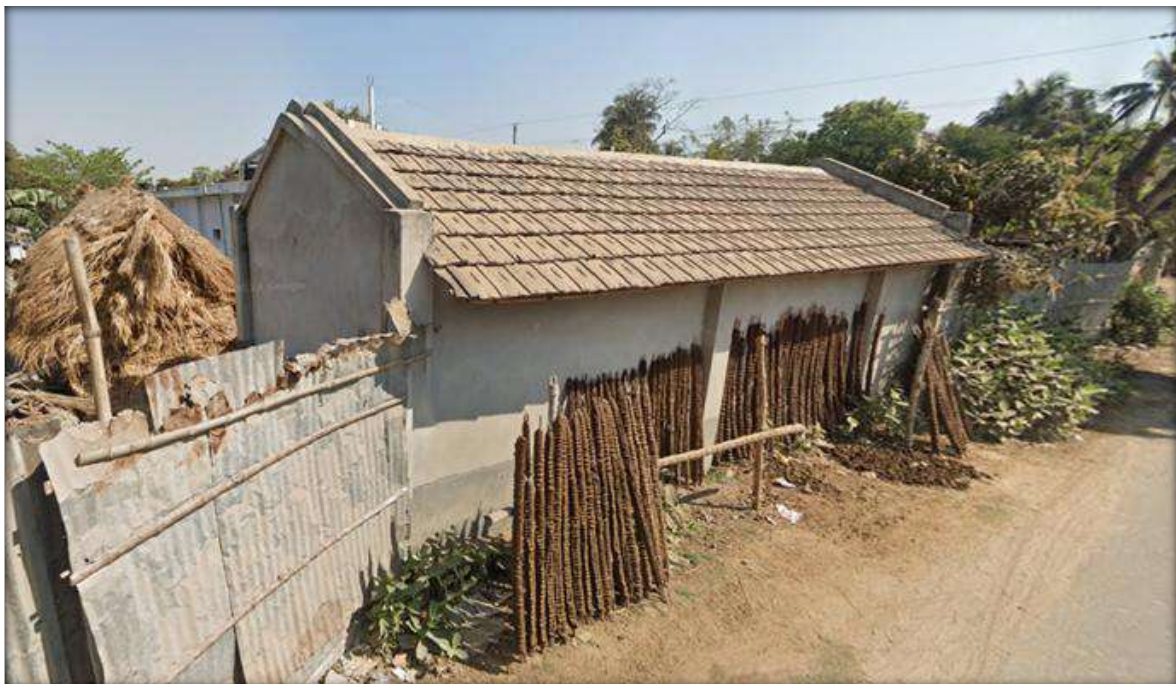
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*Figure 2-5: Sample of Pucca Structure in Meherpur Sadara Upazila (Left: Boro Bazar Area, Right: Thana Road)*



*Figure 2-6: Sample of Kancha (Left) & Pucca (Right) Structure in Gangni Upazila*



*Figure 2-7: Sample of Semi Pucca Structure in Mujibnagar Upazila*

Source: Field Survey, 2024

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## 2.5 Communication

Meherpur district has about 142.25 km of paved roads, 7858 km of unpaved roads, 159 km of railways, and 223 km of river routes (Bangladesh National Portal, 2024). It's well-connected to nearby cities like Chuadanga, Jhenaidah, Magura, Faridpur, and Dhaka. The distance from Dhaka to Meherpur city is 312 km. There is no railway in Meherpur district. The upazila and union parishads have a well-connected road network for travel throughout the year from the district headquarters.

## 2.6 Infrastructure Development

Meherpur Sadar Upazila has a good road connectivity through highways leading to Kushtia, Khulna, Dhaka. There is a bus terminal used as the main transit station for the people. The internal roads of Sadar Upazila and Paurashava are relatively good. People uses auto rickshaw, rickshaw for their local transport. There is no railway communication system in Meherpur district. Two railway stations Chuadanga and Alamdanga are used for railway communication with all over Bangladesh. Chuadanga station is 29 KM far from Meherpur and Alamdanga station is 39 KM far from Meherpur Sadar.

*Table 2-7: Road network according to type of road in Meherpur Sadar Upazila*

Road Type	Earthen (KM)	Pavement (KM)	Total Length (KM)
Upazila Road:	0.00	70.63	70.63
Union Road:	0.00	47.29	47.29
Village Road A:	56.27	204.15	260.42
Village Road B:	84.49	126.50	210.99
Total Roads:	140.76	448.57	589.33

Source: LGED, 2020

In Gangni Upazila, the internal roads are wide and paved and the condition is very good. A large portion of village roads remains unpaved and consists of earthen surfaces, increase the difficulties, particularly during unfavorable weather conditions. Heavy rains or other adverse weather events turn these roads into muddy tracks, severely hindering traffic flow and causing problems for commuters and the transportation of goods. The poor road infrastructure not only inconveniences residents but also negatively impacts the economic activities of the entire region.



*Figure 2-8: Gangni Bus Stand and Passenger Shed*

Source: Field Survey, 2024

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*Table: Road network according to type of road in Gangni Upazila*

Road Type	Earthen(km)	Pavement(km)	Total Length(km)
Upazila Road:	0.00	71.79	71.79
Union Road:	0.20	138.76	138.96
Village Road A:	34.50	137.93	172.43
Village Road B:	168.70	194.33	363.04
Total Roads:	203.40	542.81	746.21

Source: LGED, 2020

The Upazila Road and the Union Road is in very good condition in Mujibnagar upazila. But the some of the village roads are unpaved and earthen. Particularly during adverse weather conditions, the roads become muddy. This situation hampers the smooth flow of traffic, causing difficulties for commuters and hampering the transportation of goods. The inadequate road infrastructure not only leads to inconveniences but also impacts the overall economic activities of the region.

*Table: Road network according to type of road in Mujibnagar Upazila*

Road Type	Earthen(km)	Pavement(km)	Total Length(km)
Upazila Road:	0.00	42.92	42.92
Union Road:	0.04	26.52	26.57
Village Road A:	35.34	59.50	94.84
Village Road B:	37.96	71.25	109.2
Total Roads:	73.34	200.19	273.53

Source: LGED, 2020

## 2.7 Solid Waste and Fecal Sludge Management Practice

In Meherpur Sadar, the lack of an organized system for collecting solid waste and fecal sludge poses a notable challenge, prompting residents to resort to haphazard dumping practices. This uncontrolled disposal contributes to environmental deterioration as waste accumulates in different locations.



*Figure 2-9: Road site informal dustbin beside Meherpur Pouro Tohosil bazar*

Source: Field Survey, 2024

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Furthermore, in certain areas, inhabitants dispose of their waste and fecal sludge directly into nearby waterways, posing environmental and health hazards. However, Meherpur Paurashava has implemented some measures to manage household waste collection.

In Gangni Upazila, there is presently no centralized system in place to oversee the management of solid waste and fecal sludge, resulting in the disorderly disposal of waste across various locations. The lack of a structured waste management framework contributes to environmental degradation and public health concerns. Random dumping of solid waste and fecal sludge poses threats to the local ecosystem and has the potential to pollute water reservoirs. These scattered disposal methods not only detract from the aesthetic appeal of the surroundings but also raise sanitation issues within the community. Despite this, Gangni Paurashava undertake some waste collection efforts within the municipal area.

In Mujibnagar Upazila, there is currently no centralized system for managing solid waste and fecal sludge collection, leading to the unorganized disposal of waste in different areas. The lack of a structured waste management framework exacerbates environmental and public health concerns. Solid waste and fecal sludge are indiscriminately dumped, posing a significant threat to the local ecosystem and potentially contaminating water sources. These scattered waste disposal practices not only diminish the aesthetic appeal of the surroundings but also present sanitation challenges for the community.

## 2.8 Utilities: Water and Electricity

In Meherpur Sadar Upazila, access to clean and safe drinking water presents a significant challenge, particularly due to iron content in the water. Many residents rely on water pumps for their drinking and other domestic needs. To obtain potable water, individuals often have to dig deep due to the presence of iron in the water. While some relief is provided by the Paurashava, supplying water to certain households, accessibility remains an ongoing issue.



*Figure 2-10: Water Tank in Meherpur Sadar (Left), Water Tank in Gangni (Right)*

Source: Field Survey, 2024



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Regarding electricity, residents of Meherpur Sadar Upazila encounter difficulties with consistent power supply. Efforts are underway to address this issue, with initiatives focusing on expanding the electrical grid and exploring renewable energy sources like solar power. These measures aim to improve sustainability and mitigate the challenges posed by unreliable electricity access in the region.

In Gangni Upazila, securing access to safe drinking water presents a significant challenge because of the iron. The local populace heavily relies on water pumps to meet their daily needs. However, obtaining potable water from these pumps often necessitates deep digging due to elevated iron levels. Additionally, residents grapple with the issue of inconsistent power supply, impacting various aspects of daily life. These challenges underscore the importance of addressing water and electricity access to foster the well-being and sustainable development of Gangni Upazila.

The local population predominantly depends on water pumps for their daily water needs. However, obtaining potable water from these pumps often requires deep digging due to the iron levels. Furthermore, residents of Mujibnagar Upazila face challenges related to a reliable power supply. Issues with electricity availability contribute to difficulties in daily life, impacting various aspects of community living. Addressing these concerns becomes crucial to ensure the well-being and sustainable development of the region.

## 2.9 Drainage Condition

In Meherpur Sadar Upazila, there exists a notable deficiency in adequate drainage facilities, compounded by the poor condition of existing infrastructure. Unlike the Paurashava area, there are no functional drains throughout the Sadar Upazila. This lack of drainage infrastructure increase problems like waterlogging, particularly during periods of heavy rainfall. The consequences of this inadequacy include risks to both infrastructure integrity and public health. Addressing these drainage deficiencies becomes imperative to mitigate the adverse impacts of waterlogging and ensure the well-being of the community in Meherpur Sadar Upazila



*Figure 2-11: Drainage Condition at Meherpur Sadar Upazila*

Source: Field Survey, 2024

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In Gangni Upazila, while there are concrete drainage facilities in Paurashava area, the drainage infrastructure in other parts of Sadar Upazila is inadequate and in poor condition. This disparity highlights a significant deficiency in the drainage system, which can lead to various issues such as waterlogging and infrastructure damage during heavy rainfall. Improving and expanding the drainage infrastructure across Gangni Upazila is essential to mitigate these challenges and ensure the well-being of its residents.

In Mujibnagar Upazila, while there are concrete drainage facilities along the Sadar road, the drainage infrastructure in other areas of Sadar Upazila is inadequate and in poor condition. This disparity highlights a significant deficiency in the drainage system and people dump their waste here and there. Consequently, this insufficiency leads to challenges such as waterlogging during intense rainfall, posing a detrimental impact on public health. Improving and maintaining the drainage infrastructure throughout Mujibnagar Upazila is crucial to mitigate these challenges and ensure the well-being of the local community.

## 2.10 Health Services

Meherpur district provides a wide range of health services to its residents, including eleven well-equipped Upazila Health Complexes serving as primary healthcare centers. The twelve Family Welfare Centers offer services like family planning counseling and maternal care, contributing to the overall well-being of families.

*Table 2-8: Health services in Meherpur district*

Sl. No.	Name	Number	Remarks
1.	Upazila Health Complex	11	50-bedded: 6 31-bedded: 5
2.	Family Welfare Center	12	
3.	Health Sub-center	43	
4.	Community Clinic	412	Currently 354
5.	Private Clinic	72	
6.	Missionary Hospital	1	
7.	NGOs related to health activities	16	

Source: Bangladesh National Portal, 2024



*Figure 2-12: 250 Bedded General Hospital (Meherpur Sadar Upazila)*

Source: Field Survey, 2024



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Additionally, forty-three Health Sub-centers reach remote and rural areas, while four hundred and twelve Community Clinics play a vital role in delivering primary healthcare. Seventy-two Private Clinics complement the public healthcare system, addressing diverse health needs. Furthermore, sixteen NGOs actively engage in health-related activities, collaborating with various entities to address healthcare challenges and enhance community well-being.

The primary healthcare facility serving Meherpur district is the 250 Bed General Hospital. Additionally, there are several other medical institutions serving as the healthcare needs of the area, including Impact Jiban Mela Health Center, Al-Aqsa Nursing Home and Lab, Sono Diagnostic Center Ltd, New Medicare Nursing Home, Rabeya Medical Services, Tecno Diagnostic Center, and Ma and Shishu Kalyan Kendro, Taher Clinic etc. These establishments collectively contribute to the provision of healthcare services across Meherpur, ensuring that residents have access to a range of medical facilities and treatments



*Figure 2-13: Private Hospitals in Gangni Upazila*

Source: Field Survey, 2024



*Figure 2-14: Upazilla Health complex, Gangni Upazila (50 Bed)*

Source: Field Survey, 2024

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In Gangni Upazila, the only government hospital is Upazila Health Complex. But it faces challenges due to its low bed capacity, leading residents to rely on private hospitals and diagnostic centers like Robiul Islam Memorial Hospital, Popular Diagnostic Center, Raza Clinic, and Sheba Diagnostic Center. While these private facilities offer essential services, there's a need for improved public healthcare infrastructure to ensure equitable access to quality medical care for all residents.

Mujibnagar Upazila relies primarily on its Upazila Health Complex for basic medical services. However, the absence of notable private clinics or diagnostic centers poses a challenge for residents. As a result, individuals often need to travel to nearby areas such as Meherpur or Kushtia to access more specialized medical facilities. This highlights the need for improved healthcare infrastructure within Mujibnagar Upazila to ensure better access to comprehensive medical services for its residents.



*Figure 2-15: Upazilla Health complex, Mujibnagar*

Source: Field Survey, 2024

### 2.11 Drinking water sources

Most of the households (96.80%) of the Meherpur district use deep/shallow tube-well as the main source of drinking water. Besides, 2.78% of households use tap/pipe (supply) water for drinking.

*Table 2-9: General Household by Main Source of Drinking Water*

Tap/pipe (Supply)	Tube-well (Deep/ Shallow)	Bottled/Jar Water	Well	Others
2.78	96.80	0.37	0.03	0.01

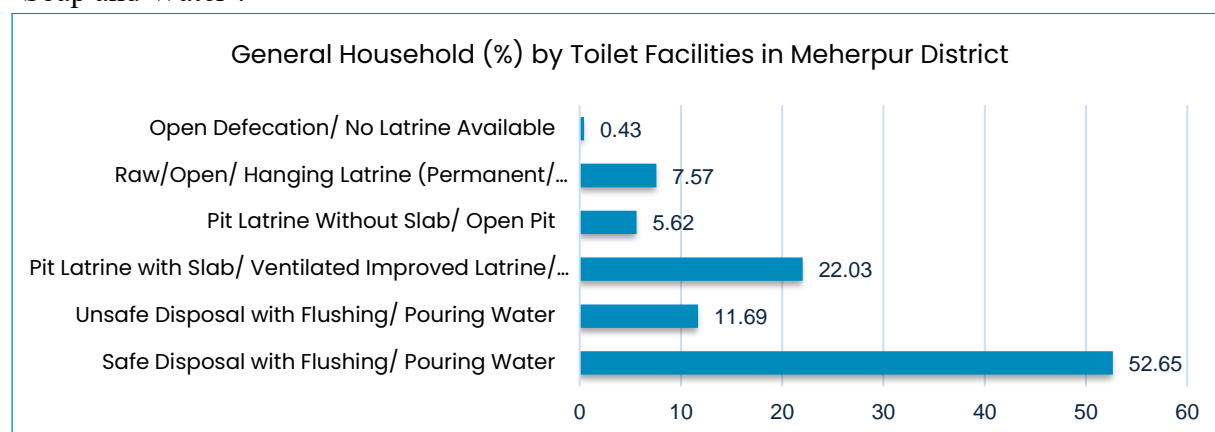
Source: Population and Housing Census 2022

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## 2.12 Toilet Facilities

At the Meherpur district level, 52.65% of the total households have toilet facilities with safe disposal by flushing/pouring water followed by pit latrine with slab/ventilated improved latrine/composting latrine with 22.03%.

According to Population and Housing Census 2022, 75.33% of the total households use toilets with no sharing in Meherpur district and 75.75% have separate handwashing facilities with ‘Soap and Water’.



*Figure 2-16: General Household (%) by Toilet Facilities in Meherpur District*

Source: Population and Housing Census 2022

## 2.13 Education

The literacy rate of the population aged 5 years and above at the Meherpur district level is 67.88%, which is 68.56% for males and 67.26% for females. The rate is recorded as 65.97% in the rural areas while it is 74.45% in the urban areas for the population of the same age group. The literacy rate of females aged 5 years and above in rural areas is 65.56%. The literacy rate for males is higher than that of females. According to the census data in 2022, the literacy rate is higher in Meherpur Sadar upazila compared to Mujibnagar and Gangi upazilas.

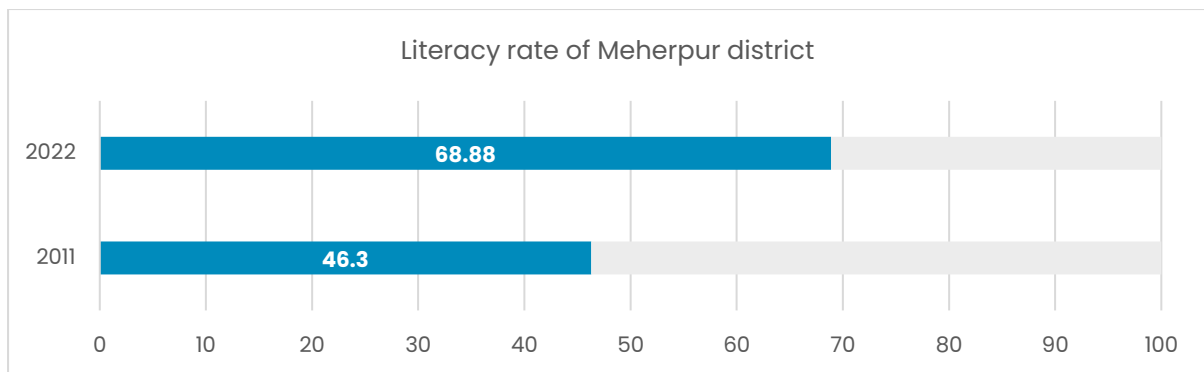
*Table 2-10: Literacy Rate of Population Aged 5 Years and above*

Total			Rural			Urban		
Total	Male	Female	Total	Male	Female	Total	Male	Female
67.88	68.56	67.26	65.97	66.42	65.56	74.45	75.86	73.13

Source: Population and Housing Census 2022

It's significant to highlight that the literacy rate has risen from 46.3% in 2011 to 67.88% in 2022 in Meherpur upazila.

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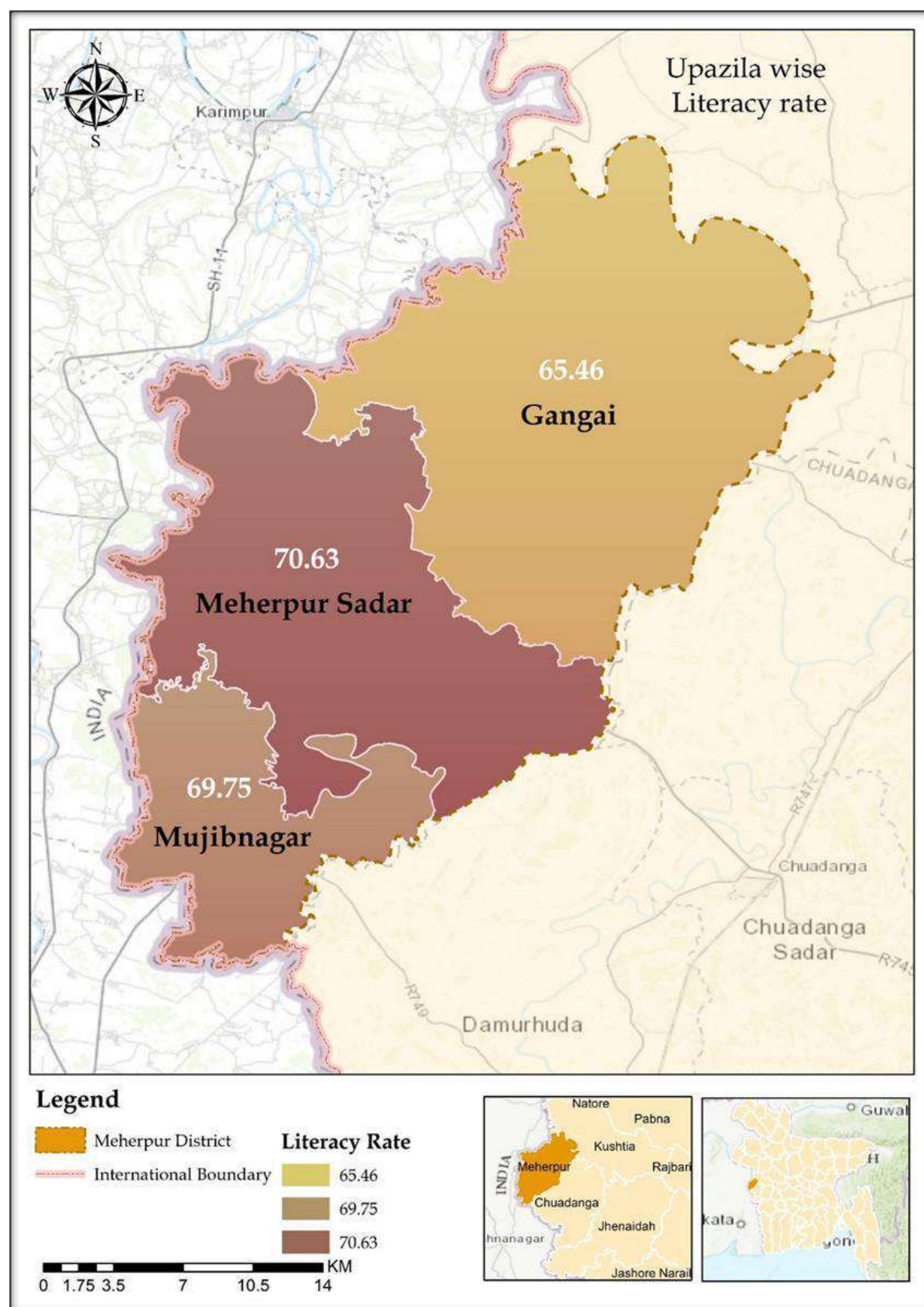


*Figure 2-17: Literacy rate of Meherpur district, (2011-2022)*

Source: Population and Housing Census 2022



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*Map 2-3: Upazila wise literacy rate of Meherpur district*

Source: Population and Housing Census 2022

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The education system is comprised of a mix of heterogeneous providers. A variety of schools operate within the Meherpur District; government-run schools, privately run schools and madrasah, English medium schools, schools run by NGOs, and kindergarten schools.

In the total institutions (131) in 2021, the share of Junior Secondary institutions was 8 (6.11%), Secondary institutions 114 (87.02%), Schools and Colleges 6 (4.58%), and Govt. Primary Schools 3 (2.29%). Among all institutions (131), 124 (94.66%) were privately managed and only 4 (3.05%) were publicly managed. The total number of teachers in 131 institutes was 1753 and among them 456 (26.01%) were female.

*Table 2-11: Educational Institutes of Meherpur district*

District	Type of Institution	Management	Number of Institution		Number of Teacher			Number of Student		
			Total	Girl	Total	Female	% of Female	Total	Girl	% of Girl
Meherpur	Junior Secondary School	Private	8	3	74	27	36.49	1186	712	60.03
		Total:	8 (6.11%)	3	74	27	36.49	1186	712	60.03
	Secondary School	Private	110	22	1503	387	25.75	47342	25957	54.83
		Public	4	2	60	14	23.33	3410	2032	59.59
		Total:	114 (87.02%)	24	1563	401	25.66	50752	27989	55.15
	School and College (School Section)	Private	6	1	116	28	24.14	4488	2169	48.33
		Total:	6 (4.58%)	1	116	28	24.14	4488	2169	48.33
	Govt. Primary	Govt. Primary	3	0	0	0	0	382	219	57.33
		Total:	3 (2.29%)	0	0	0	0	382	219	57.33
	District Total:	Private	124 (94.66%)	26	1693	442	26.11	53016	28838	54.39
		Public	4 (3.05%)	2	60	14	23.33	3410	2032	59.59
		Govt. Primary	3 (2.29%)	0	0	0	0	382	219	57.33
		Total:	131 (100%)	28	1753	456	26.01	56808	31089	54.73

Source: Bangladesh Education Statistics, 2021

In Meherpur Sadar Upazila, a range of educational institutions play a vital role in nurturing the academic growth of its residents. B.M Model Government Primary School serves as a foundational steppingstone for young learners. Meherpur Government College provides higher education opportunities, offering various undergraduate programs for the students. For those who are interested in technical education, Meherpur Government Technical School and



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College offer specialized training and education. Additionally, Sohiuddin Degree College stands as another prominent institution, contributing to the academic landscape by offering degree programs and shaping the future of numerous students. Together, these educational institutions form the backbone of Meherpur's educational infrastructure, ensuring access to quality learning opportunities for individuals at different stages of their academic journey.

Gangni Upazila is rich in educational institutions, including Alampur Government Primary School, Shandhani School and College, and Gangni Mahila Degree College. Shandhani School and College is a renowned school and college in the area and it has several campuses in the area. These establishments fulfil the educational needs of the community, offering primary, secondary, and tertiary level education. Their presence reflects a commitment to providing accessible and diverse learning opportunities within the upazila, contributing significantly to its educational landscape.

The key educational institutions of Mujibnagar are Mujibnagar Govt. High School, Mujibnagar Amrokanon High School, and Mujibnagar Technical School and College. These institutions serve as educational pillars within the region, providing students with a diverse range of academic and vocational opportunities. Their presence underscores the commitment to quality education and skill development in Mujibnagar, contributing significantly to the educational sector of the area.



*Figure 2-18: (1) BM Model Government Primary School, (2) Meherpur Government Technical School and College, (3) Meherpur govt. College (4) Sohiuddin Degree College;*

Source: Field Survey, 2024

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Figure 2-19: Mujibnagar Amrokanon High School (Left), Mujibnagar Technical School and College (Right);

Source: Field Survey, 2024



Figure 2-20: (1) Alampur Government Primary School, (2,3) Shandhani School and College, (4) Gangni Mohila Degree College in Gangni upazila;

Source: Field Survey, 2024

## 2.14 Slum Area in Meherpur District

As per the slum census of 2014, Meherpur District had a total of 26 slums with 816 households. Among the slum population, 51.25% were male, 48.67% were female, and only 0.08% were identified as hijra individuals. In the more recent census data of 2022, the number of households in Meherpur District slums has decreased to 142, accommodating a population of 573.



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*Table 2-12: Slum Area in Meherpur district*

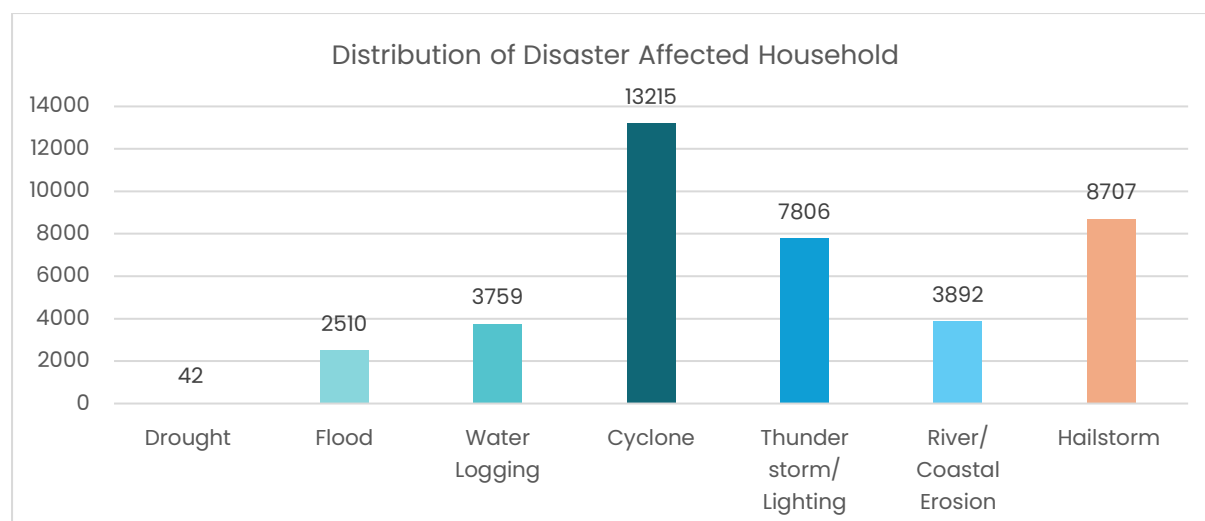
Name	Upazila	Slum Name	Household	Population			
				Total	Male	Female	Hijra
Meherpur	Gangni	Doapara	30	103	50	53	0
Meherpur	Gangni	Bhata Para	83	312	170	142	0
Meherpur	Gangni	Das Para	19	66	38	28	0
Meherpur	Gangni	Gulipara	20	71	37	34	0
Meherpur	Gangni	Doapara	30	92	43	49	0
Meherpur	Mujib Nagar	Ballabhpur Daspara	14	53	26	27	0
Meherpur	Mujib Nagar	Bhabar Para Mukti Gorda Para	8	21	12	9	0
Meherpur	Meherpur Sadar	Court Para	11	51	26	25	0
Meherpur	Meherpur Sadar	Gosh Para	15	52	26	26	0
Meherpur	Meherpur Sadar	Bhayrab School Para	16	60	29	31	0
Meherpur	Meherpur Sadar	Halderpara	20	79	36	43	0
Meherpur	Meherpur Sadar	Methar Para	30	141	75	66	0
Meherpur	Meherpur Sadar	Ghatpara	33	139	73	66	0
Meherpur	Meherpur Sadar	Tantipara	16	71	36	35	0
Meherpur	Meherpur Sadar	Seikh Para	95	373	186	187	0
Meherpur	Meherpur Sadar	Nur Filing Station	33	113	51	62	0
Meherpur	Meherpur Sadar	Hathat Para	126	445	217	227	0
Meherpur	Meherpur Sadar	Wapda Para Basti	18	52	22	30	0
Meherpur	Meherpur Sadar	Mondal Para (Agriculture Offi	10	43	20	23	0
Meherpur	Meherpur Sadar	Mondol Para	12	44	27	17	0
Meherpur	Meherpur Sadar	Pulish Line Para	51	165	72	93	0
Meherpur	Meherpur Sadar	Dighira Para	77	280	151	129	0
Meherpur	Meherpur Sadar	Govt. College	10	17	7	10	0
Meherpur	Meherpur Sadar	Uttar Stadumpara Basti	10	31	12	19	0
Meherpur	Meherpur Sadar	Poshu Hat Dakhin Para	9	33	20	13	0
Meherpur	Meherpur Sadar	Poshu; Hat C&B Road	20	77	36	41	0
Total			816	2984	1498	1485	0

Source: Slum Census, 2014

## 2.15 Impact of Climate Change and Natural Disaster

During 2015-20, a total of 13215 households and 8707 households, respectively, were affected by the cyclone and hailstorm in Megerpur district. Most of the households in disaster-prone areas are devastated by floods, cyclones and hailstorms.

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*Figure 2-21: Distribution of Disaster Affected Household*

Source: Bangladesh Disaster-related Statistics (BDRS), 2021

Meherpur Sadar Upazila, has no significant climate change impacts or disasters. In summer season, the region faces heatwaves that brings scorching temperatures and discomfort to residents. The intensity and duration of these heatwaves may be increased by broader climate trends, although direct links to climate change. Additionally, the presence of Bhairab River, which has dried up, highlights the impact of changing climate patterns on water resources. While local factors such as irrigation practices and water management may also contribute to the river's condition, alterations in precipitation patterns and increased temperatures could play a role in diminishing water availability.

In Gangni, the summer season brings intense heatwaves exacerbated by the low intensity of rainfall. This phenomenon is indicative of the impact of climate change, highlighting the region's vulnerability to extreme weather events. As temperatures rise and precipitation patterns shift, communities must adapt to increasingly challenging climatic conditions to mitigate the effects of heatwaves.

In Mujibnagar, the summer season often brings heatwaves, further intensified by minimal rainfall. This pattern underscores the influence of climate change, increase the area's susceptibility to extreme weather conditions.

## 2.16 Summary of Project Area Profile

Meherpur district, established in 1984 and comprising three upazilas—Meherpur Sadar, Gangni, and Mujibnagar—has a rich history as the site of Bangladesh's first temporary government in 1971. The district covers 751.62 square kilometers and is bordered by Kushtia, Chuadanga, and India.

The population, as recorded in the 2022 census, stands at 705,330, with an average household size of 3.68. The district has a dependency ratio of 44.2 and an infant mortality rate of 4.5 per 1,000 live births. Population density varies across the upazilas, with Meherpur Sadar having the highest at 929 people per square kilometer.

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Urbanization in Meherpur is relatively modest, with 22.53% of the population living in urban areas. The district has a mix of housing types, with kancha (temporary) structures being the most common, especially in rural areas, while pucca (permanent) structures are more prevalent in urban areas like Meherpur Paurashava.

The economy of Meherpur is primarily agrarian, with 136,513 individuals employed in agriculture. The district also has a notable presence in the service sector, which employs 76,307 people. However, the industrial sector remains relatively small. Employment distribution reveals a significant gender disparity, with males dominating the job market across all sectors. The Meherpur district, with its well-connected road network and proximity to major cities, demonstrates significant infrastructural and developmental attributes. The district's extensive roadways facilitate connectivity, though the unpaved village roads in Gangni and Mujibnagar Upazilas, coupled with frequent waterlogging, highlight areas requiring improvement. Solid waste and fecal sludge management present ongoing challenges across the district, impacting both environmental quality and public health.

Access to clean water remains a critical issue, primarily due to high iron content, compelling residents to rely on deep tube-wells. The inconsistent power supply further complicates daily life. Despite efforts to improve infrastructure, particularly in Meherpur Sadar Upazila, there is still a pressing need for enhancements in water management, electricity supply, and drainage facilities.

In terms of healthcare, Meherpur is relatively well-served with numerous health centers, though some upazilas, like Gangni and Mujibnagar, face limitations in terms of facility capacity and availability of private medical options. The district's educational sector shows a rise in literacy rates, with a notable improvement from 46.3% in 2011 to 67.88% in 2022, reflecting progress in educational access and quality.

Tourist spots such as Amjhupi Nilkuthi and the Mujibnagar Liberation War Memorial Complex offer cultural and historical significance, contributing to the region's appeal. However, the presence of slum areas, despite a reduction in recent years, underscores ongoing socioeconomic challenges.

Climate change and natural disasters have significantly impacted the district, particularly through cyclones, hailstorms, and heatwaves. These climatic challenges, coupled with changing precipitation patterns, highlight the district's vulnerability to extreme weather events and underscore the need for adaptive measures.

The review of previous master plans indicates ongoing issues related to infrastructure, such as inadequate water supply, poor road connectivity, and limited healthcare and educational facilities. The existing land use in Meherpur reflects a predominance of agricultural activities, with a significant portion of land dedicated to single crops and a substantial area of rural settlements. The municipality of Meherpur has experienced rapid urban growth, resulting in an increase in built-up areas and water bodies, while Gangni and Mujibnagar upazilas show a strong emphasis on residential and agricultural uses.

This chapter provides essential demographic, economic, and social, infrastructural and climate change impact insights into Meherpur district, laying the groundwork for strategic planning and development in the subsequent phases of the project.

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## **CHAPTER 3: TOPOGRAPHY, PHYSICAL FEATURES AND UNDULATION OF THE AREA**

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### **3.1 Background**

The physical feature survey of Meherpur Paurashava was undertaken to develop a detailed and accurate representation of the municipality's-built environment, infrastructure, and natural assets. This working paper presents an analytical overview of the data collected, covering various components such as structure types, usage patterns, construction characteristics, road and drainage systems, population dynamics, and waterbody distribution.

A key element

of the survey is the distinction between primary structures and supporting structures. While primary structures include core functional buildings such as residential houses, educational institutions, offices, and commercial establishments, supporting structures refer to auxiliary facilities that serve and enhance the usability of the primary structures. These include separate kitchens, toilets, bathrooms, garages, prayer rooms, generator rooms, livestock sheds, guard rooms, and similar spaces. They have been presented separately in the dataset to avoid overestimating the number of standalone buildings and to more accurately reflect the functional and spatial layout of individual plots and households. This differentiation is especially important in understanding infrastructure demand, land use efficiency, and the complexity of household and institutional compounds.

In total, the survey documents 18,135 primary structures alongside a significant number of 24,941 supporting structures, highlighting the intricate support systems that enable daily life and operations within the municipality.

In addition to structural data, the paper includes information on the condition and extent of infrastructure networks such as roads and drainage, categorized by type, material, width, and coverage. The survey also captures population presence during day and night hours, which reflects the intensity and nature of land use in different areas. Moreover, natural features such as rivers, ponds, and canals are examined, emphasizing their importance in urban planning, flood control, and ecological balance.

By providing a granular understanding of Meherpur Paurashava's physical features, this working paper serves as a foundational resource for informed planning, infrastructure development, and policy formulation.

### **3.2 Rationale for the Working Paper**

Urban planning and development require accurate, location-specific data to address the growing complexities of infrastructure, housing, population distribution, and environmental management. In the context of Meherpur Paurashava, a fast-developing municipal area, the absence of updated and detailed physical feature data has long posed challenges for evidence-based decision-making, efficient service delivery, and long-term planning.

This working paper is developed in response to that gap. It presents the findings of a comprehensive physical feature survey conducted to document the current state of the built environment, public infrastructure, and natural resources within the Paurashava. The data collected offers crucial insights into the types and conditions of structures, land use patterns,



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infrastructure coverage, drainage systems, and waterbody distribution—factors that directly impact urban resilience, health, mobility, and quality of life.

One of the key motivations for this study is the growing structural density and complexity within the Paurashava. The survey uniquely separates **primary structures** from **supporting structures**—a distinction often overlooked in conventional surveys. This nuanced approach enables a more realistic understanding of how land and buildings are functionally utilized, avoiding inflated structure counts while capturing essential details like kitchens, toilets, garages, and service rooms that support daily living and institutional functioning.

### 3.3 Objectives of the Working Paper

The primary objective of this working paper is to present a comprehensive analysis of the physical feature survey conducted in Meherpur Paurashava, with the aim of informing effective urban planning and development initiatives. The specific objectives are as follows:

1. **To document the existing built environment**— Record and classify all primary and supporting structures by type, use, construction material, and number of floors.
2. **To assess infrastructure coverage and conditions**— Analyze the extent, type, and condition of road networks, drainage systems, and other physical infrastructures.
3. **To capture demographic and occupancy patterns**— Collect data on day and night-time population presence, household size, and occupancy characteristics to understand land use intensity.
4. **To map the distribution of natural features**— Quantify and categorize waterbodies such as rivers, ponds, canals, and marshlands within the Paurashava area.
5. **To establish a data-driven baseline for planning**— Provide a reliable reference point for the Urban Development Directorate (UDD) and other stakeholders for use in future urban development planning, zoning, infrastructure design, and policy formulation.



*Figure 3-1: Objectives of the Working Paper*

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### 3.4 Study Area Profile

#### 3.4.1 Meherpur Paurashava

##### 3.4.1.1 Location and Administrative Context

Meherpur Paurashava is a first-class municipality located in the southwestern region of Bangladesh, serving as the administrative and urban center of **Meherpur District** under the **Khulna Division**. Geographically, the town is strategically positioned near the India-Bangladesh border, which influences its trade, cultural exchange, and mobility patterns.

##### 3.4.1.2 Area and Jurisdiction

The Paurashava spans a total area of approximately **19.53 square kilometers**, comprising several administrative wards and mahallas (neighborhood units). It functions as the core urban settlement of Meherpur Sadar Upazila and is governed by an elected municipal body under the Ministry of Local Government, Rural Development and Cooperatives.

##### 3.4.1.3 Demographic Characteristics

According to the most recent estimates, Meherpur Paurashava hosts a population of over **70,000**, with a mix of residential, commercial, institutional, and industrial activities. The urban population is growing steadily, influenced by rural-to-urban migration, administrative centralization, and economic diversification.

##### 3.4.1.4 Physical and Environmental Features

The municipality is characterized by a blend of **pucca, semi-pucca, katcha, and tinshed** structures, with residential use being the dominant land use type. The area contains several natural waterbodies—including ponds, rivers, and canals—which play a critical role in drainage, biodiversity, and water resource management. The **Bhairab River** flows nearby, supporting both ecological functions and local livelihoods.

##### 3.4.1.5 Infrastructure and Services

Meherpur Paurashava has a developing network of **roads, drainage systems, and public service facilities**, although infrastructure quality varies by location. While the majority of roads are narrow and of earthen or semi-paved type, paved roads (bituminous or RCC) are expanding. Drainage coverage is moderate, with a mix of covered and uncovered channels. Access to water, sanitation, electricity, and educational services is improving, though service gaps remain, especially in rapidly urbanizing areas.

##### 3.4.1.6 Economic and Functional Role

As a district headquarters, Meherpur Paurashava acts as the administrative, commercial, and service hub for the surrounding rural hinterlands. The economy is largely driven by **agriculture-related trade, small-scale industries, education, and public sector employment**. A growing number of **mixed-use and commercial structures** reflect an ongoing transition toward more diversified urban economic functions.

##### 3.4.1.7 Urban Planning Context

Despite its importance, Meherpur Paurashava faces challenges in urban management, including **unplanned growth, infrastructure backlogs, and data limitations**. This study aims to fill critical data gaps by providing an updated, spatially disaggregated view of the built

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environment and supporting infrastructure to guide future planning efforts by the **Urban Development Directorate (UDD)** and local authorities.

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### 3.5 Survey Methodology

#### 3.5.1 Approach for different surveys

By conducting reconnaissance survey, a clear conception on project area has been made and mobilization and reconnaissance survey report highlighted those. Findings from secondary sources has been reflected in previously submitted inception report. The survey work started with construction of BM Pillars and advanced through several stages until producing the finish product as Final Physical feature Database and land Use. The project work has been handled in the stages;

- BM Pillar Establishment
- UAV Image Collection & Processing
- Basemap Preparation
- Field Survey
- Land Use Survey
- Field Checking and database modification
- Final Database Preparation
- Land Use Preparation

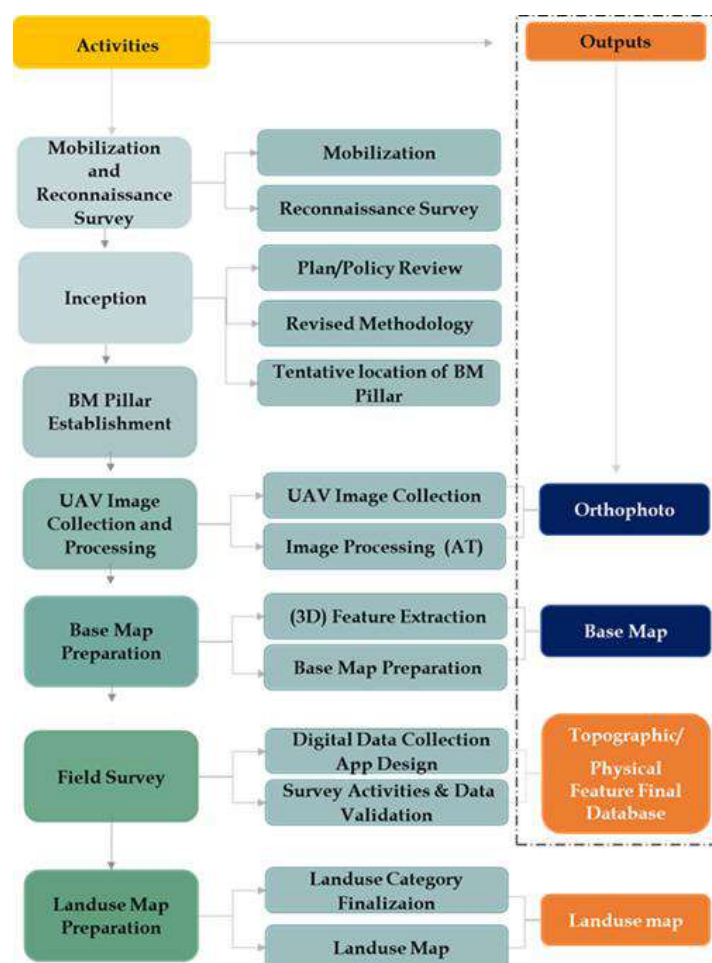


Figure 3-2: Methodological Flowchart with major activities & outputs



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### **3.5.1.1 BM Pillar Establishment**

The design of the benchmark pillar was developed in accordance with the guidelines provided in the Terms of Reference. Under the direction of the Project Director and in cooperation with local government representatives, appropriate sites were selected. One BM pillar every 25 square kilometers has been positioned throughout the project area to provide accurate and dependable references.



*Photo 1: BM Construction*

### **3.5.1.2 UAV Image Collection and Processing**

Flight plan has been designed for the intended area and images were captured by deploying the UAV along the defined flight path. Collected images were processed following photogrammetric approach including areal triangulation, 3D reconstruction etc.

3D features were structured from the stereo model including Structure, Waterbody, Road, Water Control Structure, Drain etc. Ortho mosaic images were produced to be used as background of basemap grid.



*Photo 2: UAV Raw Image & Ortho Mosaic sample*

### **3.5.1.3 Basemap Preparation**

Extracted 3D features then used to prepare base grid maps. Ortho mosaic was used as background of the Grid Map. Below is an example of base grid map.



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Photo 3: Grid Layout Example

#### **3.5.1.4 Topographic & Physical feature survey**

Topographic & Physical Feature Survey has been conducted to assess the current topology and physical infrastructure of the study area using advanced equipment, including UAVs



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(Unmanned Aerial Vehicles), RTK-GPS, and Total Stations. The use of this sophisticated technology ensures the collection of geo-referenced and highly accurate data in digital format, which is essential for precise mapping and analysis. The results of these surveys have been processed and converted into an Integrated GIS Database, providing a comprehensive and accessible spatial data framework for further analysis and planning.



Figure 3-3: Attribute Collection using INPUT App

#### **3.5.1.5 Land use survey**

Landuse survey involves recording the existing use of land by its functional activity such as residential, industrial, commercial etc. The activity has been undertaken simultaneously with the physical feature survey and then the landuse maps have been prepared utilizing specific notations and colors as directed by the Survey & GIS Experts.

#### **3.5.1.6 Field Checking by the Client and Compilation of the Final Database**

After the physical feature survey has been completed, the client has visited the project area to validate the collected data. Based on the feedback received during this visit, inconsistencies have been addressed and the necessary adjustments have been made. Consequently, these refinements have led to the compilation of a final physical feature and landuse database.

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## 3.6 Urban Area

### 3.6.1 Meherpur Paurashava

#### 3.6.1.1 Structure Use and Functional Distribution:

The structure use data from Meherpur Paurashava illustrates the municipality's predominant residential character alongside a range of functional land uses supporting civic, economic, and social activities. Residential structures overwhelmingly dominate the urban landscape, with 12,854 primary structures and 24,213 supporting structures. This high number of auxiliary units—nearly double the number of primary dwellings—suggests a strong reliance on separate facilities such as kitchens, toilets, and storage units, characteristic of household layouts in many South Asian towns. Mixed-use structures (1,251 primary units) are also notable, indicating a blend of residential and commercial or service-oriented functions within the same premises. These have no reported supporting structures, possibly due to the integrated design of such buildings. Service activity structures (1,357) and commercial buildings (868) reflect a significant base of economic and retail operations, though they have minimal supporting structures, which may indicate efficient land use or shared service spaces in commercial areas. Administrative/Public Service and Community Service structures, while fewer in number (102 and 152 respectively), have a relatively higher count of supporting structures (185 and 187), likely comprising outbuildings such as guard rooms, prayer rooms, or utility facilities that serve institutional needs. The Education and Research sector has 180 primary structures supported by 170 ancillary units, pointing to dispersed or multi-block educational campuses with supporting infrastructure. Industrial structures (219 primary, 50 supporting) are modest in number but indicate a small industrial presence. Agricultural structures, with 151 primary and 22 supporting units, represent the peri-urban or rural-urban fringe areas where farming activities persist. Notably, 810 structures are under construction, highlighting ongoing development and urban expansion. These have no supporting structures, which is typical at early stages of construction.

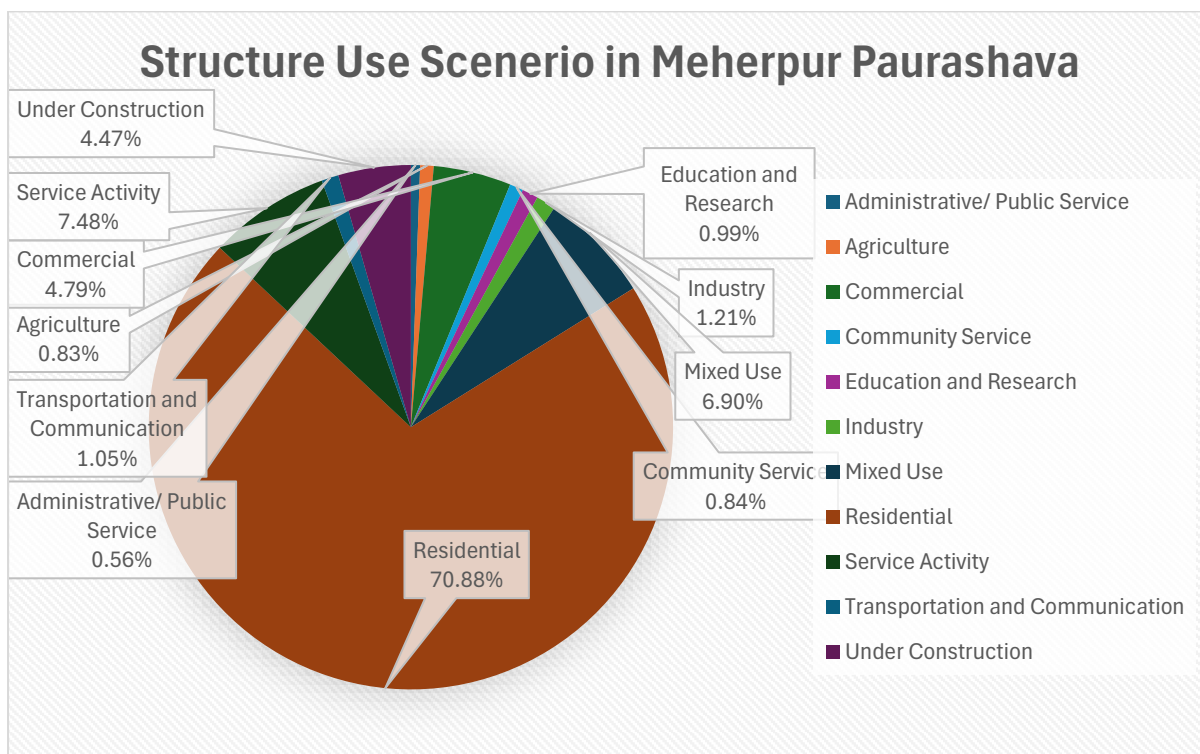
Overall, the data reflects a residentially-driven municipality with diversified but small-scale presence of service, educational, administrative, and commercial functions. The substantial volume of supporting structures, especially in the residential sector, emphasizes the need for inclusive infrastructure planning to ensure utility access and service coverage across these auxiliary units.

*Table 3-1: Structure Use and Functional Distribution in Meherpur Paurashava*

Structure Use	Number of Primary Structure	Supporting Structure
Administrative/ Public Service	102	185
Agriculture	151	22
Commercial	868	6
Community Service	152	187
Education and Research	180	170
Industry	219	50
Mixed Use	1251	0
Residential	12854	24213

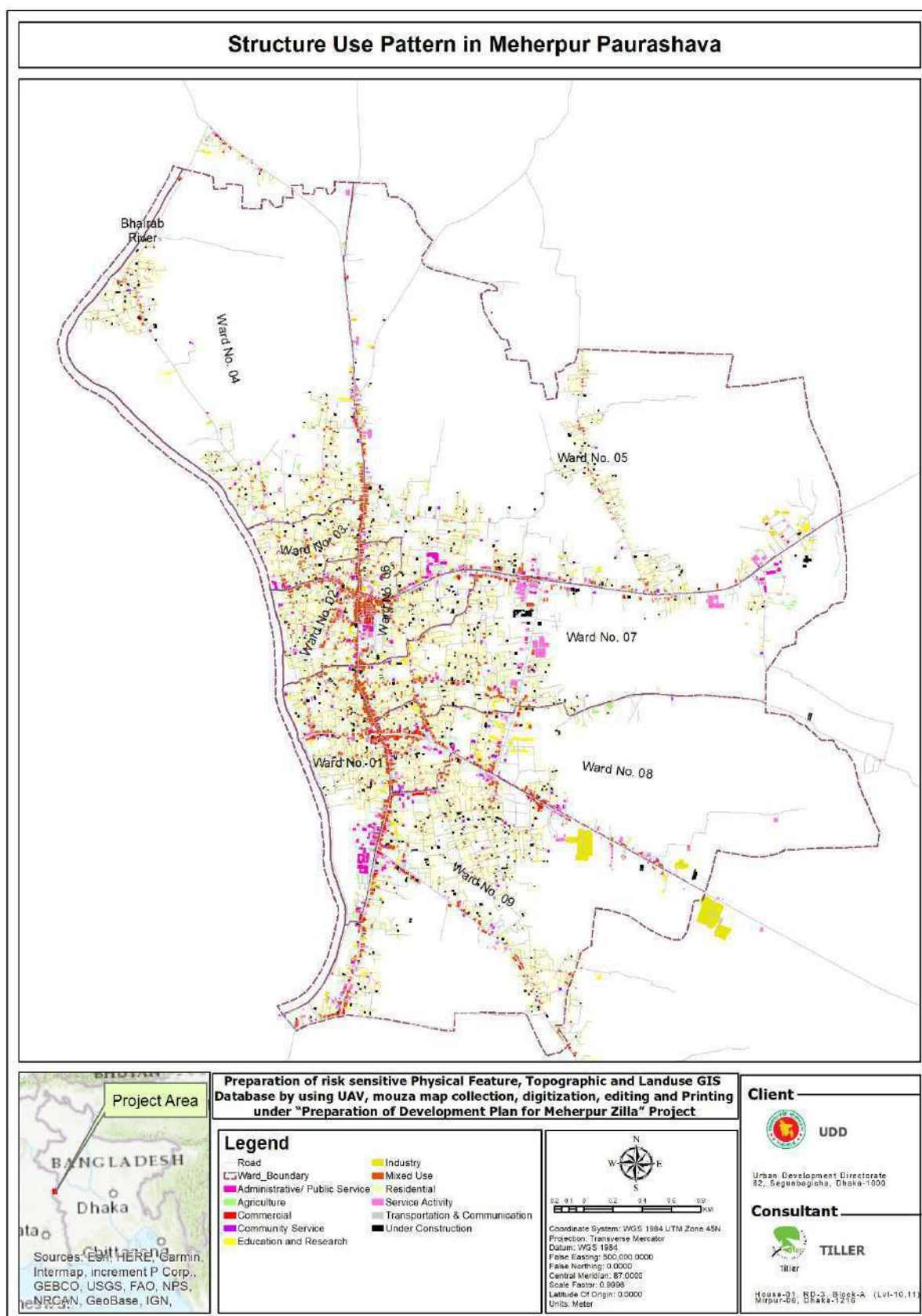
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Service Activity	1357	102
Transportation and Communication	191	6
Under Construction	810	0
Total	18135	24941



*Figure 3-4: Structure Use and Functional Distribution in Meherpur Paurashava*

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*Map 3-1: Structure Use and Functional Distribution in Meherpur Paurashava*

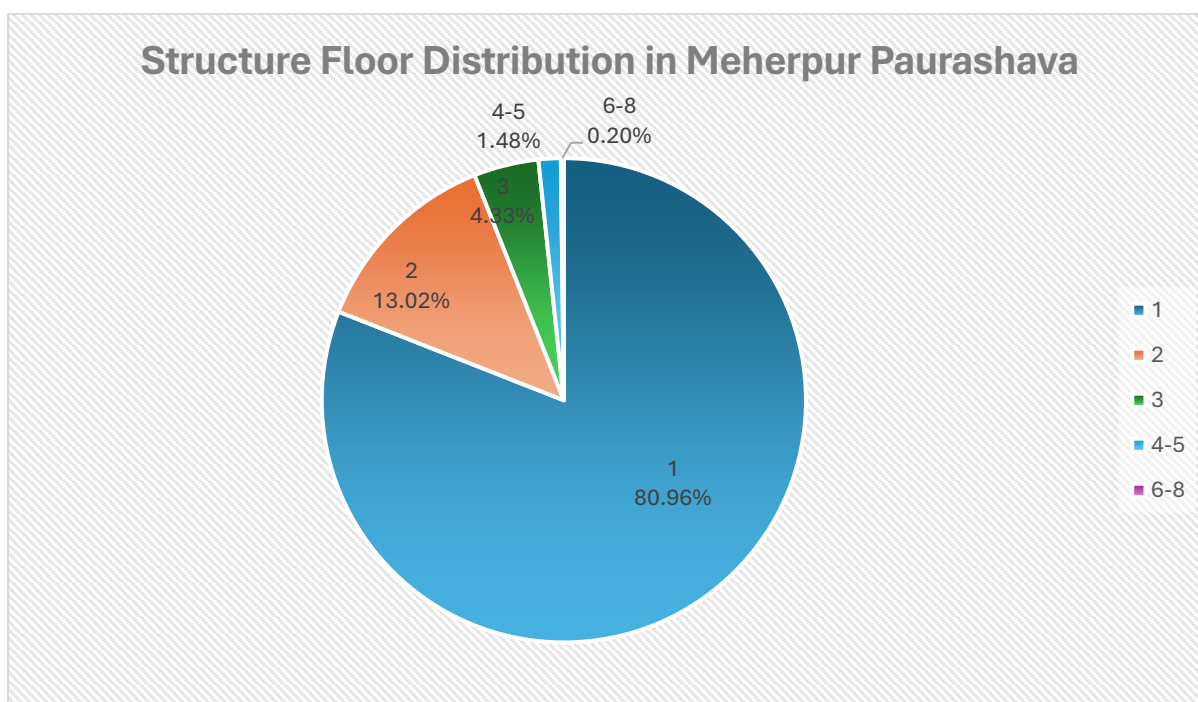
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### 3.6.1.2 Vertical Distribution of Structures:

The vertical distribution of structures in Meherpur Paurashava reveals a predominantly low-rise urban landscape. Single-storey buildings account for 14,683 primary structures, making up over 81% of the total built units. Notably, these are also the only structures associated with supporting units, totaling 24,941. This indicates that auxiliary facilities such as kitchens, toilets, and storage spaces are typically constructed as separate, ground-level structures. In contrast, multi-storey buildings—comprising 2-storey (2,362 units), 3-storey (785 units), 4–5 storey (269 units), and 6–8 storey (36 units)—do not report any supporting structures. This suggests that in taller buildings, such ancillary functions are likely integrated within the main structure. Overall, the data reflects a horizontal pattern of development, with limited vertical expansion, highlighting the municipality’s reliance on land-intensive construction and signaling potential challenges for future infrastructure efficiency and land use planning.

*Table 3-2: Vertical Distribution of Structures in Meherpur Paurashava*

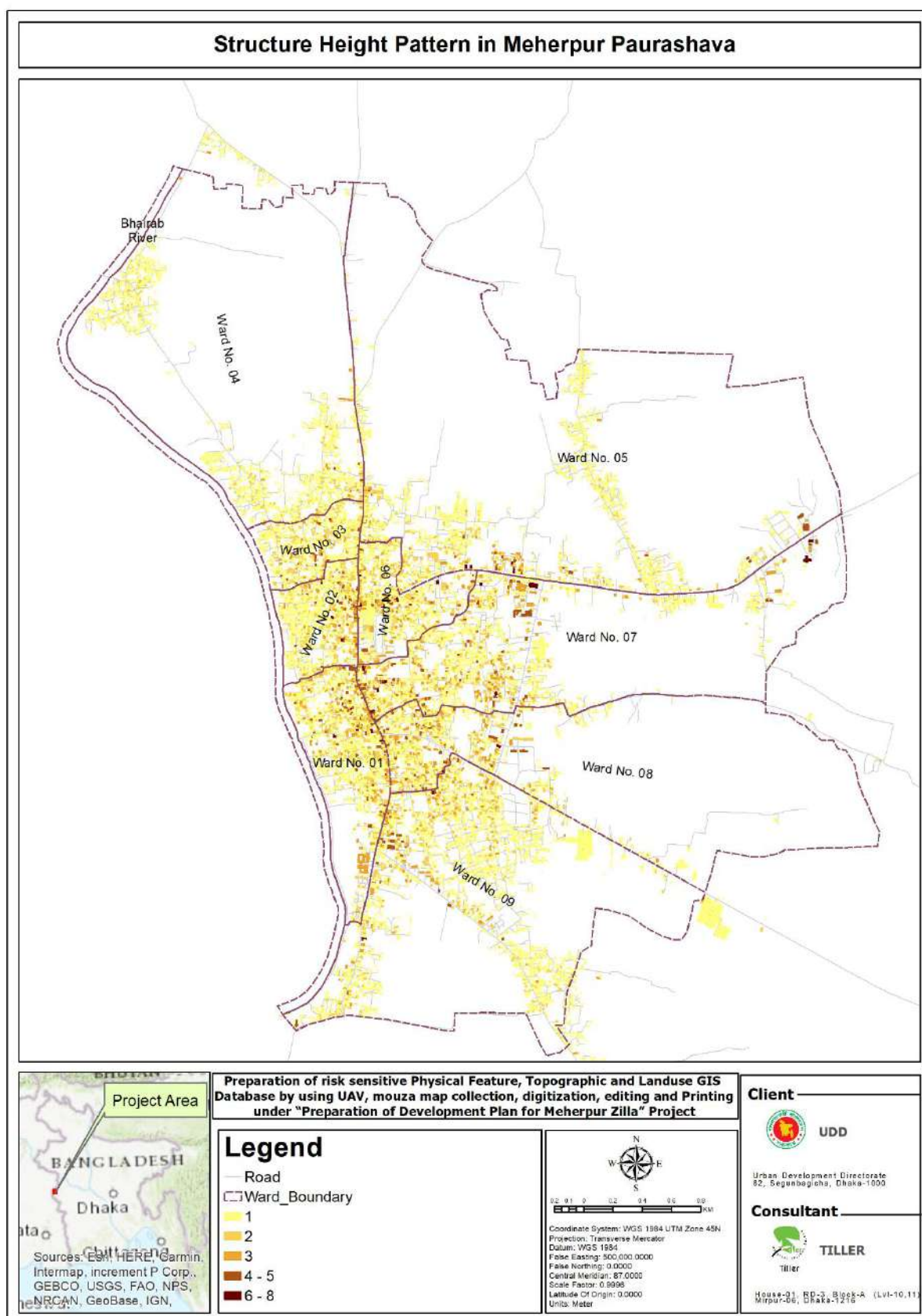
Number of Floor	Number of Primary Structure	Supporting Structure
1	14683	24941
2	2362	0
3	785	0
4-5	269	0
6-8	36	0
Total	18135	24941



*Figure 3-5: Vertical Distribution of Structures in Meherpur Paurashava*



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Map 3-2: Vertical Distribution of Structures in Meherpur Paurashava

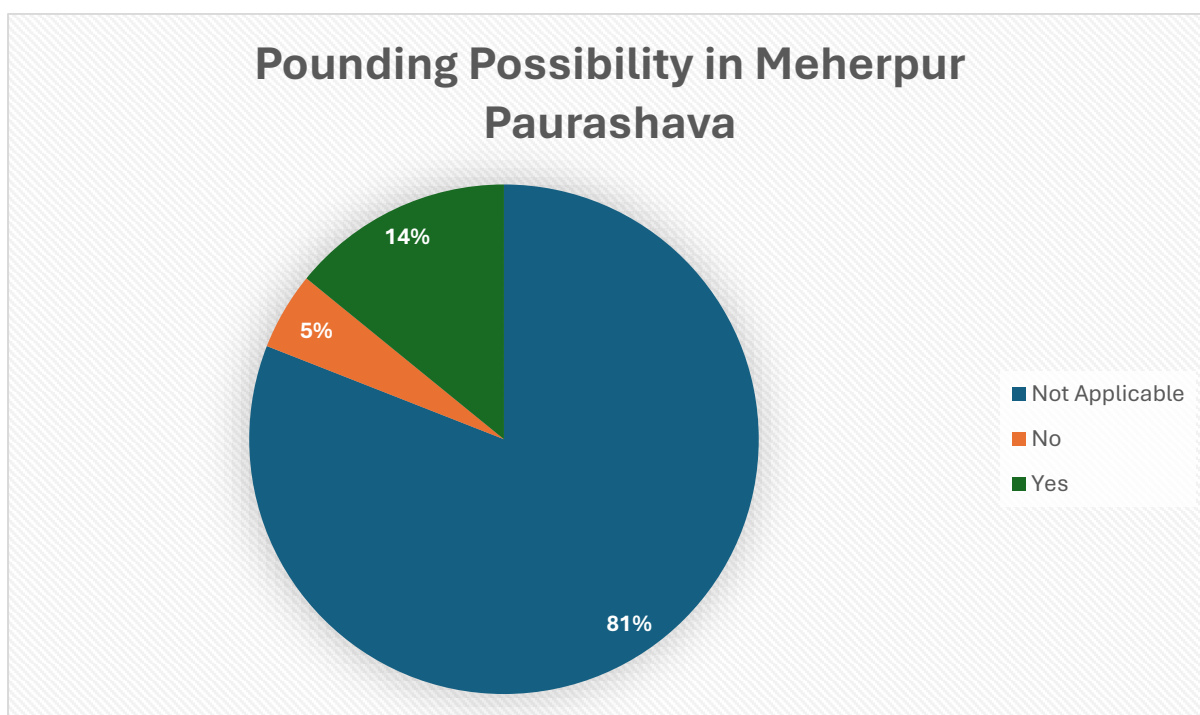
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### 3.6.1.3 Pounding Possibility of Structures:

The survey findings on pounding possibility—a structural risk where adjacent buildings may collide during seismic events—indicate that the majority of structures in Meherpur Paurashava fall outside this risk category. A total of 14,682 structures (80.96%) are marked as Not Applicable, which includes detached single-storey buildings with sufficient spacing. However, 2,561 structures (14.12%) are identified as having a pounding possibility, highlighting a notable portion of the urban fabric where buildings are in close proximity. An additional 892 structures (4.92%) are confirmed to have no such risk. The presence of pounding risk in over 14% of structures signals a need for targeted building code enforcement and urban design interventions, particularly in denser areas with multi-storey or closely packed constructions.

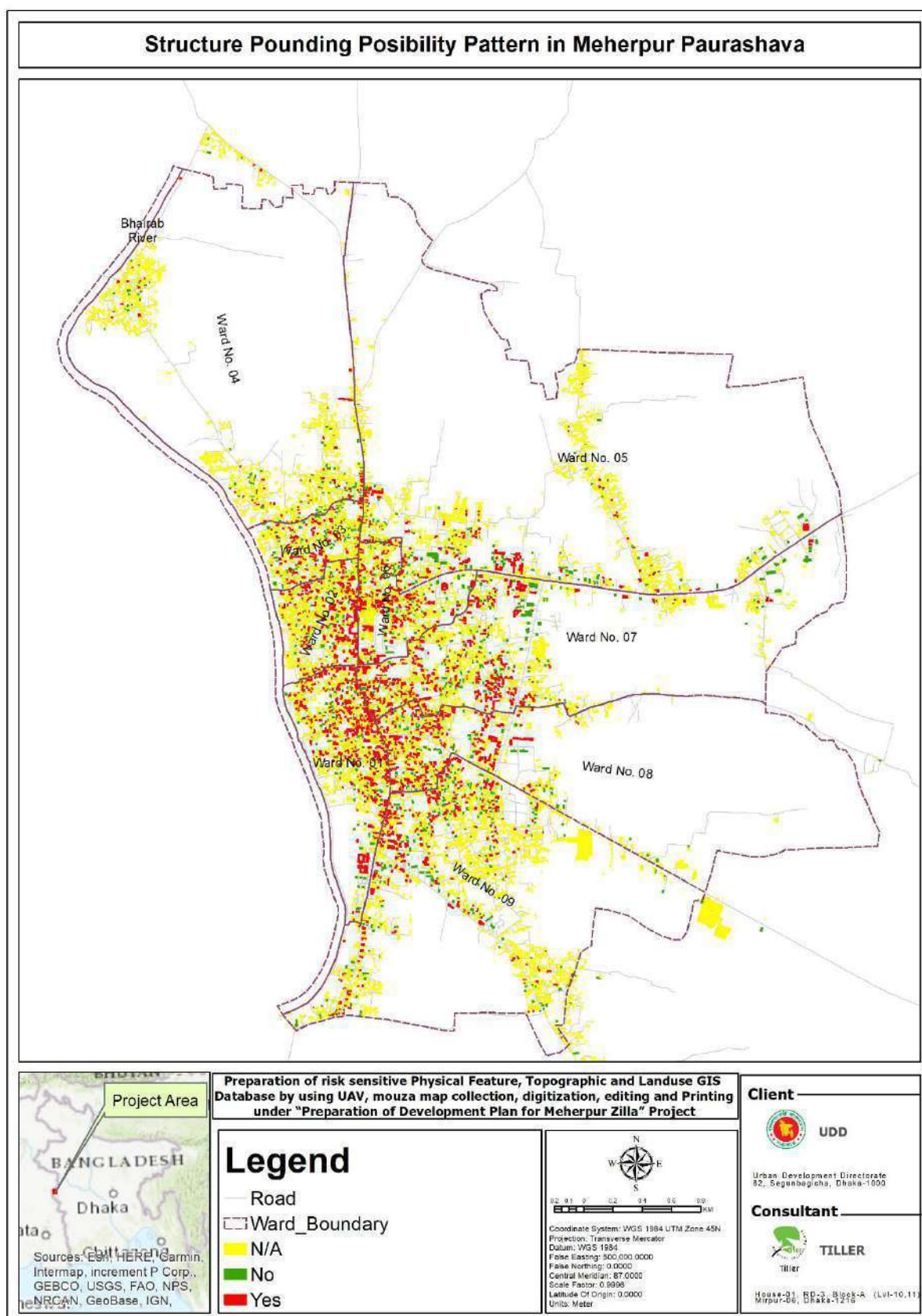
*Table 3-3: Pounding Possibility of Structures in Meherpur Paurashava*

Pounding Possibility	Number of Structure	Percentage
Not Applicable	14682	80.96%
No	892	4.92%
Yes	2561	14.12%
Total	18135	100.00%



*Figure 3-6: Pounding Possibility of Structures in Meherpur Paurashava*

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*Map 3-3: Pounding Possibility of Structures in Meherpur Paurashava*

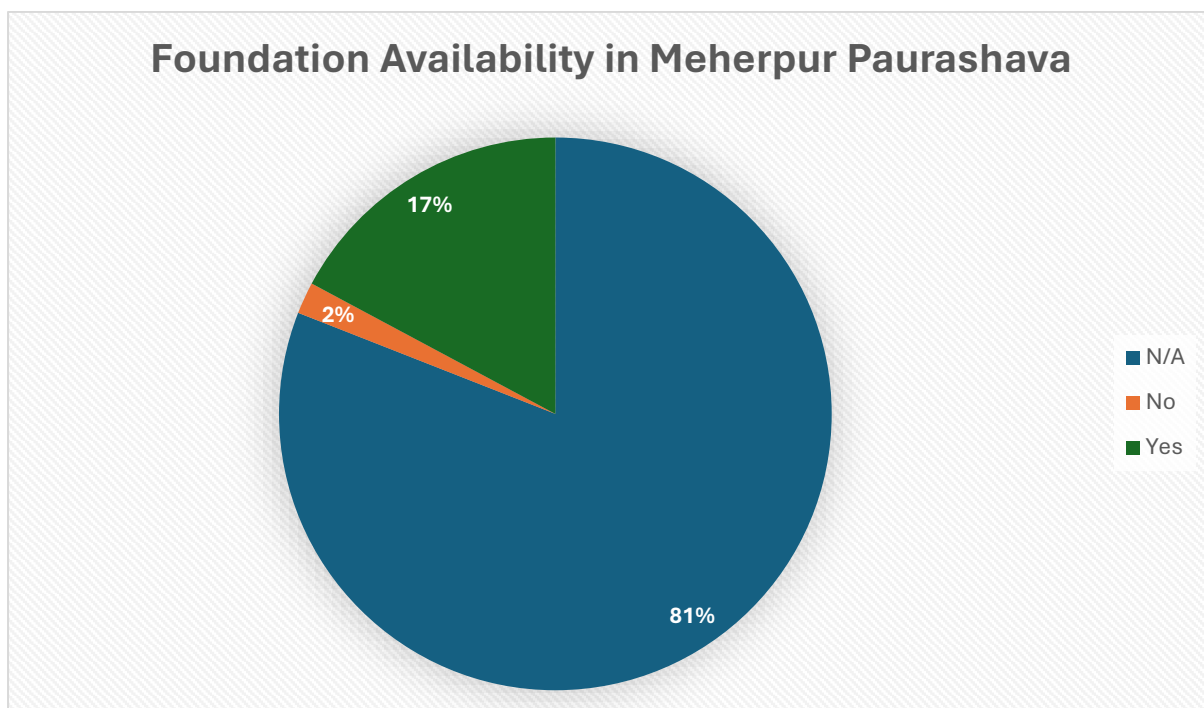
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#### **3.6.1.4 Presence of Building Foundations:**

The data on building foundations in Meherpur Paurashava shows that a significant majority of structures—14,682 units (80.96%)—are listed as Not Applicable, which corresponds to single-storey or informal constructions that do not follow standard foundation documentation or practices. Only 3,116 structures (17.18%) are confirmed to have proper foundations, suggesting that formal construction standards are followed in less than one-fifth of the total built environment. Additionally, 337 structures (1.86%) are noted as lacking foundations, which may pose structural safety concerns, particularly in areas vulnerable to soil instability or seismic activity. The data underscores the need for improved construction oversight and awareness of foundational requirements, especially as urban density increases.

*Table 3-4: Presence of Building Foundations in Meherpur Paurashava*

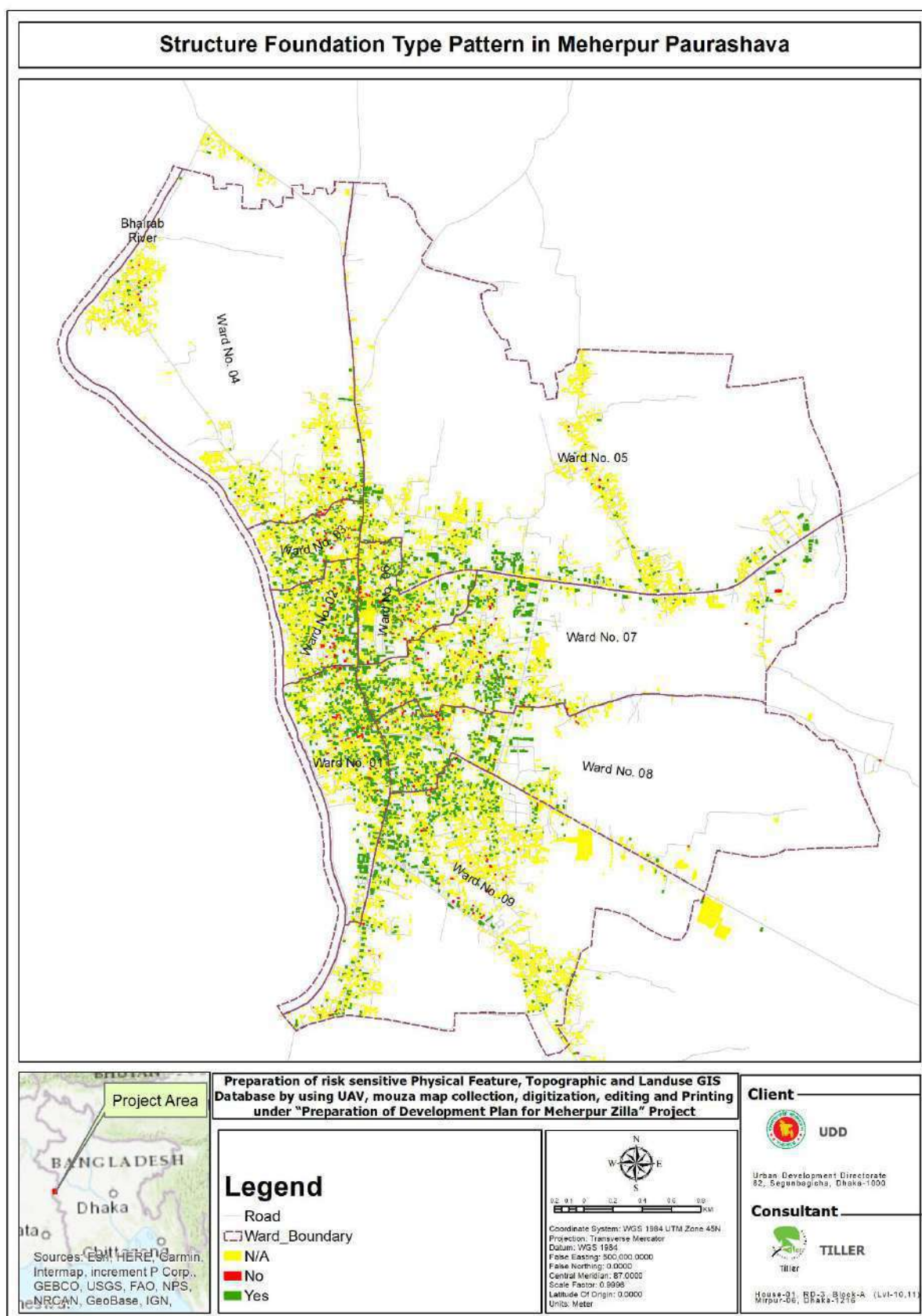
Foundation	Number of Structure	Percentage
N/A	14682	80.96%
No	337	1.86%
Yes	3116	17.18%
Total	18135	100.00%



*Figure 3-7: Presence of Building Foundations in Meherpur Paurashava*



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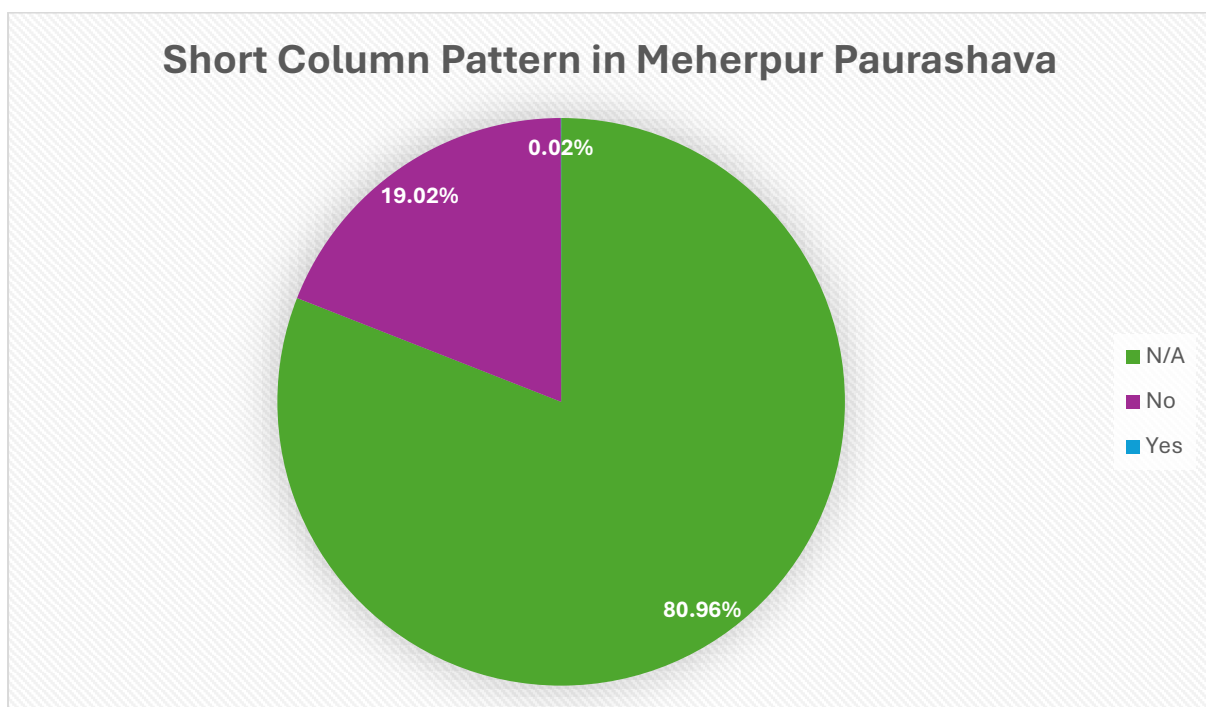
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### 3.6.1.5 Presence of Short Columns in Structures:

The survey data on short columns in Meherpur Paurashava reveals that the majority of structures—14,682 units (80.96%)—are marked as Not Applicable, indicating that the buildings do not feature short columns or are not designed with such elements. A notable portion, 3,450 structures (19.02%), are reported to lack short columns, suggesting that these buildings do not face the structural concerns associated with inadequate column design. Only 3 structures (0.02%) were identified as having short columns, a minimal percentage. While the prevalence of short columns is low, the presence of these elements in any structures highlights the need for attention to structural integrity, particularly in seismic-prone areas.

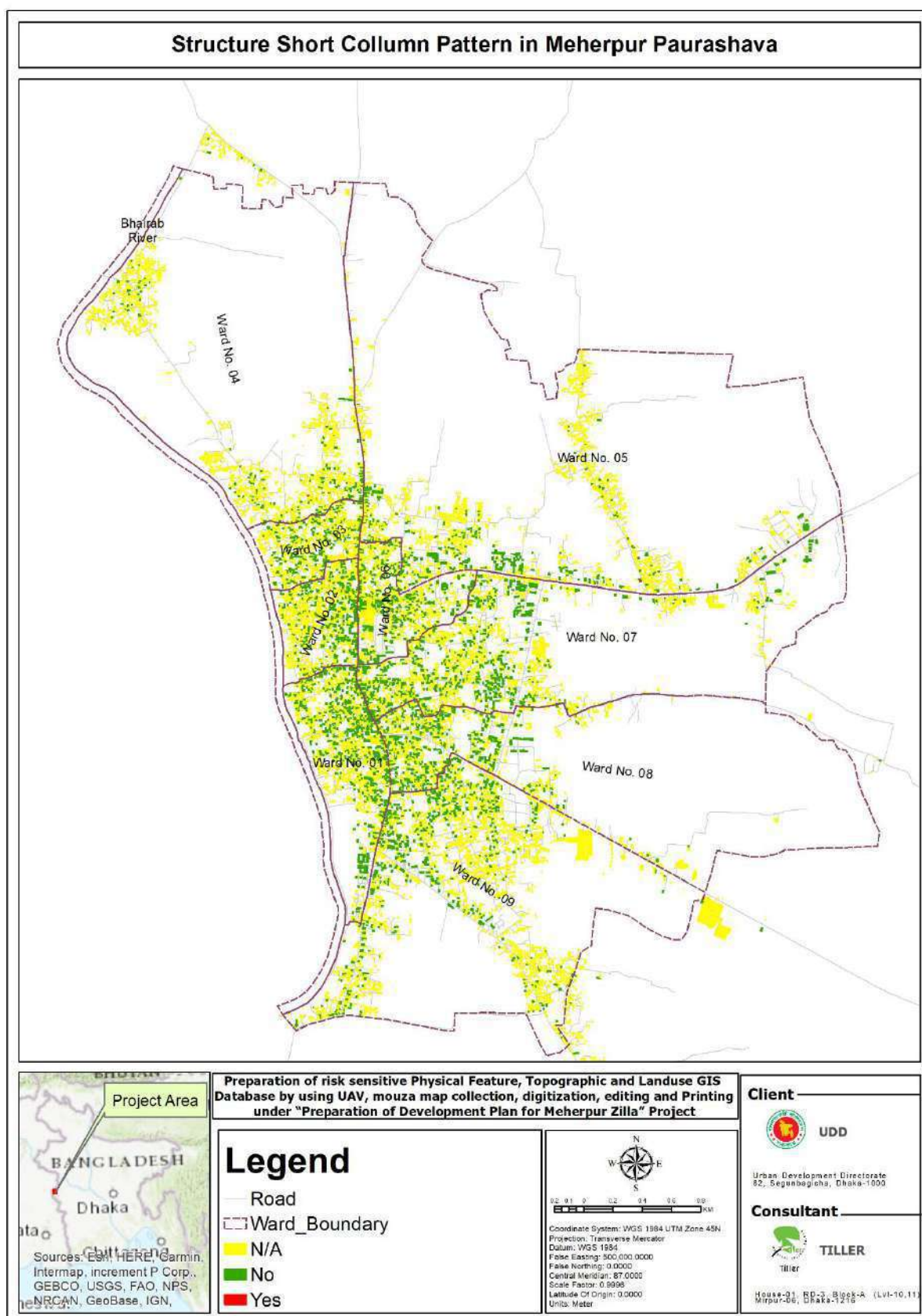
*Table 3-5: Presence of Short Columns in Structures in Meherpur Paurashava*

Short Column	Number of Structure	Percentage
N/A	14682	80.96%
No	3450	19.02%
Yes	3	0.02%
Total	18135	100.00%



*Figure 3-8: Presence of Short Columns in Structures in Meherpur Paurashava*

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Map 3-5: Presence of Short Columns in Structures in Meherpur Paurashava

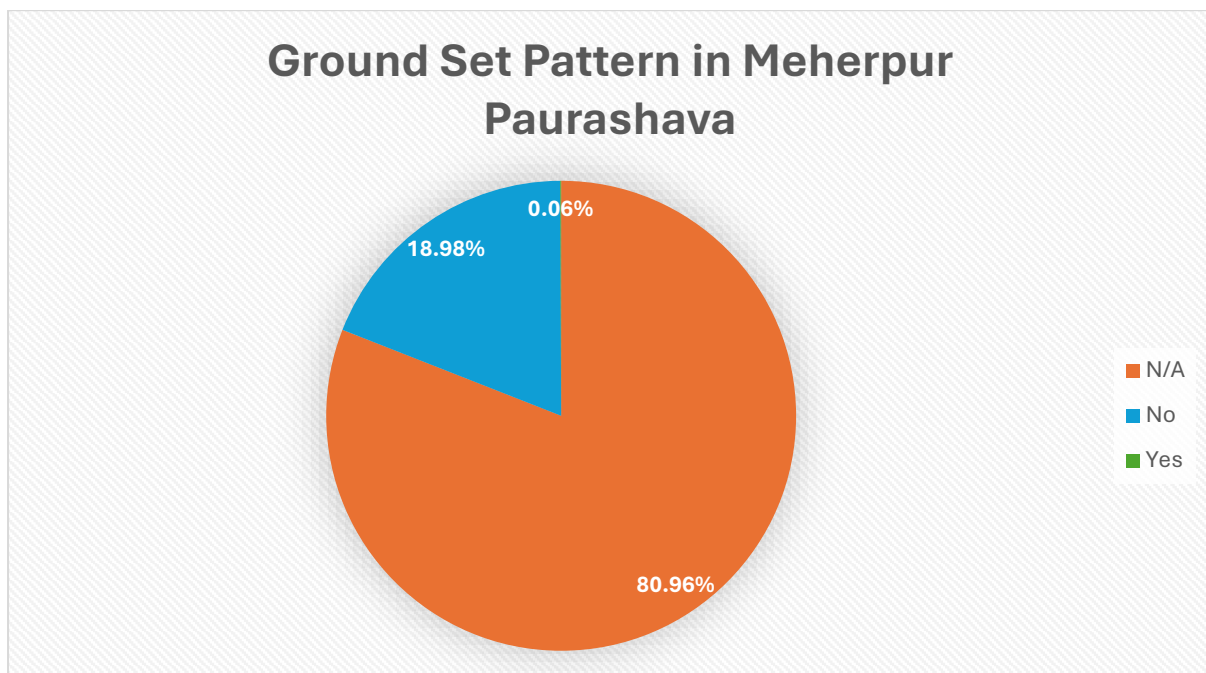
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### 3.6.1.6 Ground Set Presence in Structures:

The data on ground sets in Meherpur Paurashava indicates that most structures—14,682 units (80.96%)—are marked as Not Applicable, suggesting that ground sets, which may refer to specific foundation or base-level structural features, are not used or required for these buildings. 3,442 structures (18.98%) are reported as without a ground set, while only 11 structures (0.06%) feature a ground set. The very small percentage of buildings with ground sets highlights their limited use, potentially indicating that the majority of structures do not require or integrate this feature in their design.

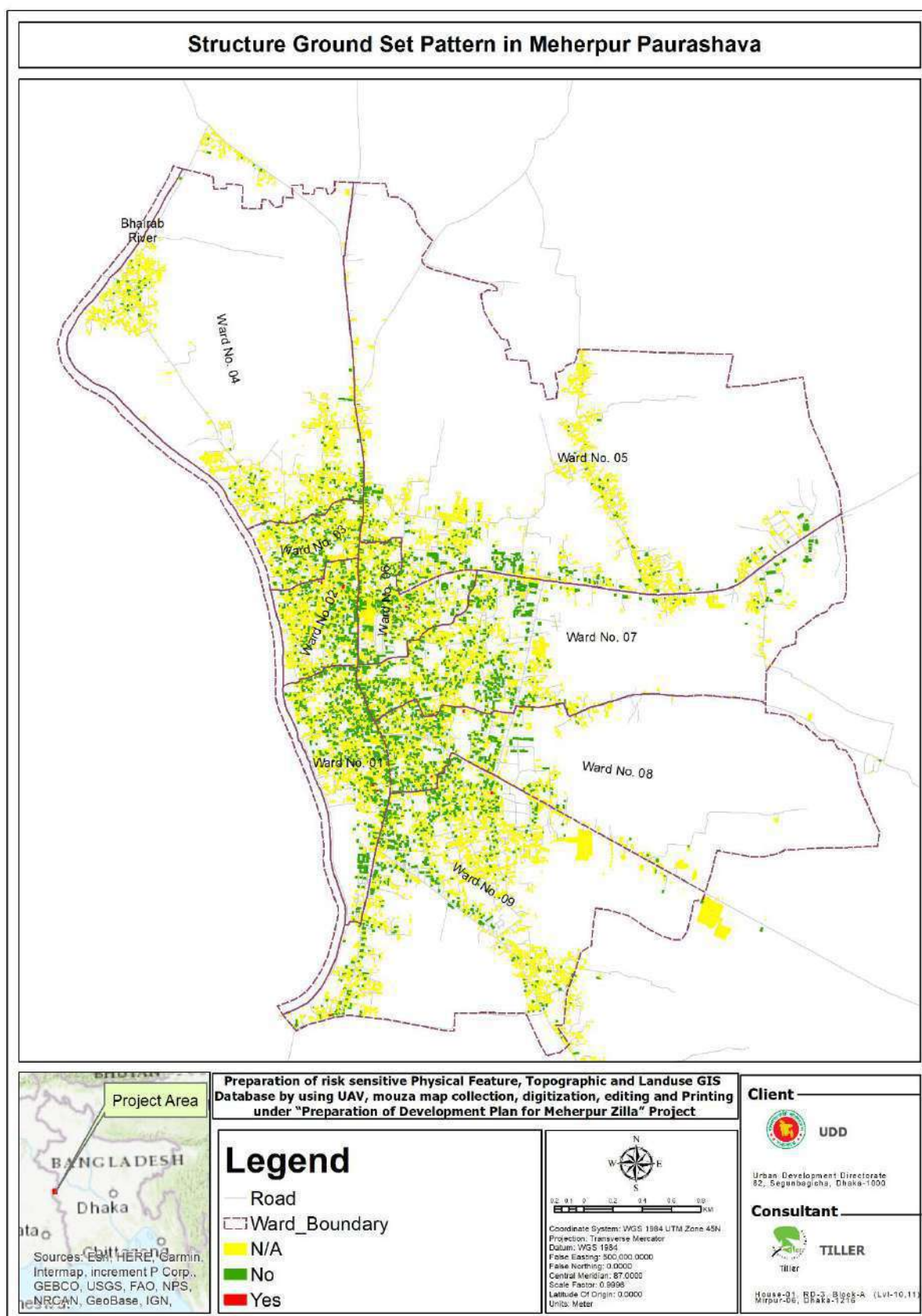
*Table 3-6: Ground Set Presence in Structures in Meherpur Paurashava*

Ground Set	Number of Structure	Percentage
N/A	14682	80.96%
No	3442	18.98%
Yes	11	0.06%
Total	18135	100.00%



*Figure 3-9: Ground Set Presence in Structures in Meherpur Paurashava*

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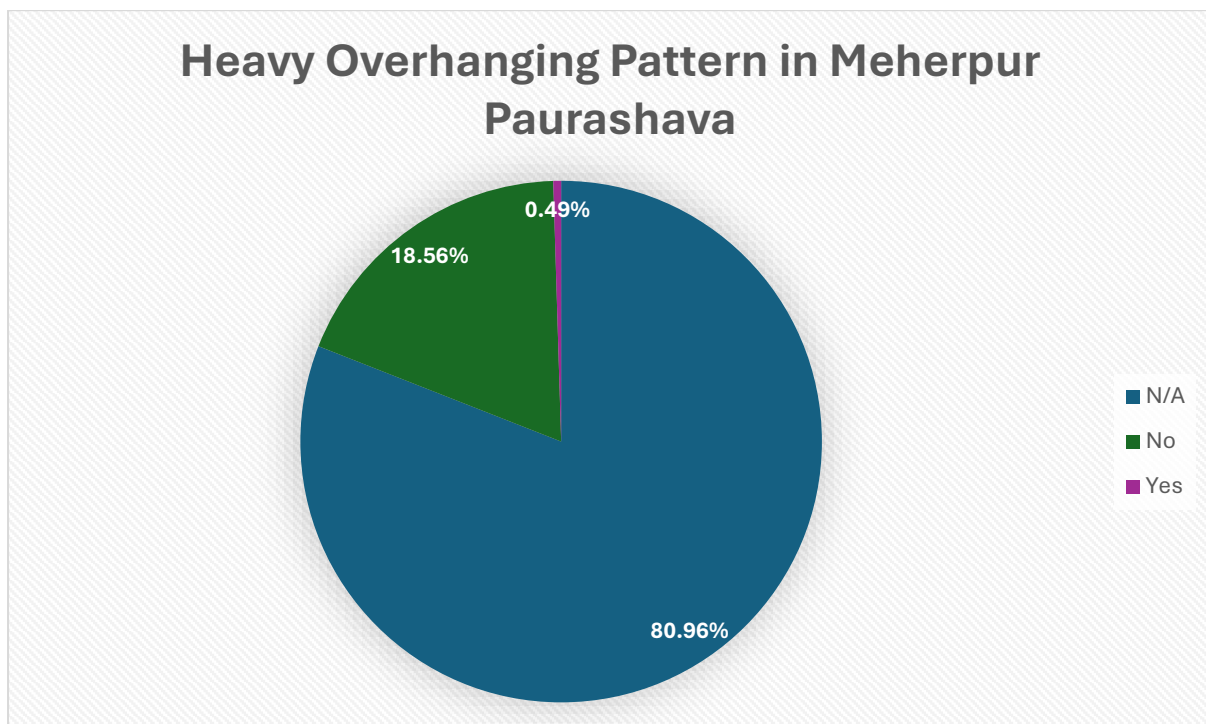
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### 3.6.1.7 Presence of Heavy Overhanging in Structures:

The survey data on heavy overhanging in Meherpur Paurashava shows that the majority of structures—14,682 units (80.96%)—are marked as Not Applicable, suggesting that heavy overhanging elements are not present in these buildings. 3,365 structures (18.56%) do not have heavy overhanging, while only 88 structures (0.49%) are reported to feature heavy overhanging. This minimal percentage indicates that such architectural features are relatively uncommon, but their presence may still warrant consideration in structural planning, especially regarding load distribution and potential safety risks in high-wind or seismic zones.

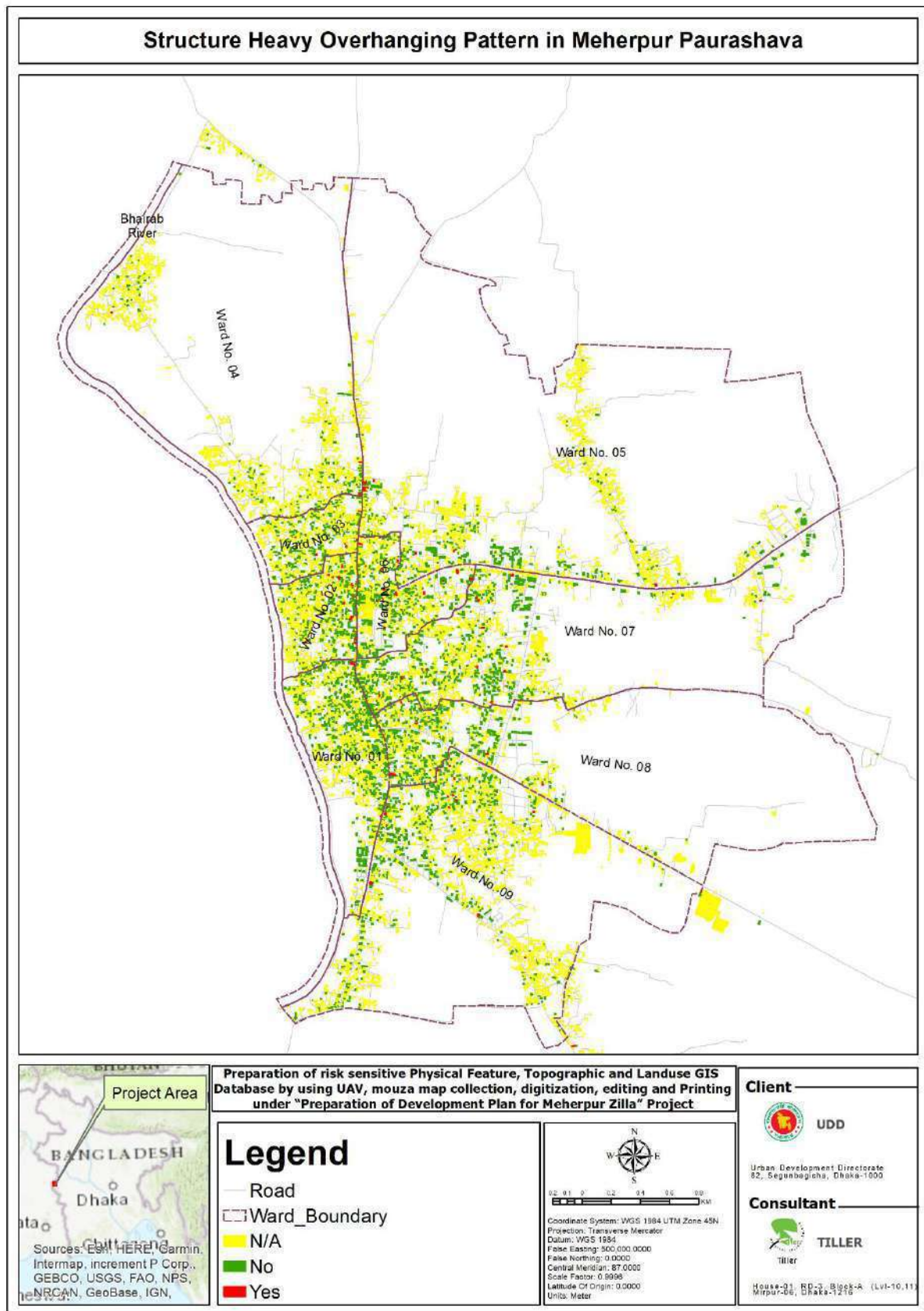
*Table 3-7: Presence of Heavy Overhanging in Structures in Meherpur Paurashava*

Heavy Overhanging	Number of Structure	Percentage
N/A	14682	80.96%
No	3365	18.56%
Yes	88	0.49%
Total	18135	100.00%



*Figure 3-10: Presence of Heavy Overhanging in Structures in Meherpur Paurashava*

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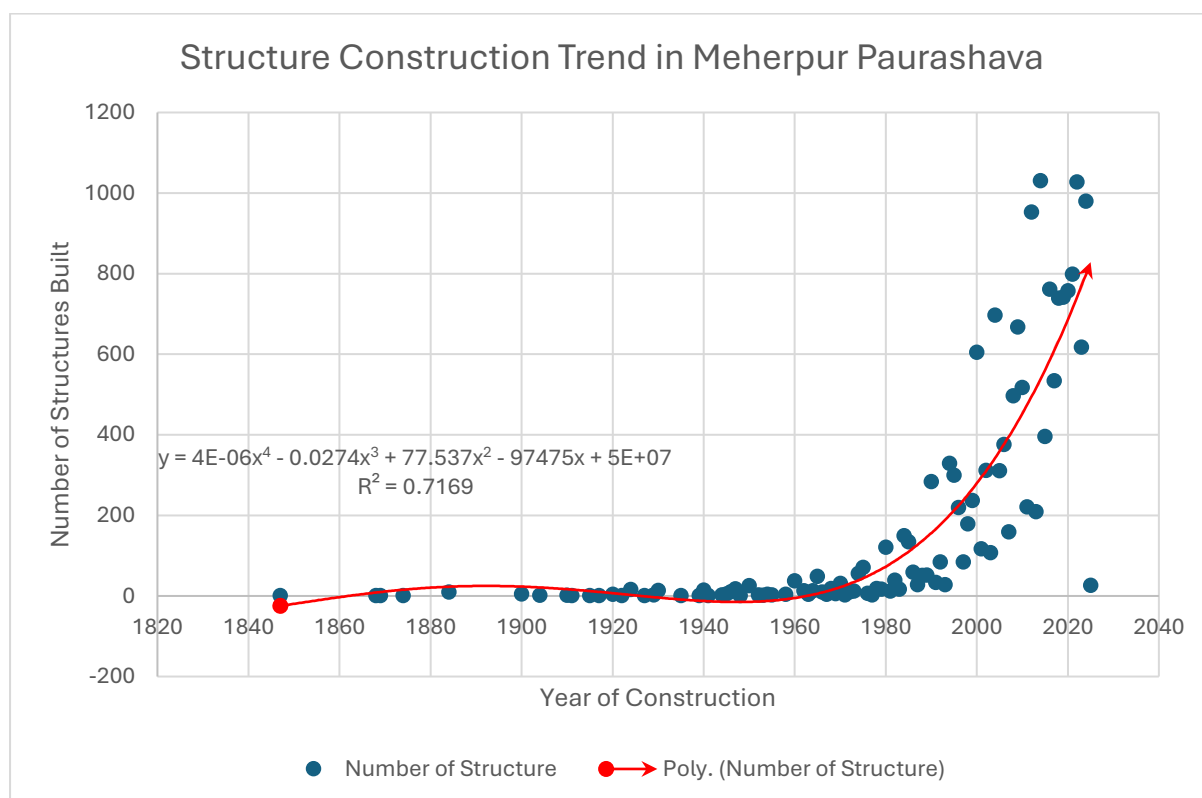
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### 3.6.1.8 Structure Construction Trend:

The construction trend of structures in Meherpur Paurashava reveals a significant concentration of relatively modern buildings. 9,797 structures (54.02%) were constructed between 2011 and 2025, indicating a period of rapid urbanization and growth in recent years. This is followed by 5,746 structures (31.68%) built between 1993 and 2010, showing consistent development over the past few decades. A smaller portion, 1,456 structures (8.03%), were constructed between 1956 and 1992, while 159 structures (0.88%) were built between 1847 and 1955, reflecting a much older stock of buildings. Additionally, 977 structures (5.39%) fall under the category of No Information Found, where construction years could not be determined. The high proportion of newer structures underscores the ongoing urban development in Meherpur Paurashava, with the majority of buildings being constructed in the last two decades.

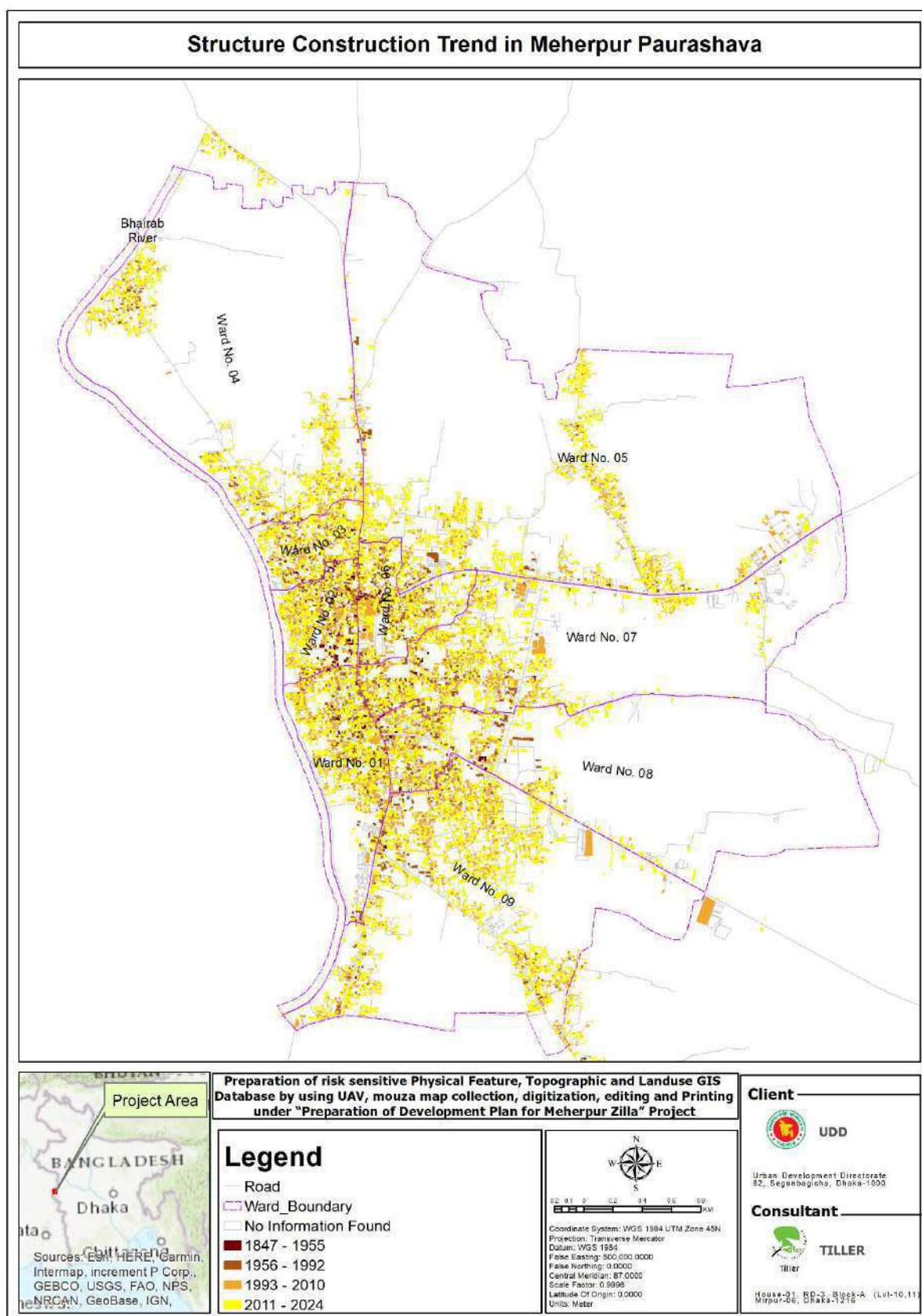
*Table 3-8: Structure Construction Trend in Meherpur Paurashava*

Construction Year	Number of Structure	Percentage
No Information found	977	5.39%
1847-1955	159	0.88%
1956-1992	1456	8.03%
1993-2010	5746	31.68%
2011-2025	9797	54.02%
Total	18135	100.00%



*Figure 3-11: : Structure Construction Trend in Meherpur Paurashava*

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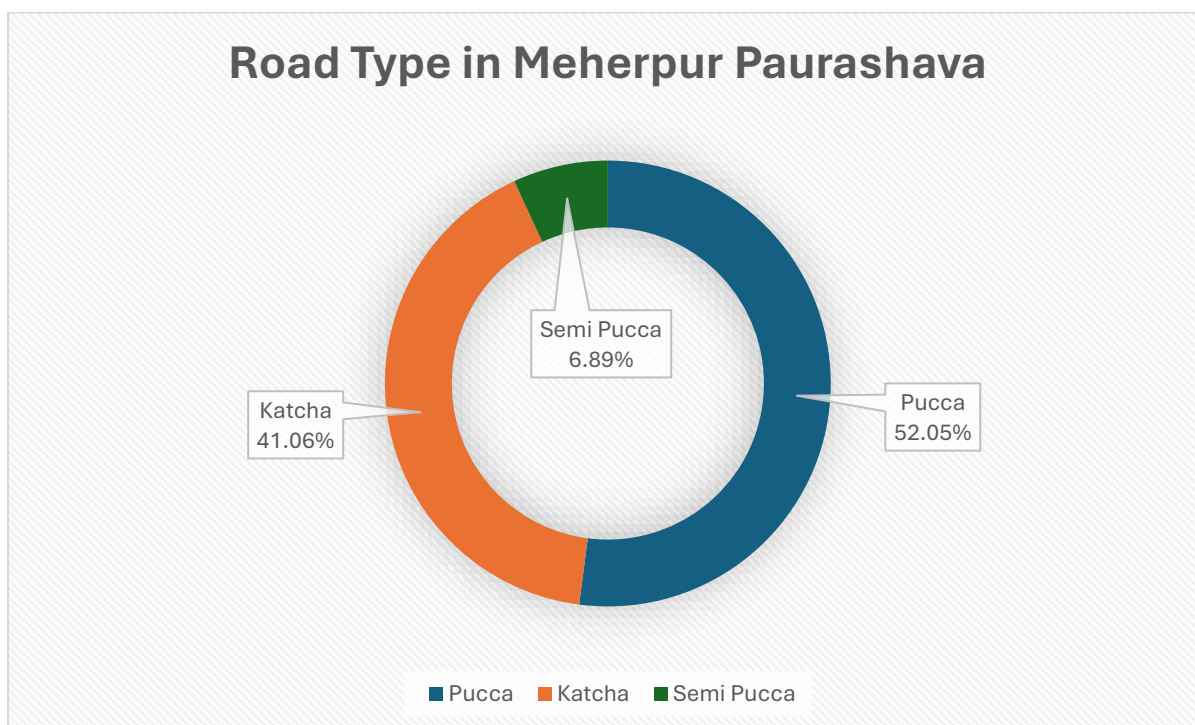
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### 3.6.1.9 Road Type:

The road network in Meherpur Paurashava is predominantly made up of Pucca (permanent) roads, which account for 121.50 km (52.05%) of the total road length. Katcha (unpaved) roads follow closely, with a total length of 95.84 km (41.06%), reflecting a substantial portion of the road network that may require improvements for durability and accessibility. A smaller segment of the road network consists of Semi Pucca (partially paved) roads, covering 16.09 km (6.89%). The data highlights the mixed condition of the road infrastructure, with a strong reliance on both permanent and unpaved roads, and underscores the potential for enhancing connectivity and road quality across the area.

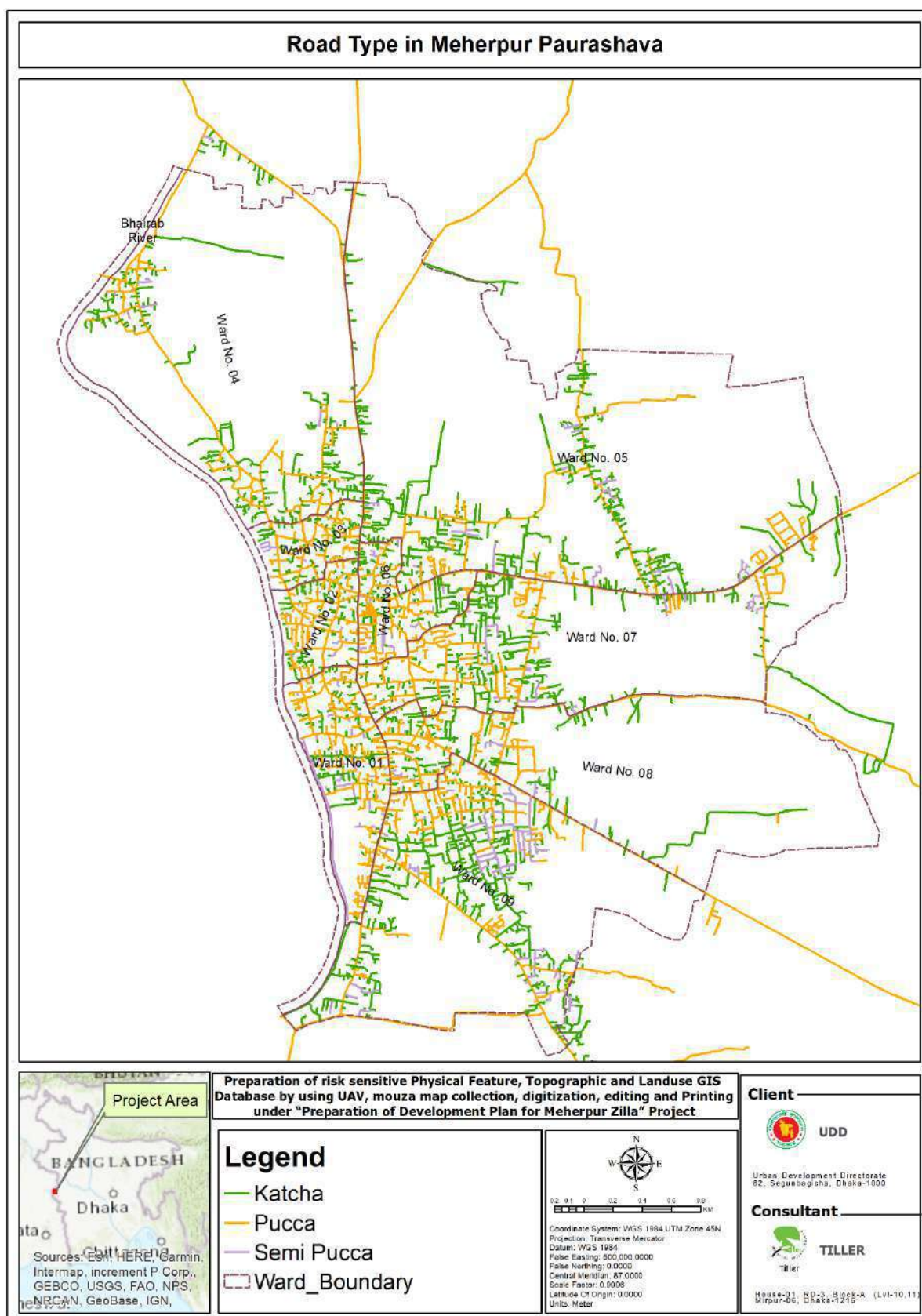
*Table 3-9: Road Type Pattern in Meherpur Paurashava*

Road Type	Length in KM	Percentage
Pucca	121.50	52.05%
Katcha	95.84	41.06%
Semi Pucca	16.09	6.89%
Total	233.43	100.00%



*Figure 3-12: Road Type Pattern in Meherpur Paurashava*

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Map 3-9: Road Type Pattern in Meherpur Paurashava

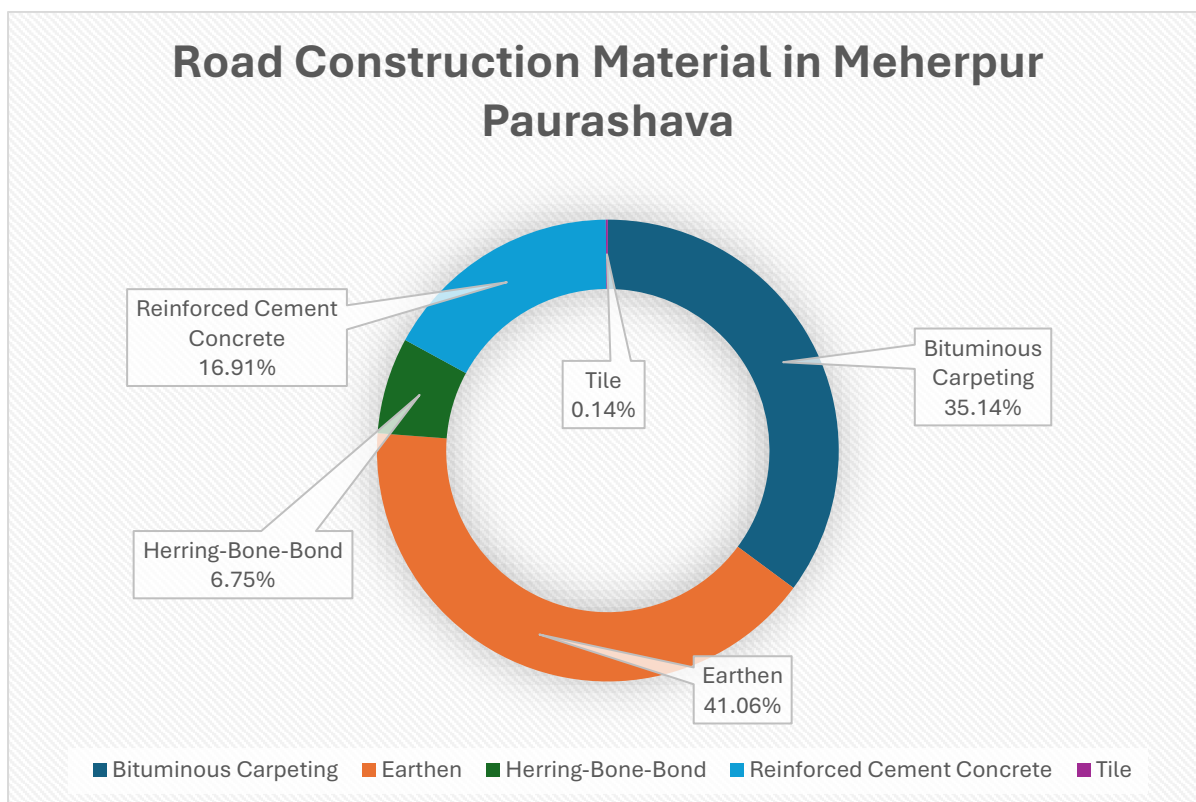
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### 3.6.1.10 Road Construction Material:

The road construction materials in Meherpur Paurashava reveal a diverse mix, with Earthen roads making up the largest portion at 95.84 km (41.06%), indicating a significant reliance on unpaved roads in the area. Bituminous carpeting, a more durable material, covers 82.02 km (35.14%) of the road network, providing a smoother and more resilient surface for transportation. Reinforced Cement Concrete (RCC) roads account for 39.48 km (16.91%), suggesting the presence of more robust infrastructure in certain areas. Herring-Bone-Bond roads, a traditional brickwork construction, cover 15.76 km (6.75%), while Tile roads represent a minimal portion at 0.33 km (0.14%).

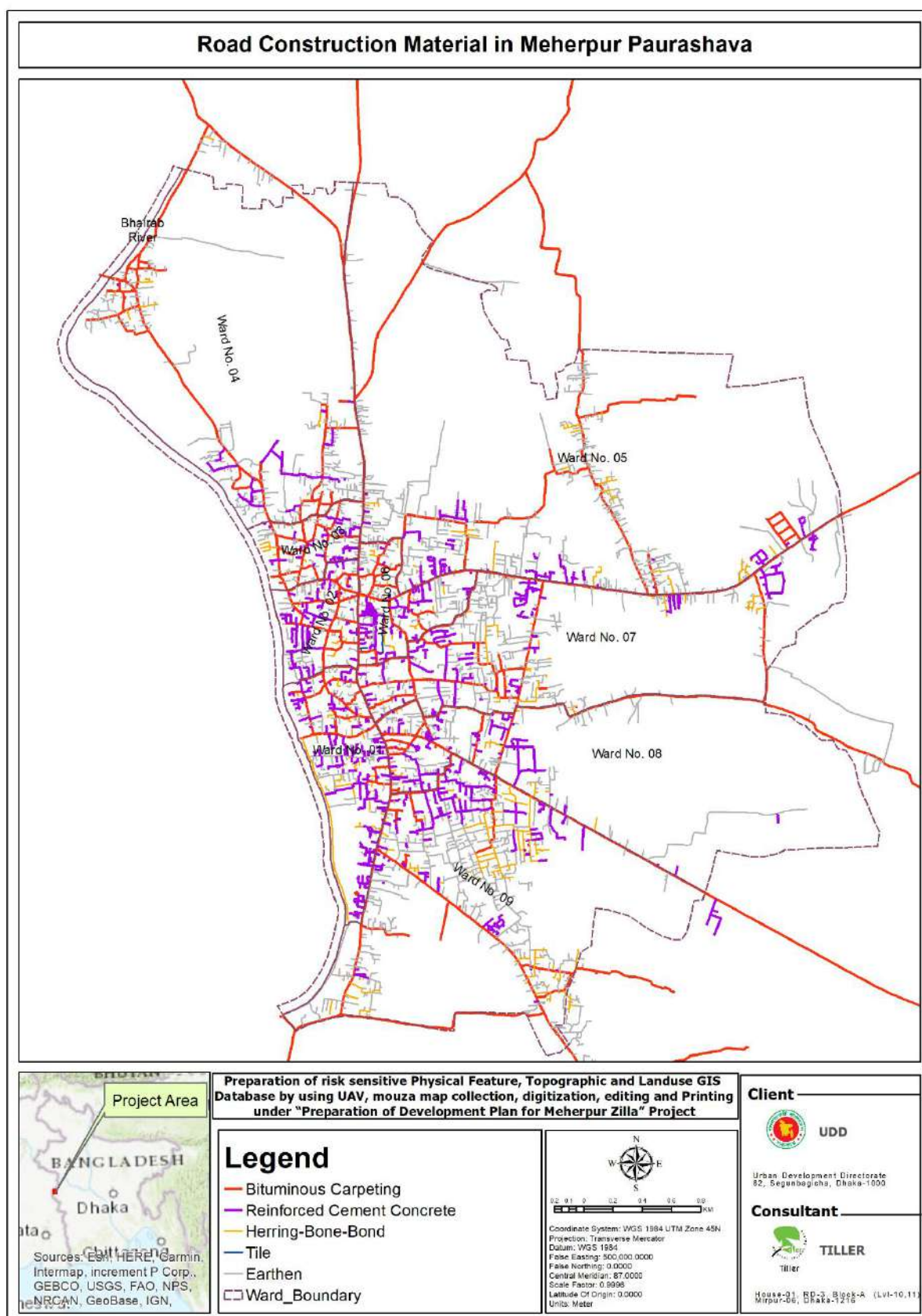
*Table 3-10: Road Construction Material in Meherpur Paurashava*

Road Construction Material	Length in KM	Percentage
Bituminous Carpeting	82.02	35.14%
Earthen	95.84	41.06%
Herring-Bone-Bond	15.76	6.75%
Reinforced Cement Concrete	39.48	16.91%
Tile	0.33	0.14%
Total	233.43	100.00%



*Figure 3-13: Road Construction Material in Meherpur Paurashava*

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Map 3-10: Road Construction Material in Meherpur Paurashava



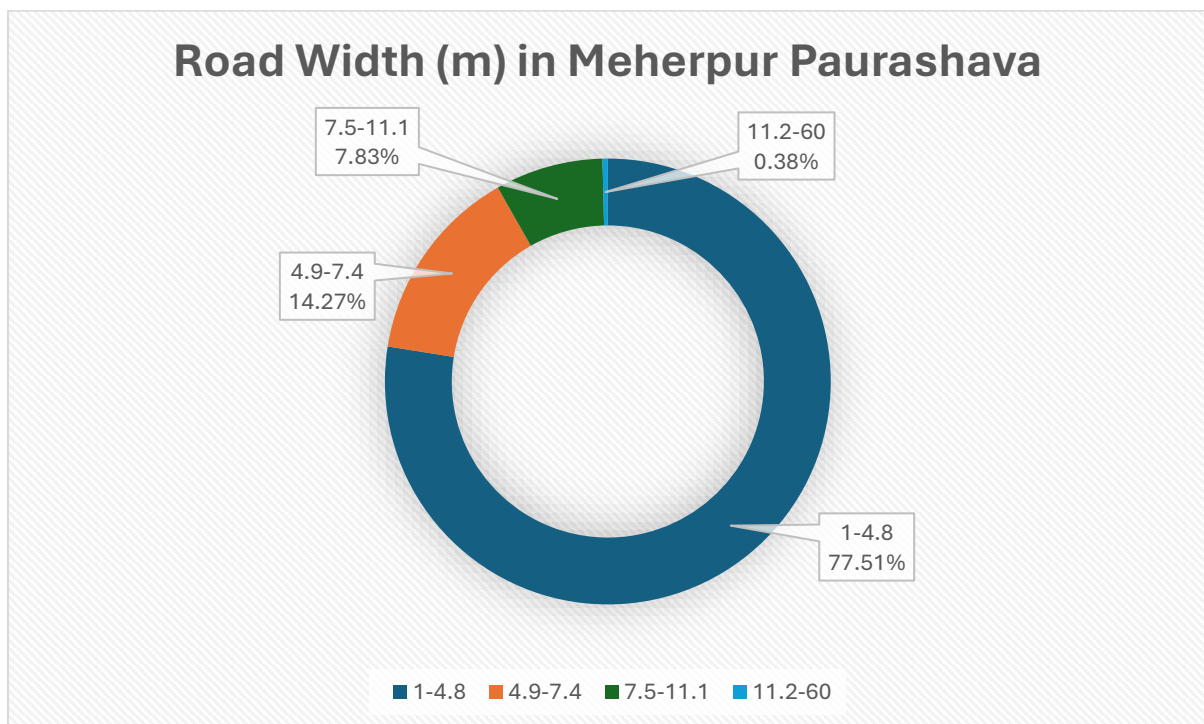
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### 3.6.1.11 Road Width Distribution:

The road width data in Meherpur Paurashava shows that the majority of roads—180.94 km (77.51%)—fall within the narrowest category, ranging from 1 to 4.8 meters. These narrower roads are likely to serve residential areas and smaller streets. 33.32 km (14.27%) of roads have widths ranging from 4.9 to 7.4 meters, which may accommodate more traffic and provide better mobility. A smaller portion, 18.27 km (7.83%), has road widths between 7.5 and 11.1 meters, indicating roads that are slightly more expansive. Only 0.90 km (0.38%) of roads have widths between 11.2 and 60 meters, suggesting very few wide roads, likely major thoroughfares or highways. The road width distribution highlights the dominance of narrow roads, which may limit traffic flow and pose challenges for transportation and infrastructure development.

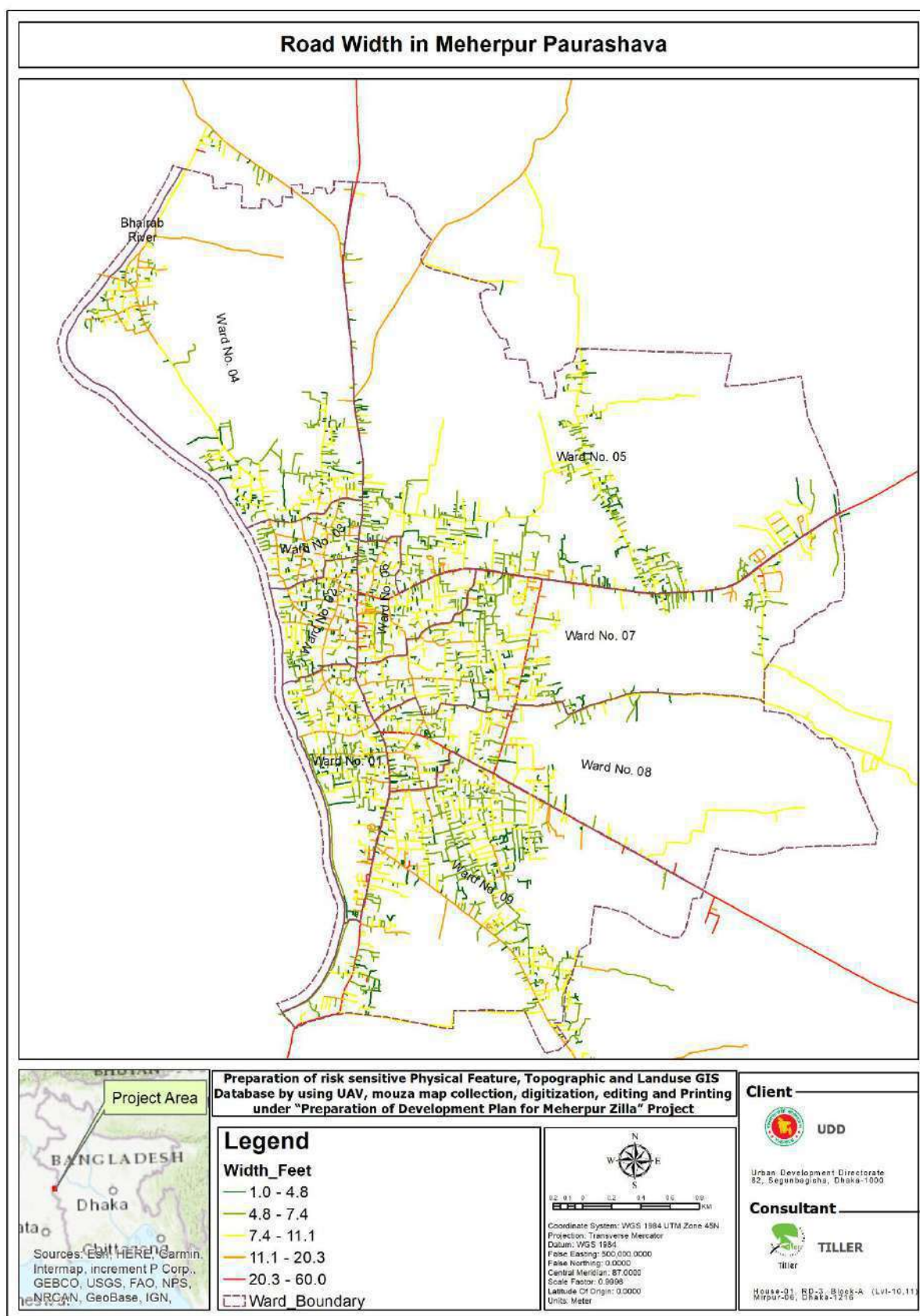
*Table 3-11: Road Width Distribution in Meherpur Paurashava*

Road Width (Meter)	Length in KM	Percentage
1-4.8	180.94	77.51%
4.9-7.4	33.32	14.27%
7.5-11.1	18.27	7.83%
11.2-60	0.90	0.38%
Total	233.43	1



*Figure 3-14: Road Width Distribution in Meherpur Paurashava*

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Map 3-11: Road Width Distribution in Meherpur Paurashava

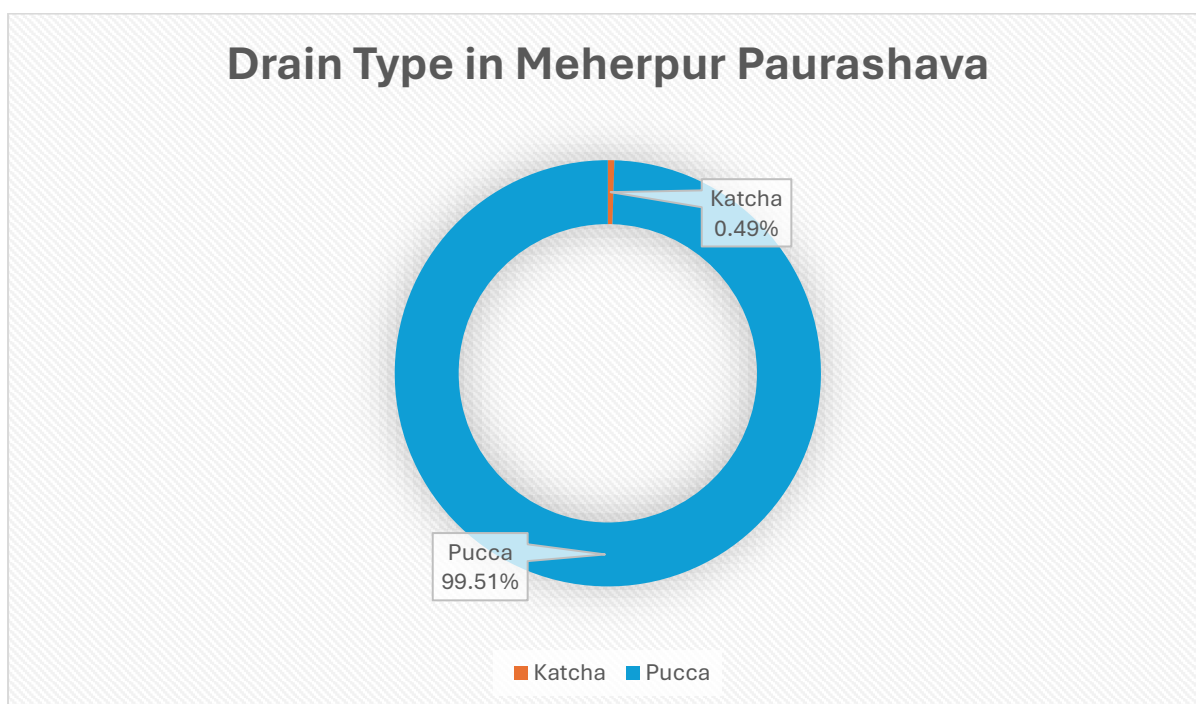
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#### **3.6.1.12 Drain Type Distribution:**

The drainage system in Meherpur Paurashava is overwhelmingly dominated by Pucca (permanent) drains, which account for 58.79 km (99.51%) of the total drain length. This indicates a highly developed drainage infrastructure, designed for durability and better management of wastewater. In contrast, only 0.29 km (0.49%) of the drainage network is made up of Katcha (unpaved) drains, suggesting limited reliance on less durable drainage solutions. The data highlights a robust drainage network with an overwhelming focus on permanent systems, which is crucial for long-term urban planning and maintenance.

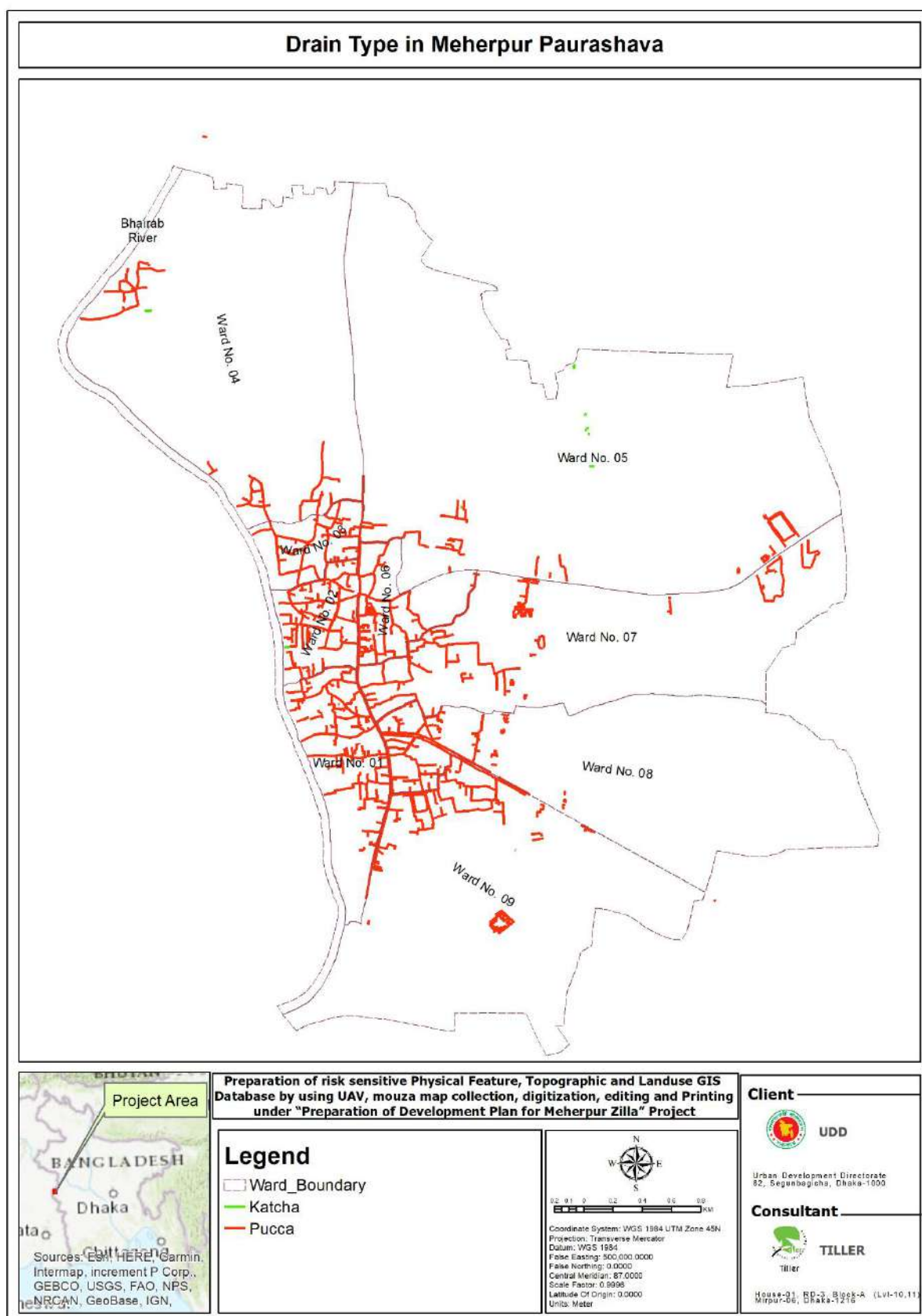
*Table 3-12: Drain Type Distribution in Meherpur Paurashava*

Drain Type	Length in KM	Percentage
Katcha	0.29	0.49%
Pucca	58.79	99.51%
Total	59.08	100.00%



*Figure 3-15: Drain Type Distribution in Meherpur Paurashava*

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*Map 3-12: Drain Type Distribution in Meherpur Paurashava*



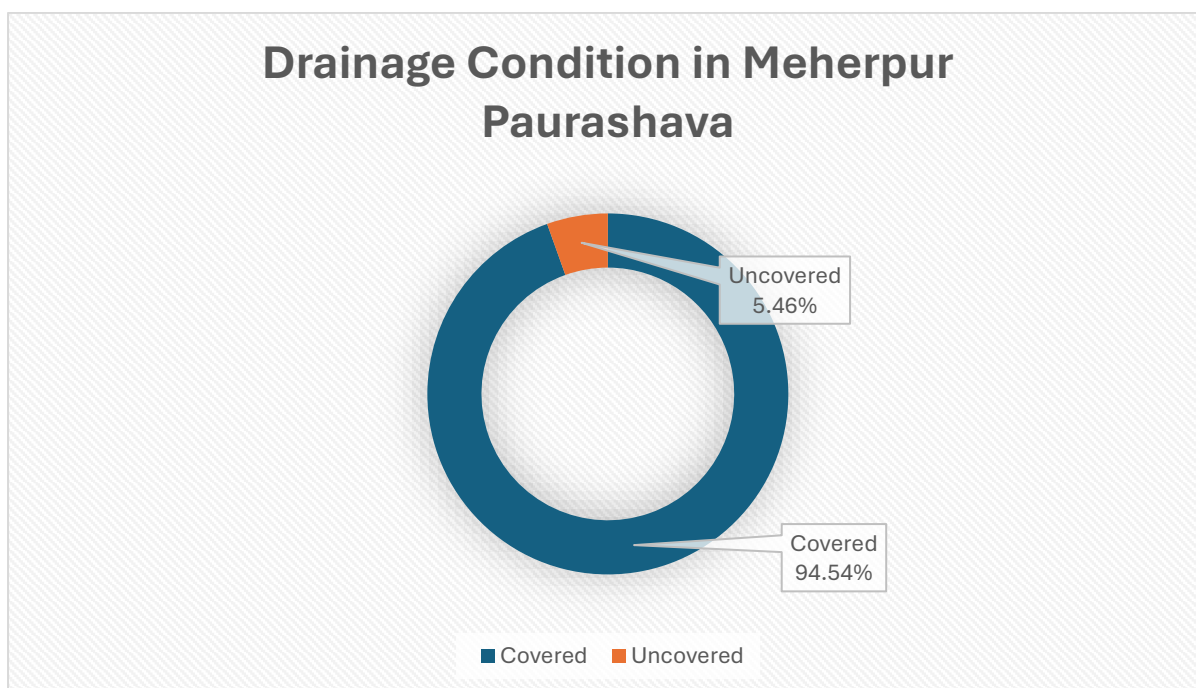
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### 3.6.1.13 Drainage Condition:

The condition of the drainage network in Meherpur Paurashava shows a clear preference for covered drains, which account for 48.11 km (81.42%) of the total length. This suggests a focus on maintaining hygienic and protected drainage systems, likely aimed at minimizing health risks and environmental contamination. Uncovered drains make up a smaller portion, with 10.98 km (4.70%), indicating that while most drains are covered, a small fraction remains exposed, which could potentially lead to issues such as blockages or environmental concerns. The data reflects a well-maintained drainage system with an emphasis on covered drains, which are more effective in urban settings for waste management and flood control.

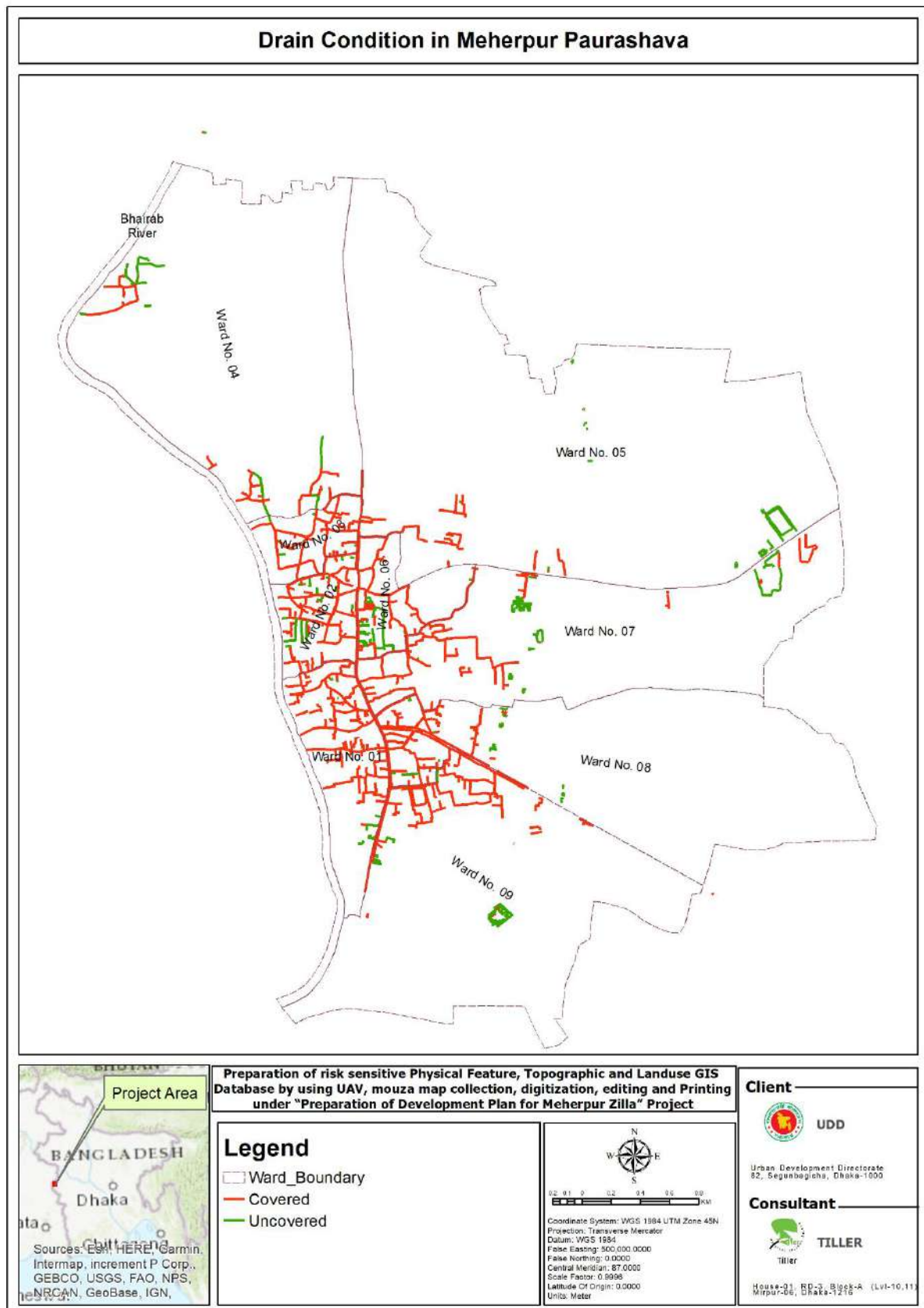
*Table 3-13: Drainage Condition in Meherpur Paurashava*

Drainage Condition	Length in KM	Percentage
Covered	48.11	81.42%
Uncovered	10.98	4.70%
Total	59.08	25.31%



*Figure 3-16: Drainage Condition in Meherpur Paurashava*

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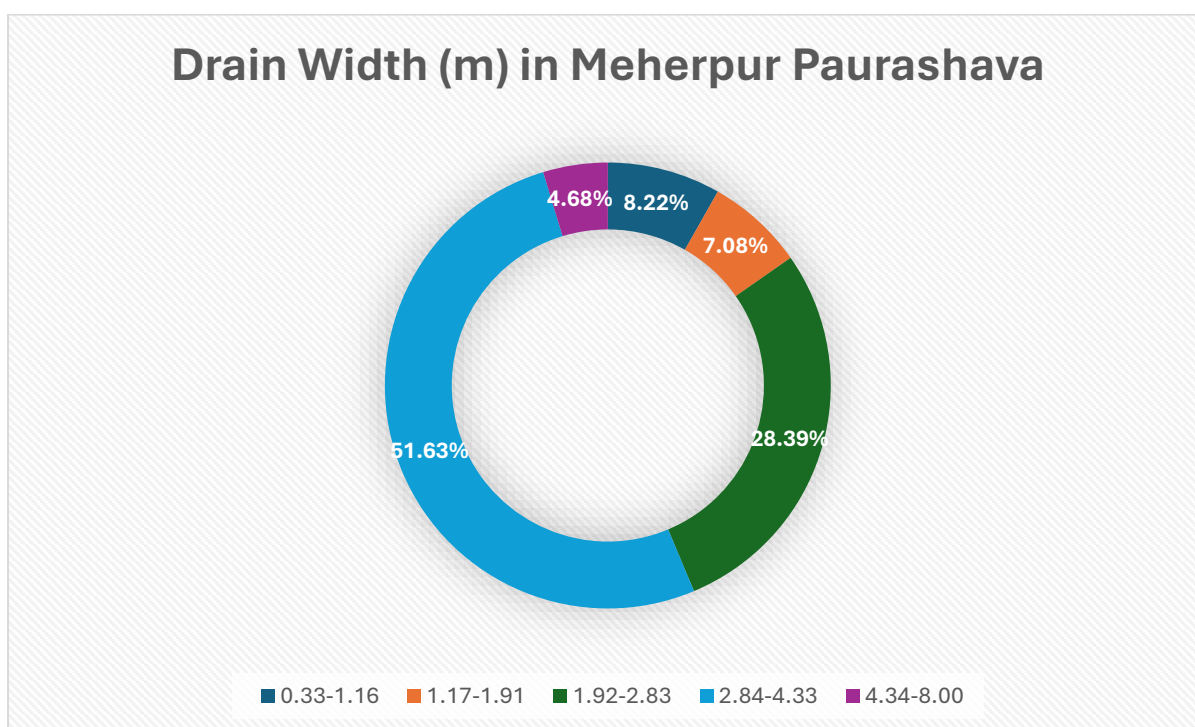
*Map 3-13: Drainage Condition in Meherpur Paurashava*

#### 3.6.1.14 Drain Width:

The width of the drains in Meherpur Paurashava varies significantly, with the majority of the network having relatively wide drains. The 28.39% of the drain network—16.77 km—has widths ranging from 1.92 to 2.83 feet, followed closely by 30.51 km (51.63%) with widths between 2.84 and 4.33 feet, which constitutes the largest share of the drainage system. A smaller portion, 4.86 km (8.22%), has widths between 0.33 and 1.16 feet, while 4.18 km (7.08%) falls within the 1.17 to 1.91 feet range. Finally, 2.77 km (4.68%) of the drains have widths between 4.34 and 8.00 feet, indicating the presence of some much wider drains, likely intended for larger water volumes or high-traffic areas. The data reflects a well-distributed drain width, with a strong emphasis on medium to wide drains to handle significant water flow, important for efficient drainage management.

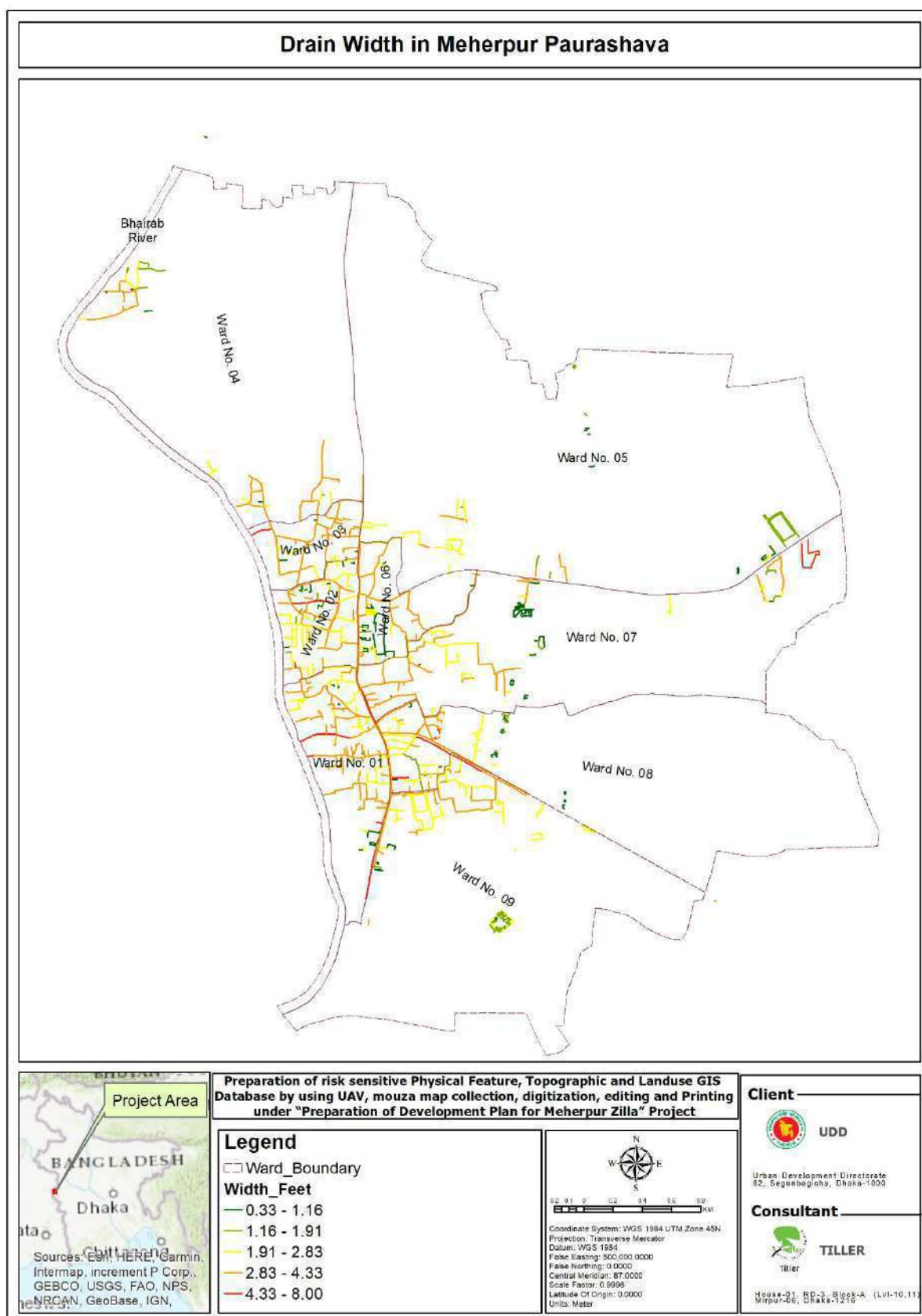
*Table 3-14: Drain Width Distribution in Meherpur Paurashava*

Drain Width (Feet)	Length in KM	Percentage
0.33-1.16	4.86	8.22%
1.17-1.91	4.18	7.08%
1.92-2.83	16.77	28.39%
2.84-4.33	30.51	51.63%
4.34-8.00	2.77	4.68%
Total	59.08	100.00%



*Figure 3-17: Drain Width Distribution in Meherpur Paurashava*

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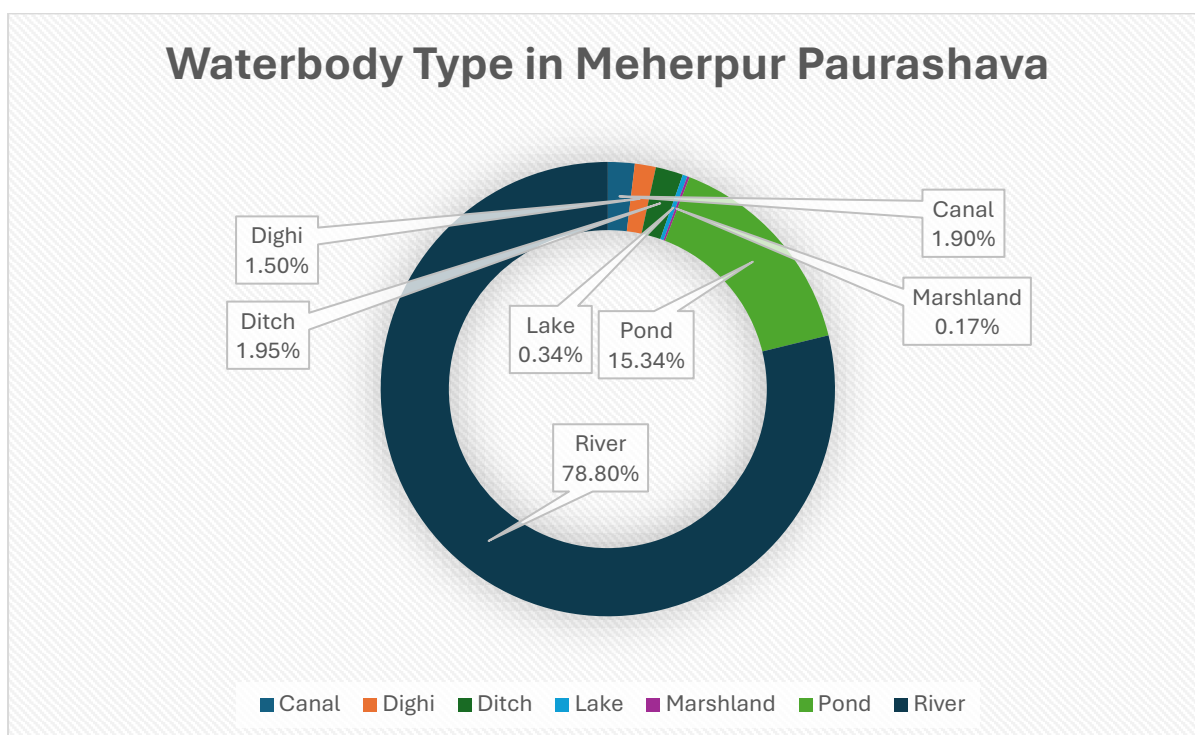
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### 3.6.1.15 Waterbody Types:

The waterbody distribution in Meherpur Paurashava is dominated by the River, which accounts for a significant 655.73 acres (78.80%) of the total waterbody area. This large portion suggests that rivers play a central role in the region's hydrology and ecosystem. Ponds follow with 127.62 acres (15.34%), indicating a considerable presence of smaller water bodies, likely serving for irrigation or local water needs. Other waterbody types, such as Canals (15.81 acres, 1.90%), Ditches (16.27 acres, 1.95%), and Dighis (12.47 acres, 1.50%), make up smaller portions of the area, pointing to their role in irrigation or drainage. The presence of Lakes (2.80 acres, 0.34%) and Marshlands (1.41 acres, 0.17%) is minimal but still significant in terms of biodiversity and environmental value. Overall, the data highlights the dominance of rivers and ponds, with smaller but important contributions from other types of waterbodies.

*Table 3-15: Waterbody Types in Meherpur Paurashava*

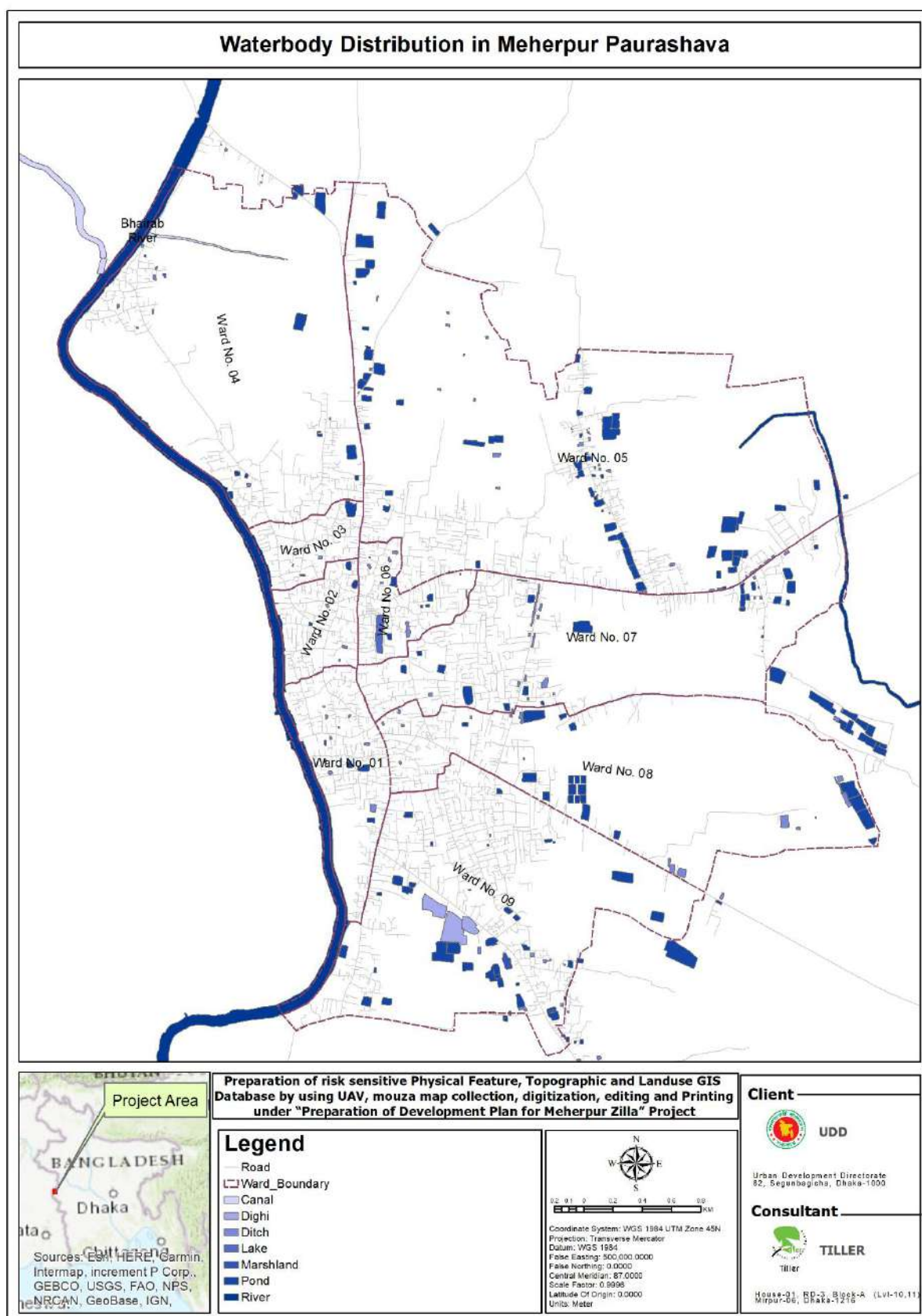
Waterbody Type	Area in Acre	Percentage
Canal	15.81	1.90%
Dighi	12.47	1.50%
Ditch	16.27	1.95%
Lake	2.80	0.34%
Marshland	1.41	0.17%
Pond	127.62	15.34%
River	655.73	78.80%
Total	832.10	100.00%



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*Figure 3-18: Waterbody Types in Meherpur Paurashava*

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Map 3-15: Waterbody Types in Meherpur Paurashava

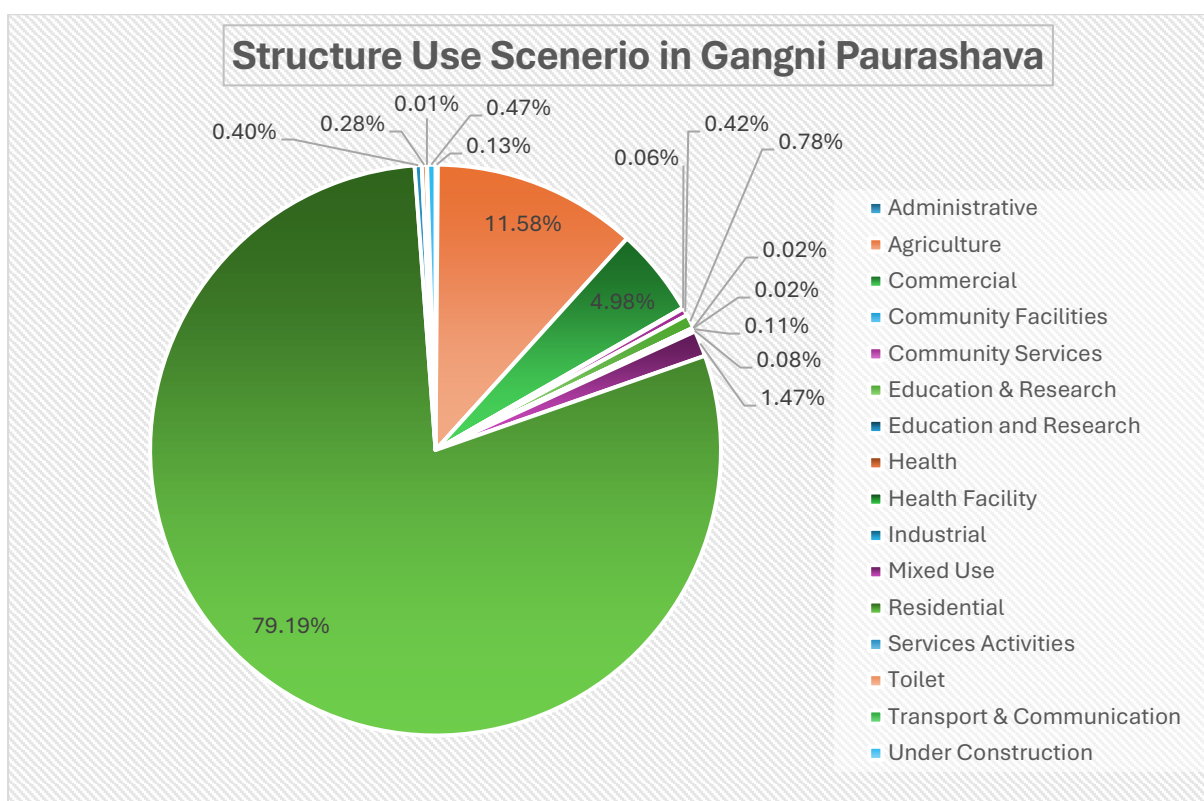
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### 3.6.2 Gangni Paurahava:

#### 3.6.2.1 Structure Use Scenerio in Gangani Paurashava

Table 3-16: Structure Use Scenerio in Gangni Paurashava

Structure Use and Functional Distribution	Number	Percentage
Administrative	26	0.13%
Agriculture	2371	11.58%
Commercial	1019	4.98%
Community Facilities	12	0.06%
Community Services	85	0.42%
Education & Research	160	0.78%
Education and Research	4	0.02%
Health	4	0.02%
Health Facility	23	0.11%
Industrial	17	0.08%
Mixed Use	300	1.47%
Residential	16210	79.19%
Services Activities	82	0.40%
Toilet	58	0.28%
Transport & Communication	3	0.01%
Under Construction	97	0.47%
Total	20471	100%

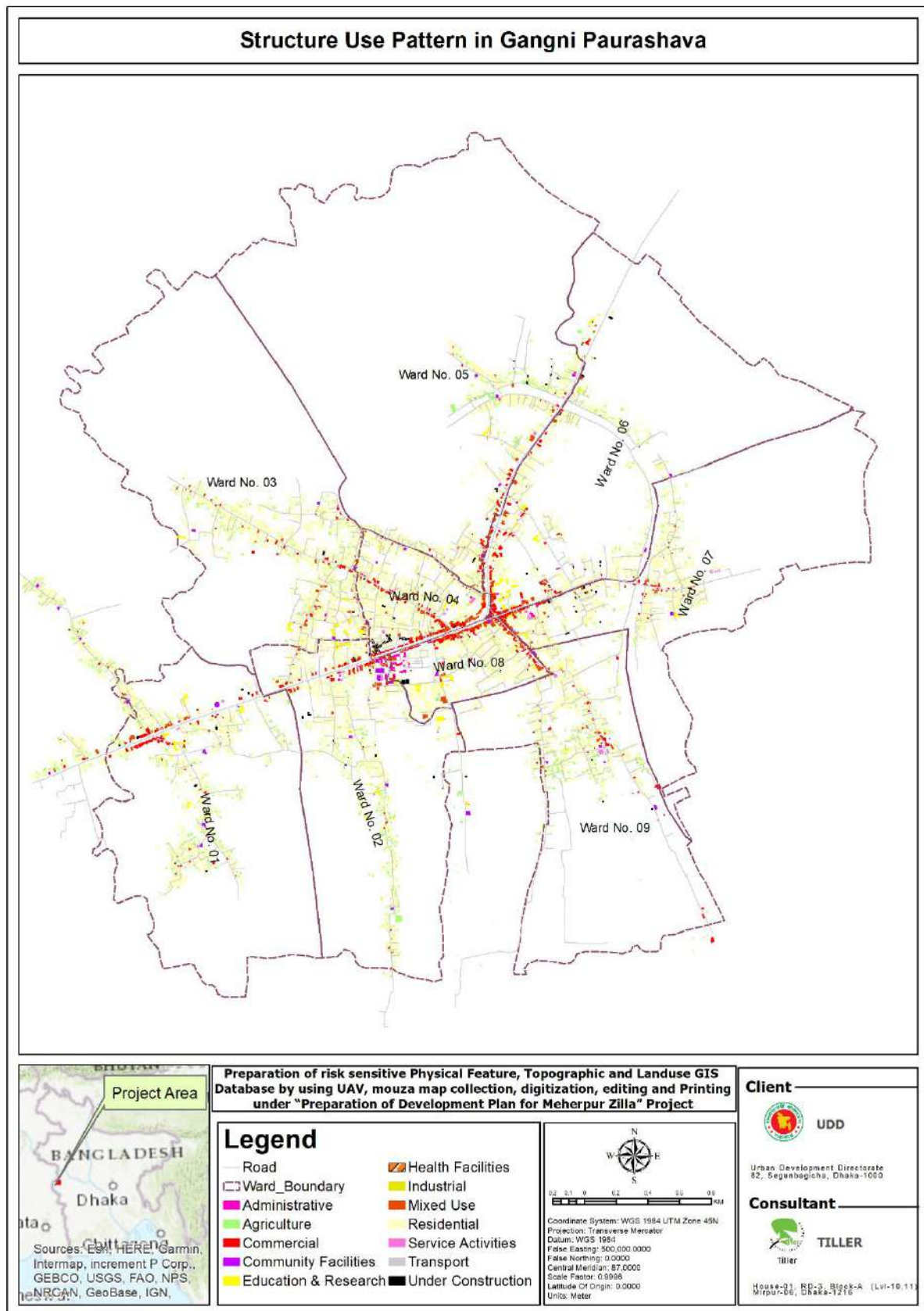




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*Figure 3-19: Structure Use Scenerio in Gagni Paurashava*

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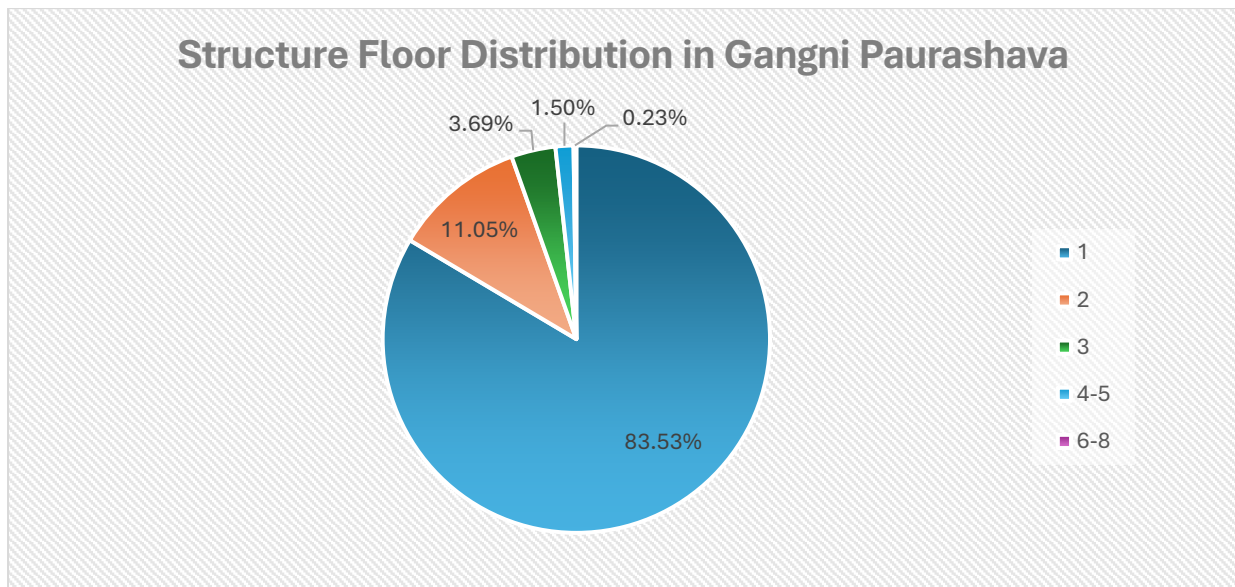


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### 3.6.2.2 Vertical Distribution of Structures

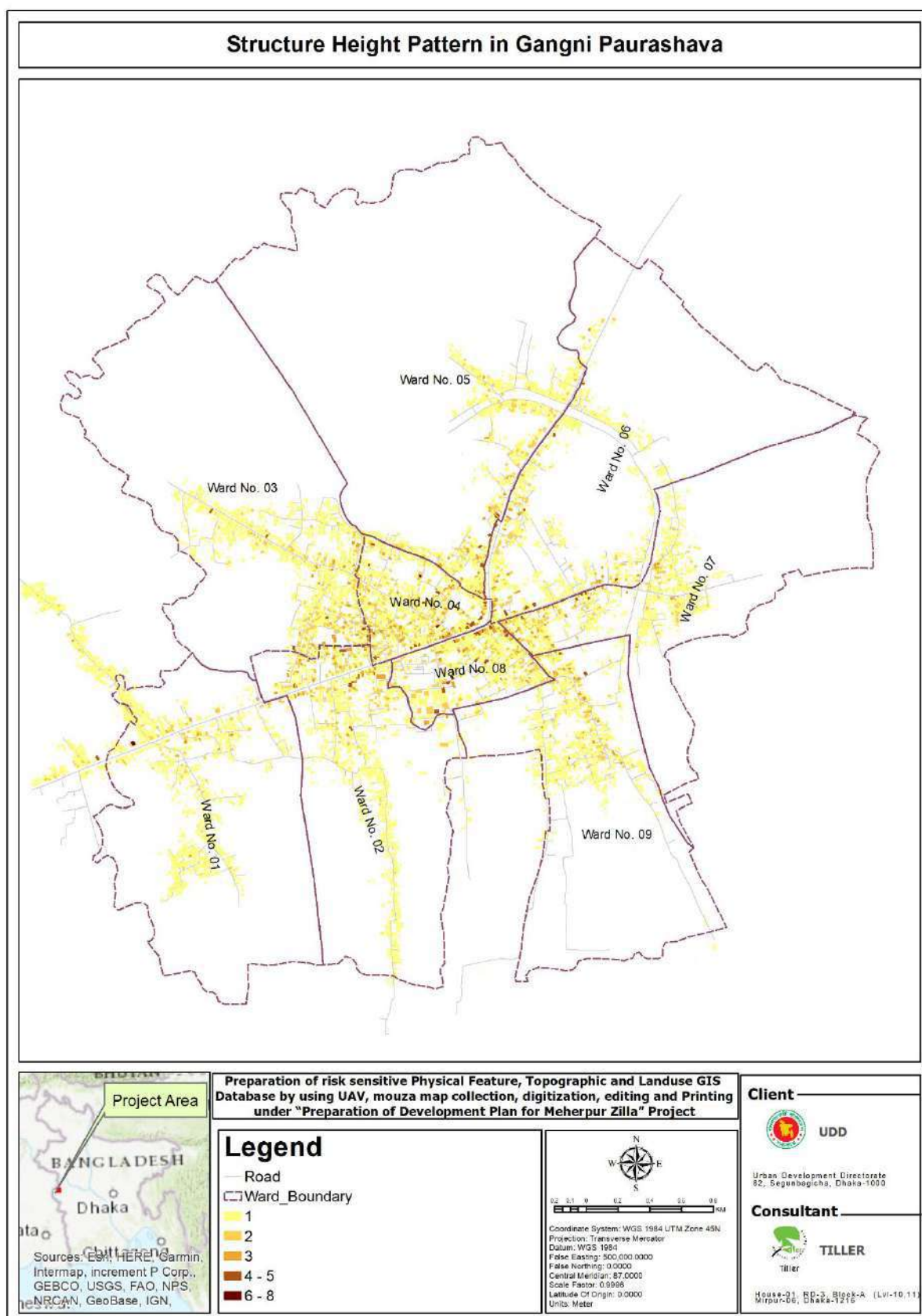
*Table 3-17: Vertical Distribution of Structures in Gangni Paurashava*

Number of Floor	Number of Primary Structure	Percentage
1	18857	83.53%
2	2494	11.05%
3	834	3.69%
4-5	338	1.50%
6-9	52	0.23%
Total	22575	100.00%



*Figure 3-20: Vertical Distribution of Structures in Gangni Paurashava*

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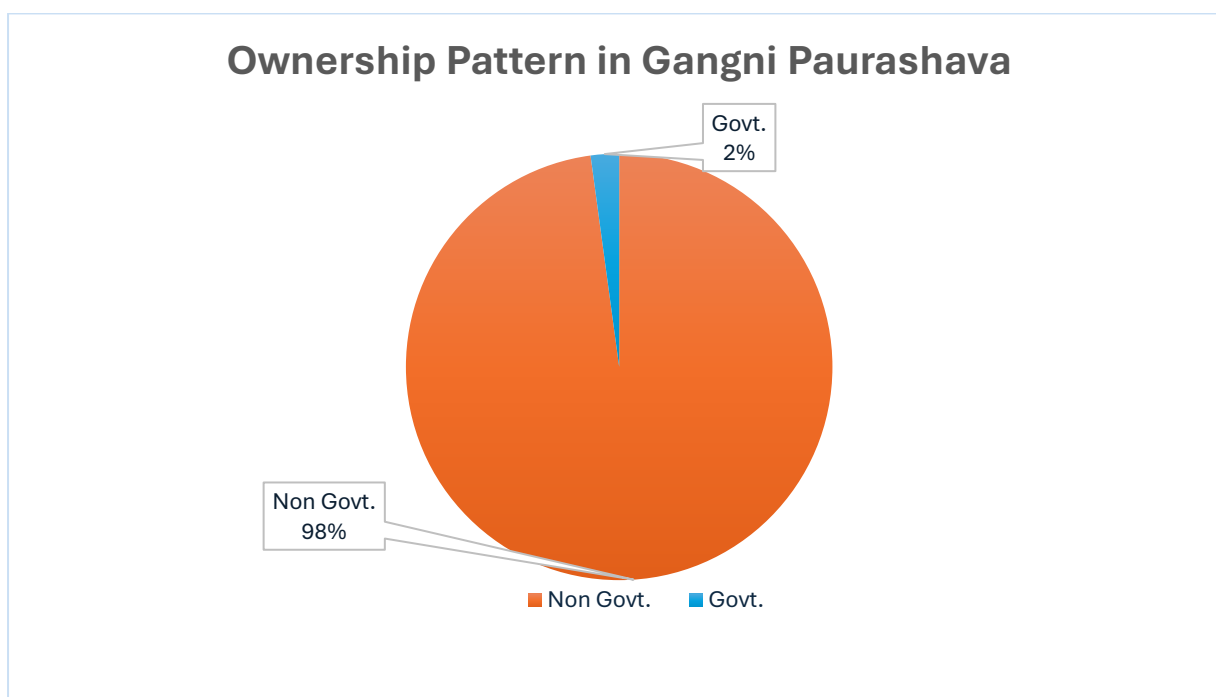


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### 3.6.2.3 Ownership Pattern of Structures

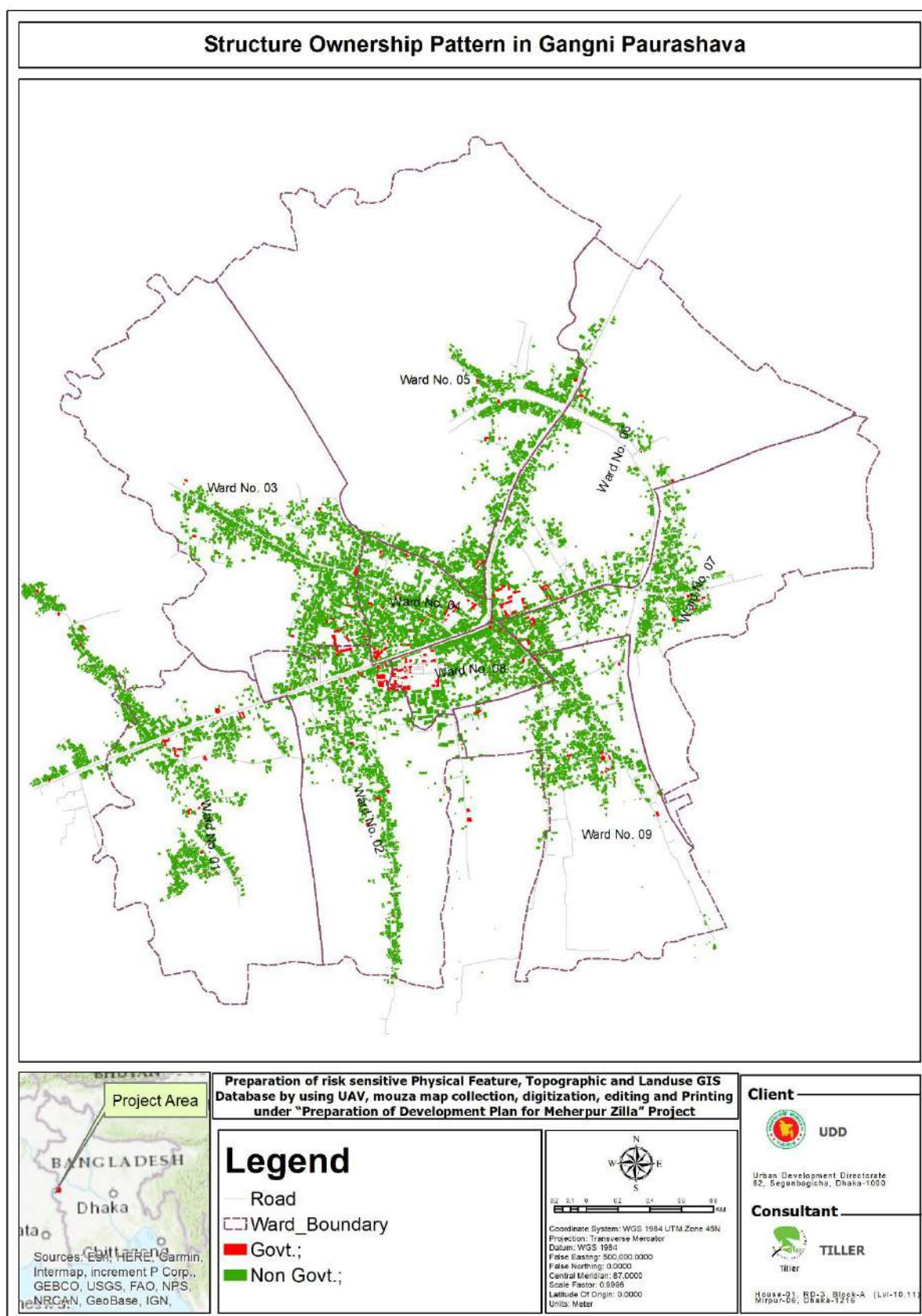
*Table 3-18: Ownership Pattern of Structures in Gangni Paurashava*

Ownership Type	Number of Structure	Percentage
Non-Govt.	20032	97.86%
Govt.	439	2.14%
Total	20471	100%



*Figure 3-21: Ownership Pattern of Structures in Gangni Paurashava*

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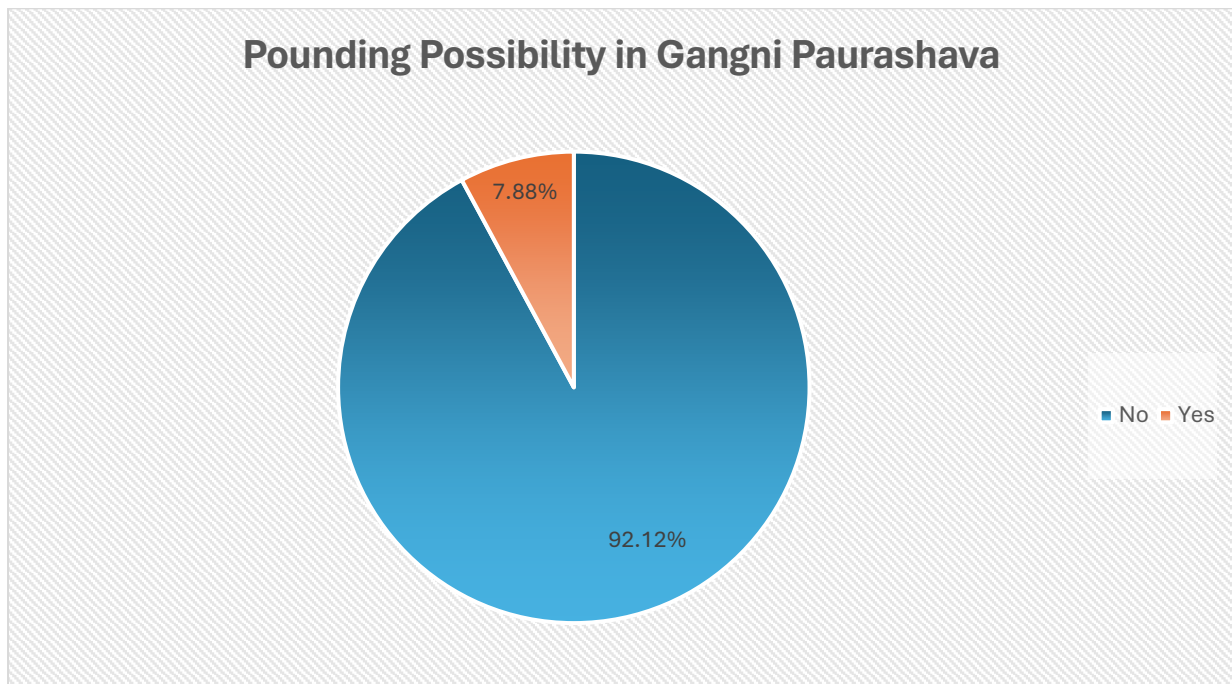
Map 3-18: Ownership Pattern of Structures in Gangni Paurashava

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#### 3.6.2.4 Pounding Possibility of Structures

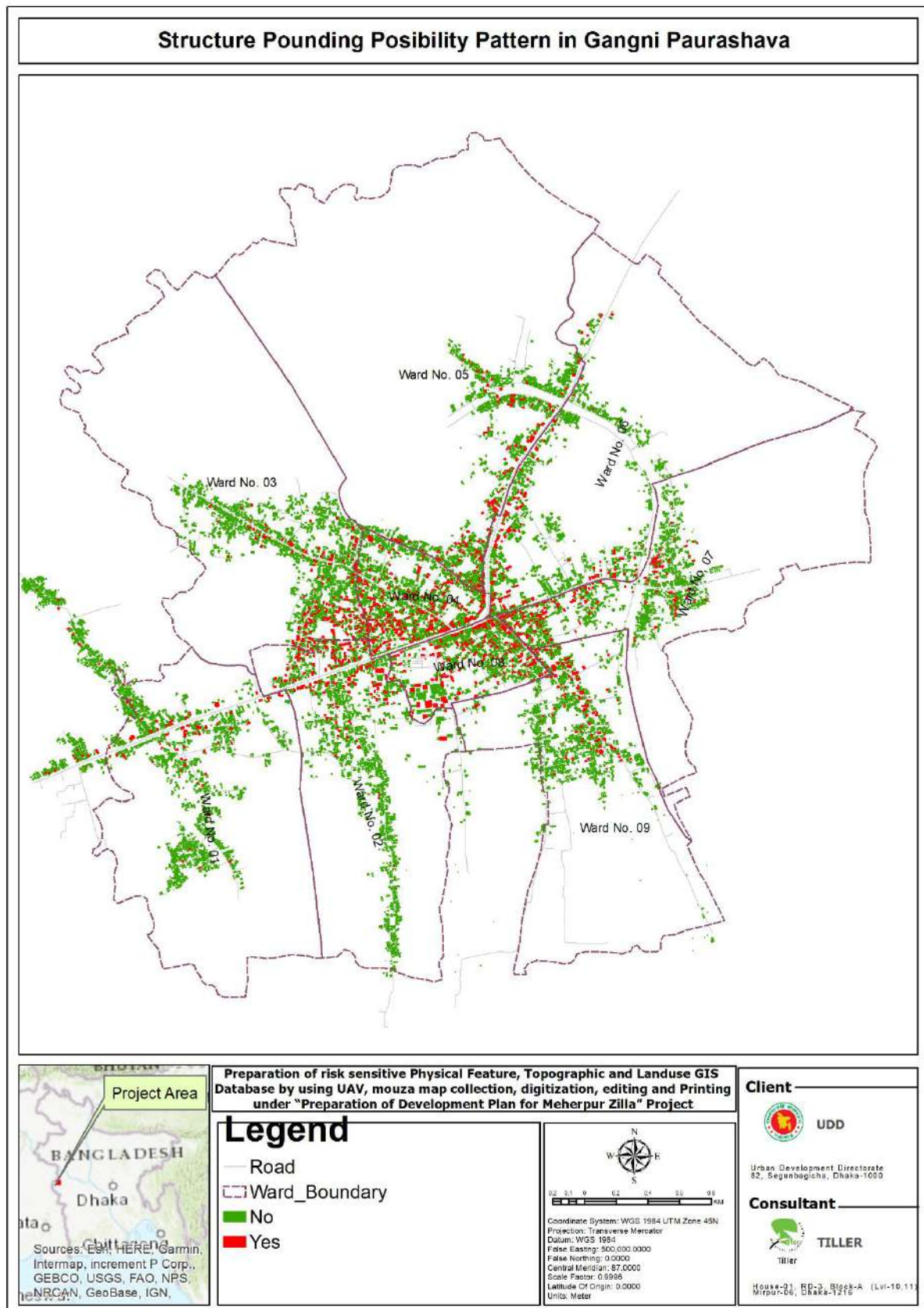
*Table 3-19: Pounding Possibility of Structures in Gangni Paurashava*

Pounding Possibility	Number of Structure	Percentage
No	18857	92.12%
Yes	1614	7.88%
Total	20471	100.00%



*Figure 3-22: Pounding Possibility of Structures in Gangni Paurashava*

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Map 3-19: Pounding Possibility of Structures in Gangni Paurashava

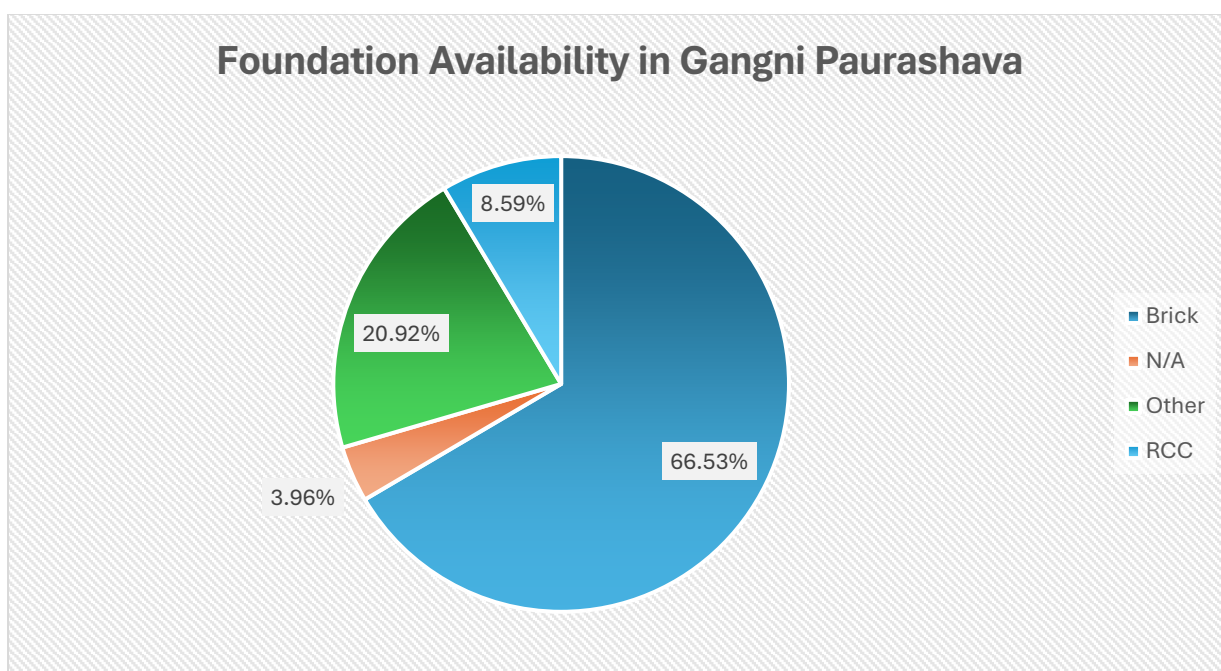


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### 3.6.2.5 Presence of Building Foundations

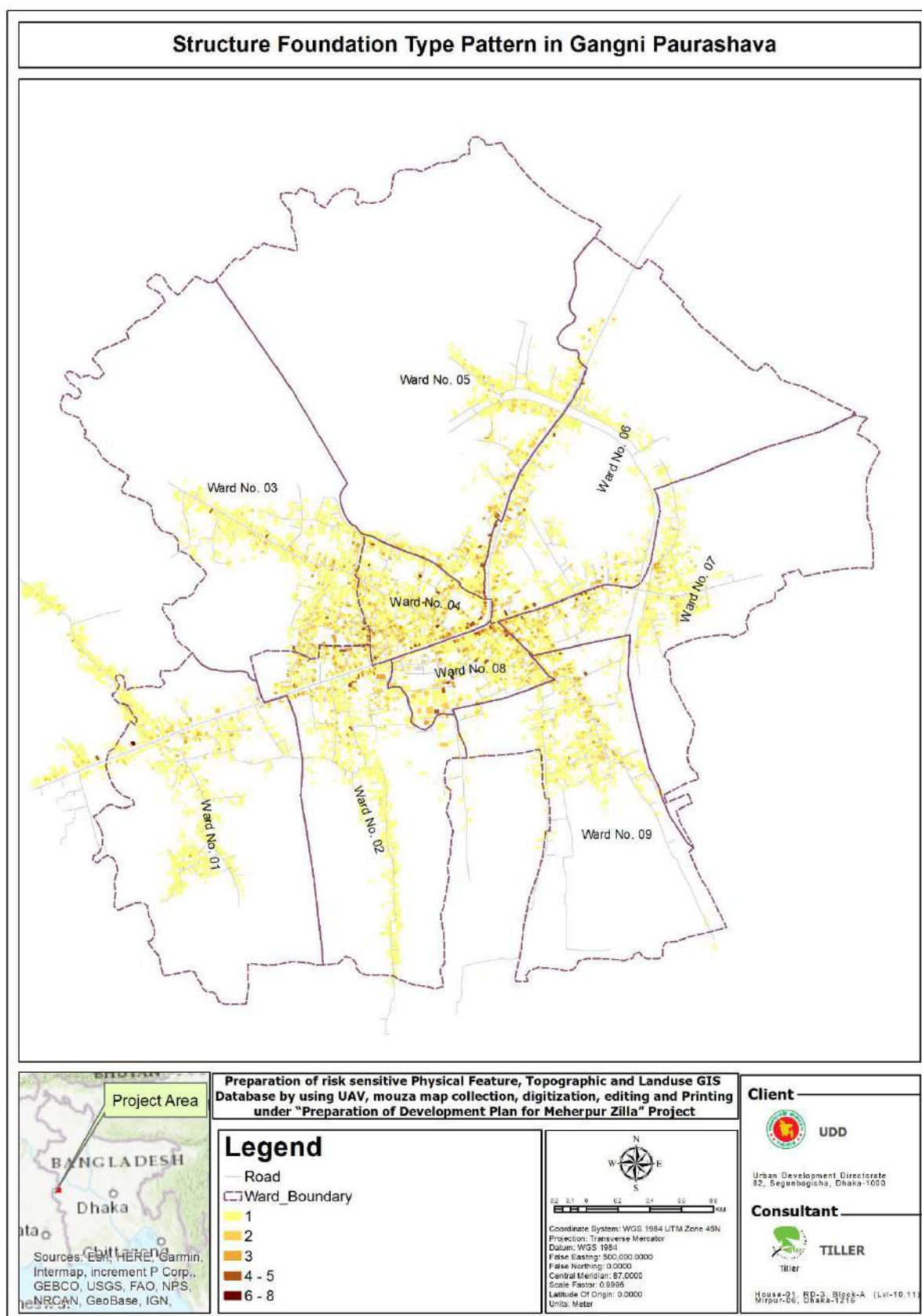
*Table 3-20: Presence of Building Foundations in Gangni Paurashava*

Foundation	Number of Structure	Percentage
Brick	13620	66.53%
N/A	811	3.96%
Other	4282	20.92%
RCC	1758	8.59%
Total	20471	100.00%



*Figure 3-23: Presence of Building Foundations in Gangni Paurashava*

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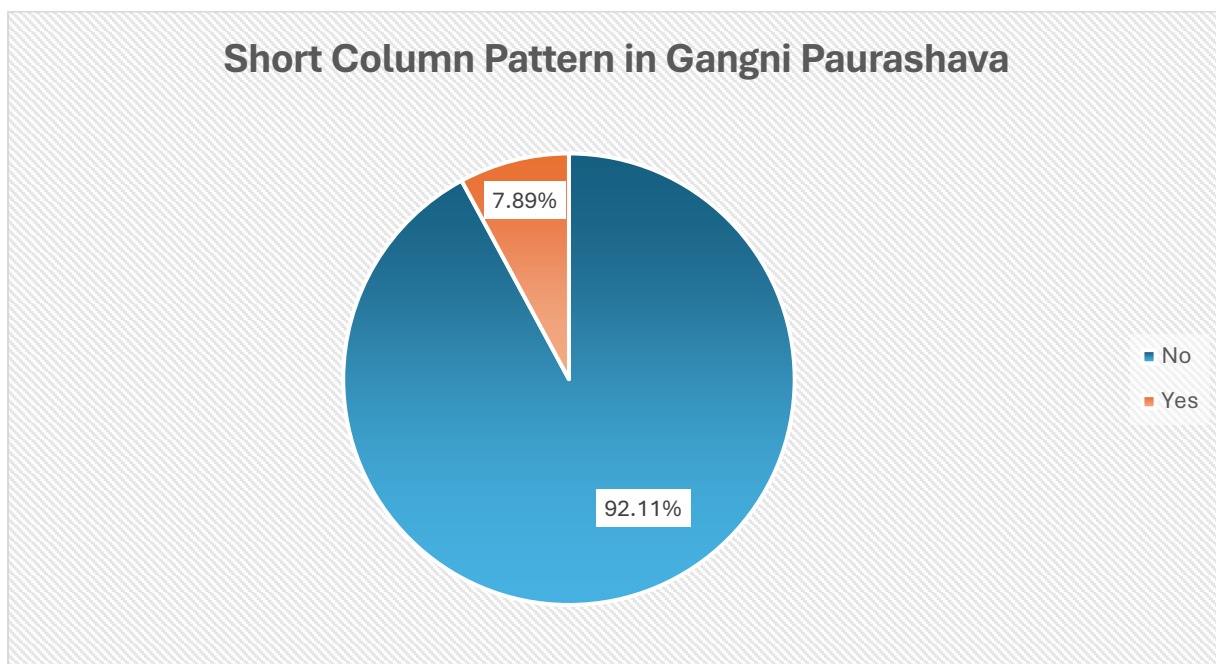


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### 3.6.2.6 Presence of Short Columns in Structures

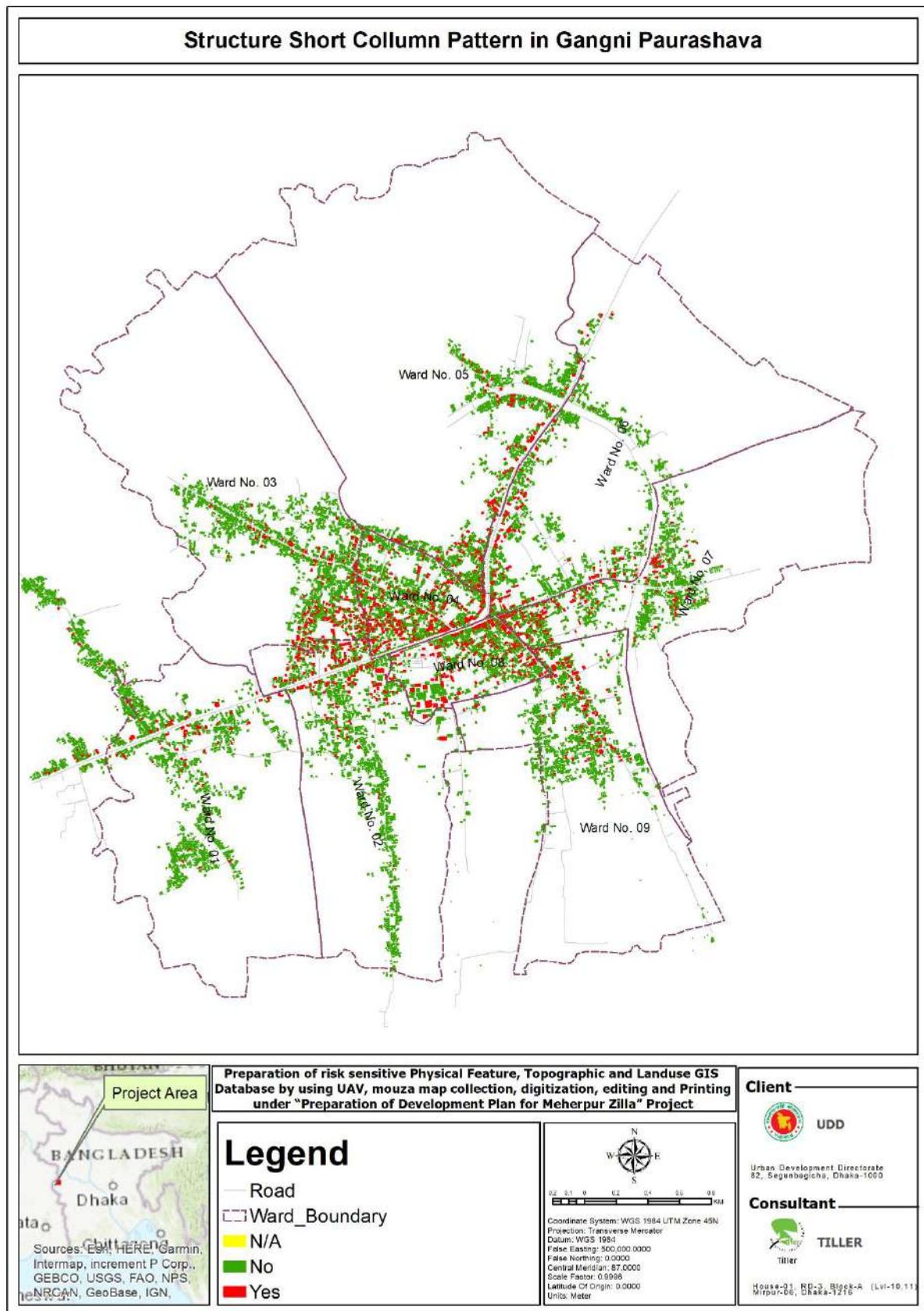
*Table 3-21: Presence of Short Columns in Structures in Gangni Paurashava*

Short Column	Number of Structure	Percentage
No	18856	92.11%
Yes	1615	7.89%
Total	20471	100.00%



*Figure 3-24: Presence of Short Columns in Structures in Gangni Paurashava*

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*Map 3-21: Presence of Short Columns in Structures in Gangni Paurashava*

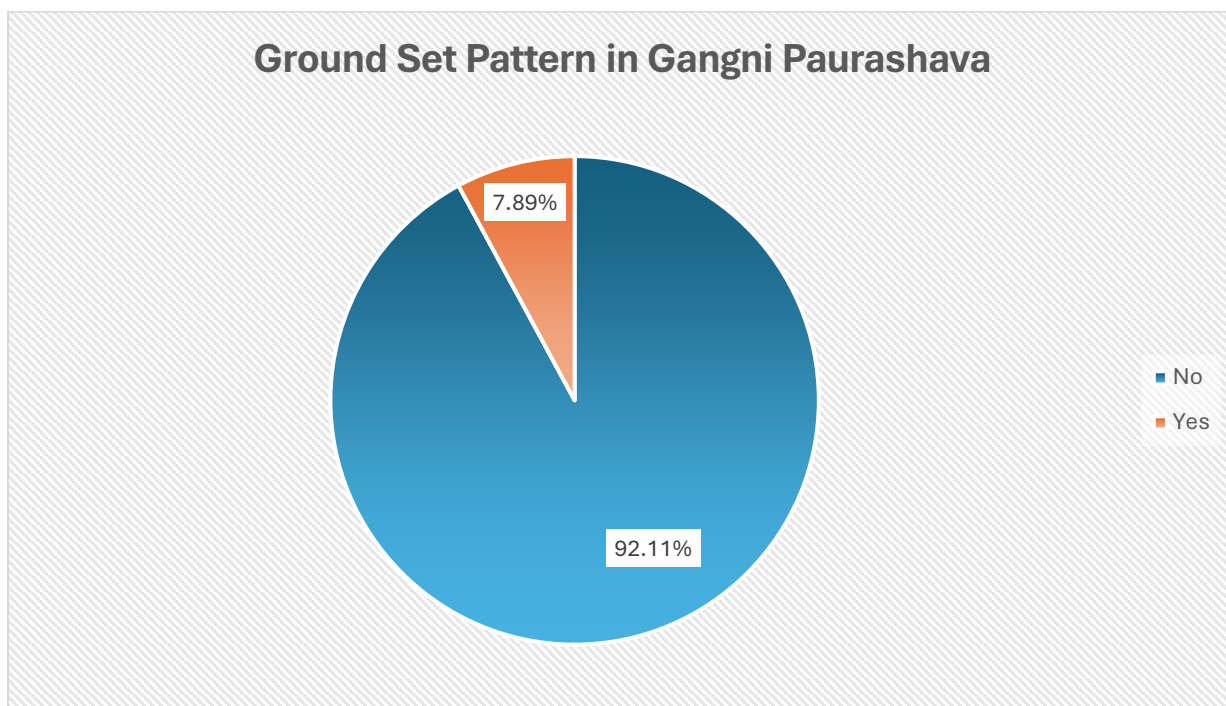


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### 3.6.2.7 Ground Set Presence in Structures

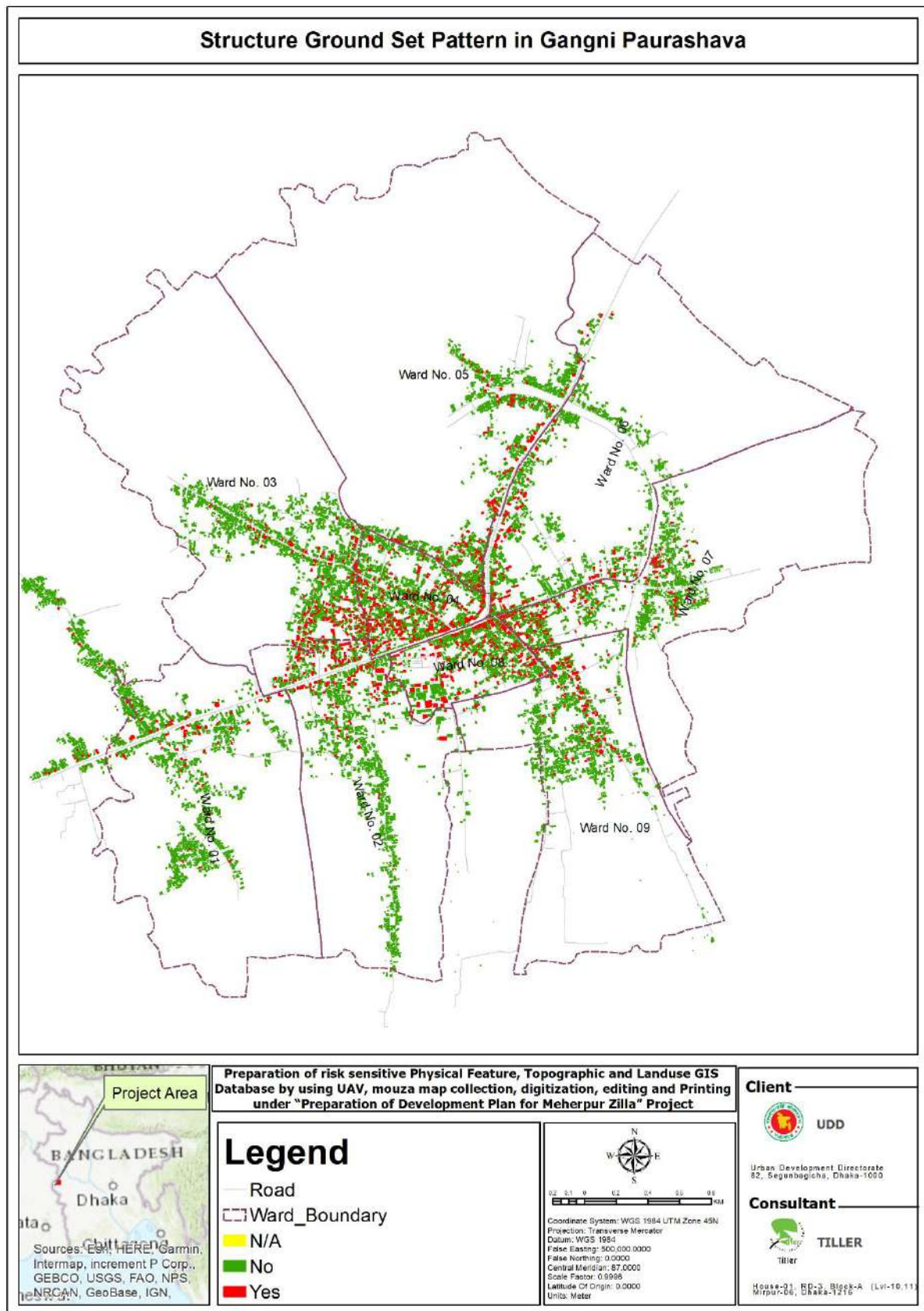
*Table 3-22: Ground Set Presence in Structures in Gangni Paurashava*

Ground Set	Number of Structure	Percentage
No	18856	92.11%
Yes	1615	7.89%
Total	20471	100.00%



*Figure 3-25: Ground Set Presence in Structures in Gangni Paurashava*

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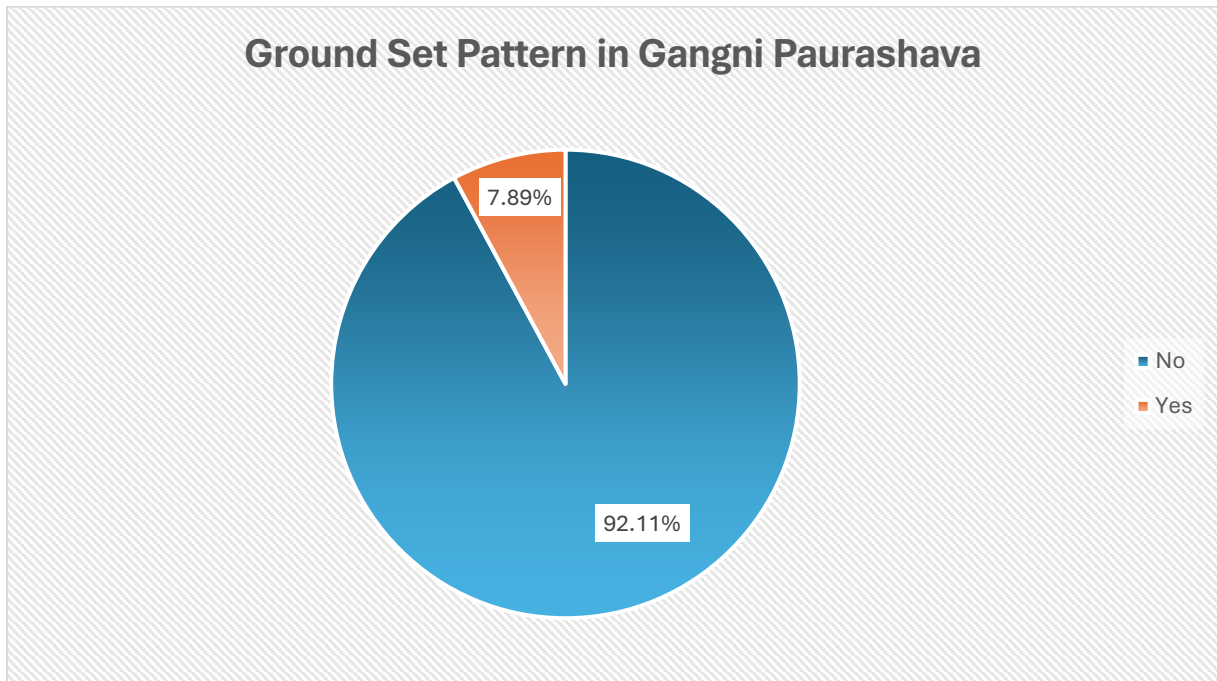


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### 3.6.2.8 Presence of Heavy Overhanging in Structures

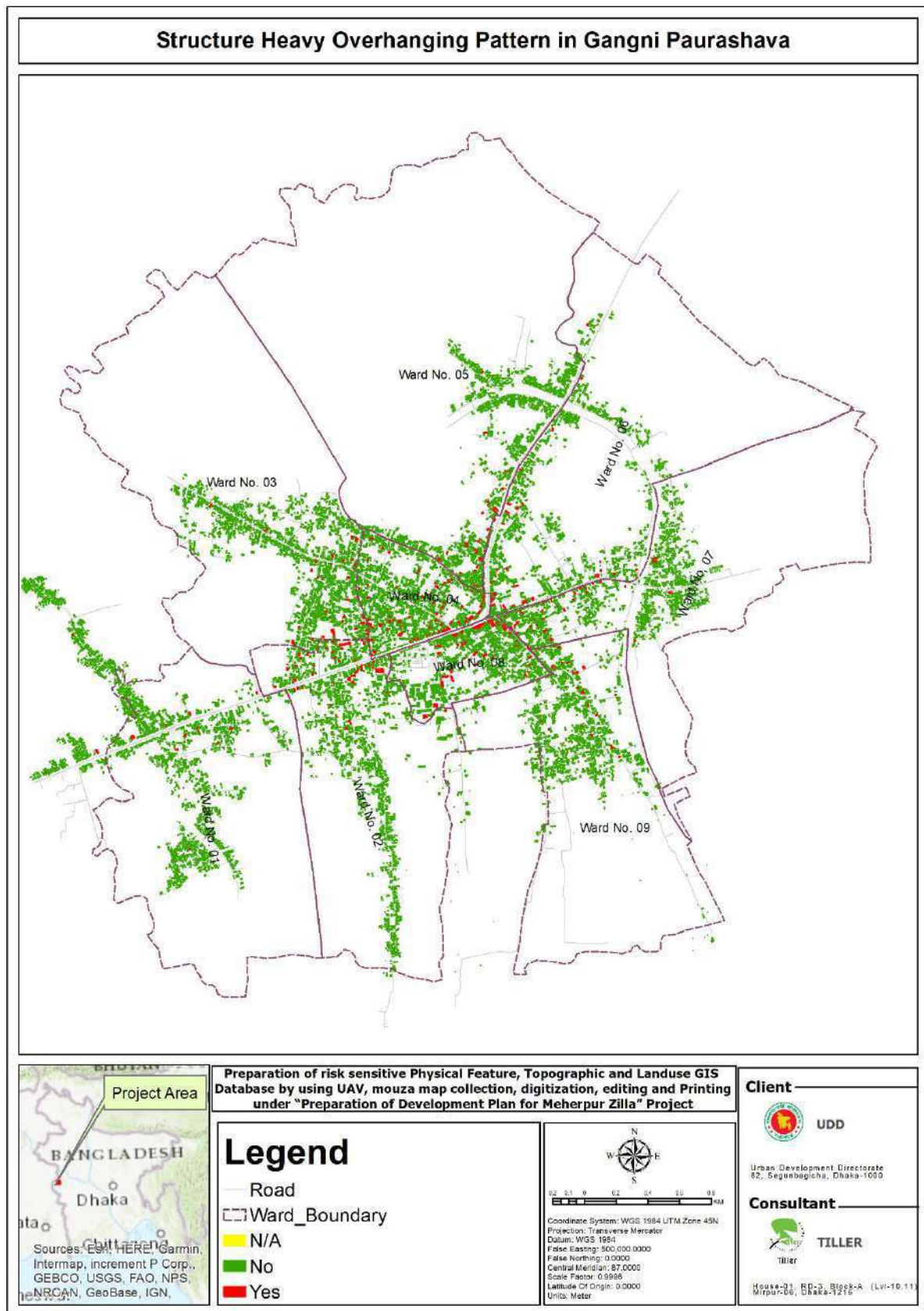
*Table 3-23: Presence of Heavy Overhanging in Structures in Gangni Paurashava*

Ground Set	Number of Structure	Percentage
No	18856	92.11%
Yes	1615	7.89%
Total	20471	100.00%



*Figure 3-26: Presence of Heavy Overhanging in Structures in Gangni Paurashava*

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*Map 3-23: Presence of Heavy Overhanging in Structures in Gangni Paurashava*

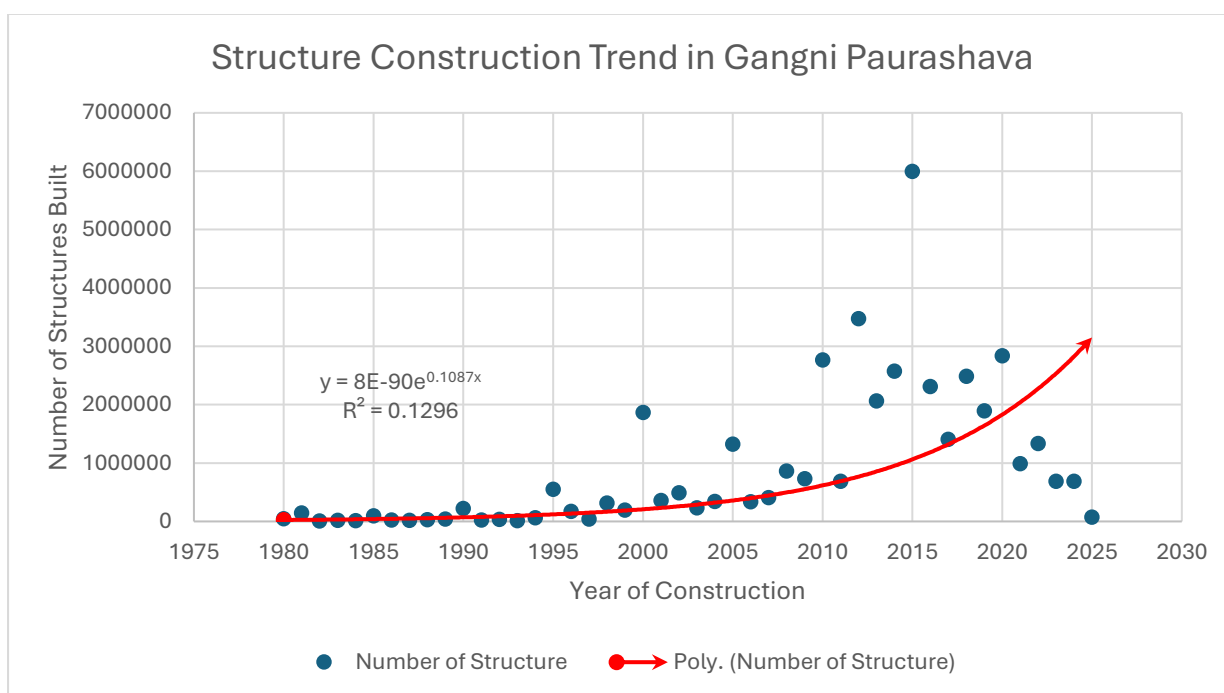


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### 3.6.2.9 Structure Construction Trend

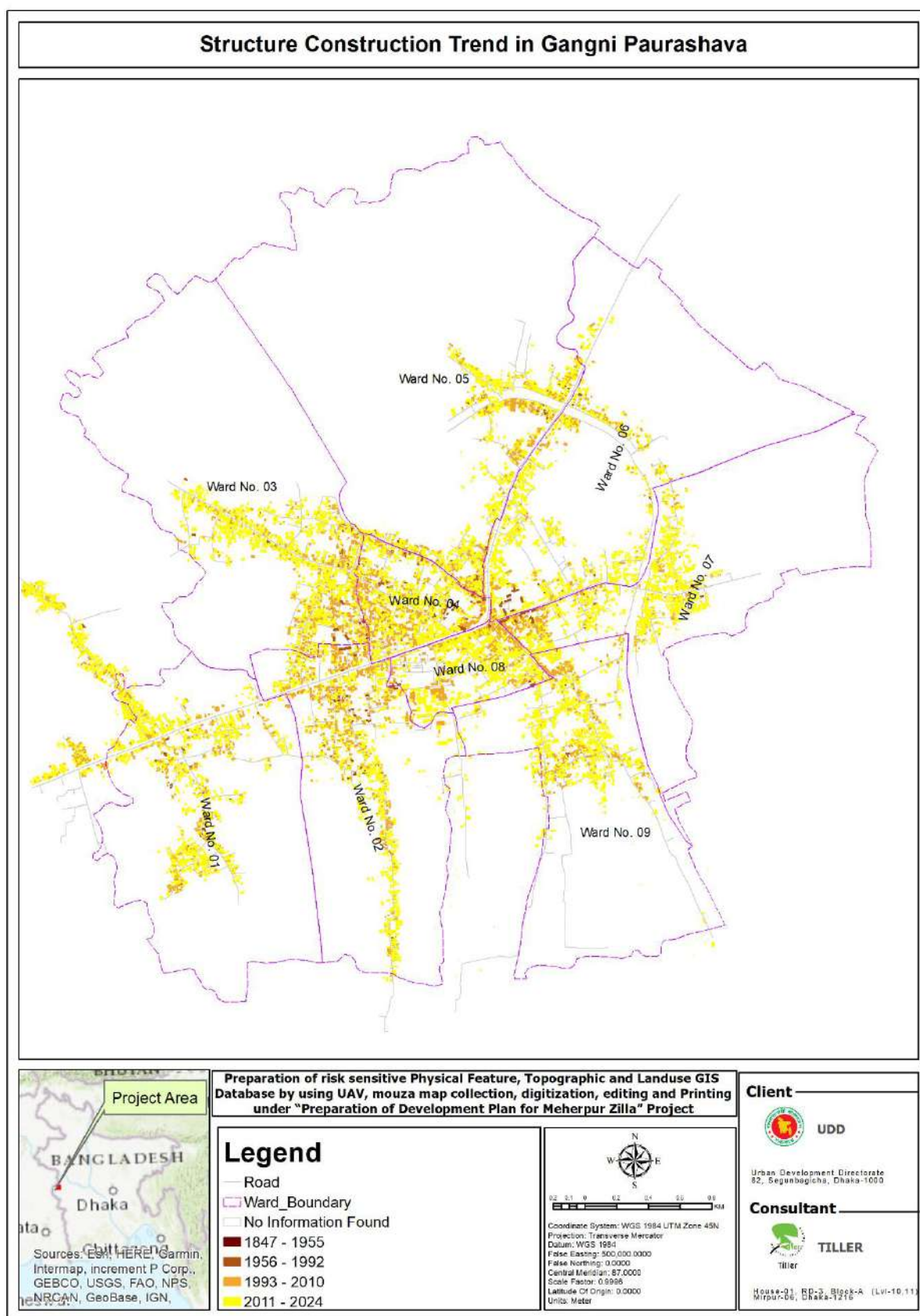
*Table 3-24: Structure Construction Trend in Gangni Paurashava*

Construction Year	Number of Structure	Percentage
1847-1955	0	0%
1956-1992	701162	2%
1993-2010	11035462	27%
2011-2025	29465979	72%
Total	41202603	100%



*Figure 3-27: Structure Construction Trend in Gangni Paurashava*

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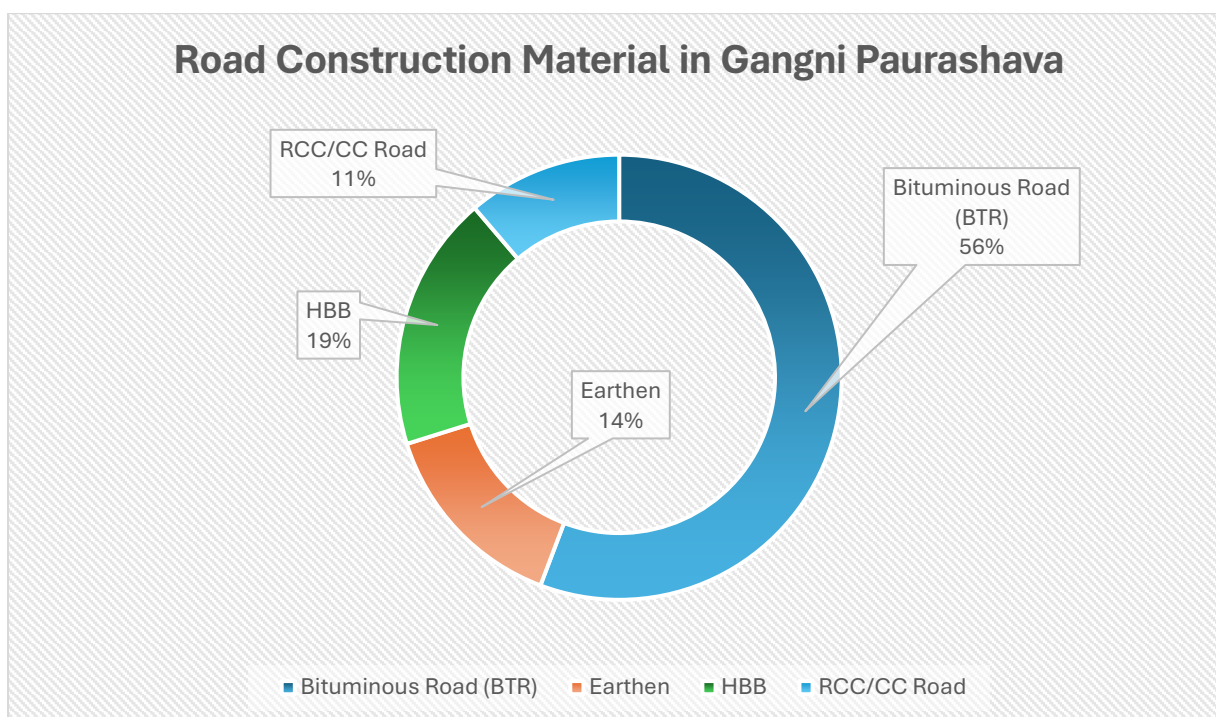
*Map 3-24: Structure Construction Trend in Gangni Paurashava*

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### 3.6.2.10 Road Construction Material

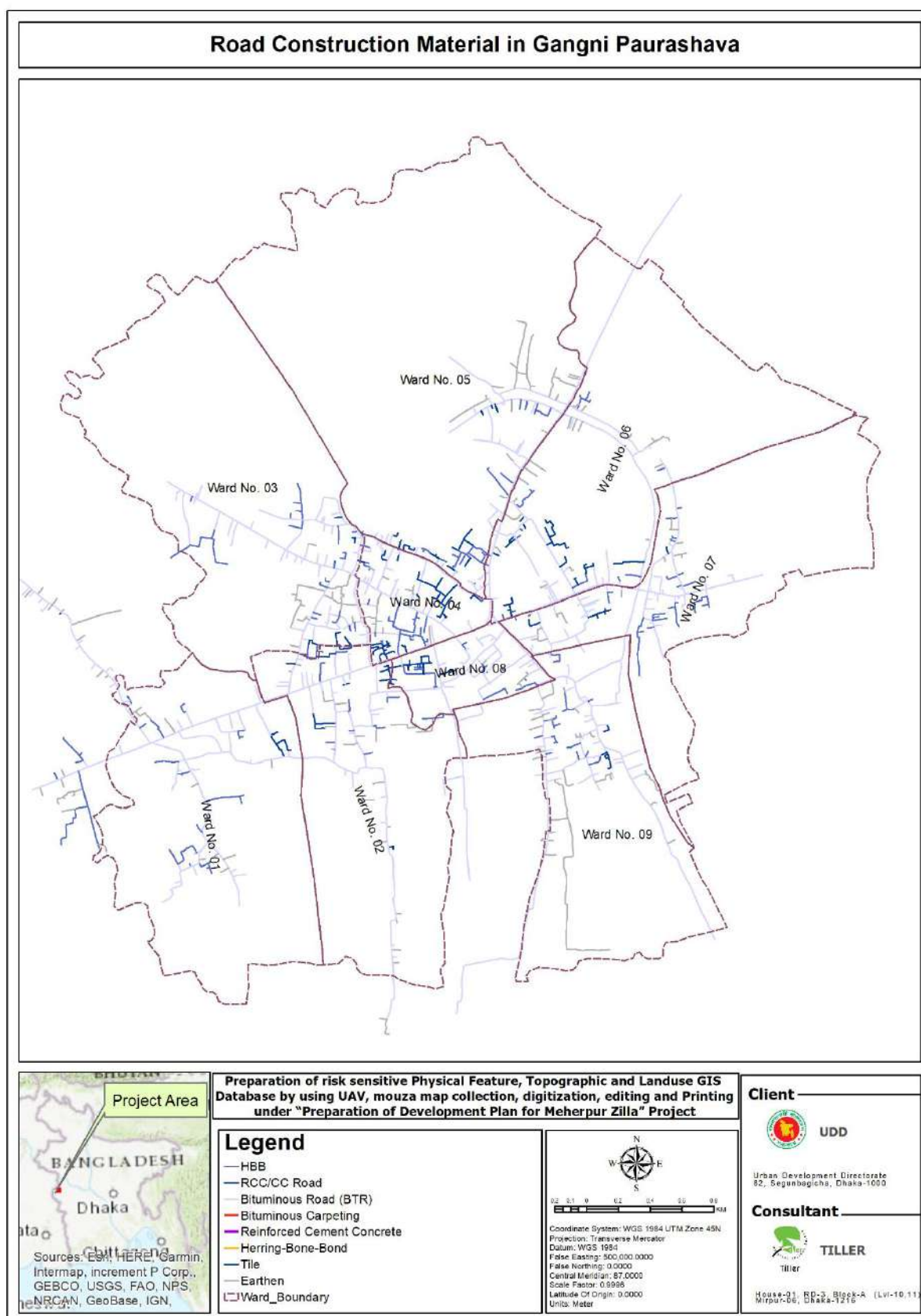
*Table 3-25: Road Construction Material in Gangni Paurashava*

Road Construction Material	Length in KM	Percentage
Bituminous Road (BTR)	867	55.76%
Earthen	224	14.41%
HBB	289	18.59%
RCC/CC Road	175	11.25%
Total	1555	100.00%



*Figure 3-28: Road Construction Material in Gangni Paurashava*

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*Map 3-25: Road Construction Material in Gangni Paurashava*

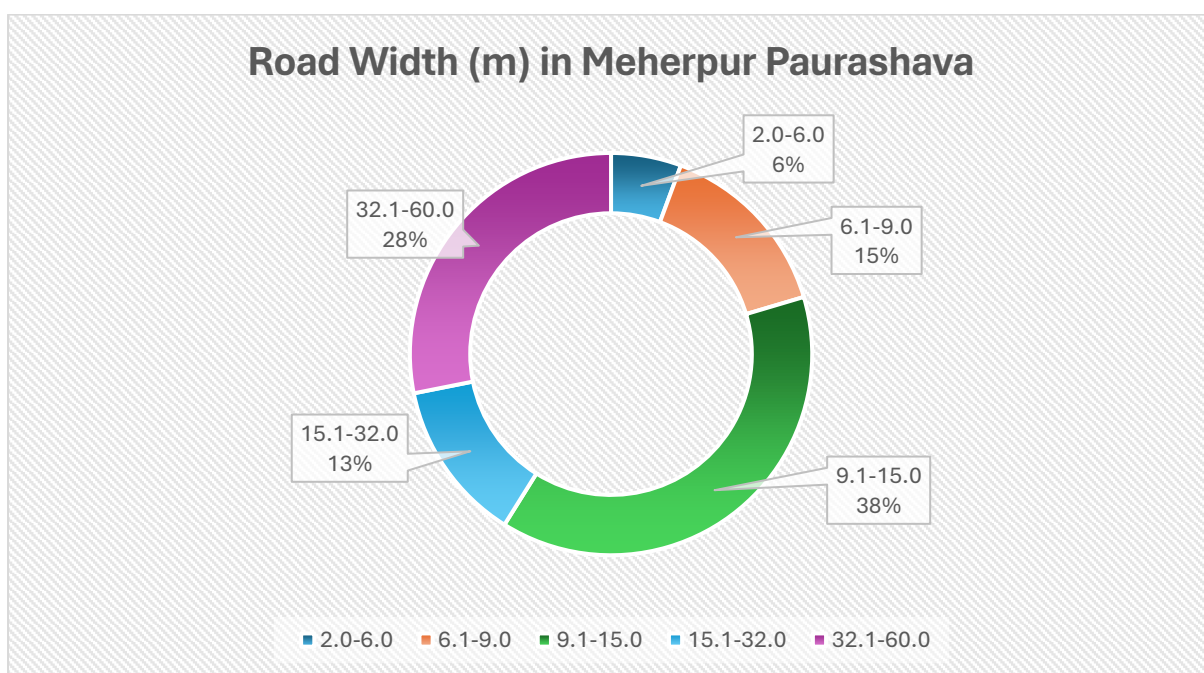


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### 3.6.2.11 Road Width Distribution

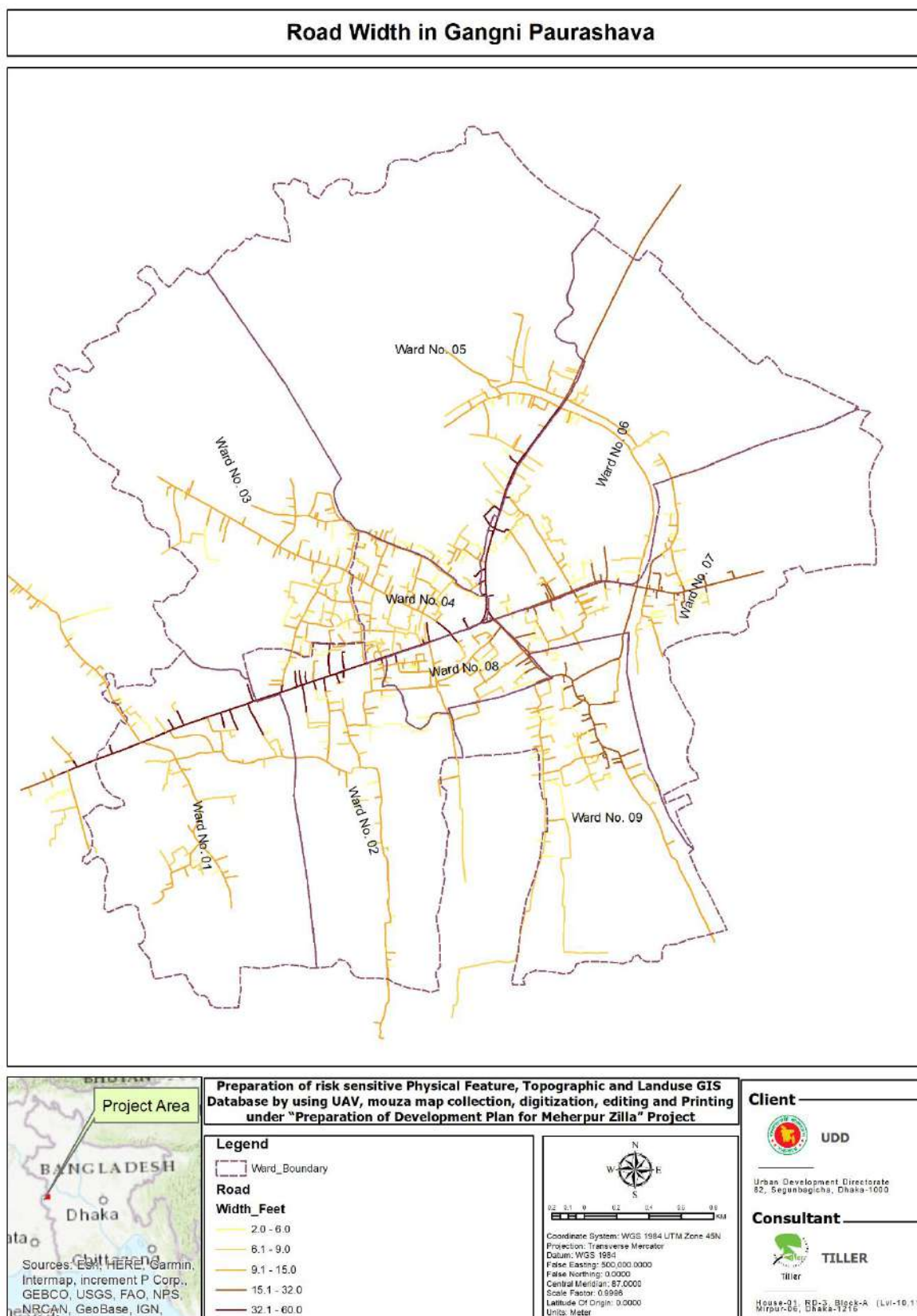
*Table 3-26: Road Width Distribution in Gangni Paurashava*

Road Width (Meter)	Length in KM	Percentage
2.0-6.0	1183	5.65%
6.1-9.0	3094	14.77%
9.1-15.0	8061	38.48%
15.1-32.0	2721	12.99%
32.1-60.0	5892	28.12%
Total	20951	100.00%



*Figure 3-29: Road Width Distribution Gangni Paurashava*

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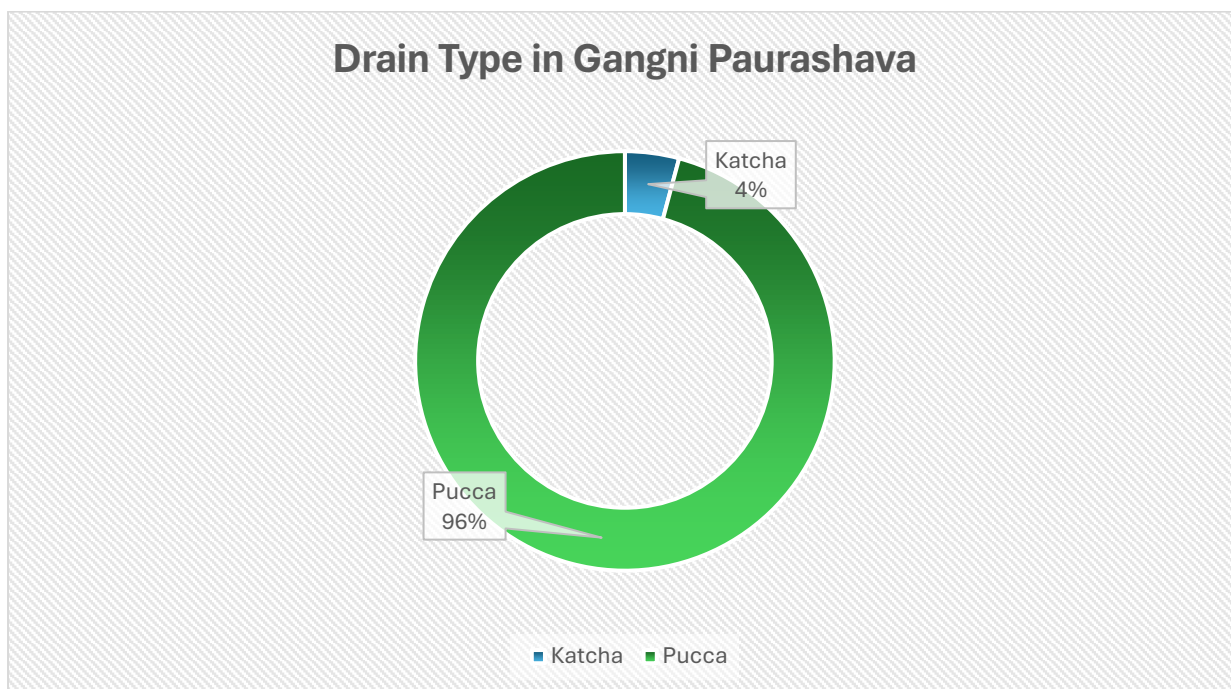
*Map 3-26: Road Width Distribution in Gangni Paurashava*

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### 3.6.2.12 Drain Type Distribution

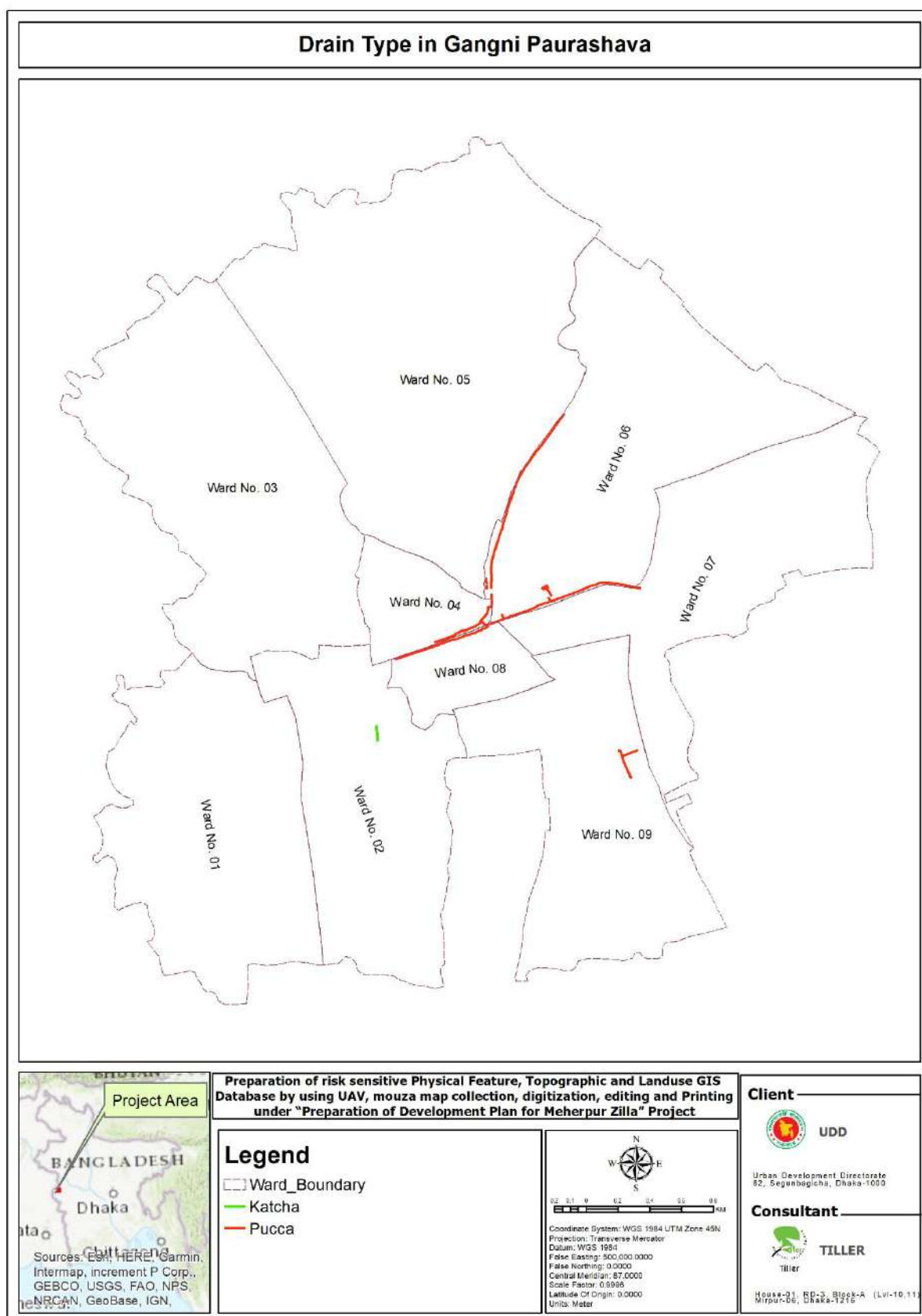
*Table 3-27: Drain Type Distribution in Gangni Paurashava*

Drain Type	Length in KM	Percentage
Katcha	1	4.17%
Pucca	23	95.83%
Total	24	100.00%



*Figure 3-30: Drain Type Distribution in Gangni Paurashava*

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*Map 3-27: Drain Type Distribution in Gangni Paurashava*

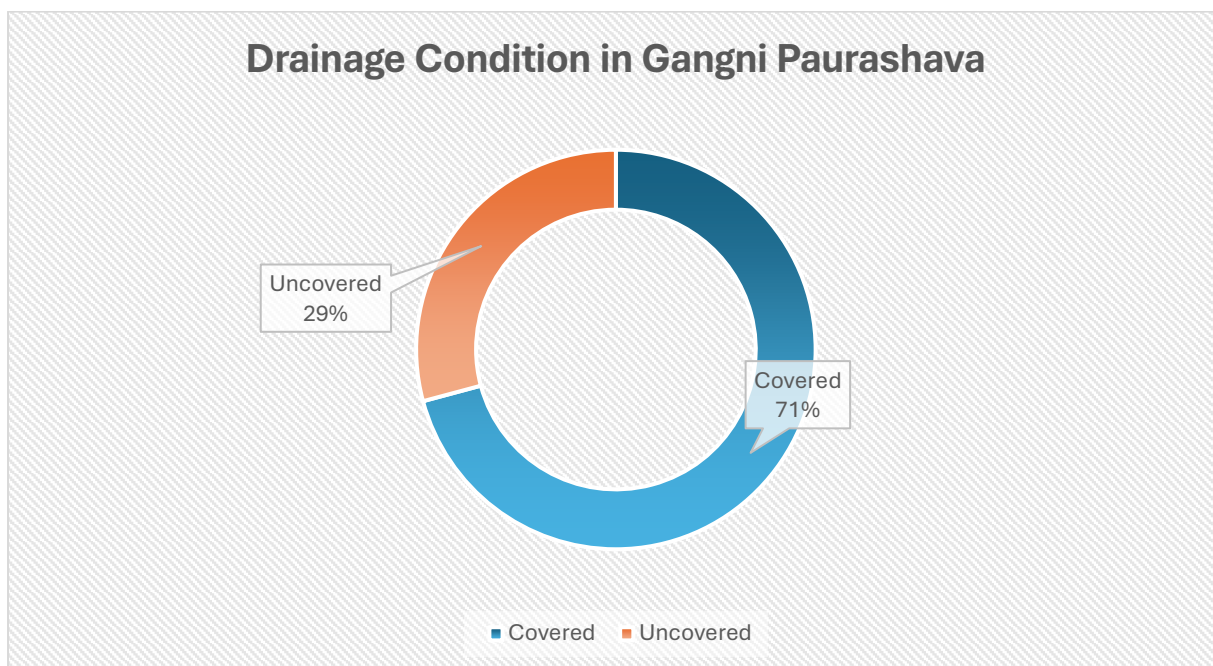


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### 3.6.2.13 Drainage Condition

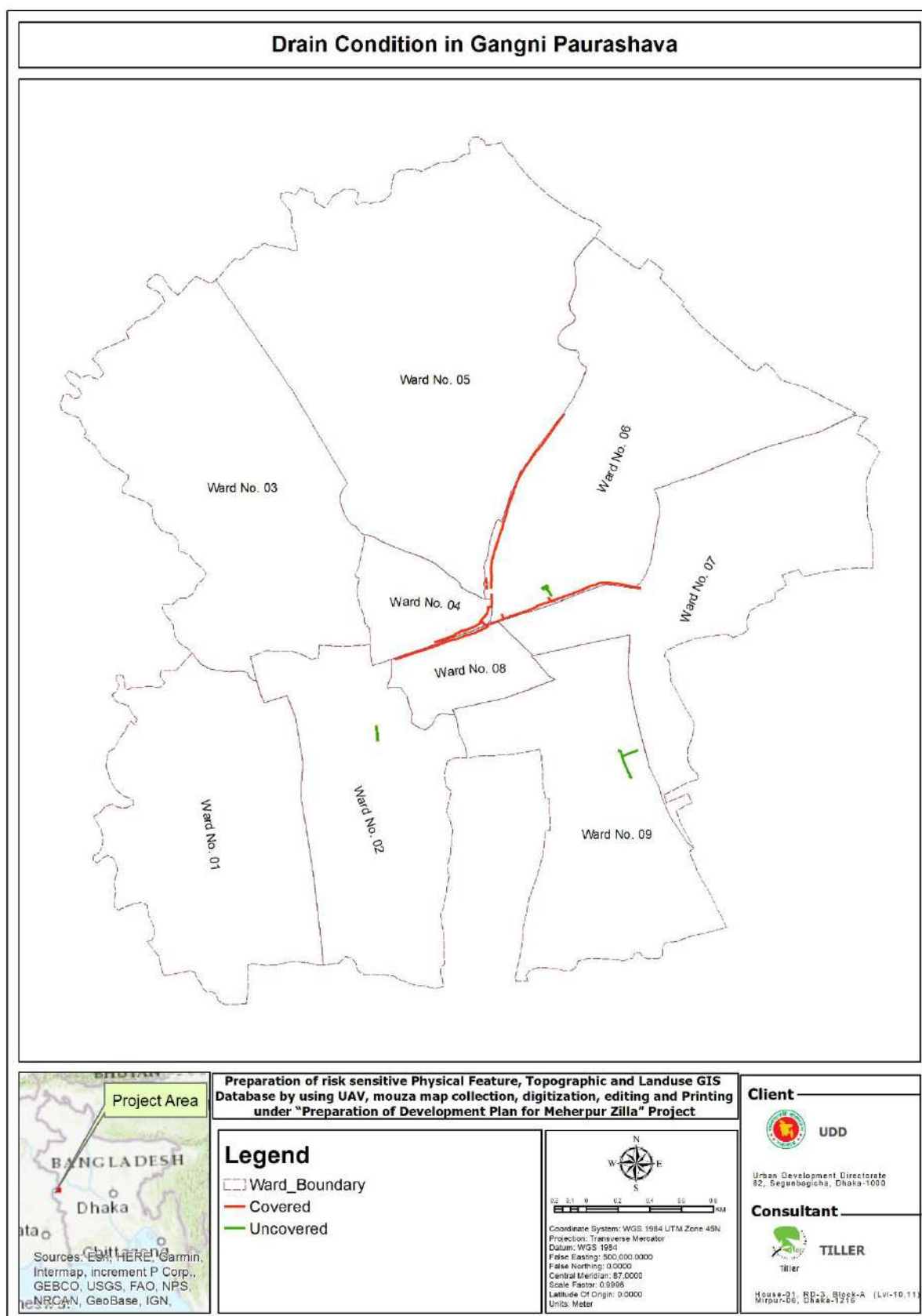
*Table 3-28: Drainage Condition in Gangni Paurashava*

Drainage Condition	Length in KM	Percentage
Covered	17	70.83%
Uncovered	7	29.17%
Total	24	100.00%



*Figure 3-31: Drainage Condition in Meherpur Paurashava*

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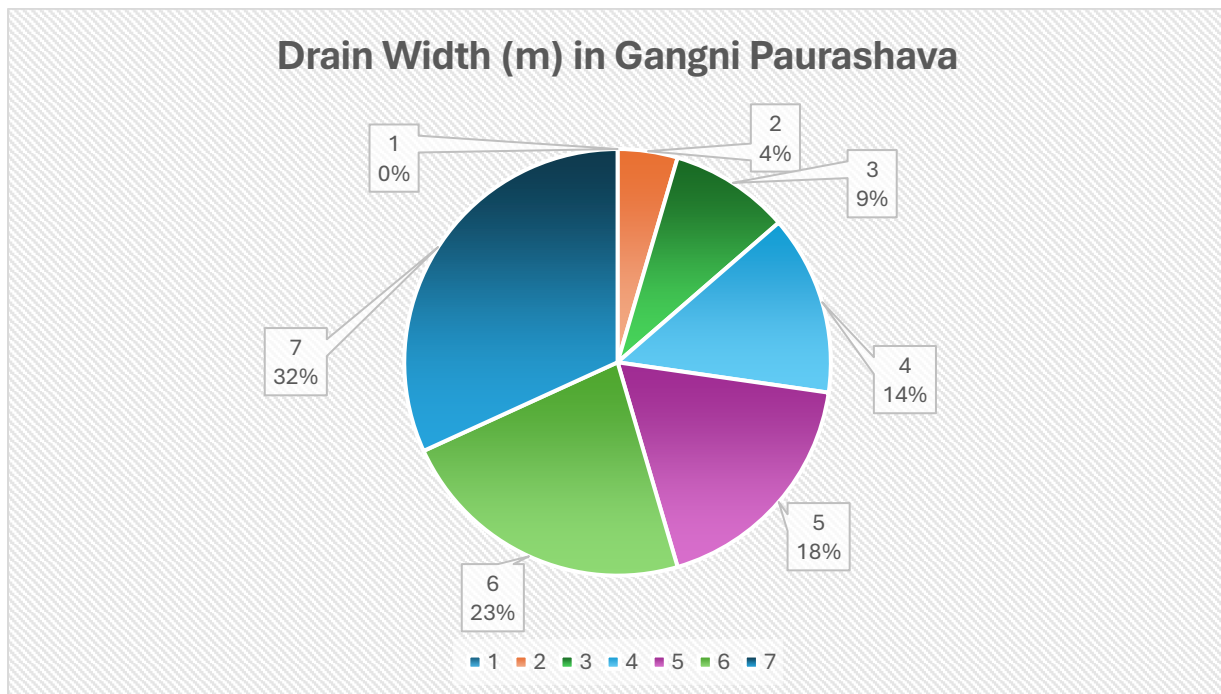
*Map 3-28: Drainage Condition in Gangni Paurashava*

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### 3.6.2.14 Drain Width

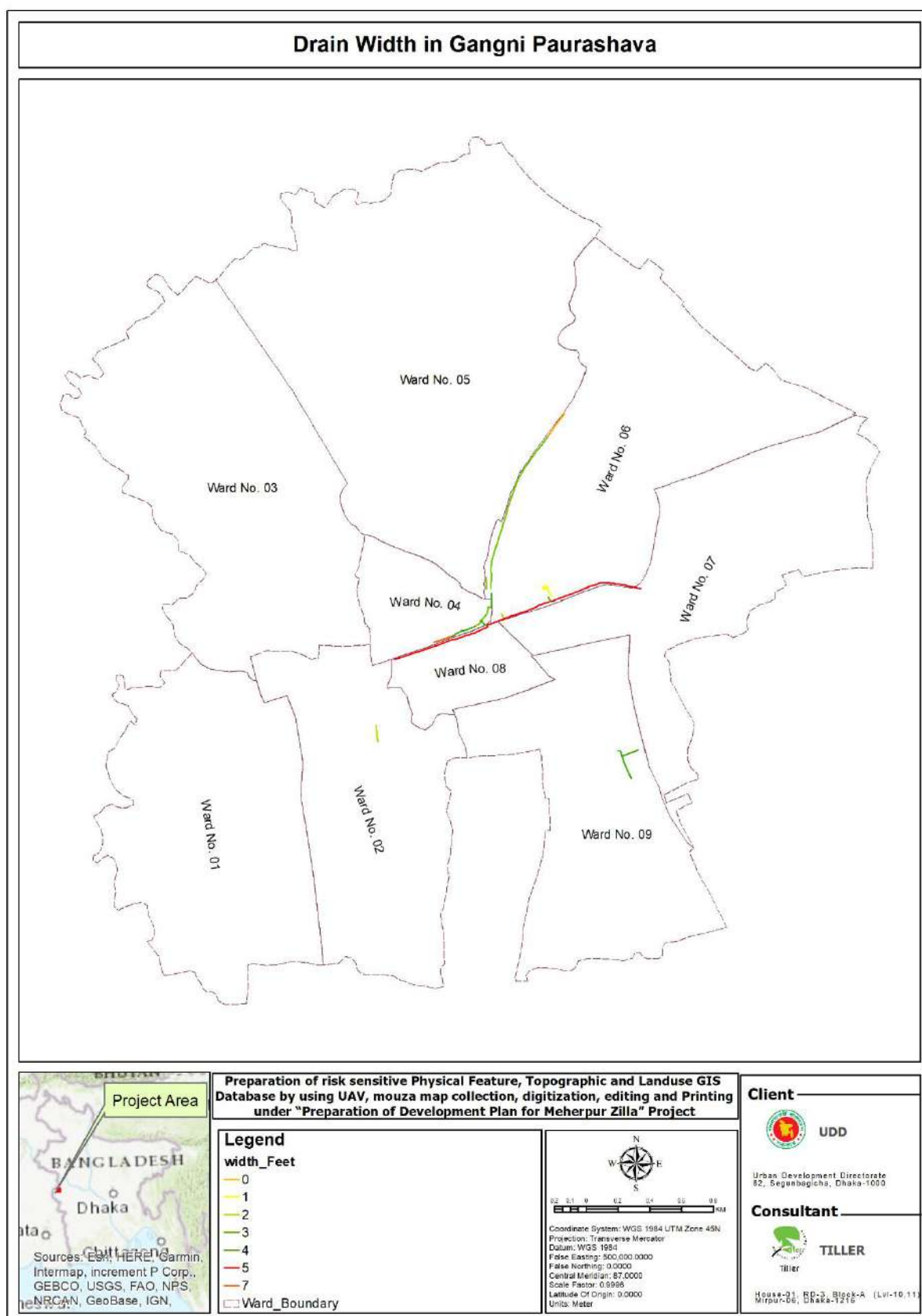
*Table 3-29: Drain Width Distribution in Gangni Paurashava*

Drain Width (Feet)	Length in KM	Percentage
0	0	0.00%
1	2	2.44%
2	4	4.88%
3	18	21.95%
4	36	43.90%
5	15	18.29%
7	7	8.54%
Total	82	100.00%



*Figure 3-32: Drain Width Distribution in Gangni Paurashava*

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*Map 3-29: Drain Width Distribution in Gangni Paurashava*

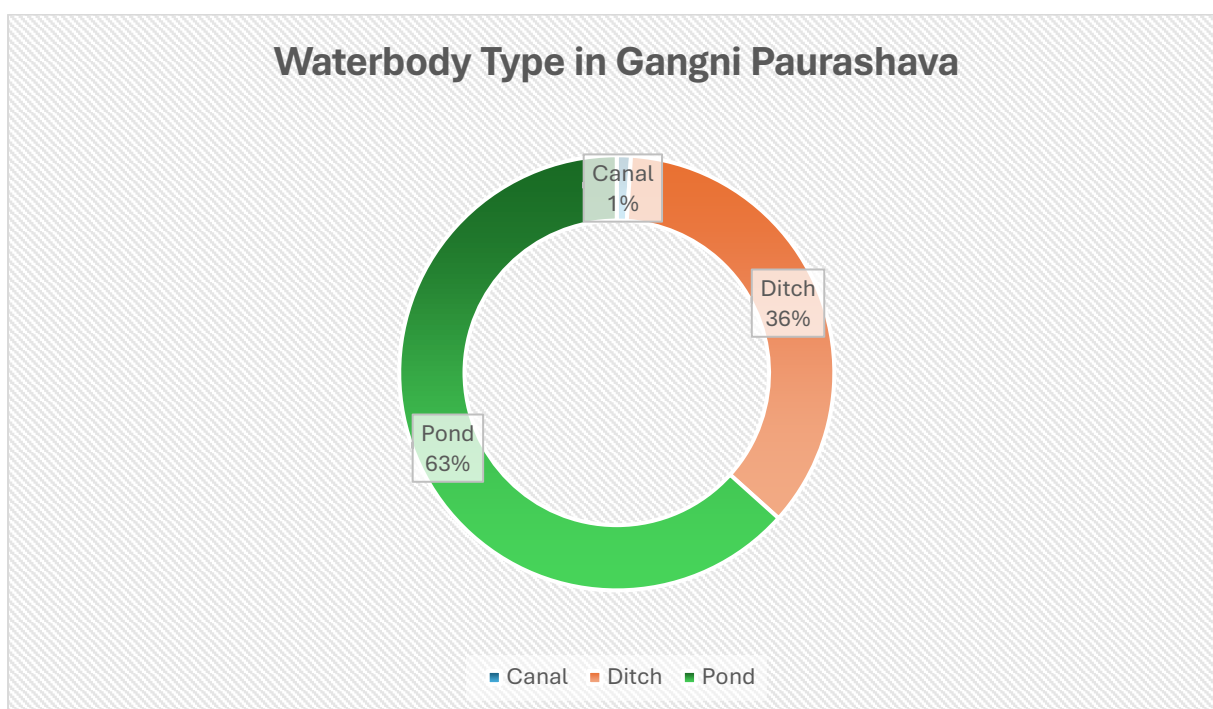


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### 3.6.2.15 Waterbody Types

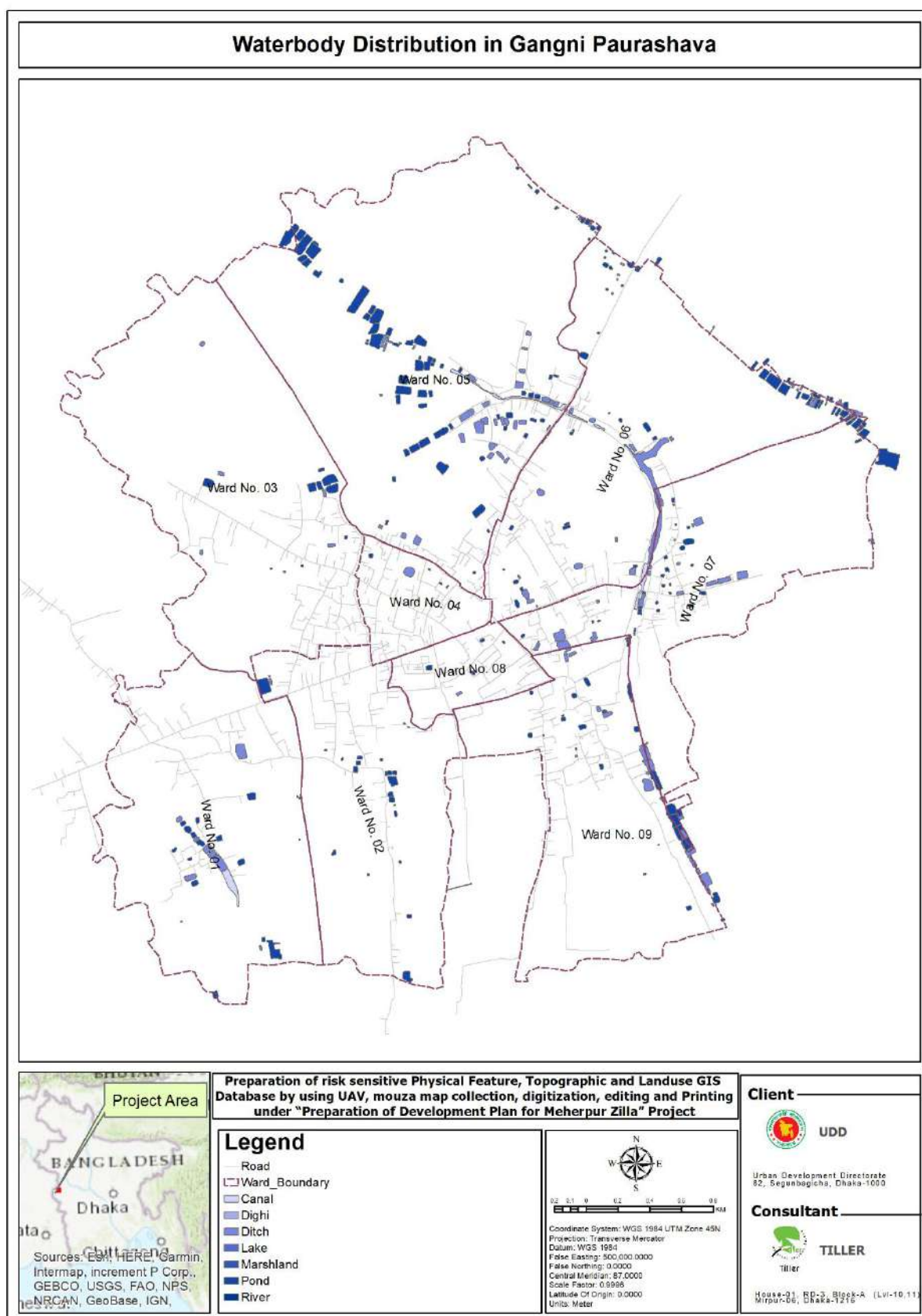
*Table 3-30: Waterbody Types in Gangni Paurashava*

Waterbody Type	Area in Acre	Percentage
Canal	4	1.05%
Ditch	136	35.60%
Pond	242	63.35%
Total	382	100.00%



*Figure 3-33: Waterbody Types in Gangni Paurashava*

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Map 3-30: Waterbody Types in Gangni Paurashava

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### 3.7 Concluding Remarks

The survey findings offer a comprehensive snapshot of Meherpur Paurashava's existing physical infrastructure and built environment. A strong dominance of residential structures and recent construction activity indicates rapid urban growth, with over half of the structures built since 2011. However, the presence of a large number of supporting structures points to complex and evolving land-use patterns that warrant coordinated planning.

The road network, though moderately developed, reveals a heavy reliance on narrow and earthen roads, limiting transportation efficiency. Similarly, while the drainage system is predominantly pucca and covered, disparities in width and exposure still pose risks in certain areas. Data gaps, such as a significant proportion of "No Information Found" responses regarding population and household characteristics, underscore the need for improved data collection mechanisms and community engagement during surveys.

The prominence of natural waterbodies, especially rivers and ponds, is a valuable ecological asset that should be preserved and integrated into urban development strategies. Collectively, this working paper lays the groundwork for evidence-based urban planning and serves as a baseline for monitoring future development in Meherpur Paurashava.

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## **CHAPTER 4: LAND USE INCLUDING SPATIAL QUALITY, AND TRENDS AND PATTERNS OF GROWTH**

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### **4.1 LULC Change Trends**

The LULC analysis of Meherpur District from 2017 to 2024 highlights a transitional pattern of land development characterized by urban expansion at the expense of natural and semi-natural features such as waterbodies and vegetation. Despite this, agricultural land has remained largely stable, reaffirming its central role in the district’s economy. The significant reduction in barren lands indicates improved land use efficiency, while the post-2021 increase in vegetation suggests early signs of ecological recovery. These evolving land use dynamics underscore the importance of incorporating balanced zoning regulations, environmental safeguards, and sustainable land management strategies into the upcoming Structure Plan and Area Plans for Meherpur.

#### **4.1.1 Land Use Land Cover (LULC) Change Analysis: 2017–2024**

The Land Use Land Cover (LULC) data for Meherpur District over the years 2017, 2021, and 2024 reveals notable transformations in the spatial distribution of land resources, reflecting dynamic changes in land utilization, urbanization, and ecological conditions.

##### **4.1.1.1 Decline in Waterbodies**

The area covered by waterbodies has decreased significantly from **4,471.46 acres in 2017 (2.50%)** to **3,263.02 acres in 2024 (1.82%)**, representing a **27% decline** over the 7-year period. This reduction may be attributed to the filling of small ponds and wetlands for agricultural or built-up expansion, potentially indicating stress on surface water resources and aquatic ecosystems.

##### **4.1.1.2 Fluctuations in Vegetation Cover**

Vegetative land experienced a sharp decline between 2017 and 2021, dropping from **16,438.76 acres (9.18%)** to **11,000.69 acres (6.14%)**, suggesting deforestation, clearing for agriculture, or urban expansion. However, by 2024, vegetation cover rose to **13,021.42 acres (7.27%)**, indicating a possible resurgence of green areas, afforestation efforts, or fallow lands reverting to vegetative states.

##### **4.1.1.3 Barren Land Reduction**

Barren land has decreased drastically from **823.70 acres (0.46%) in 2017** to only **11.05 acres (0.01%) in 2024**, nearly a **99% reduction**. This trend implies that most previously unused or degraded lands have been brought under productive use, either for agriculture, settlement, or other purposes, pointing to improved land utilization efficiency.

##### **4.1.1.4 Stability in Agricultural Land**

Agricultural land remains the dominant land cover category, consistently accounting for around **74%** of the district’s total area. The slight fluctuation—from **133,842.15 acres in 2017**



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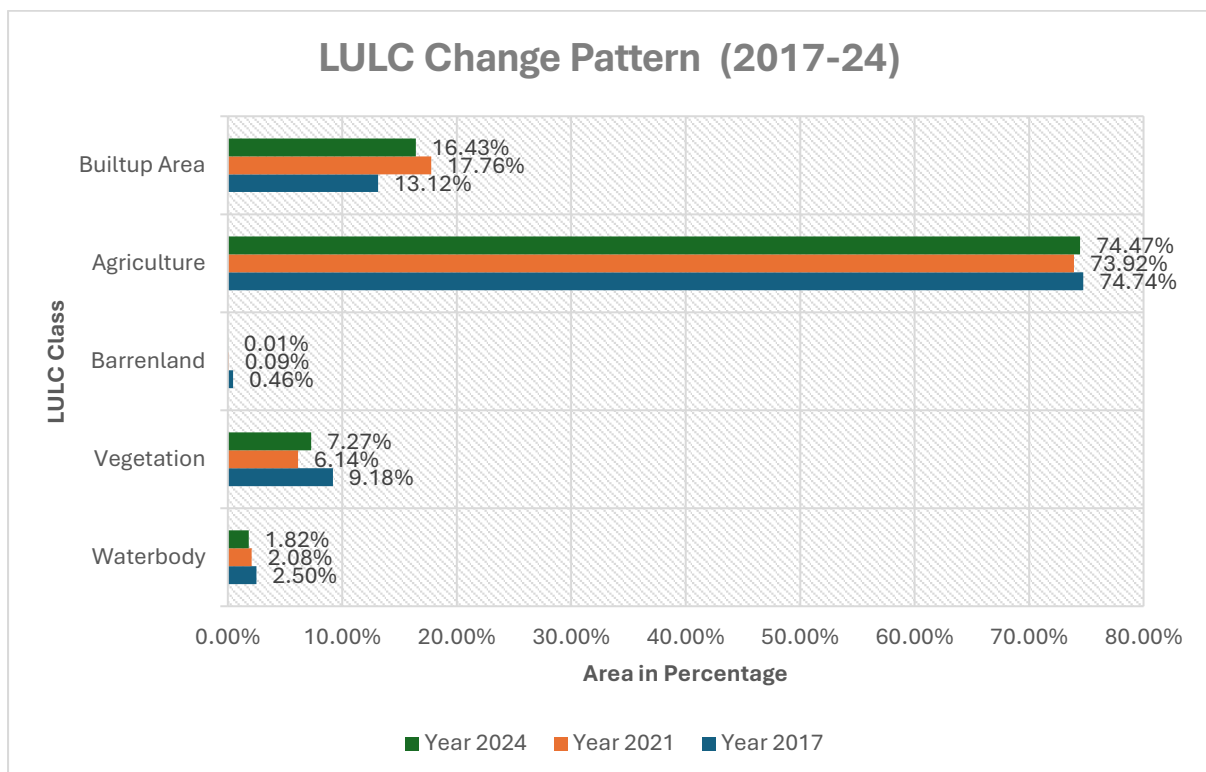
(74.74%) to **133,348.95 acres in 2024 (74.47%)**—indicates relative stability in agricultural practices, despite urban growth. This suggests that urban expansion is occurring more through the conversion of waterbodies, vegetation, and barren land rather than large-scale reduction of cultivable land.

#### 4.1.1.5 Urban Expansion and Built-up Growth

Built-up areas increased significantly from **23,493.73 acres (13.12%) in 2017** to **31,810.27 acres (17.76%) in 2021**, reflecting rapid urbanization and infrastructure development. However, a marginal decline to **29,425.36 acres (16.43%) in 2024** suggests a possible saturation of urban growth areas or reclassification of some peripheral settlements. Nonetheless, the net gain in built-up area over the 7-year period still underscores growing urban pressure and demand for housing, services, and connectivity.

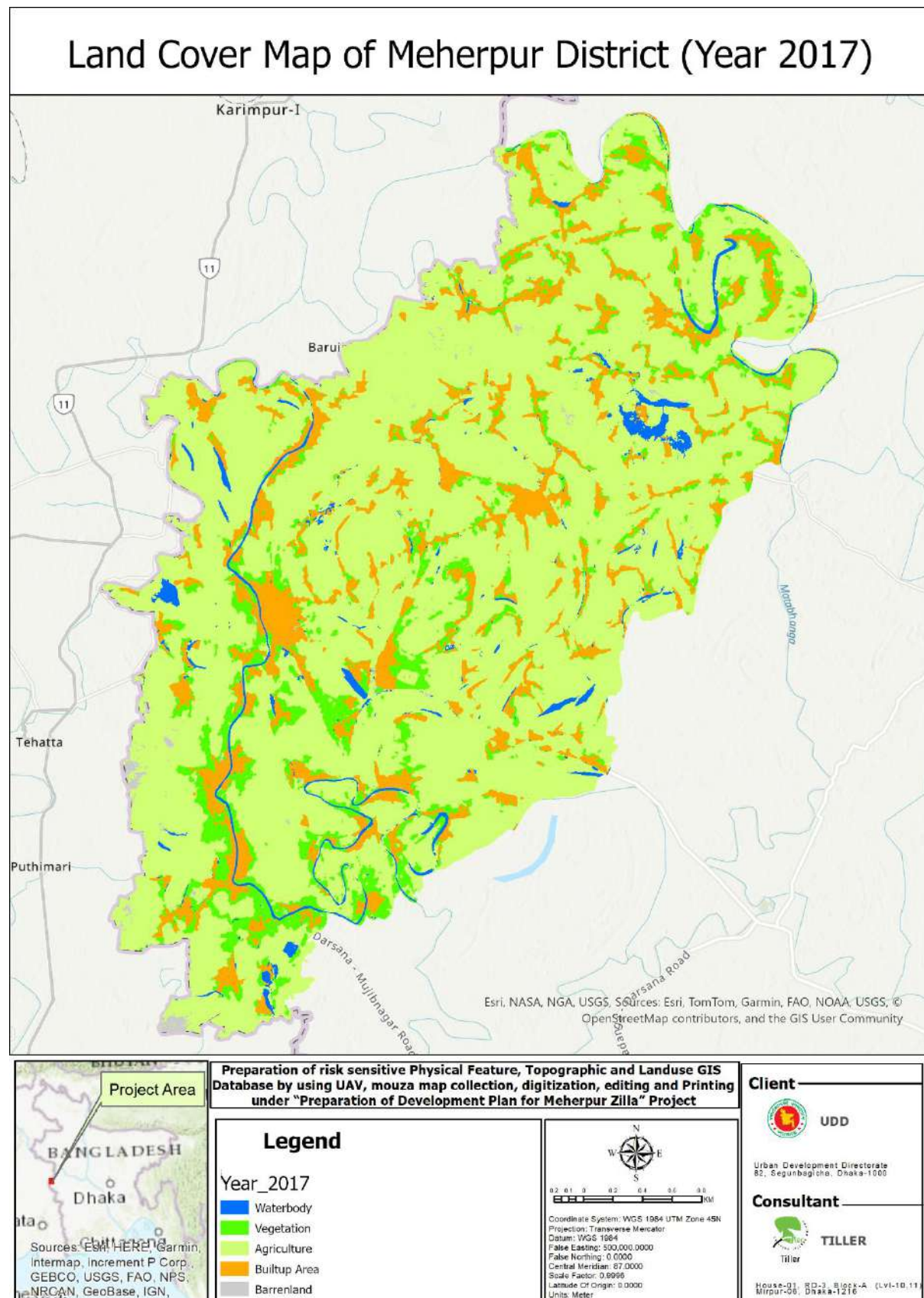
*Table 4-1: LULC Change Pattern (2017-24)*

Land Cover Class	Year 2017		Year 2021		Year 2024	
	Area in Acre	%	Area in Acre	%	Area in Acre	%
Waterbody	4471.46	2.50%	3732.99	2.08%	3263.02	1.82%
Vegetation	16438.76	9.18%	11000.69	6.14%	13021.42	7.27%
Barren land	823.70	0.46%	152.64	0.09%	11.05	0.01%
Agriculture	133842.15	74.74%	132373.21	73.92%	133348.95	74.47%
Built-up Area	23493.73	13.12%	31810.27	17.76%	29425.36	16.43%
<b>Total</b>	<b>179069.80</b>	<b>100.00%</b>	<b>179069.80</b>	<b>100.00%</b>	<b>179069.80</b>	<b>100.00%</b>



*Figure 4-1: LULC Change Pattern (2017-24)*

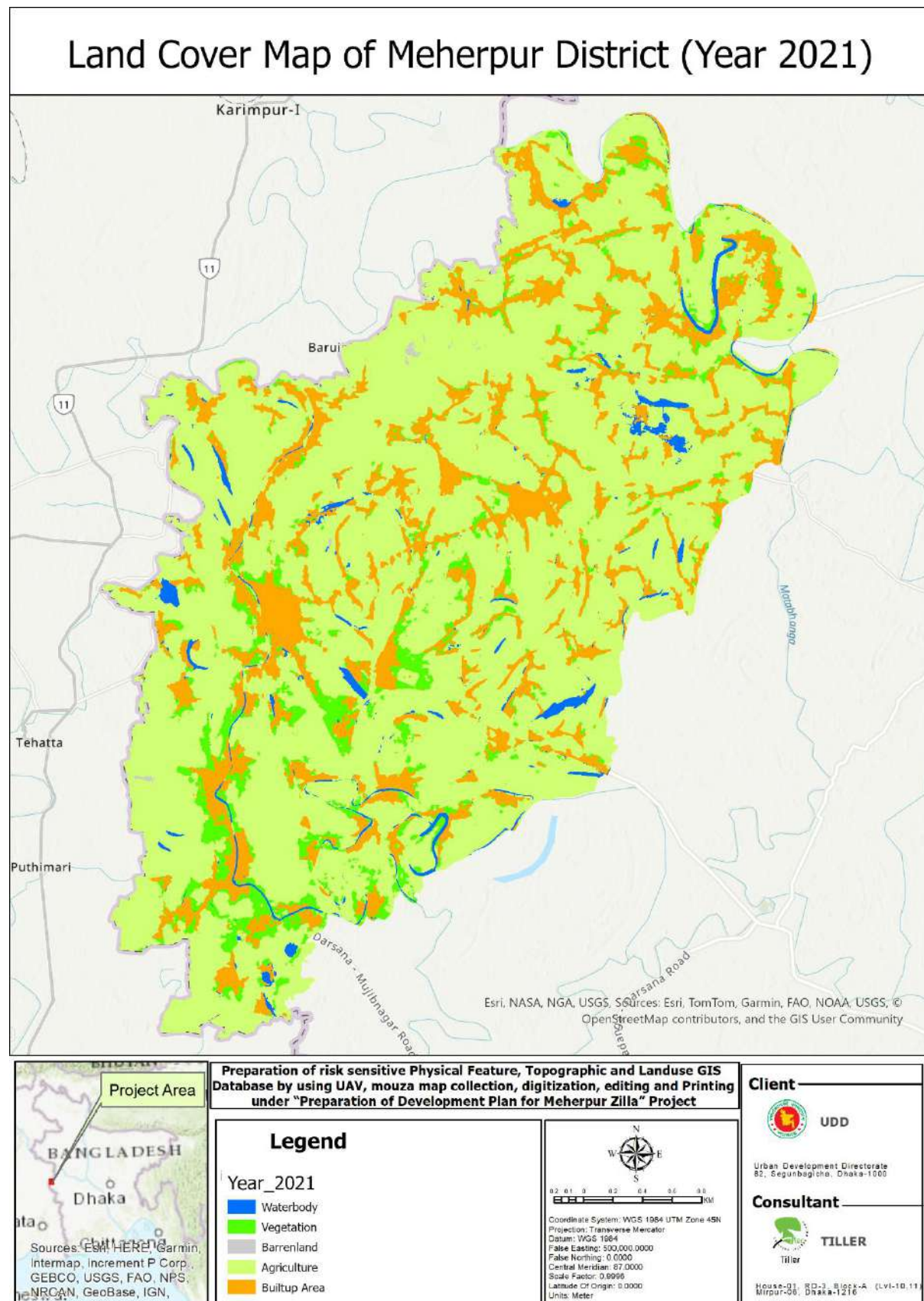
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Map 4-1: Land Cover Map of Meherpur District (Year 2017)

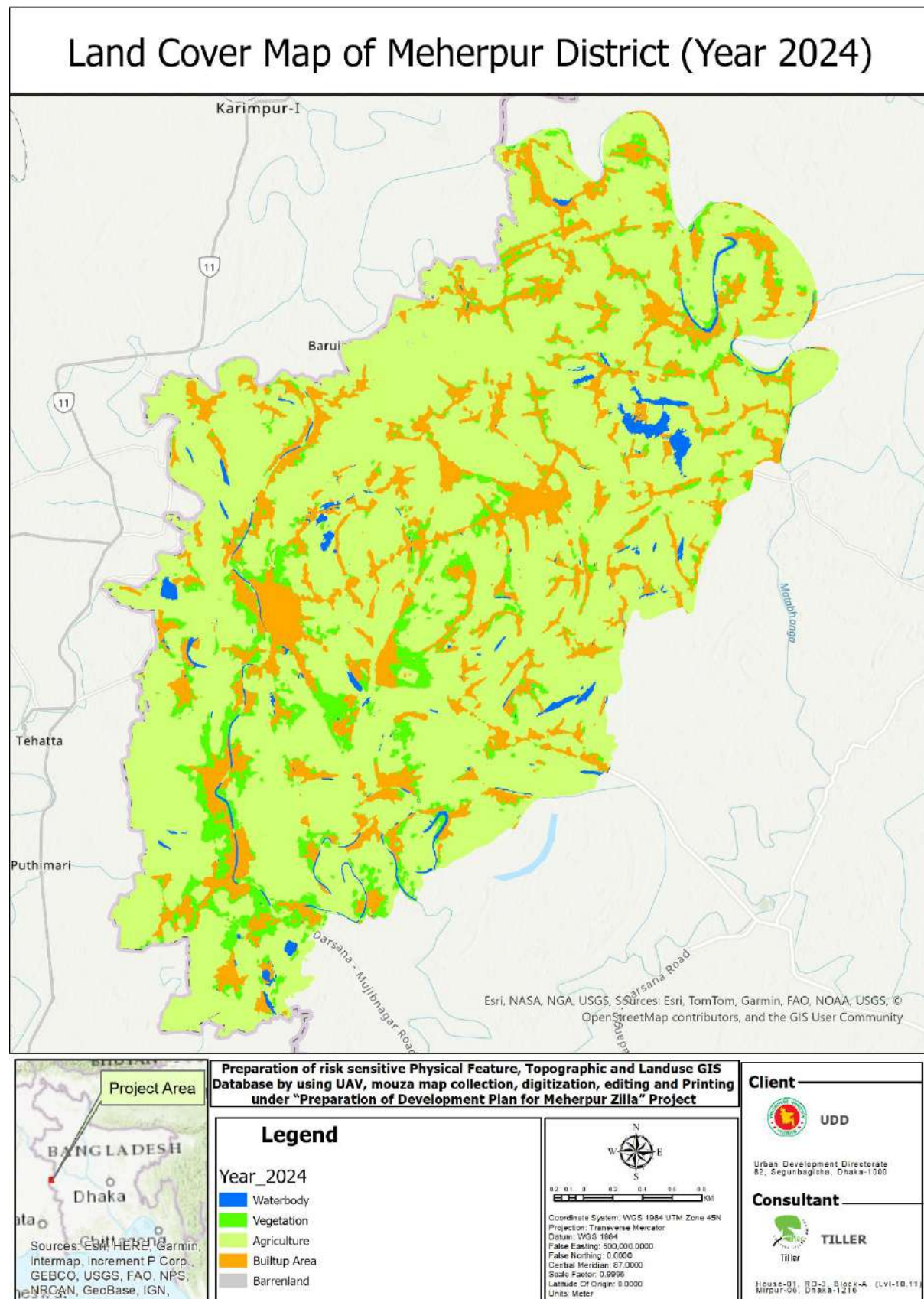


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Map 4-2: Land Cover Map of Meherpur District (Year 2021)

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Map 4-3: Land Cover Map of Meherpur District (Year 2024)



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## CHAPTER 5: HOUSING AND SOCIO-ECONOMIC CONDITION

### 5.1 Meherpur Paurashava

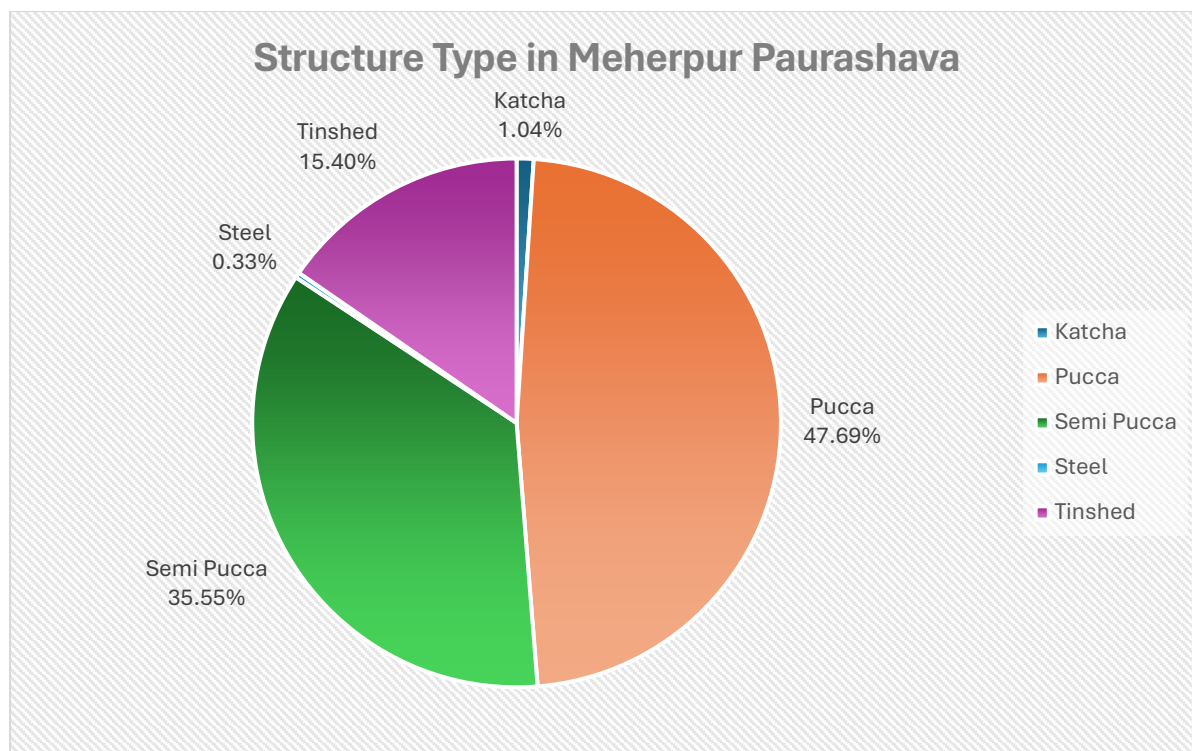
#### 5.1.1 Structure Type:

The physical feature survey of Meherpur Paurashava reveals a diverse composition of structural types, indicating varied socio-economic conditions and construction preferences across the municipality. The structures are categorized into five main types: Katcha, Pucca, Semi Pucca, Steel, and Tinshed, each with associated primary and supporting structures. Pucca structures dominate the built environment, with 8,649 primary structures and 3,423 supporting structures, reflecting a relatively higher prevalence of permanent, concrete-built dwellings and facilities. This suggests a significant portion of the population resides or operates within durable, well-established buildings, often indicative of better economic status and infrastructure access. Semi Pucca structures are the next most common, comprising 6,447 primary structures and 7,457 supporting structures. Interestingly, the number of supporting structures slightly exceeds the number of primary units, implying that these dwellings or facilities often require or are accompanied by multiple auxiliary structures—perhaps due to design practices, family size, or land use customs. Tinshed structures, while lower in primary count (2,792), are accompanied by a disproportionately high number of supporting structures (12,772). This could indicate a prevalence of temporary or semi-permanent homestead arrangements where ancillary units (like kitchens, toilets, and livestock sheds) are constructed separately from the main living space. It may also suggest limited integration of amenities within the primary structure, leading to the proliferation of detached support units. Katcha structures, typically made of mud or similar non-permanent materials, account for 188 primary structures, but are supported by 1,273 ancillary units. This high ratio (approximately 6.8 supporting structures per primary unit) may reflect the needs of low-income households living in traditional housing forms that rely on separate facilities for essential functions. Steel structures are the least common, with only 59 primary units and 16 supporting structures, possibly representing commercial or specialized industrial-type buildings rather than residential use.

*Table 5-1: Structure Type Distribution in Meherpur Paurashava*

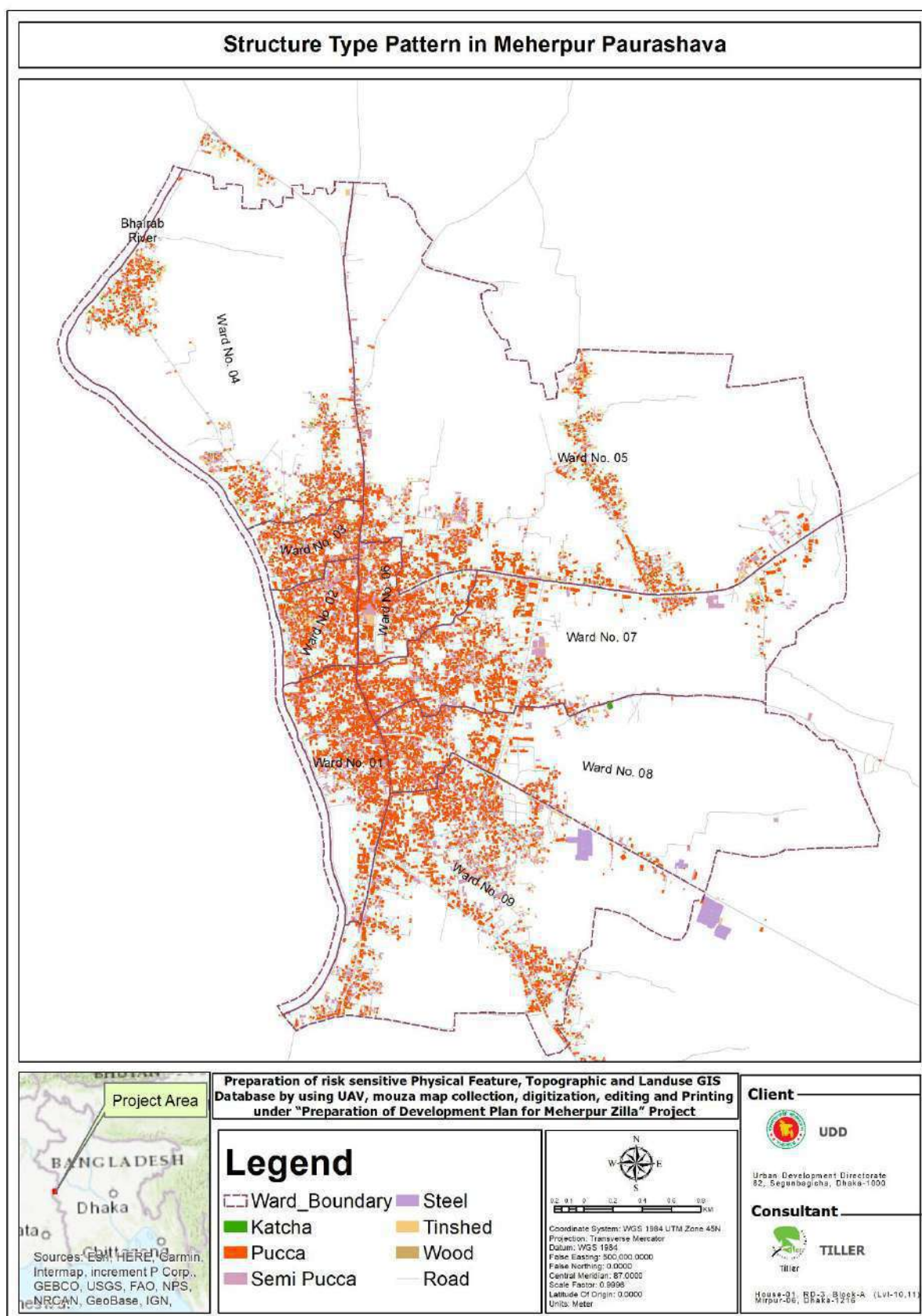
Structure Type	Number of Primary Structure	Supporting Structure
Katcha	188	1273
Pucca	8649	3423
Semi Pucca	6447	7457
Steel	59	16
Tinshed	2792	12772

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*Figure 5-1: Structure Type Distribution in Meherpur Paurashava*

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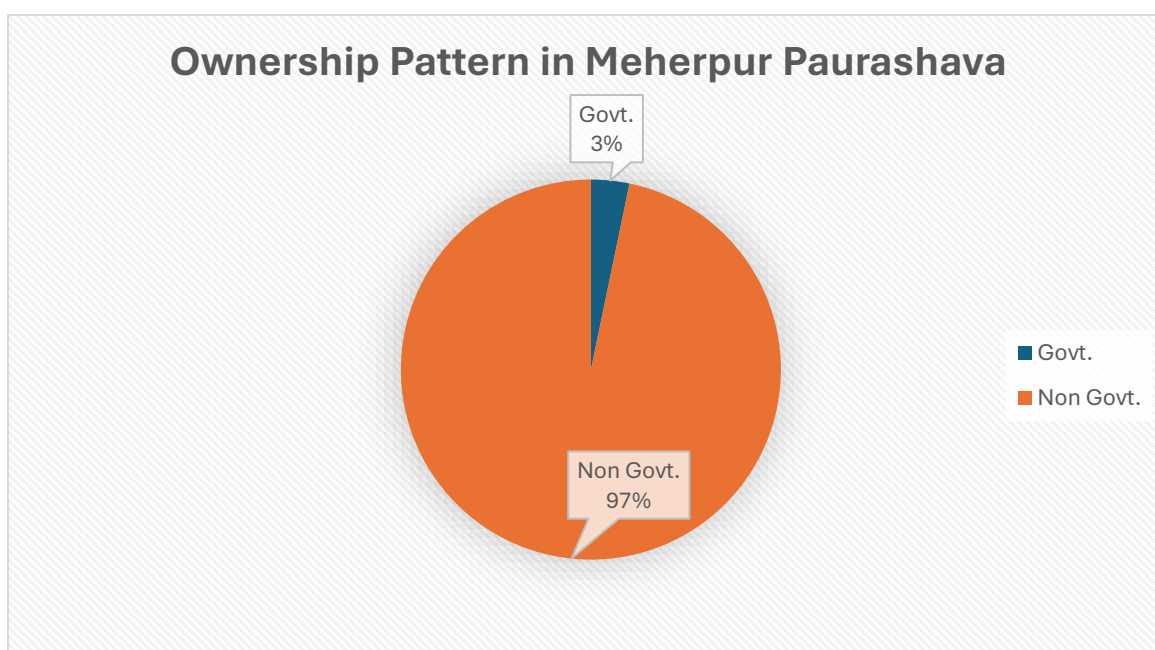
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### 5.1.2 Ownership Pattern of Structures:

The ownership data from Meherpur Paurashava indicates that the vast majority of structures are under non-government ownership, accounting for 17,544 structures, or 96.74% of the total. In contrast, only 591 structures (3.26%) are owned by the government. This distribution clearly reflects a privately dominated built environment, where residential, commercial, and service activities are primarily driven by individual or institutional private stakeholders.

*Table 5-2: Ownership Pattern of Structures in Meherpur Paurashava*

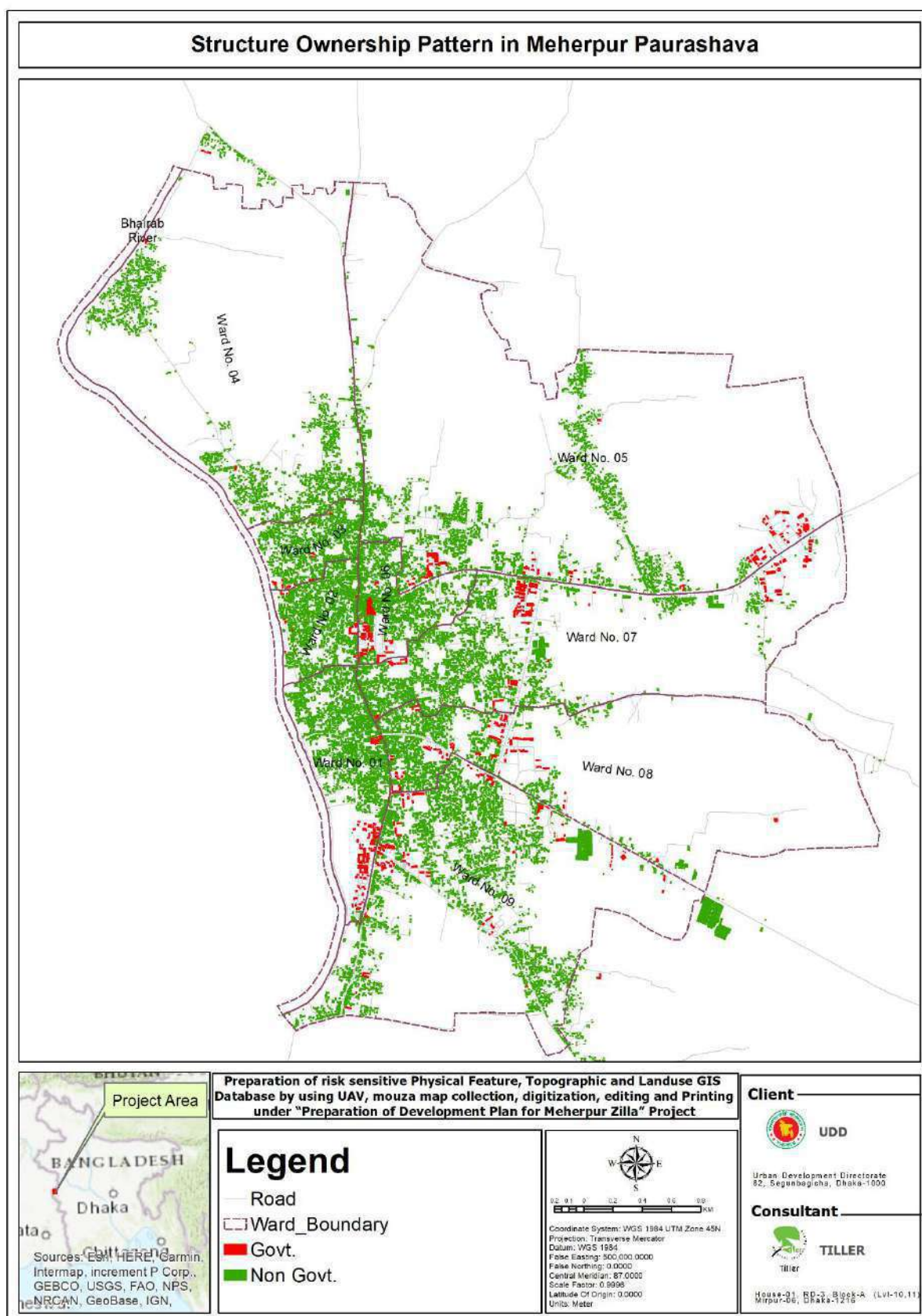
Ownership Type	Number of Structure	Percentage
Govt.	591	3.26%
Non Govt.	17544	96.74%
Total	18135	100.00%



*Figure 5-2: Ownership Pattern of Structures in Meherpur Paurashava*



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Map 5-2: Ownership Pattern of Structures in Meherpur Paurashava

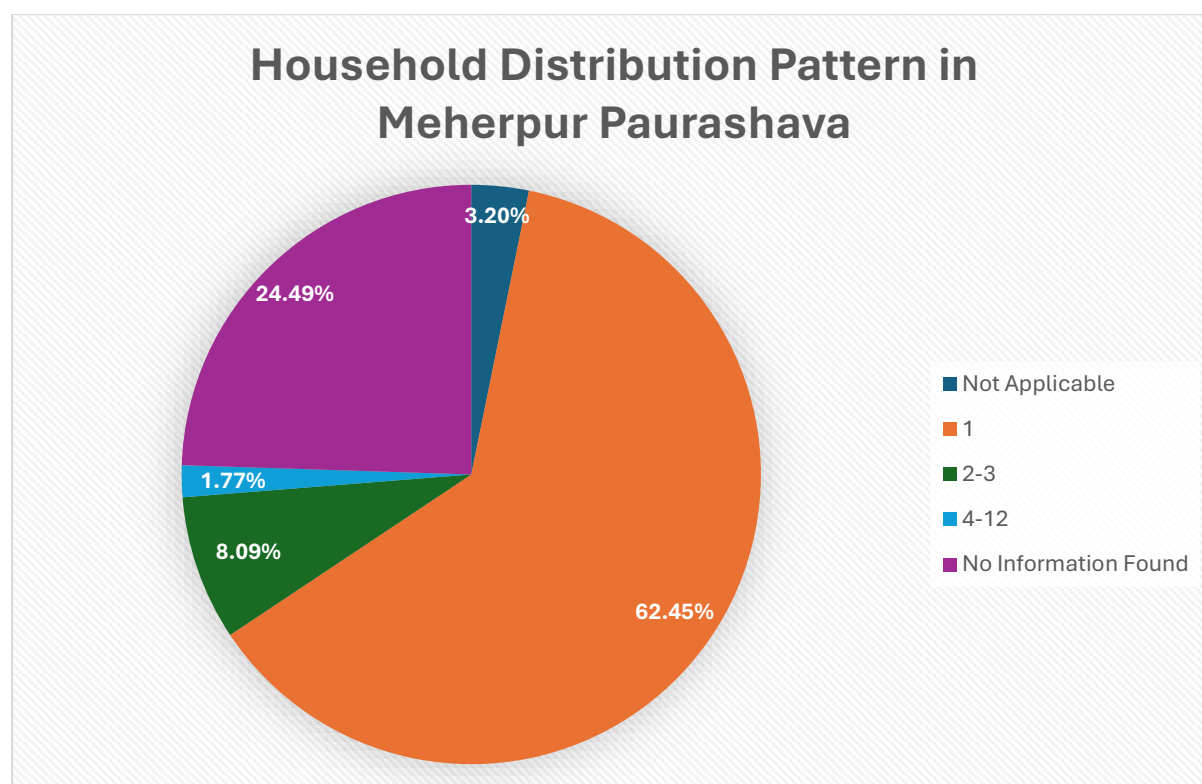
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### 5.1.3 Household Composition:

The survey data on household numbers in Meherpur Paurashava shows that the majority of structures are occupied by small households. A total of 11,326 structures (62.45%) are home to 1 household member, reflecting a significant portion of the population living in single-person households. 1,467 structures (8.09%) accommodate 2–3 household members, and 321 structures (1.77%) house between 4–12 members. Notably, 4,441 structures (24.49%) fall under the category of No Information Found, where either the household members were absent during the survey, declined to participate, or were uncomfortable sharing personal details. This category suggests that a substantial portion of the data comes from external respondents, such as neighbors or outsiders, who may not have accurate knowledge about the household size.

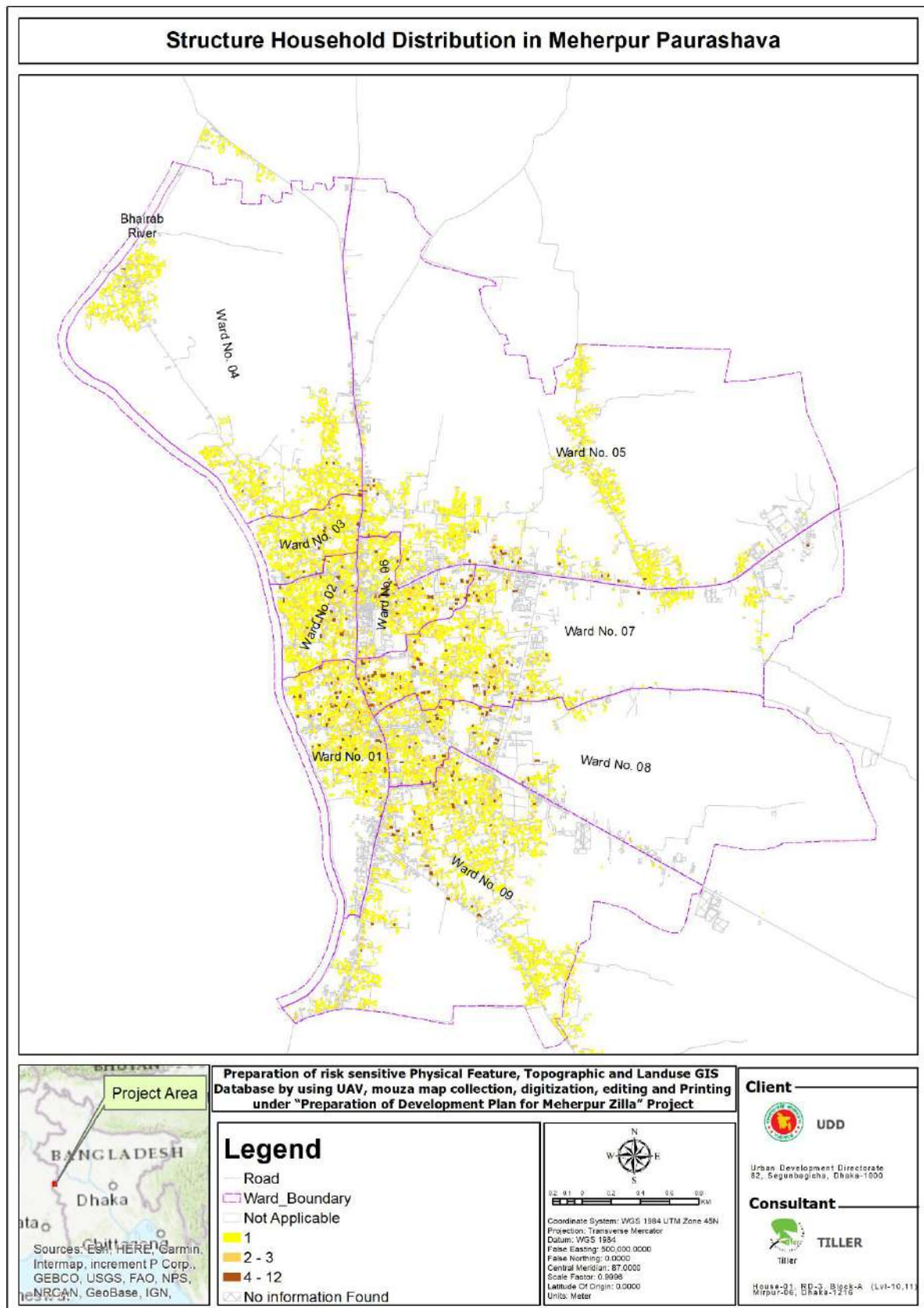
*Table 5-3: Household Composition in Meherpur Paurashava*

Household Number	Number of Structure	Percentage
Not Applicable	580	3.20%
1	11326	62.45%
2-3	1467	8.09%
4-12	321	1.77%
No Information Found	4441	24.49%
Total	18135	100.00%



*Figure 5-3: Household Composition in Meherpur Paurashava*

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*Map 5-3: Household Composition in Meherpur Paurashava*

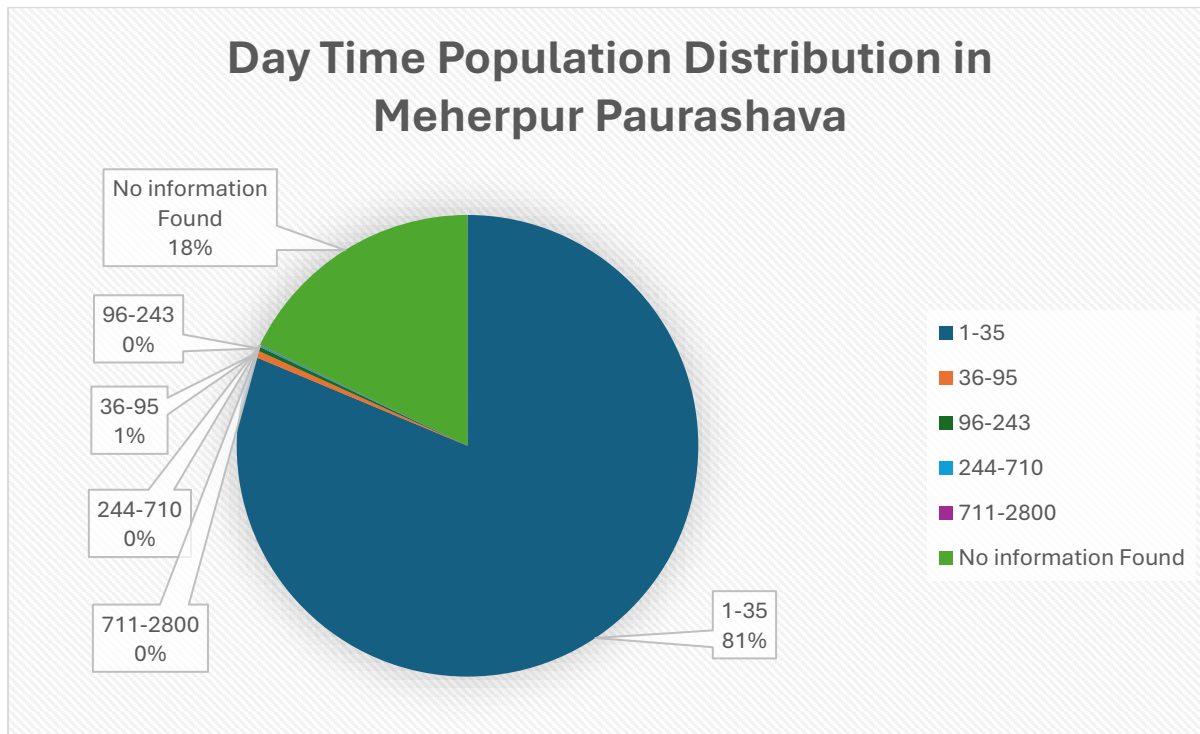
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#### 5.1.4 Day Time Population:

The survey data on daytime population in Meherpur Paurashava reveals that the majority of structures—14,747 units (81.32%)—house relatively small daytime populations as those are predominantly residential in nature, ranging from 1 to 35 people. A small number of structures report significantly larger daytime populations: 85 structures (0.47%) accommodate between 36–95 people, 52 structures (0.29%) have between 96–243 people, and 17 structures (0.09%) host between 244–710 people. Only 6 structures (0.03%) are recorded with daytime populations ranging from 711–2800 people, suggesting a few locations with high foot traffic, such as large offices or public institutions. Additionally, 3,228 structures (17.80%) fall under No Information Found, likely due to household members being absent during the survey or the reluctance to share household details.

*Table 5-4: Day Time Population Distribution in Meherpur Paurashava*

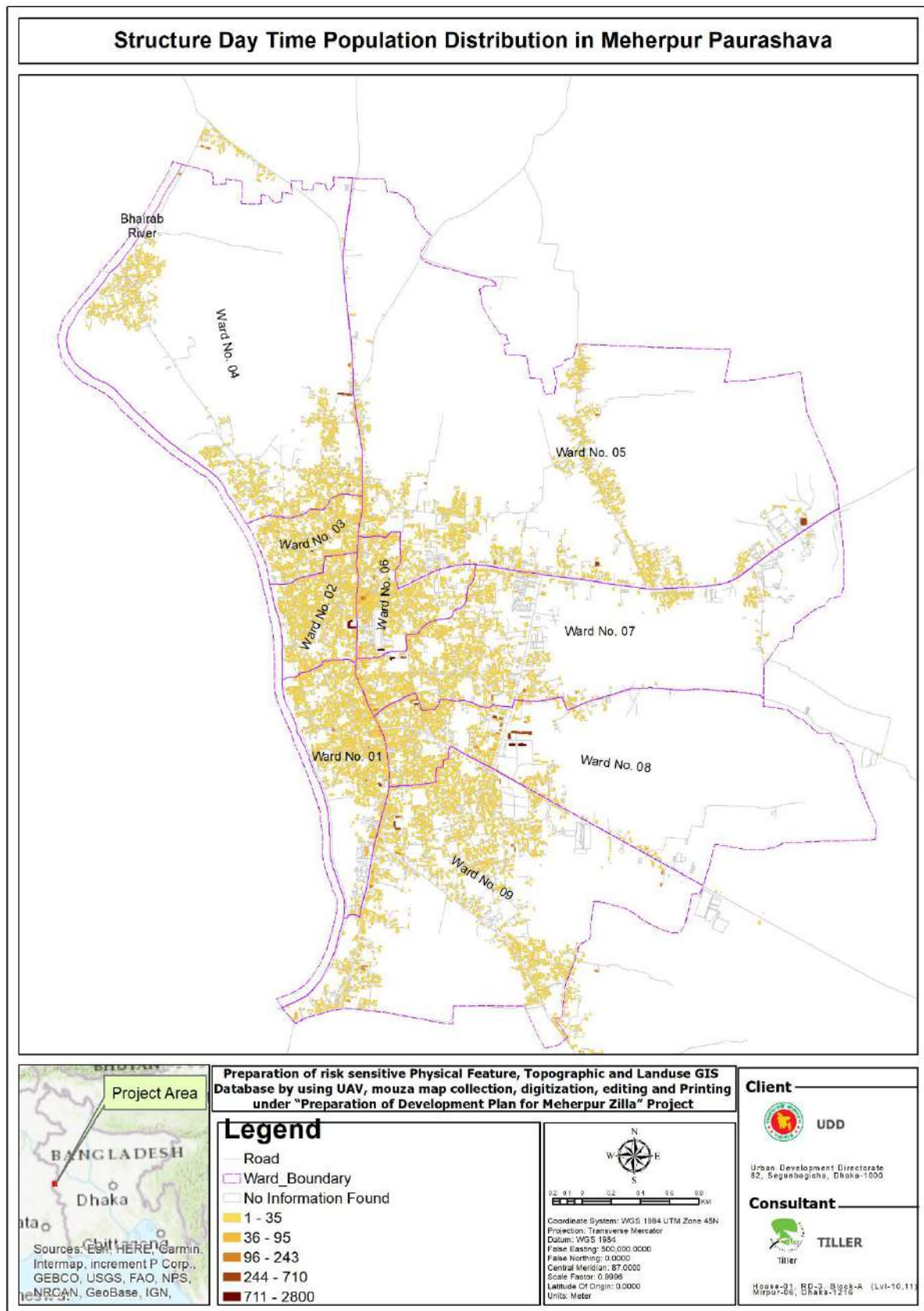
Day time Population	Number of Structure	Percentage
1-35	14747	81.32%
36-95	85	0.47%
96-243	52	0.29%
244-710	17	0.09%
711-2800	6	0.03%
No information Found	3228	17.80%
Total	18135	100.00%



*Figure 5-4: Day Time Population Distribution in Meherpur Paurashava*



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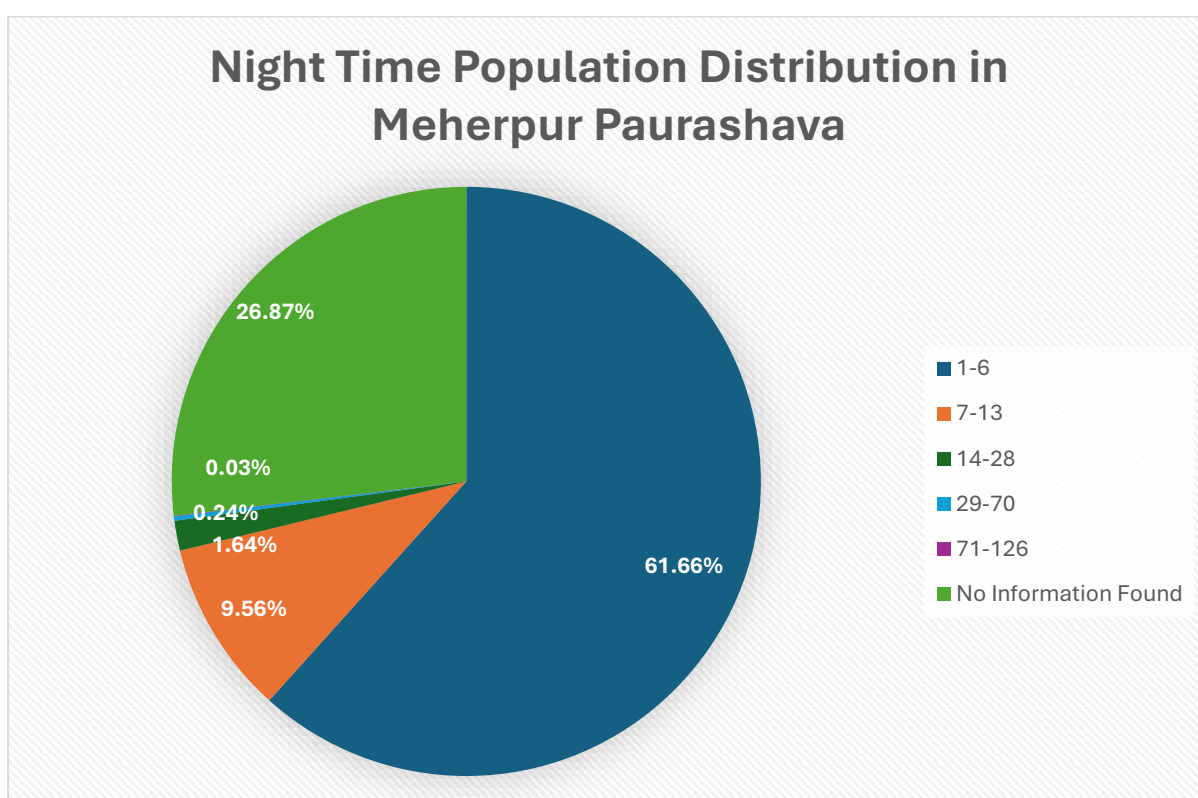
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### 5.1.5 Night Time Population:

The survey data on nighttime population in Meherpur Paurashava shows that the majority of structures—11,182 units (61.66%)—house between 1 and 6 people during the night. A smaller portion of structures—1,734 units (9.56%)—accommodate 7–13 people, and 298 units (1.64%) house 14–28 people. Even fewer structures report larger nighttime populations: 44 units (0.24%) host 29–70 people, and only 5 units (0.03%) have between 71–126 people. Additionally, 4,872 structures (26.87%) fall under No Information Found, likely due to household members being absent during the survey or the reluctance to share household details.

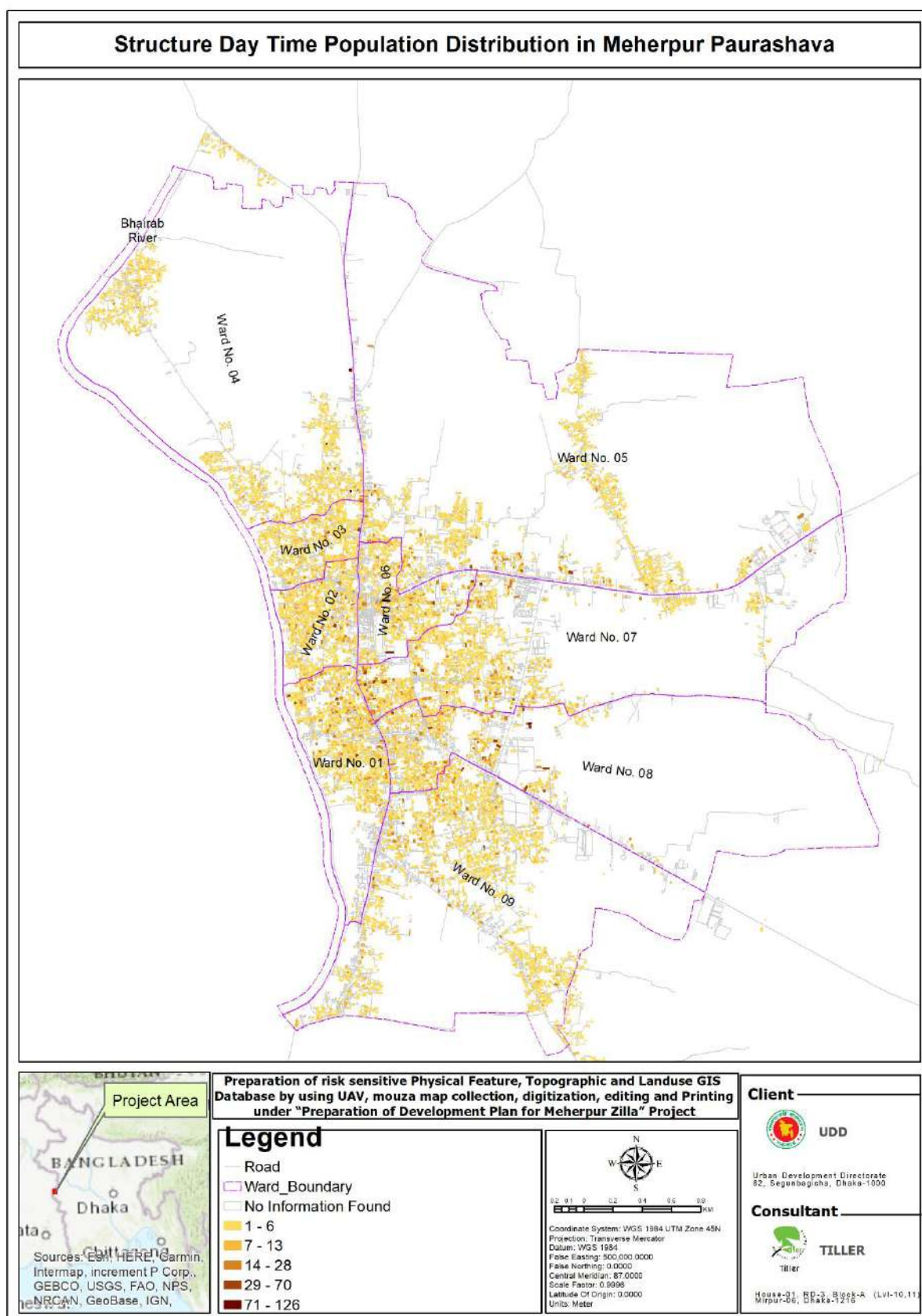
*Table 5-5: Night Time Population Distribution in Meherpur Paurashava*

Night Time Population	Number of Structure	Percentage
1-6	11182	61.66%
7-13	1734	9.56%
14-28	298	1.64%
29-70	44	0.24%
71-126	5	0.03%
No Information Found	4872	26.87%
Total	18135	100.00%



*Figure 5-5: Night Time Population Distribution in Meherpur Paurashava*

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*Map 5-5: Night Time Population Distribution in Meherpur Paurashava*

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## 5.2 Gangni Paurashava:

### 5.2.1 Structure Type:

Table 5-6: Structure Type Distribution in Gangni Paurashava

Structure Type	Number	Percentage
Katcha	966	4.72%
Pucca	5735	28.02%
Semi Pucca	8520	41.62%
Tin Shed	5055	24.69%
Under Construction	195	0.95%
Total	20471	100.00%

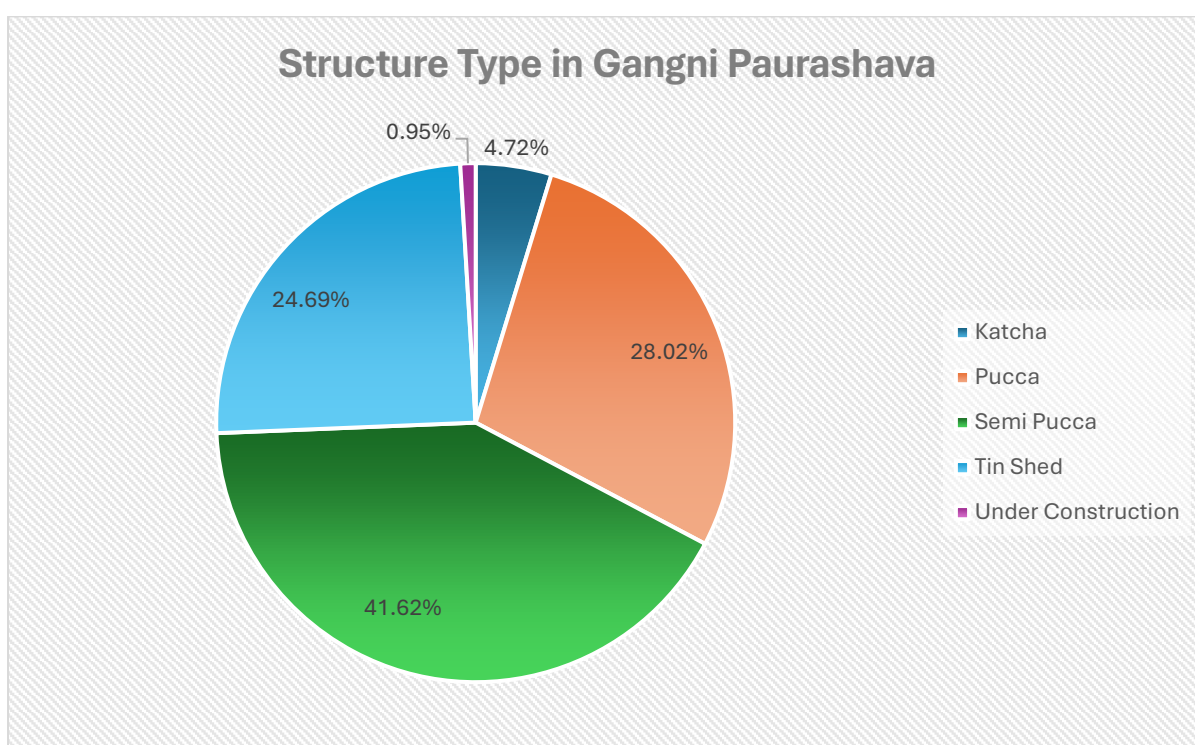
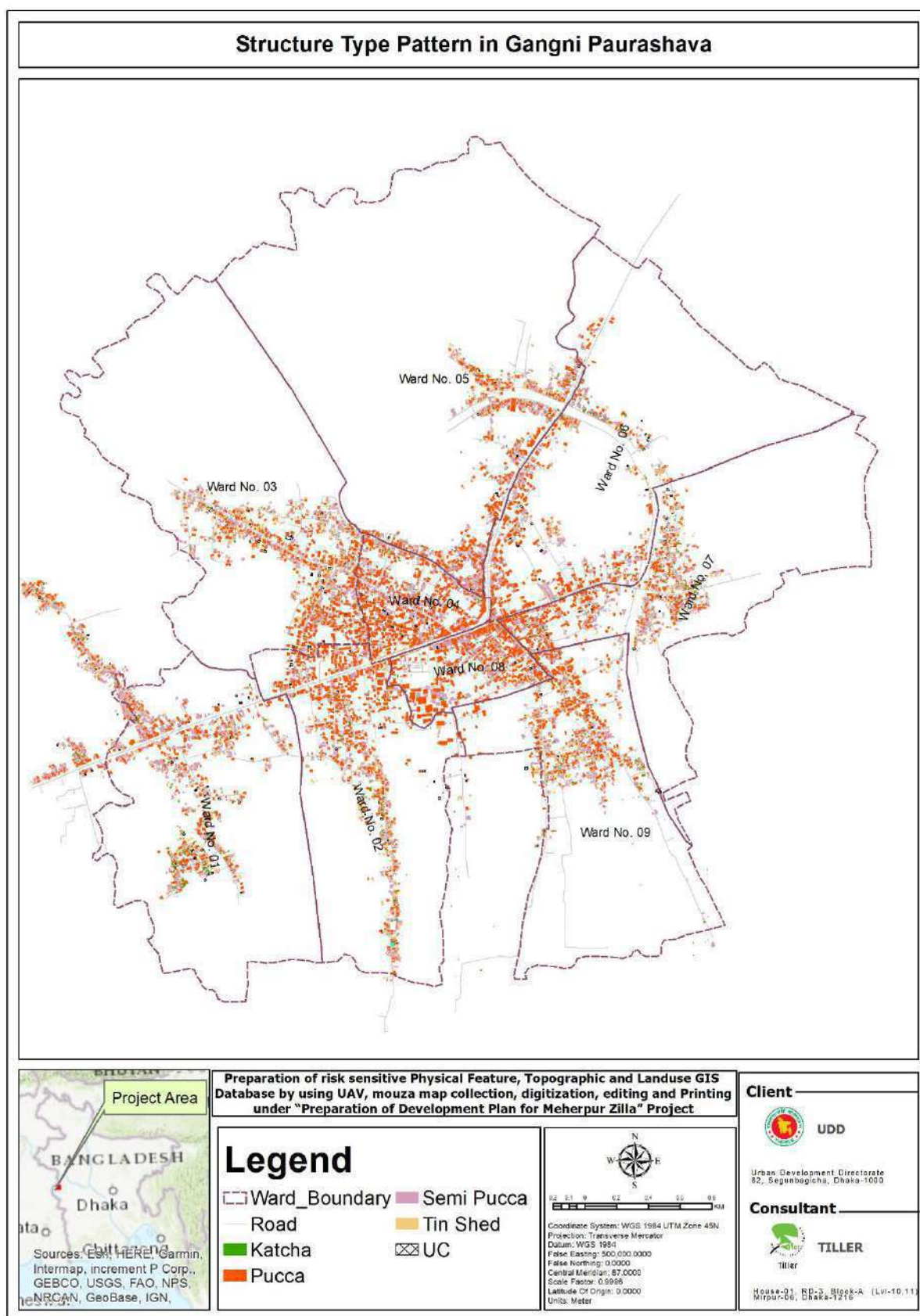


Figure 5-6: Structure Type Distribution in Gangni Paurashava



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Map 5-6: Structure Type Distribution in Gangni Paurashava

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## 5.2.2 Household Composition

Table 5-7: Household Composition in Gangni Paurashava

Household Number	Number of Structure	Percentage
0-2	2727	5.85%
3-6	28490	61.09%
7-13	9562	20.50%
14-26	4998	10.72%
27-65	860	1.84%
Total	46637	100.00%

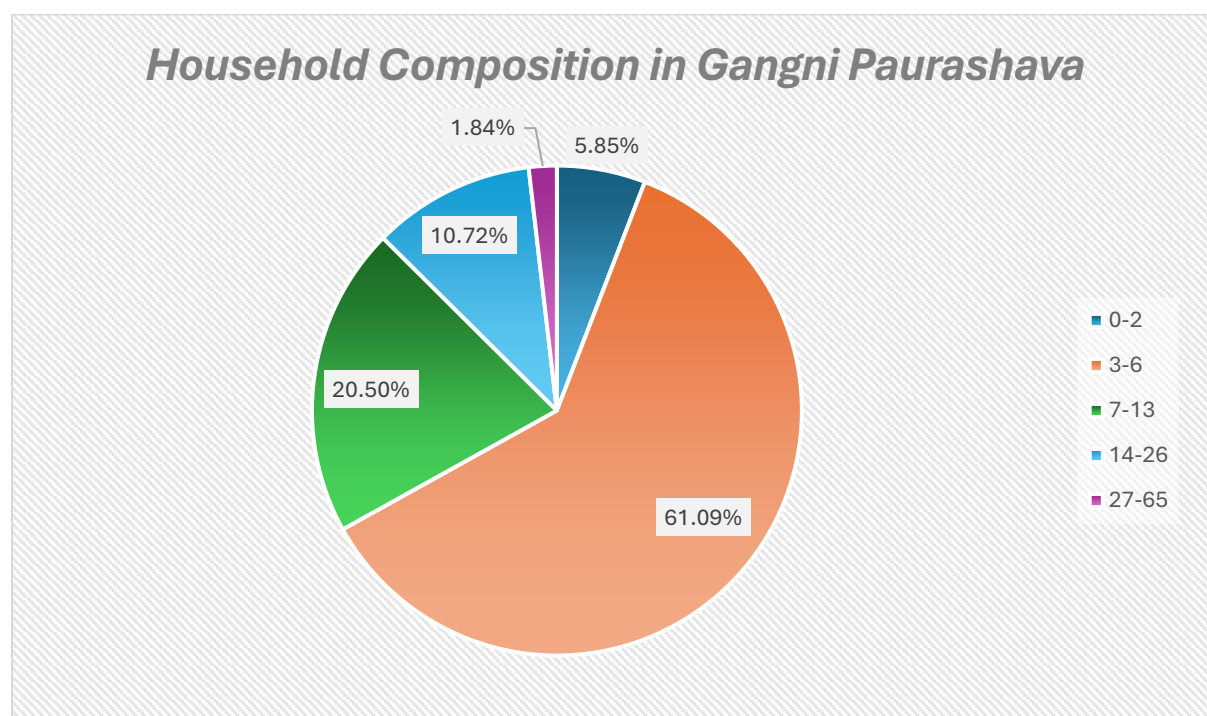
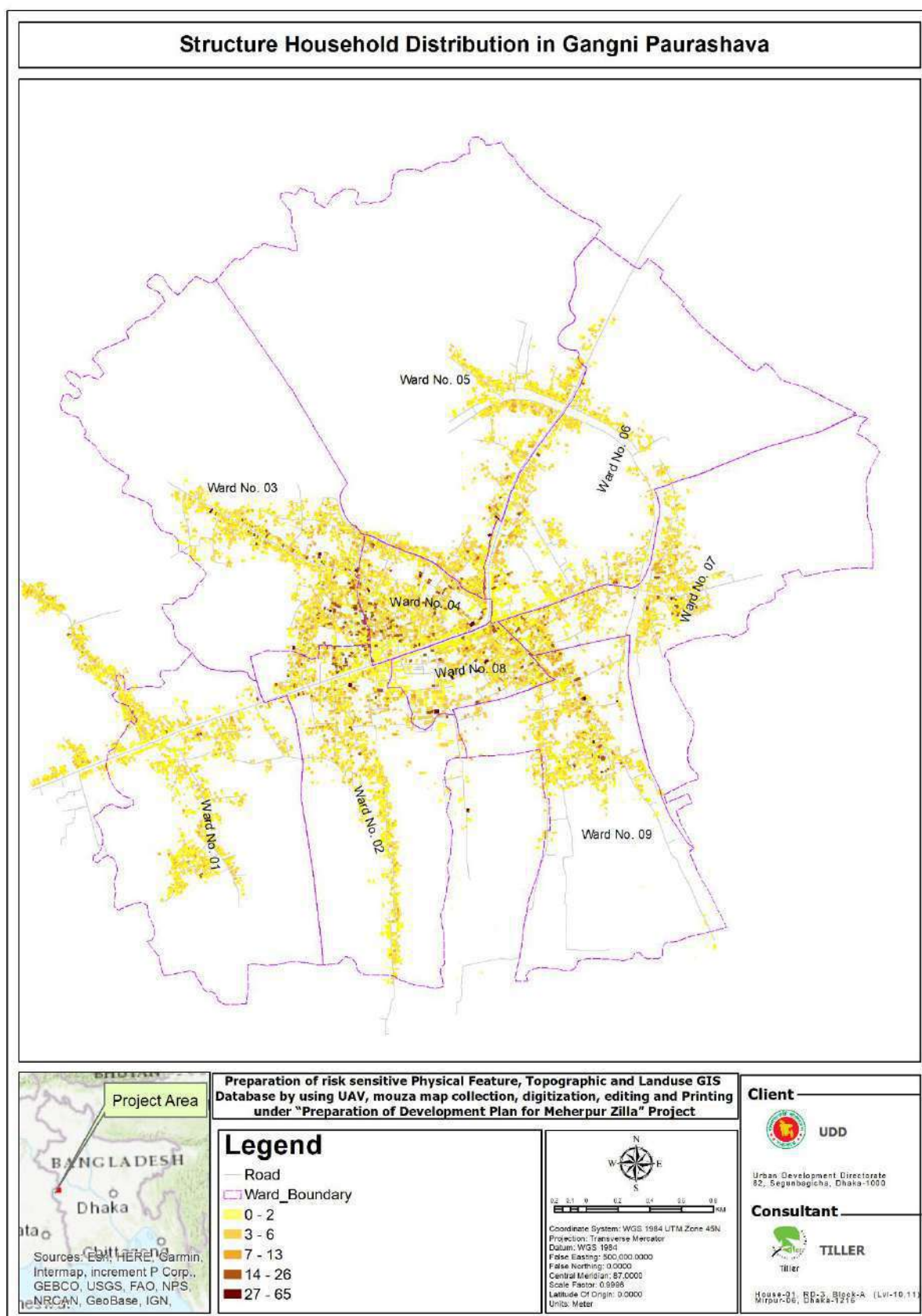


Figure 5-7: Household Composition in Gangni Paurashava

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Map 5-7: Household Composition in Gangni Paurashava

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### 5.2.3 Day Time Population

Table 5-8: Day Time Population Distribution in Gangni Paurashava

Day time Population	Number of Structure	Percentage
1-35	32284	67.42%
36-95	1032	2.16%
96-243	4653	9.72%
244-710	9915	20.71%
Total	47884	100.00%

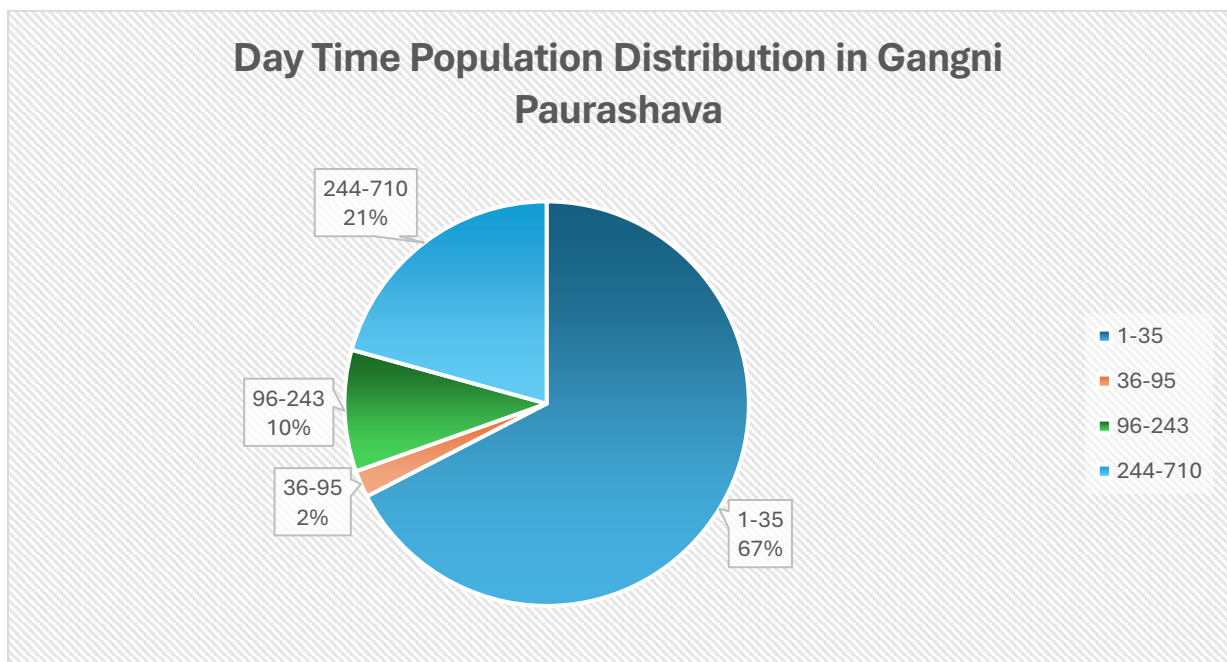
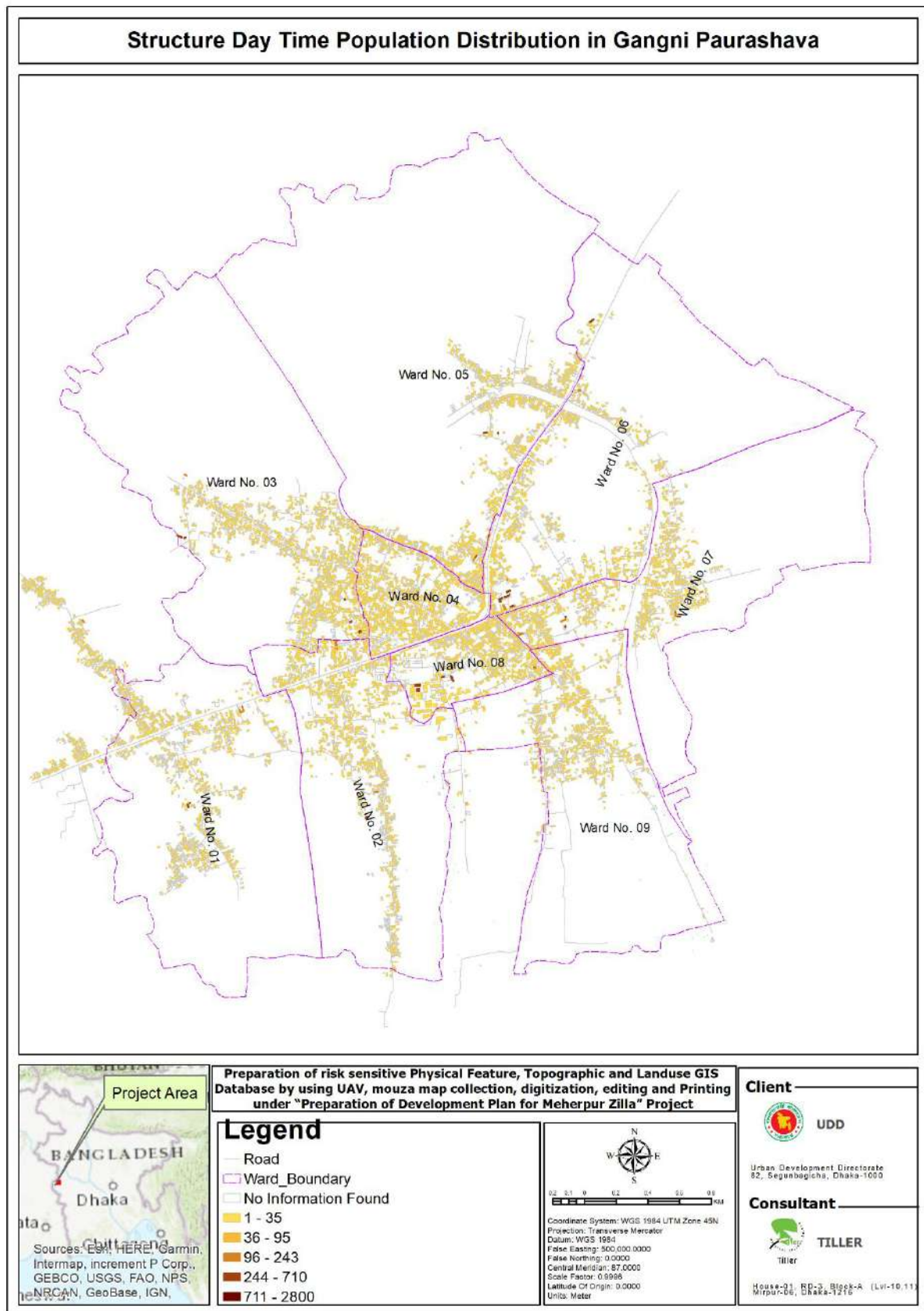


Figure 5-8: Day Time Population Distribution in Gangni Paurashava



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Map 5-8: Day Time Population Distribution in Gangni Paurashava

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#### 5.2.4 Night Time Population

Table 5-9: Night Time Population Distribution in Gangni Paurashava

Night Time Population	Number of Structure	Percentage
1-6	30581	67.01%
7-13	9313	20.41%
14-28	5035	11.03%
29-70	708	1.55%
Total	45637	100.00%

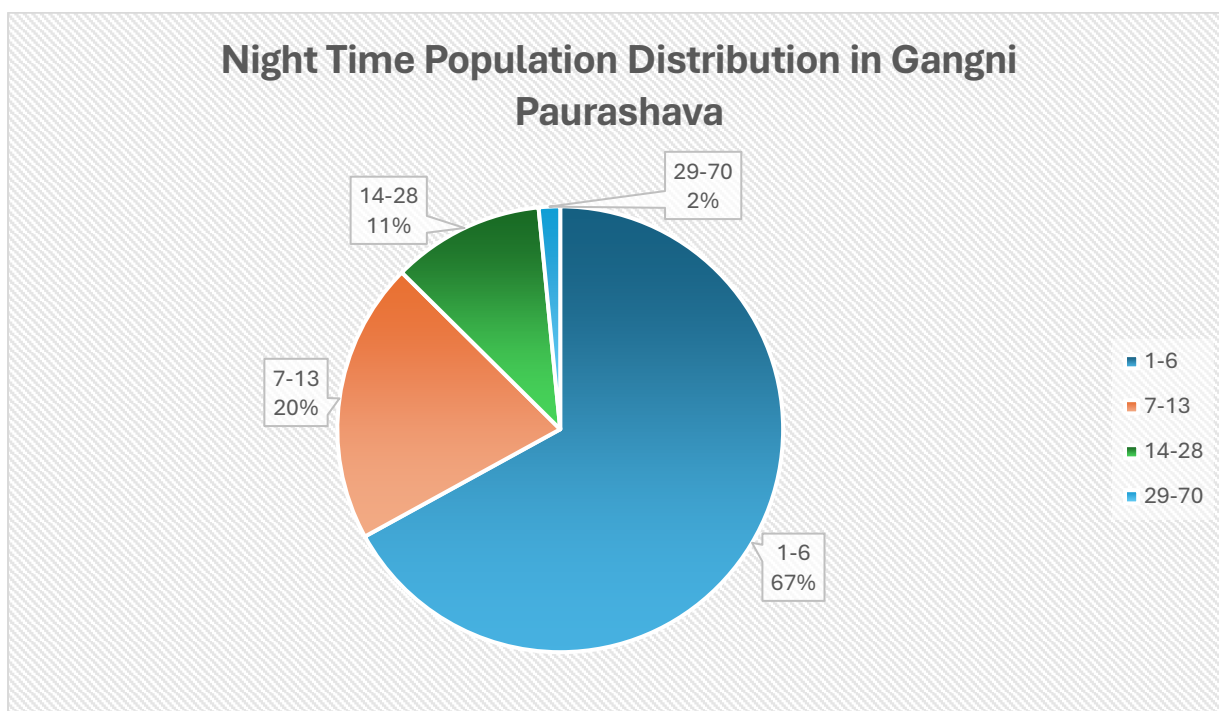
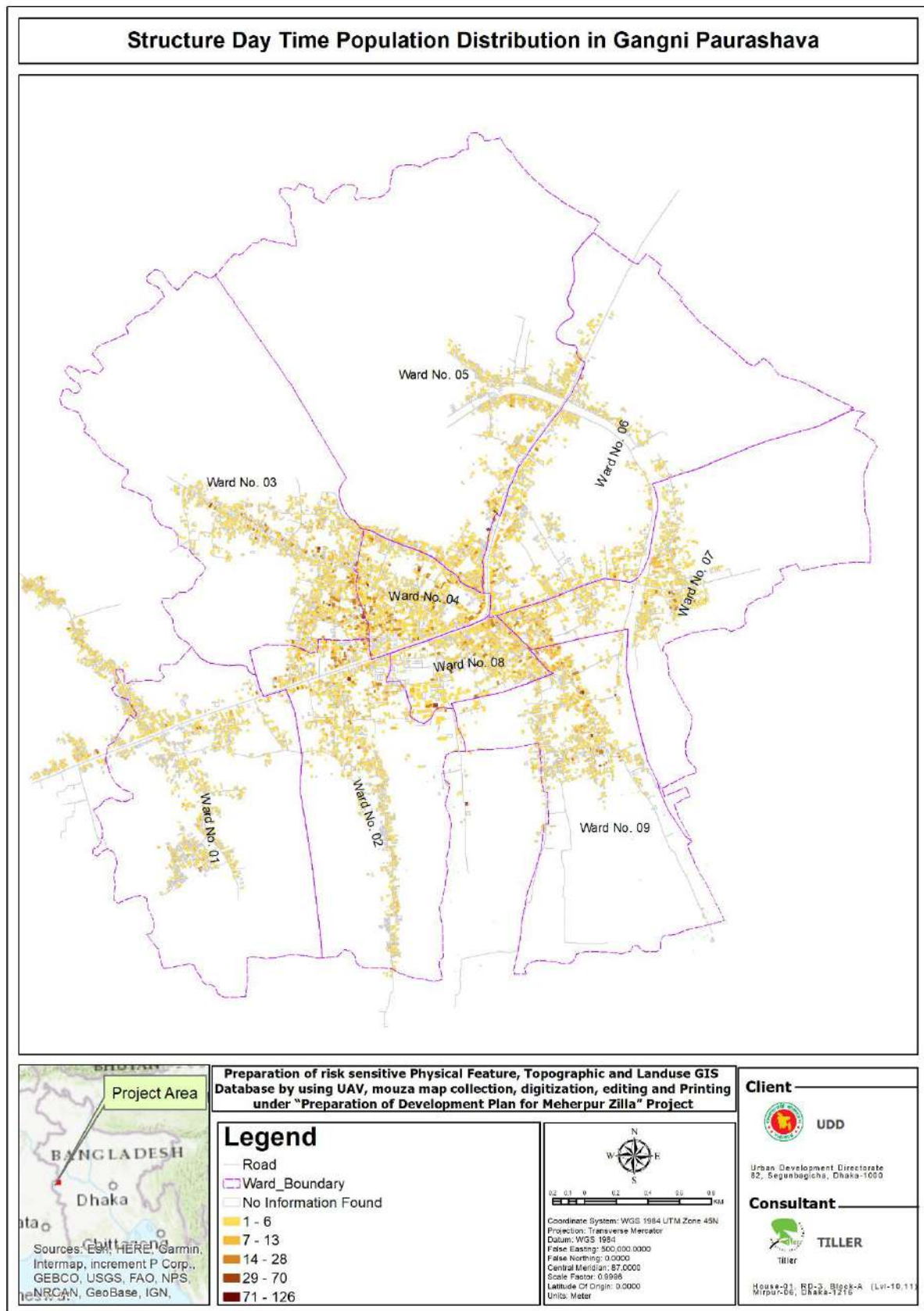


Figure 5-9: Night Time Population Distribution in Gangni Paurashava

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Map 5-9: Night Time Population Distribution in Gangni Paurashava

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### 5.3 Economy & Working Status

The following table depicts the findings of working status of the population aged 5 years and above. The analysis shows that out of the total population of 5 years and above, 34.27% are employed, 34.50% engaged in household work, 1.18% looking for work and 30.05% do not work. By sex, it is seen that the proportion of male and female in the employed population is 30.51 and 3.75 respectively. On the other hand, the proportion of male and female engaged in household work is 0.88% and 33.62%, and the same in the category of looking for work are 0.89% and 0.29% respectively. Additionally, the proportion of male and female not engaged in any work are 15.71% and 14.34% respectively.

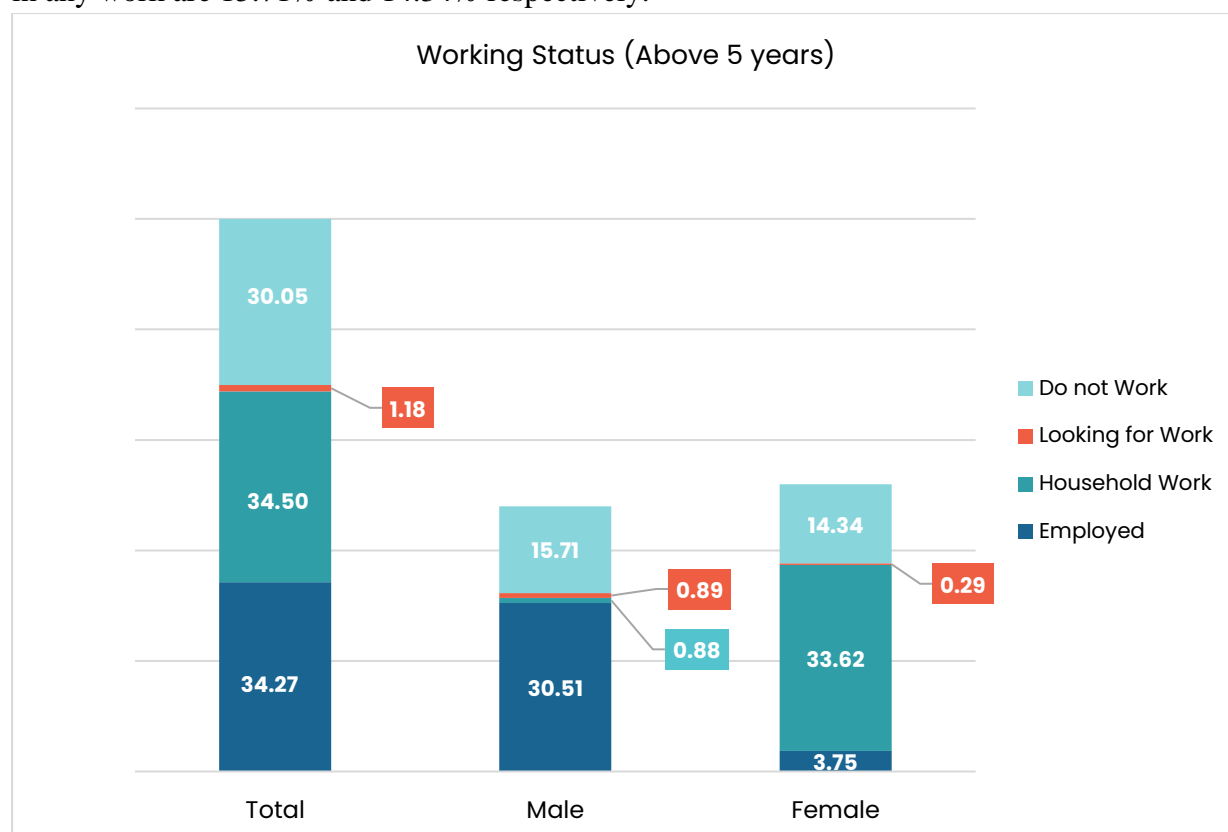


Figure 5-10: Population Aged 5 Years and above by Working Status, & Sex

Source: Population and Housing Census 2022

In Meherpur district, there are 233,700 individuals employed across various sectors. Of these, 105,309 are engaged in salaried or wage employment who receive regular compensation from an employer, typically in the form of a fixed salary or hourly wage, with 95,094 being males and 10,215 females. Additionally, 51,680 people are involved in profit-oriented work who engaged in activities aimed at generating profit, such as running their own businesses or working as freelancers, while 59,949 individuals work in household use or consumption activities who perform work primarily for household use or consumption, such as homemaking, subsistence farming, or other unpaid family labor. A further 6,762 individuals are engaged in apprenticeship-type work who are learning a trade or profession through practical experience under the supervision of skilled workers.

Table 5-10: Employed Population by Type of Work, Sex and District, 2022



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District	Total			Salary/ Wage			Profit (Business)			Household use/ Consumption (Unpaid Family Labor)			Apprenticeship		
Meherpur	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
	233700	199205	24495	105309	95094	10215	51680	46954	4726	59949	54551	5398	6762	2606	4156

Source: Population and Housing Census 2022

Approximately 45% of households in Meherpur District has an average monthly household income ranging from Tk. 5000 to 49999 in 2021, while 53.9% has an average monthly household income ranging from Tk. 50000 to 999999. A small percentage of households has income below Tk. 5000 and above Tk. 2500000.

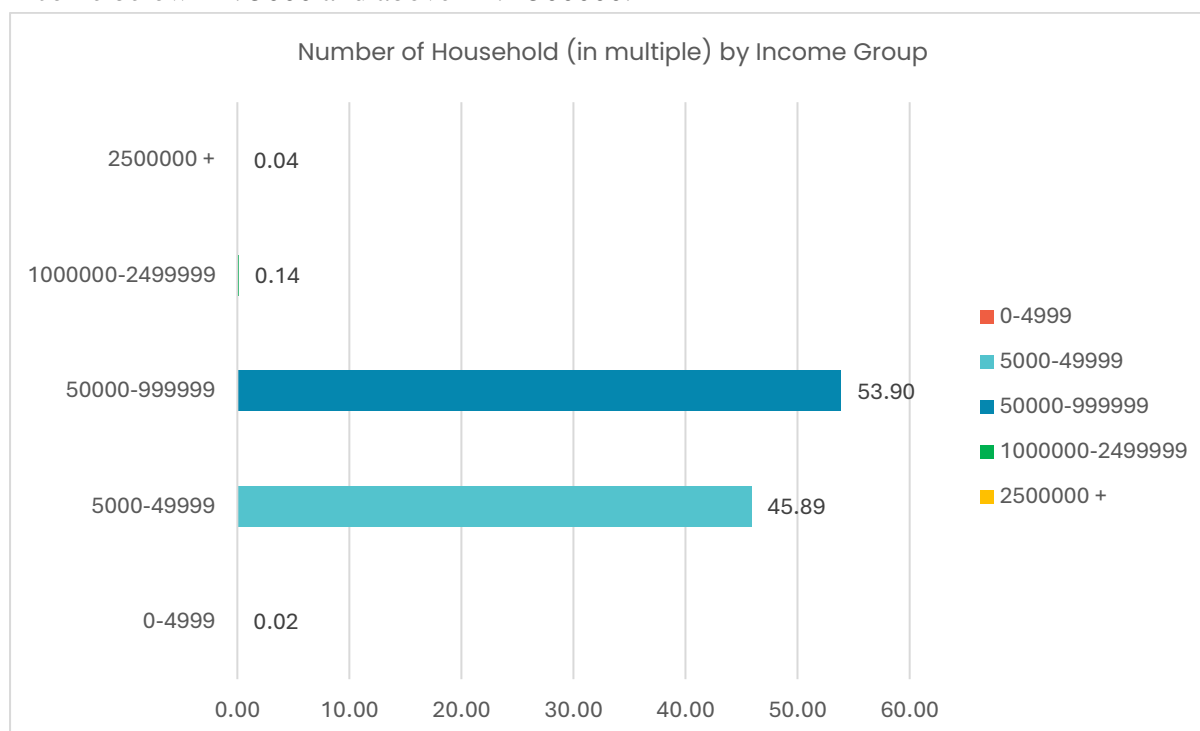


Figure 5-11: Percentage of Household by Income Group

Source: Disaster-related Statistics (BDRS), 2021

The total number of 1,01,856 persons is engaged in the total of 41,880 establishments in Meherpur district. The numbers in the following tables imply that the male has the strong dominance in the job market, while the female is still insignificant.

Table 5-11: Number of Establishments and Total Persons Engaged (TPE) by Sex, and Average Size of Establishment by Economic Activity, 2013

Sl. No.	Economic Activities	Establishments			Total Persons Engaged		
		Total	Urban	Rural	Total	Urban	Rural
	Mining and Quarrying	0	0	0	0	0	0
	Manufacturing	2155	448	1707	12232	2782	9450

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Electricity, Gas, Steam and Air Conditioning Supply	7	4	3	144	119	25
Water Supply, Sewerage, Waste Management and Remediation Activities	2	2	0	11	11	0
Construction	37	9	28	149	71	78
Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles	20675	3724	16951	44961	10380	34581
Transportation and Storage	9428	1494	7934	15892	2781	13111
Accommodation and Food Service Activities (Hotel and Restaurants)	2163	408	1755	4745	1011	3734
Information and Communication	66	25	41	275	106	169
Financial and Insurance Activities	193	99	94	1538	973	565
Real Estate Activities	4	1	3	8	2	6
Professional, Scientific and Technical Activities	303	162	141	1000	732	268
Administrative and Support Service Activities	117	61	56	306	164	142
Public Administration and Defense, Compulsory Social Security	211	113	98	2777	1919	858
Education	716	111	605	5836	914	4922
Human Health and Social Work Activities	485	127	358	1836	735	1101
Art, Entertainment and Recreation	25	3	22	33	4	29
Other Service Activities	5293	978	4315	10113	2126	7987
Total	41880	7769	34111	101856	24830	77026

Source: Economic Census, 2013

In Meherpur district, out of a total of 223,700 employed individuals, 136,513 work in the agricultural sector, comprising 118,545 males and 17,968 females. There are 10,880 people employed in the industrial sector. The service sector employs 76,307 individuals in various capacities.

Table 5-12: Employed Population by Sector, Sex, District and Location, 2022

District	Total			Agriculture			Industry			Service		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Meherpur	223700	199205	24495	136513	118545	17968	10880	10444	436	76307	70216	6091
Rural	173943	154949	18994	116255	100711	15544	7635	7338	297	50053	46900	3153
Urban	49757	44256	5501	20258	17834	2424	3245	3106	139	26254	23316	2938

Source: Population and Housing Census 2022

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## 5.4 SDG Indicators for Meherpur District

The Sustainable Development Goals (SDGs) indicators for Meherpur district, as highlighted in the Population and Housing Census 2022, are as follows:

Table 5-13: SDG Indicators for Meherpur District

Indicator	Percentage
4.2.2: Participation rate in organized learning (one year before the official primary entry age) by sex.	60.98
5.b.1: Proportion of individuals (15 years & above) who own a mobile phone by sex	63.76
6.2.1: Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water.	59.14
6.2.1.a: Proportion of population using safely managed sanitation services.	77.03
7.1.1: Proportion of population with access to electricity. (*Excluding Floating Population)	99.67
7.1.2: Proportion of population with primary reliance on clean fuels and technology. (*Excluding Floating Population) As data on clean technology has not been collected. Few fuels were not evaluated (i.e., Kerosine, Paraffin etc.)	5.72
8.6.1: Proportion of youth (aged 15-24 years) not in education, employment or training.	37.6
8.10.2: Proportion of adults (15 years and above) with an account at a bank or other financial institution or with a mobile-money-service provider.	44.74
11.1.1: Proportion of urban population living in slums, informal settlements or inadequate housing.	0.36
17.8.1: Internet User (15 years & above)	35.38

Source: Population and Housing Census 2022

In Meherpur district, the percentage of individuals aged 5 years and above who own a mobile phone is 53.56%. Among males, this ownership rate is 68.99%, while among females, it is 40.22%. In rural areas, 51.88% of the population owns a mobile phone, whereas in urban areas, this figure rises to 59.32%. For those aged 15 years and above, the ownership rate increases to 63.76%, with 81.93% of males and 47.48% of females owning a mobile phone.

Table 5-14: Population having Mobile Phone for Own Use by Sex, District and Location

District	Total			Rural			Urban		
Meherpur	5 Years and Above								
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	53.56	68.00	40.22	51.88	67.23	37.77	59.32	70.63	48.71
	15 Years and Above								
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	63.76	81.93	47.48	61.76	80.96	44.63	70.63	85.25	57.37

Source: Population and Housing Census 2022

In Meherpur district, the overall percentage of internet users aged 5 years and above is 31.45%. Among males, the internet usage rate is 39.21%, while among females, it is 24.28%. In rural areas, 29.14% of the population uses the internet, compared to 39.38% in urban areas. For those aged 15 years and above, the internet usage rate is 35.38%, with 44.91% of males and 26.84% of females using the internet. In rural areas, 32.96% of individuals use the internet, whereas in urban areas, this figure rises to 43.68%.

Table 5-15: Internet User by Sex, District and Location

District	Total	Rural	Urban
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Meherpur	Total	Male	Female	Total	Male	Female	Total	Male	Female
	5 Years and above								
	31.45	39.21	24.28	29.14	36.94	21.98	39.38	46.94	32.30
	15 Years and above								
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	35.38	44.91	26.84	32.96	42.51	24.45	43.68	53.11	35.13

Source: Population and Housing Census 2022

In Meherpur district, a total of 23.35% of the population holds accounts in financial institutions such as banks, insurance companies, micro-credit organizations, or post offices. The rate of account ownership is higher among men, with 29.52% of males having accounts compared to 17.83% of females. In rural areas of Meherpur, 21.14% of the population has financial accounts. This contrasts with urban areas, where the figure rises to 30.98%, with 38.09% of men and 24.52% of women holding accounts.

Table 5-16: Population Aged 15 Years and above having Account in Financial Institution by Sex, District and Location

District	Total			Rural			Urban		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Meherpur	23.35	29.52	17.83	21.14	27.01	15.90	30.98	38.09	24.52

Source: Population and Housing Census 2022



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## **CHAPTER 6: SOCIAL AND URBAN INFRASTRUCTURE**

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### **6.1 Background of The Study**

Meherpur, a district of notable historical and cultural importance, holds a unique position in the national landscape due to its rich heritage, agricultural productivity, and emerging economic potential. Known for its fertile land and scenic beauty, Meherpur has long served as a key agricultural hub, contributing significantly to the local and regional economy. However, despite these strengths, the district faces several development challenges that hinder its full potential. These include inadequate infrastructure, persistent socio-economic inequalities, and limited access to quality services. Recognizing these opportunities and challenges, the socioeconomic survey was designed to provide a detailed and realistic understanding of the current conditions in the area. The survey aims to capture critical data on demographic trends, livelihoods, education, income levels, and other socio-economic indicators that influence the quality of life in the district. Special attention is given to identifying service gaps and areas requiring targeted interventions. To ensure the reliability and accuracy of the data, the mobilization phase of the study was carefully planned and executed. This phase involved the deployment of trained personnel, the use of structured data collection tools, and the integration of modern technologies such as GPS-enabled devices and digital survey platforms. A coordinated field approach helped streamline data gathering, reduce errors, and ensure realtime monitoring. By grounding the survey in a robust methodological framework, the study supports evidence-based decision-making and provides a strong foundation for future planning and development initiatives in Meherpur.

#### **6.1.1 Historical Events of the Project Area**

There are two preeminent pieces of information about the name of Meherpur. One is the name of Meherpur, after some time, in conjunction with the name of a person named Islam, according to the name of a person named Meher Ali. The name of Meherpur was started after some time. The spread of Islam began from the beginning of Muslim rule in this region. Hazrat Khan Jahan Ali (R), started spreading Islam widely in the areas of greater Kushtia, Jessore, Khulna, Barobazar, Chuadanga, and Meherpur. Pir Khan Jahan Ali went to Bagerhat on Barobazar via Meherpur on the way to Bhairab from Gaur. At that time, it is said that there were 360 saints and 60 thousand soldiers. He hoisted the flag of Islam in the southern part of the country and established a settlement and governance system. At the same time in this region, the arrival of Allah's blessed personality came to be several Islamists. Shah Alai, Shah Alai and Enayet Ullah are notable. The name of Meherpur was established in line with the name of Durga Mehr Ali Shah, the goddess of Purna Atna Islam. It is known that Meher Ali was very well known as a very influential and famous spiritual person. The second aspect of the origin of the Namharpur name is to be noted here, in the travelogue of the East Bengal Railway, Mihir and his own son-in-law Khanna (famous for Khana Bachchan) lived in this region on the banks of the Bhairab river. It is assumed that named after Meherpur in Mihirpur and later in the subconscious, named after him. Declaration of Independence, Bangladesh's official declaration of independence of Bangladesh on April 17, 1971. During the Liberation War, the expatriate Mujibnagar

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Government came into effect as the interim Constitution of the country. Even before the formation of the new constitution of independent Bangladesh on 16 December 1972, this declaration was effective as the country's constitution. On 25 March 1971, the Pakistani Awami League leaders, Constituencies, and provincial council members took refuge in India on the pretext of attacking the people in Dhaka and other parts of East Pakistan during the Pakistani military on March 25, after crossing the border for safety. Many of them gathered in Calcutta by March 30th. The members of the Constituent Assembly and the Provincial Assembly met in Calcutta on April 10, forming an Expatriate Legislative Council and formulating the Declaration of Independence. On 17 April, a member of the Constituent Assembly, M Yusuf Ali, officially announced the Declaration of Independence at an informal ceremony at Vaidyanathata (present-day Mujibnagar) on the border of Meherpur district. With the announcement, the newly formed Legislative Assembly declared the independence and sovereignty of Bangladesh. In this announcement, the expatriate Mujibnagar government was considered to be valid, and in this announcement, it was instructed to set up a chain of command among all those who participated in the liberation war.

## **6.2 Objectives of the Study**

The objectives of the work comprise the following:

- a) Identify the socio-economic condition of the people of different strata and minority groups including tribes, and also identify people's aspirations, attitudes, and opinions towards the development of the area
- b) Identification of needs and demands of the inhabitants for their development and the project area as a whole.
- c) Prepare people-oriented, demand-driven planning and other relevant planning packages for the region.
- d) Preparation of the physical quality of life index (PQLI) of the inhabitants of the project area.
- e) Preparation of Socio-economic and other related survey reports containing spatial translation from the output of the survey findings.

## **6.3 Scope of Work**

The survey firm will conduct all necessary socio-economic and other surveys and studies for the project, prepare working papers on the relevant fields under study, and assist the UDD team members in preparing the final plan and all relevant reports till completion of the project.

At the same time, the firm would extend all necessary assistance, particularly in gathering and procuring all relevant socio-economic and cultural attribute data of each feature within the project area; GIS database operation and management, analysis, and preparation of all maps and reports till completion of the project. The firm shall also arrange workshops/seminars on collected data and information, findings, interpretation, and working papers, and conduct other ancillary activities relating to the project activities as directed by the PD, wherever necessary. UDD project team would conduct all PRA sessions and the survey firm would extend necessary assistance in communication with the mayor, ward councilors, Union Parishad Chairman, and other stakeholders as directed by PD for arranging the PRA sessions and collect all relevant

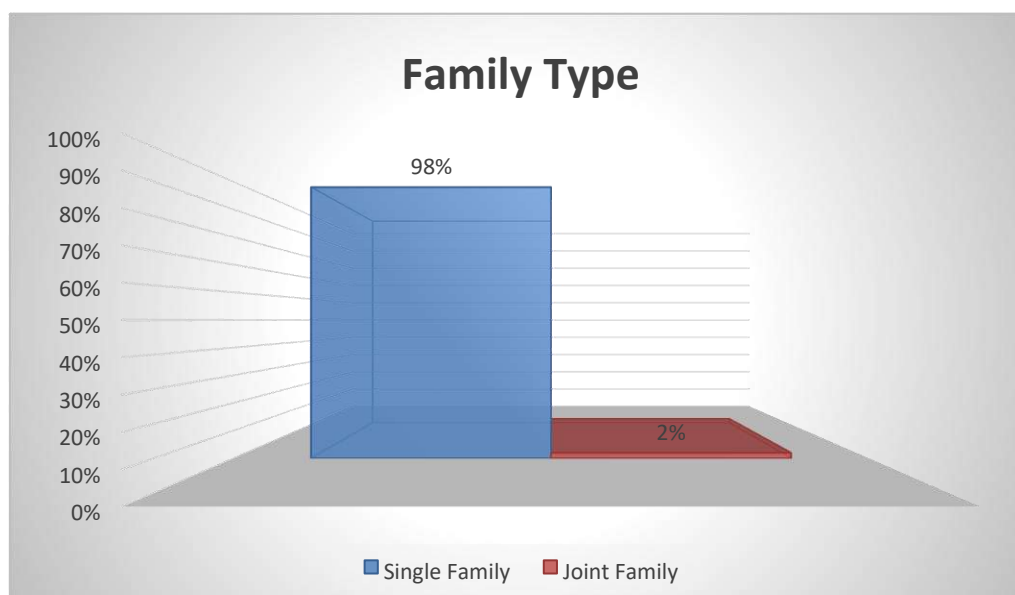
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data and information through a digital survey and upload the collected data to the website instantly through an online communication device; at the end of each month submit a report containing all information that has been uploaded to the website and ensure that all data and information are accessible to viewer.

The survey firm shall be responsible for the quality of data and information collected, data processing, cleaning and editing, and presentation into tabular form, including preparation of working papers as required by PD. The survey firm shall deliver all raw and processed data and working papers containing guidelines for preparing the planning package. It would emphasize the tourism development in and around Meherpur Upazila and the local people's livelihood needs and demands.

## 6.4 Socio-Economic Condition of Meherpur Pourshava

### 6.4.1 Family Type of Meherpur Pourshava

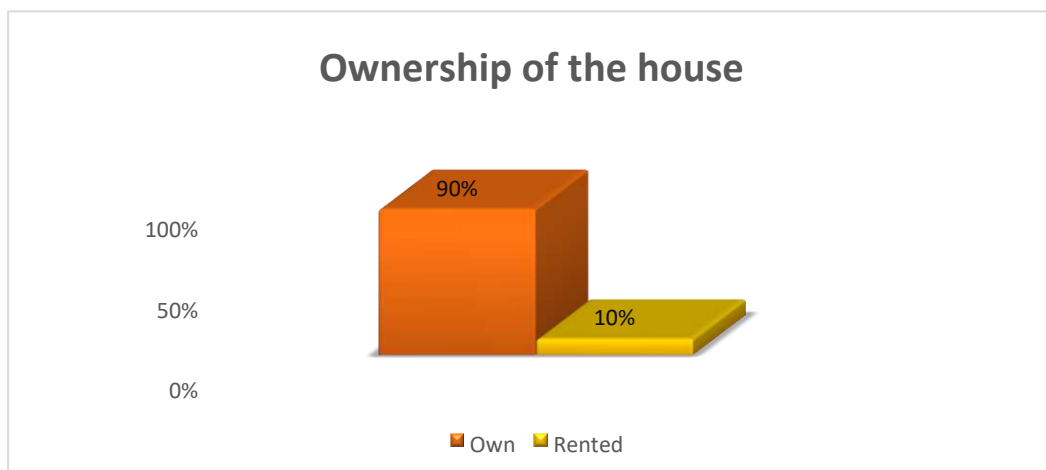


*Figure 6-1: Family Type of Meherpur Pourshava*

The chart illustrates the distribution of family types, showing that an overwhelming majority, 98%, belong to single-family households, while only 2% are part of joint families. This indicates a strong dominance of nuclear family structures within the surveyed population. The data suggests a trend toward smaller household units, possibly reflecting modern societal shifts such as urbanization, individualism, or economic factors favoring nuclear families over traditional joint family setups.

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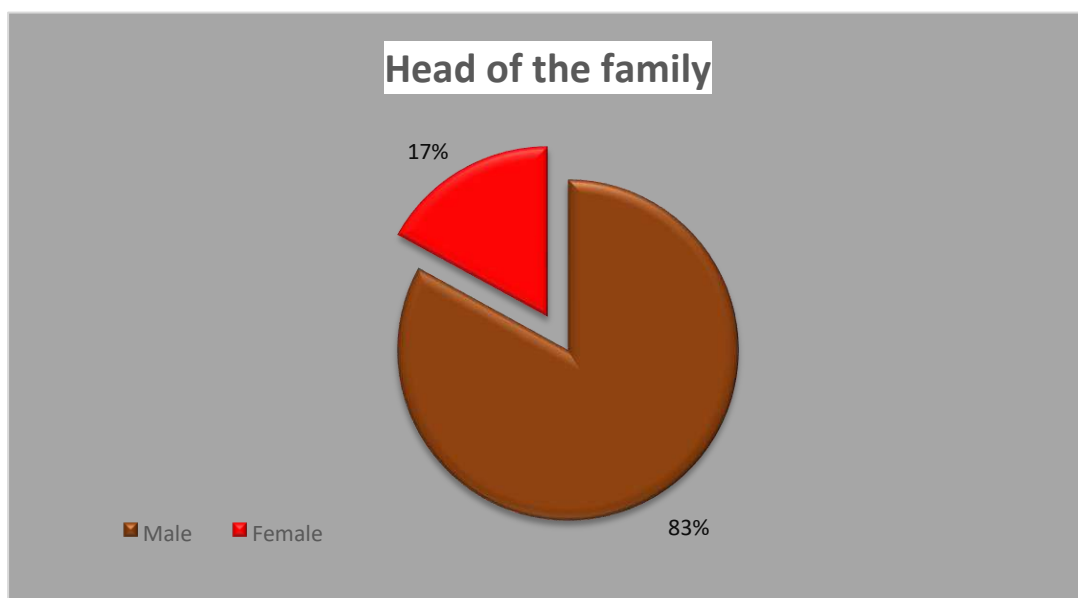
#### 6.4.2 Ownership of the Houses



*Figure 6-2: Ownership of houses of Meherpur Pourshava*

The bar chart titled "Ownership of the house" illustrates the proportion of families based on whether they own or rent their homes. According to the data, a vast majority of families—**90%**—own their homes, while only **10%** live in rented accommodations. This significant disparity suggests a high rate of home ownership within the surveyed population, which may reflect economic stability, access to property, or cultural preferences for owning property rather than renting.

#### 6.4.3 Head of the Family Members



*Figure 6-3: Head of the family of Meherpur Pourshava*

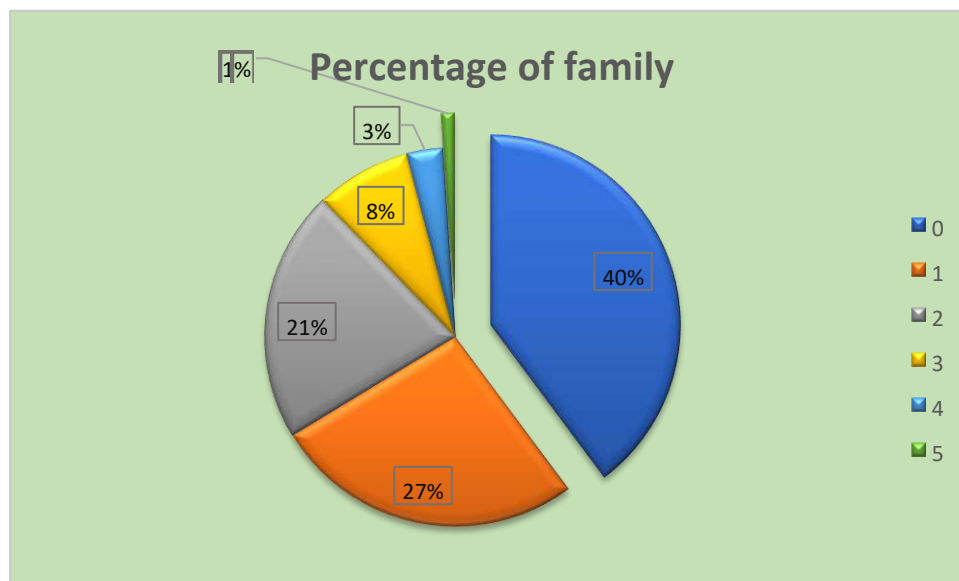
This chart illustrates the gender distribution of family heads. According to the chart, **83%** of families are headed by **males**, while only **17%** are headed by **females**. This significant gender disparity indicates that the traditional role of males as primary decision-makers within households remains dominant. Although a smaller percentage, the presence of femaleheaded



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families highlights a shift toward gender diversity in household leadership, which may be influenced by factors such as widowhood, migration, employment, or changing social norms.

#### 6.4.4 Number of Educated Family Members



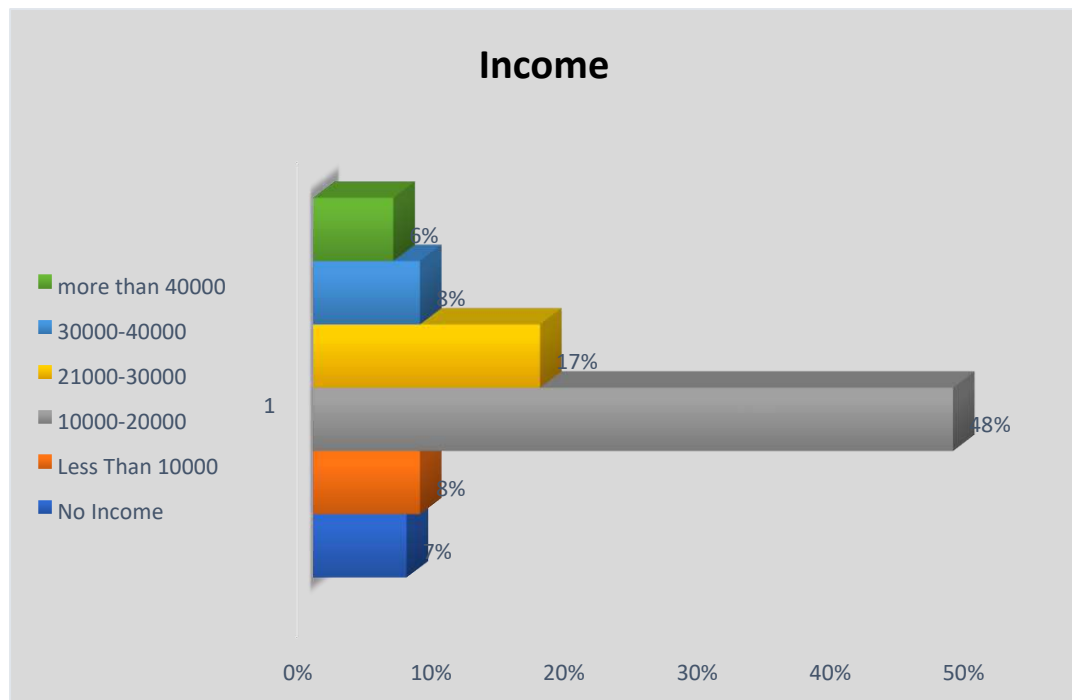
*Figure 6-4: Educated members in families of Meherpur Pourshava*

The pie chart titled "Percentage of family" shows the distribution of families based on the number of educated members within each household, ranging from zero to five. A significant portion of families, 40%, have no educated members, indicating a widespread lack of access to education or low literacy levels. Families with one educated member account for 27%, suggesting that in many households, only a single individual has received formal education. About 21% of families have two educated members, while smaller percentages are seen as the number of educated members increases—8% have three, 3% have four, and only 1% of families have five educated members. This data highlights a clear trend where the number of educated individuals per family decreases significantly as the count rises, pointing to a need for enhanced educational outreach and support across families.

#### 6.4.5 Income

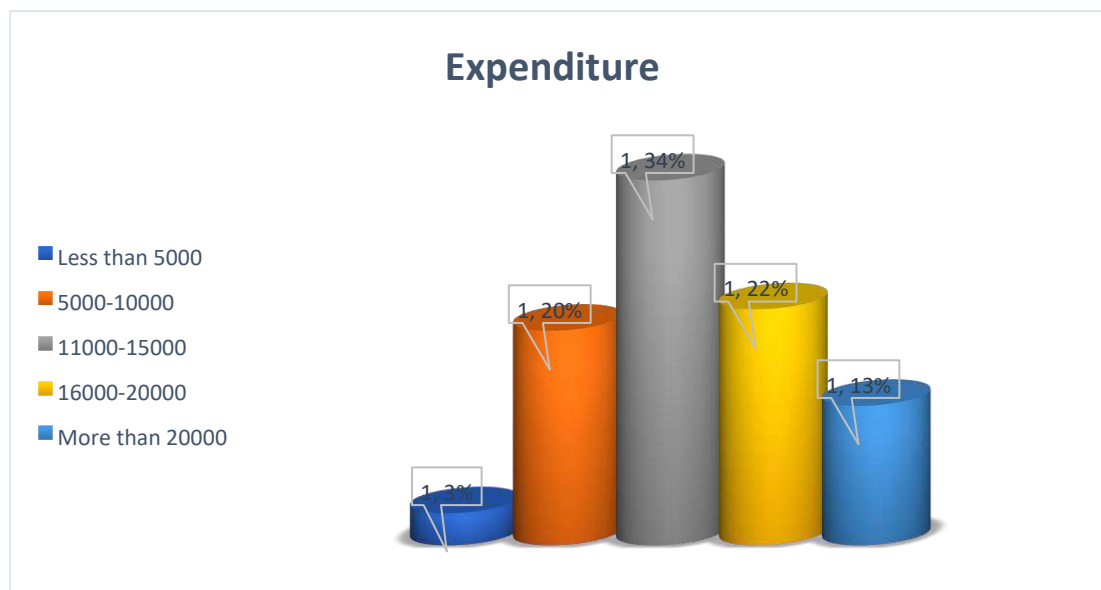
The bar chart displays the distribution of families based on their monthly income levels. The largest portion of families, **48%**, falls within the income range of **10,000–20,000**, indicating that nearly half of the population earns a modest income. This is followed by **17%** of families earning between **21,000–30,000**, and **8%** each earning **less than 10,000** and **30,000–40,000**. Meanwhile, **7%** of families report having **no income at all**, and **6%** earn **more than 40,000**, the highest income bracket represented. The data reflects a concentration of families in the lower to mid-income ranges, highlighting potential economic challenges and a need for targeted support to improve income levels in the community

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*Figure 6-5: Income of the family of Meherpur Pourshava*

#### 6.4.6 Expenditure



*Figure 6-6: Income of the family of Meherpur Pourshava*

The bar chart titled "**Expenditure**" illustrates the distribution of families based on their monthly household spending. The largest group, comprising **34%** of families, spends between **11,000 and 15,000** units of currency per month. Following this, **22%** of families fall into the **16,000– 20,000** expenditure range, and **20%** spend between **5,000 and 10,000**. A smaller share, **13%**, report spending **more than 20,000**, while only **3%** of families spend **less than 5,000** per month. These figures suggest that the majority of families have moderate monthly expenditures, reflecting an average lifestyle with limited spending at either extreme.

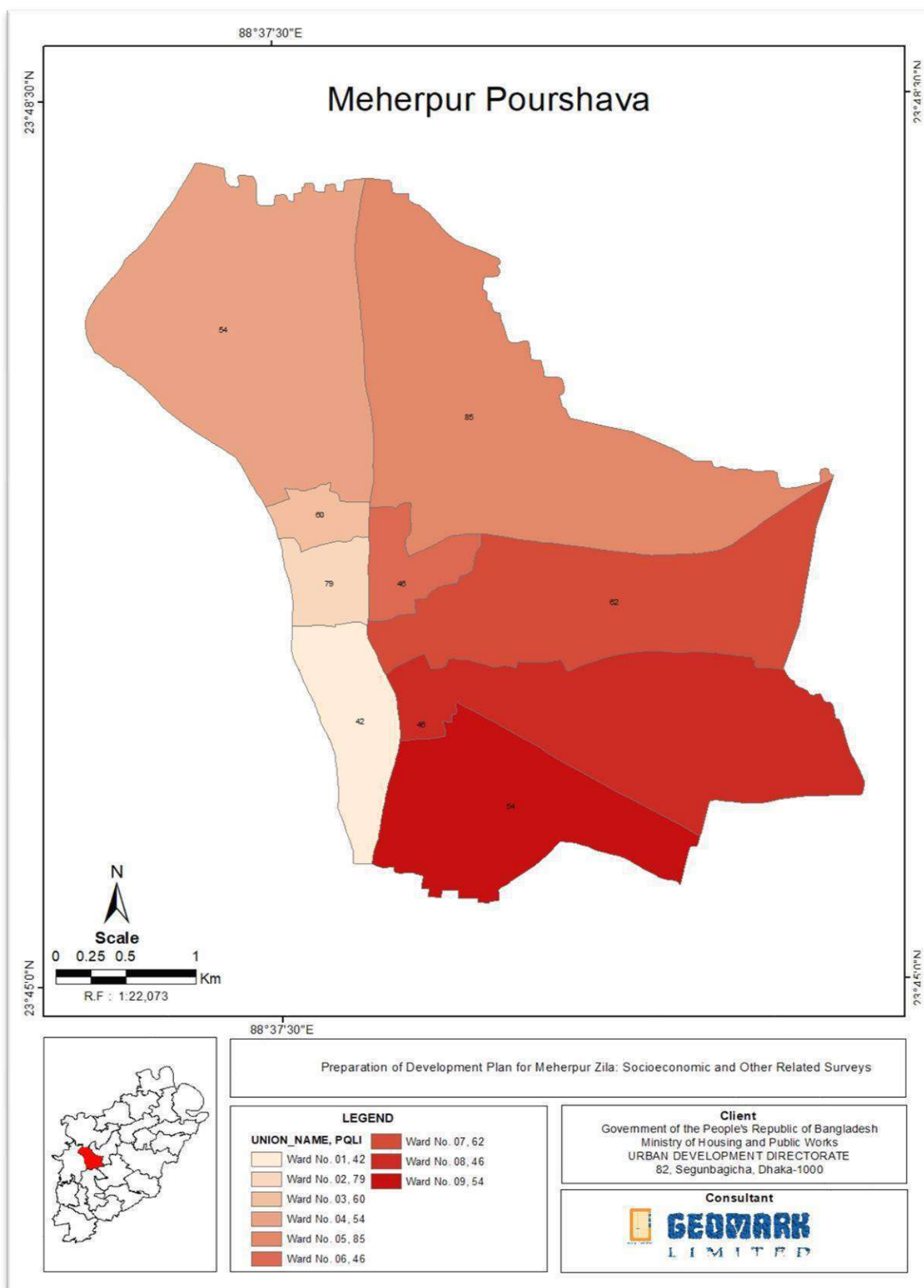
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#### **6.4.7 Physical Quality of Life Index:**

This figure illustrates the Physical Quality of Life Index (PQLI) across the wards of Meherpur Pourashava, offering a spatial understanding of living standards within the municipality. PQLI is a composite indicator that reflects basic human needs, typically including literacy rate, infant mortality, and life expectancy. In this map, the wards are color-coded based on their respective PQLI scores, where darker shades represent higher index values, indicating better living conditions.

Notably, Ward No. 05 stands out with the highest PQLI value of 85, suggesting superior access to essential services and quality of life. In contrast, Ward No. 01 has the lowest PQLI score of 42, highlighting areas where developmental attention is most needed. The variation in PQLI across the wards underscores the disparities in socioeconomic conditions within Meherpur Pourashava. This visualization is a critical tool for guiding policy and resource allocation, helping planners identify priority areas for intervention to improve the overall quality of life for residents.

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*Map 6-1: Physical Quality of Life Index of Meherpur Pourshava*

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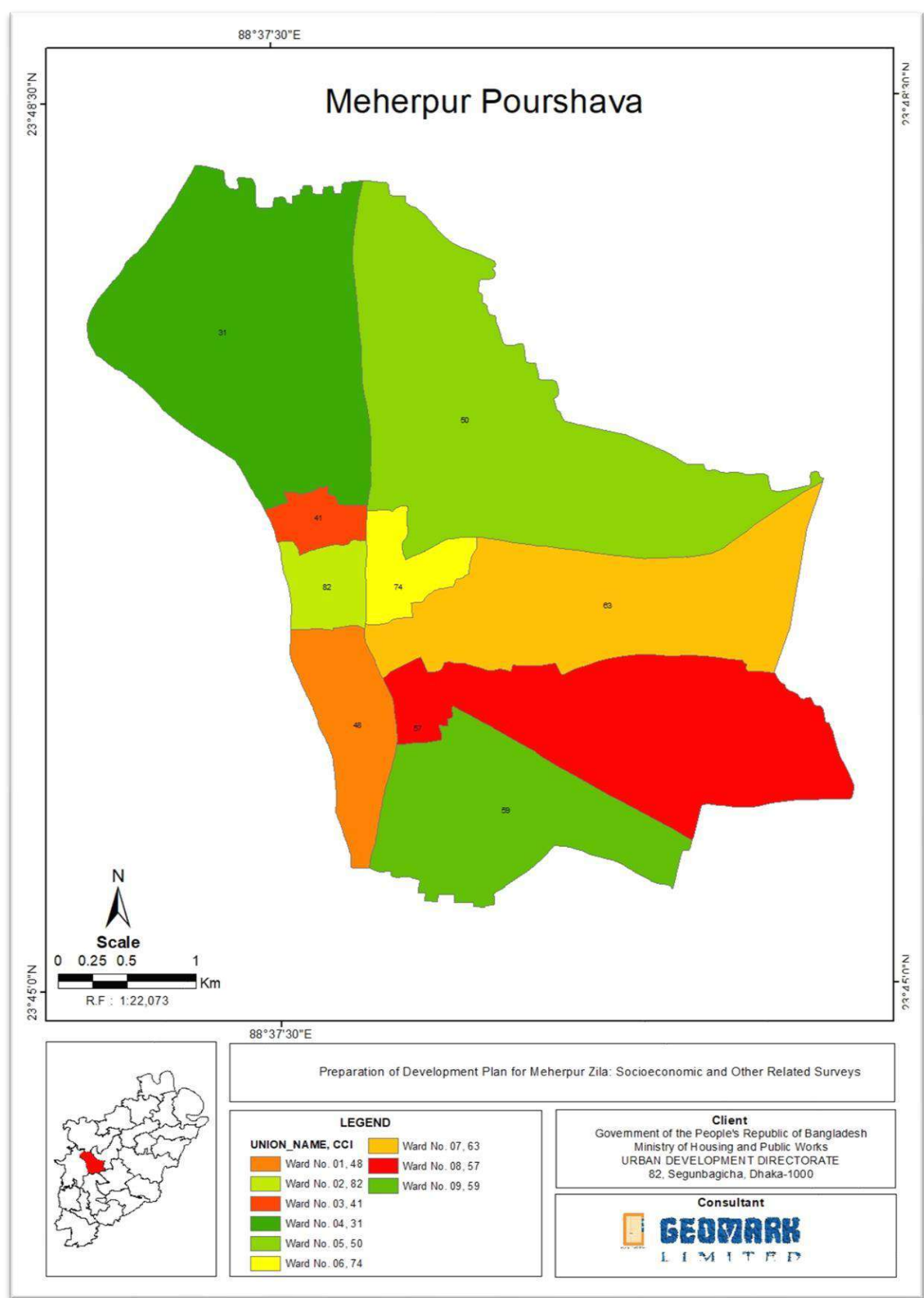
#### **6.4.8 Cultural Capital Index of the Pourshava**

The map titled “**Meherpur Pourashava**” provides a ward-level visualization of the **Cultural Capital Index (CCI)**, an important socio-spatial indicator used in the preparation of the Development Plan for Meherpur Zila. The CCI reflects the cultural vibrancy, heritage assets, social participation, educational opportunities, and access to cultural infrastructure across the municipal wards. Each ward is color-coded based on its CCI score, with the legend specifying numerical values and associated colors. Wards shaded in **green**, such as **Ward No. 04 (CCI 31)**, **Ward No. 05 (CCI 50)**, and **Ward No. 09 (CCI 59)**, represent areas with relatively high cultural capital, suggesting better access to educational institutions, libraries, community centers, and cultural practices.

In contrast, **Ward No. 03 (CCI 41)** and **Ward No. 08 (CCI 57)** are shaded **red**, indicating a lower cultural capital presence, possibly due to limited cultural infrastructure or community engagement. **Ward No. 02 (CCI 82)** and Ward No. 06 (CCI 74) score higher and are represented in **light green and yellow**, highlighting moderate to strong cultural presence. This spatial differentiation is vital for identifying culturally deprived areas and directing policy and development efforts towards promoting inclusive cultural growth and social development. By mapping CCI across Meherpur Pourashava, planners and decision-makers can better allocate resources to enhance cultural equity and foster community identity across all municipal wards.



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Map 6-2: Cultural Capital Index of Meherpur pourshava

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#### **6.4.9 Quality of Infrastructural Index of Meherpur Pourshava**

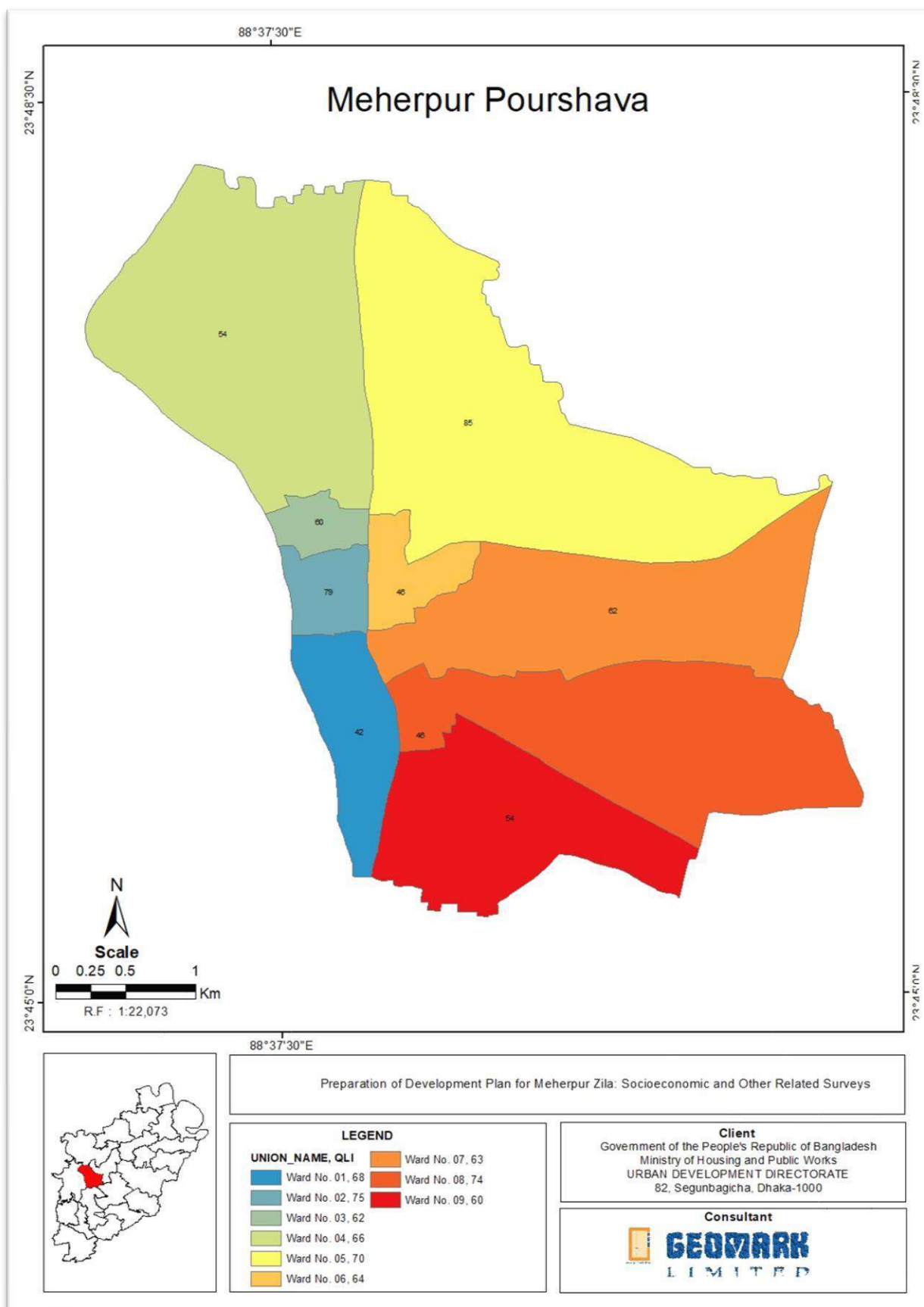
The map illustrates the Quality of Infrastructure Index (QLI) across different wards within Meherpur Pourashava, located in Meherpur Zila. The QLI values range from 60 to 85, indicating varying levels of infrastructural development in the area.

Each ward is represented with a unique color corresponding to its QLI score:

- Ward No. 07 (QLI 63) and Ward No. 08 (QLI 74) are located in the central and southern parts, showing moderately good infrastructure.
- Ward No. 01 (QLI 68) and Ward No. 05 (QLI 70) are in the western and southerncentral regions, indicating slightly above-average infrastructure.
- Ward No. 02 (QLI 75) shows relatively strong infrastructural quality and lies in the central-western zone.
- Ward No. 03 (QLI 62) and Ward No. 09 (QLI 60) are among the lower-scoring areas, located in the east-central and northwestern sectors, respectively.
- Ward No. 04 (QLI 66) occupies a large area in the northeast with a moderately good QLI score.
- The highest-scoring area is Ward No. 06 (QLI 85), located centrally-north, indicating the best infrastructural facilities within the Pourashava.

This spatial distribution of QLI helps in understanding infrastructure disparities and can aid policymakers in planning targeted improvements for underperforming areas.

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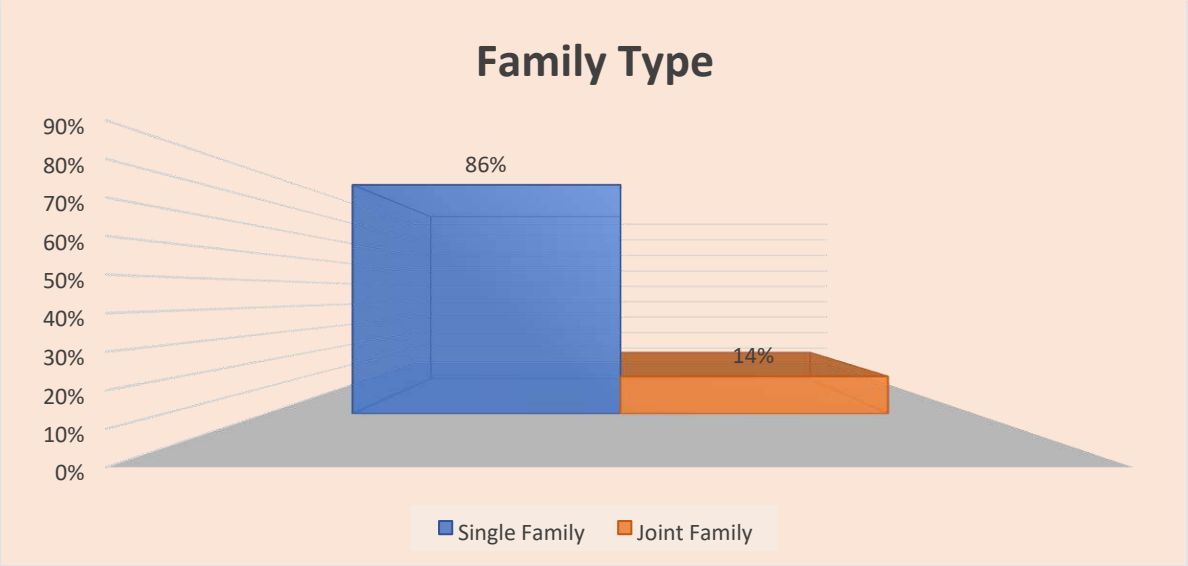


Map 6-3: Quality of Infrastructural Index of Meherpur Pourshava

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**6.5 Socio-Economic Condition of Gangni Pourshava**

**6.5.1 Family Type of Gangni Paurashava**



*Figure 6-7: Family Type of Gangni Paurashava*

*Table 6-1: Family Type of Meherpur Paurashava*

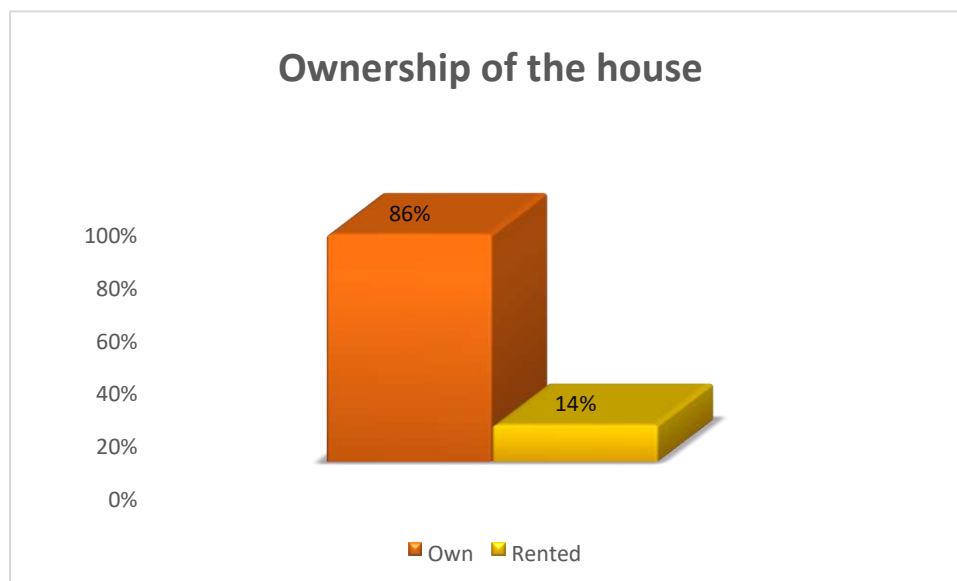
Catagories	Frequency	Percentage
Joint	188	86%
Single	30	14%

Source: Field Survey, 2025

The chart titled "*Family Type*" illustrates the distribution of two types of family structures: Single Family and Joint Family. According to the chart, single-family homes make up the majority, accounting for 86% of the total. This is visually represented by a tall blue bar. In contrast, Joint Families comprise only 14%, shown with a much shorter red bar. Overall, the chart highlights that single-family households are significantly more common than joint-family households in the surveyed population.

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### 6.5.2 Ownership of the Houses



*Figure 6-8: Ownership of houses of Gangni Paurashava*

*Table 6-2: Ownership of the House*

Categories	Frequency	Percentage
Own	188	86%
Rented	30	14%

Source: Field Survey, 2025

The bar chart titled "Ownership of the house" illustrates the proportion of families based on whether they own or rent their homes. According to the data, a vast majority of families— **86%**—own their homes, while only **14%** live in rented accommodations. This significant disparity suggests a high rate of home ownership within the surveyed population, which may reflect economic stability, access to property, or cultural preferences for owning property rather than renting.



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**6.5.3 Head of the Family Members**

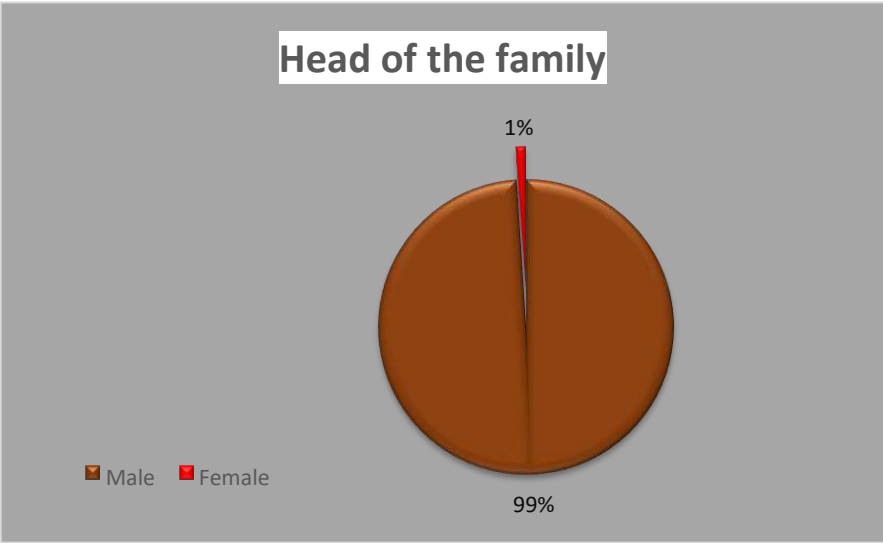


Figure 6-9: Head of the family of Gangni Paurashava

Table 6-3: Head of the Family

Categories	Frequency	Percentage
Male	216	99%
Female	2	1%

Source: Field Survey, 2025

This chart illustrates the gender distribution of family heads. According to the chart, **99%** of families are headed by **males**, while only **1%** are headed by **females**. This significant gender disparity indicates that the traditional role of males as primary decision-makers within households remains dominant. Although a smaller percentage, the presence of female headed families highlights a shift toward gender diversity in household leadership, which may be influenced by factors such as widowhood, migration, employment, or changing social norms.

**6.5.4 Number of Educated Family Members**

Table 6-4: Number of educated Family Members

Categories	Frequency	Percentage
0	31	14%
1	43	20%
2	44	20%
3	21	10%

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4	20	9%
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Source: Field Survey, 2025

The pie chart titled "Percentage of family" shows the distribution of families based on the number of educated members within each household, ranging from zero to five. A significant portion of families, 14%, have no educated members, indicating a widespread lack of access to education or low literacy levels. Families with one educated member account for 20%, suggesting that in many households, only a single individual has received formal education. About 20% of families have two educated members, while smaller percentages are seen as the number of educated members increases—10% have three, 9% have four. This data highlights a clear trend where the number of educated individuals per family decreases significantly as the count rises, pointing to a need for enhanced educational outreach and support across families.

**6.5.5 Income of The Household**

The bar chart displays the distribution of families based on their monthly income levels. The largest portion of families, **52%**, falls within the income range of **10,000–20,000**, indicating that nearly half of the population earns a modest income. This is followed by **12%** of families earning between **21,000–30,000**, and **7%** each earning **less than 10,000** and 10% of families earning is between **30,000–40,000**. The data reflects a concentration of families in the lower to mid-income ranges, highlighting potential economic challenges and a need for targeted support to improve income levels in the community

*Table 6-5: Income of the Household*

Categories	Frequency	Percentage
No Income	0	0
Less than 10000	16	7%
10000-20000	114	52%
21000-30000	52	12%
31000-40000	21	10
More than 4000	0	0

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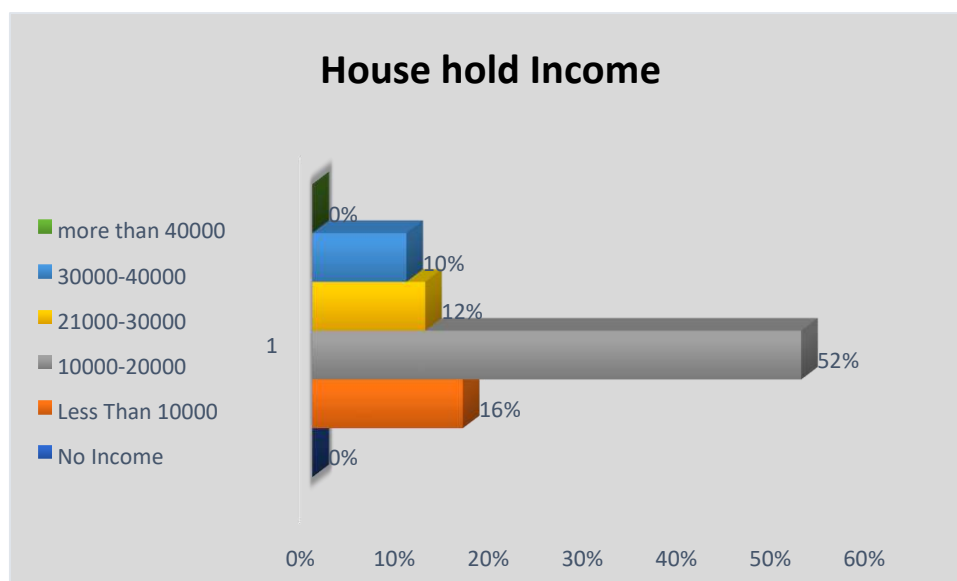


Figure 6-10: Income of the family of Gangni Paurashava

### 6.5.6 Expenditure of the Household

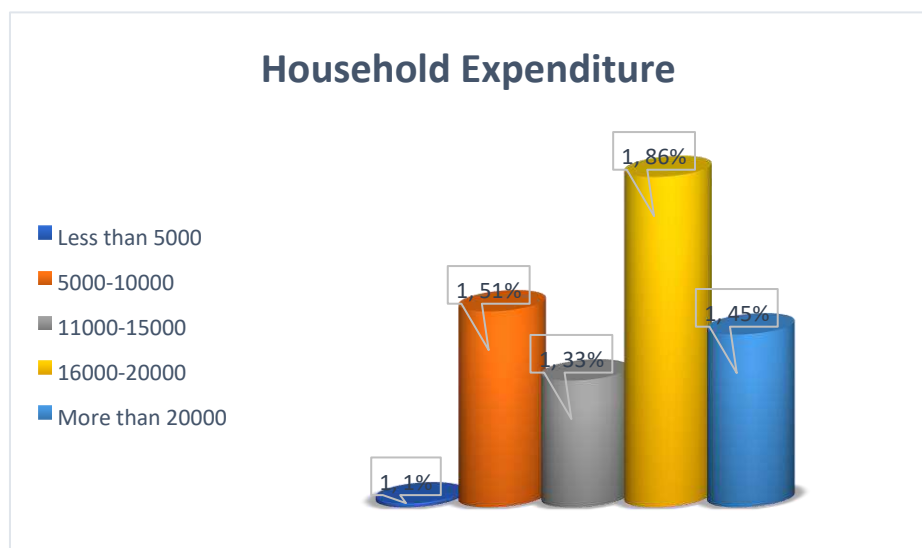


Figure 6-11: Expenditure of the family of Gangni Paurashava

Table 6-6: Expenditure of the Family

Categories	Frequency	Percentage
Less than 5000	3	1%
5000-10000	51	23%
11000-15000	33	15%
16000-20000	86	39%
More than 20000	45	20%

Source: Field Survey,2025

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The bar chart titled "**Expenditure**" illustrates the distribution of families based on their monthly household spending. The largest group, comprising **33%** of families, spends between **11,000 and 15,000** units of currency per month. Following this, **29%** of families fall into the **16,000– 20,000** expenditure range, and **23%** spend between **5,000 and 10,000**. A smaller share, **20%**, report spending **more than 20,000**, while only **1%** of families spend **less than 5,000** monthly. These figures suggest that most families have moderate monthly expenditures, reflecting an average lifestyle with limited spending at either extreme.

### 6.5.7 Physical Quality of Life Index

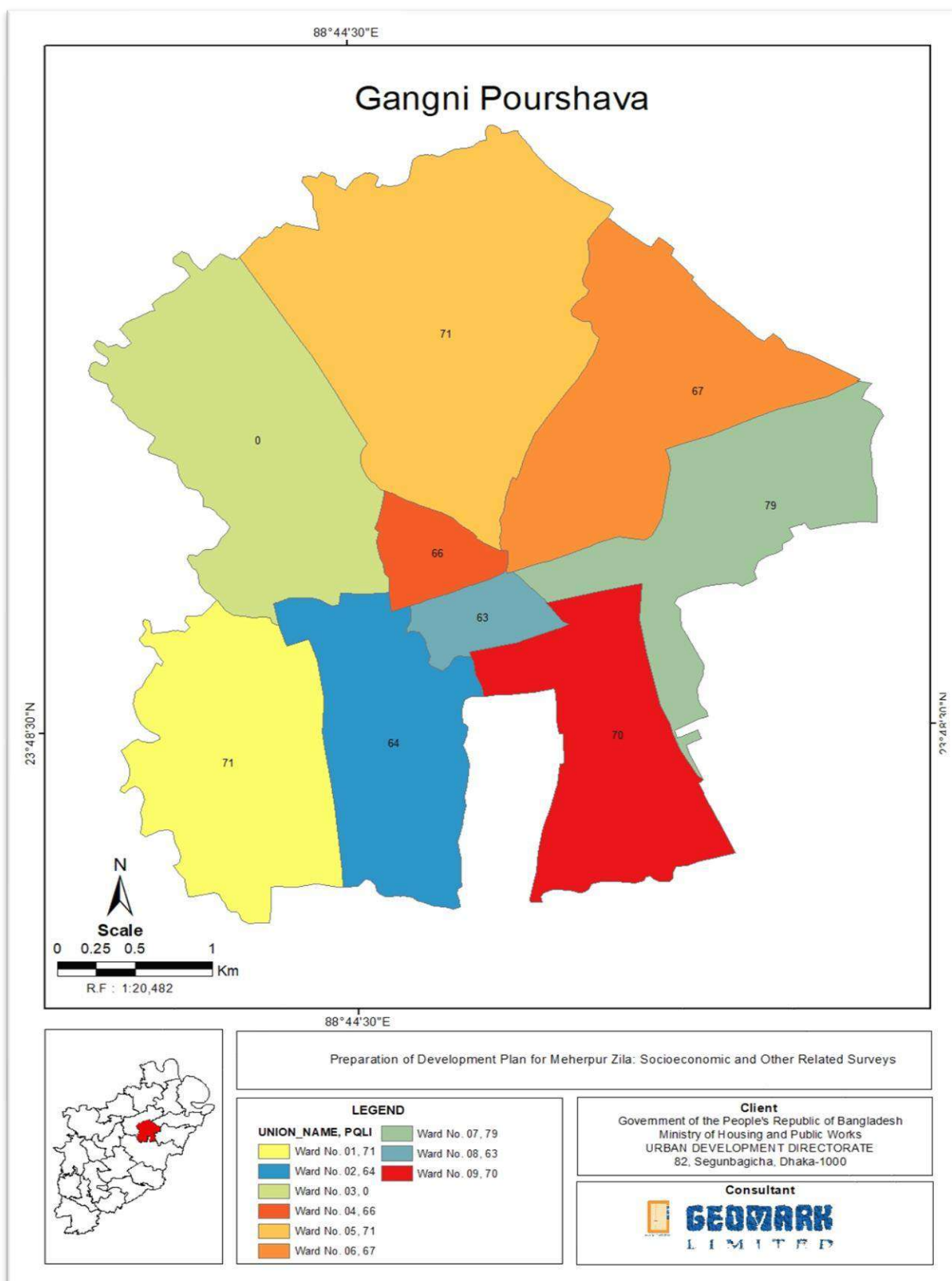
The map displays the Physical Quality of Life Index (PQLI) for various wards within Gangni Pourashava, part of Meherpur District, Bangladesh. The PQLI values on the map range from 63 to 79, reflecting differences in living standards and essential services across the area.

Each ward is color-coded according to its respective PQLI score:

- Ward No. 07 (PQLI 79), located in the northeastern region, has the highest quality of life, indicating better access to basic needs such as healthcare, education, and sanitation.
- Ward No. 01 and Ward No. 05 (PQLI 71) also show high PQLI values and are situated in the northwestern and southwestern parts of Gangni, respectively.
- Ward No. 06 (PQLI 67) and Ward No. 04 (PQLI 66) represent moderately developed zones in the east-central and central areas.
- Ward No. 09 (PQLI 70) lies in the southeast and also reflects a fairly good physical quality of life.
- Ward No. 08 (PQLI 63) in the center shows the lowest score, possibly indicating underperformance in key life quality indicators.
- Ward No. 02 (PQLI 64) in the south-central area also reflects below-average conditions.

Ward No. 03 appears unscored (value marked as 0), which may suggest a lack of available data or that it was not assessed.

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Map 6-4: Physical Quality of Life Index Gangni Paurashava



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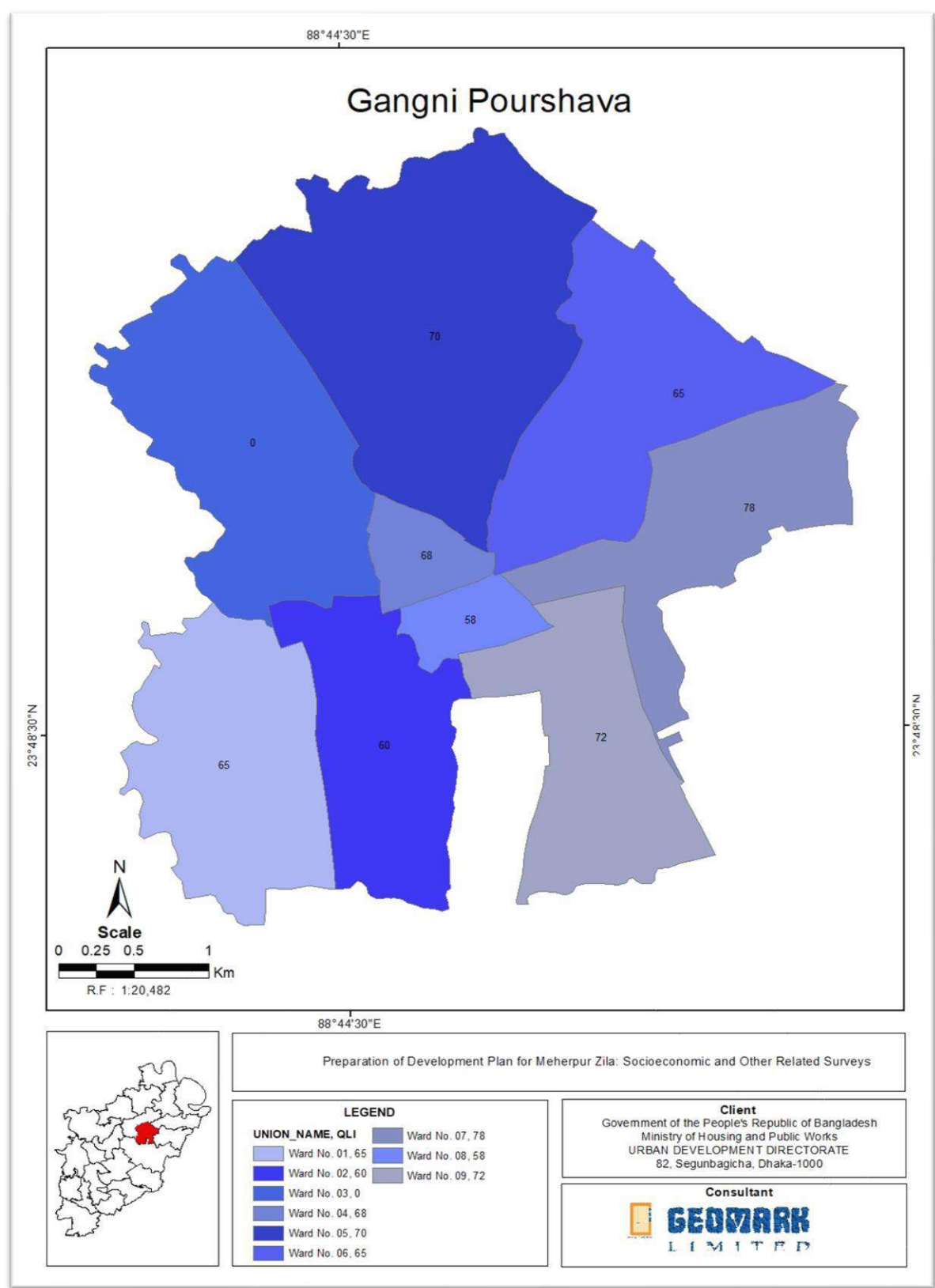
#### **6.5.8 Quality of Infrastructural Index of Gangni Pourshava**

The map illustrates the Quality of Infrastructure Index (QLI) for Gangni Pourashava in Meherpur District, Bangladesh. The QLI scores, represented through various shades of blue, indicate the relative infrastructural development of each ward, ranging from 58 to 78.

- Ward No. 07 (QLI 78), located in the eastern part of the Pourashava, has the highest infrastructure quality, suggesting well-developed roads, utilities, sanitation, and public facilities.
- Ward No. 09 (QLI 72) also scores highly, indicating strong infrastructure in the southeastern region.
- Ward No. 04 (QLI 68) and Ward No. 05 (QLI 70), in the central-northern area, show above-average infrastructure conditions.
- Ward No. 02 (QLI 60) and Ward No. 10 (QLI 58) register the lowest scores, pointing to potential infrastructural deficiencies in the central and southwestern parts of Gangni
- Ward Nos. 01 and 06 (both QLI 65) and Ward No. 08 (QLI 65) reflect moderate infrastructural development, with room for improvement.
- Ward No. 03 is marked with a score of 0, indicating a lack of data or exclusion from the assessment.

This spatial overview serves as an essential tool for local authorities and planners to identify infrastructural disparities and strategically allocate resources for improvement, focusing especially on underdeveloped and moderately developed wards.

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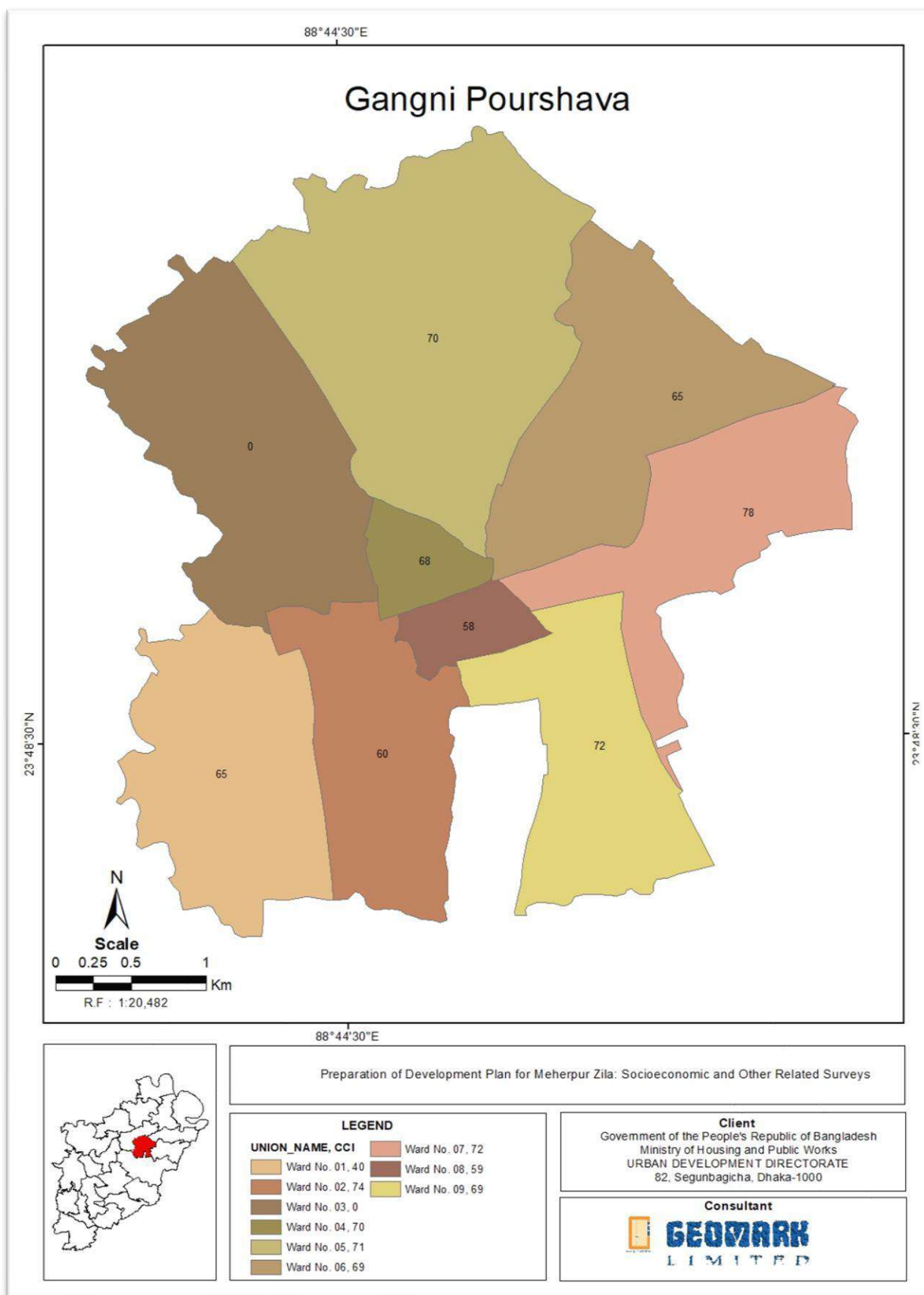
### **6.5.9 Cultural Capital Index of Gangni Pourshava**

The map shows the Cultural Capital Index (CCI) of Gangni Pourashava, providing a ward-wise depiction of cultural development within the municipality, based on indicators like access to cultural institutions, participation in cultural activities, and preservation of heritage.

Key Observations:

- Ward No. 07 (CCI 72) ranks highest, indicating strong cultural engagement, likely due to access to cultural centers, educational institutions, or preserved heritage.
  - Ward No. 03, marked with CCI 0, reflects a lack of available data or negligible cultural infrastructure.
  - Ward Nos. 02 and 06 (CCI 74 and 69 respectively) show high scores, suggesting good cultural resources and community participation.
  - Wards 01 and 09 (CCI 40 and 69 respectively) present lower CCI values, implying a need for focused cultural investment and programming.
  - Ward No. 08 (CCI 59) and Ward No. 04 (CCI 70) score moderately, indicating average cultural infrastructure and activities.
  - Ward No. 05 (CCI 71) is also among the top performers, showing a strong cultural profile.
- This CCI distribution highlights significant inter-ward disparity in cultural development, suggesting that while some areas have rich cultural infrastructure and engagement, others—especially Ward No. 03 and parts of central Gangni—require focused attention to boost cultural inclusion and accessibility.

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*Map 6-6: Cultural Capital Index of Gangni Pourshava*

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## 6.6 Mental Map Preparation of the Study Area

The chapter has described the mental map of the respondent in the project area, which represents the accessibility of the respondent of the project area. We will include their place in space, which will be incorporated into the physical plan.

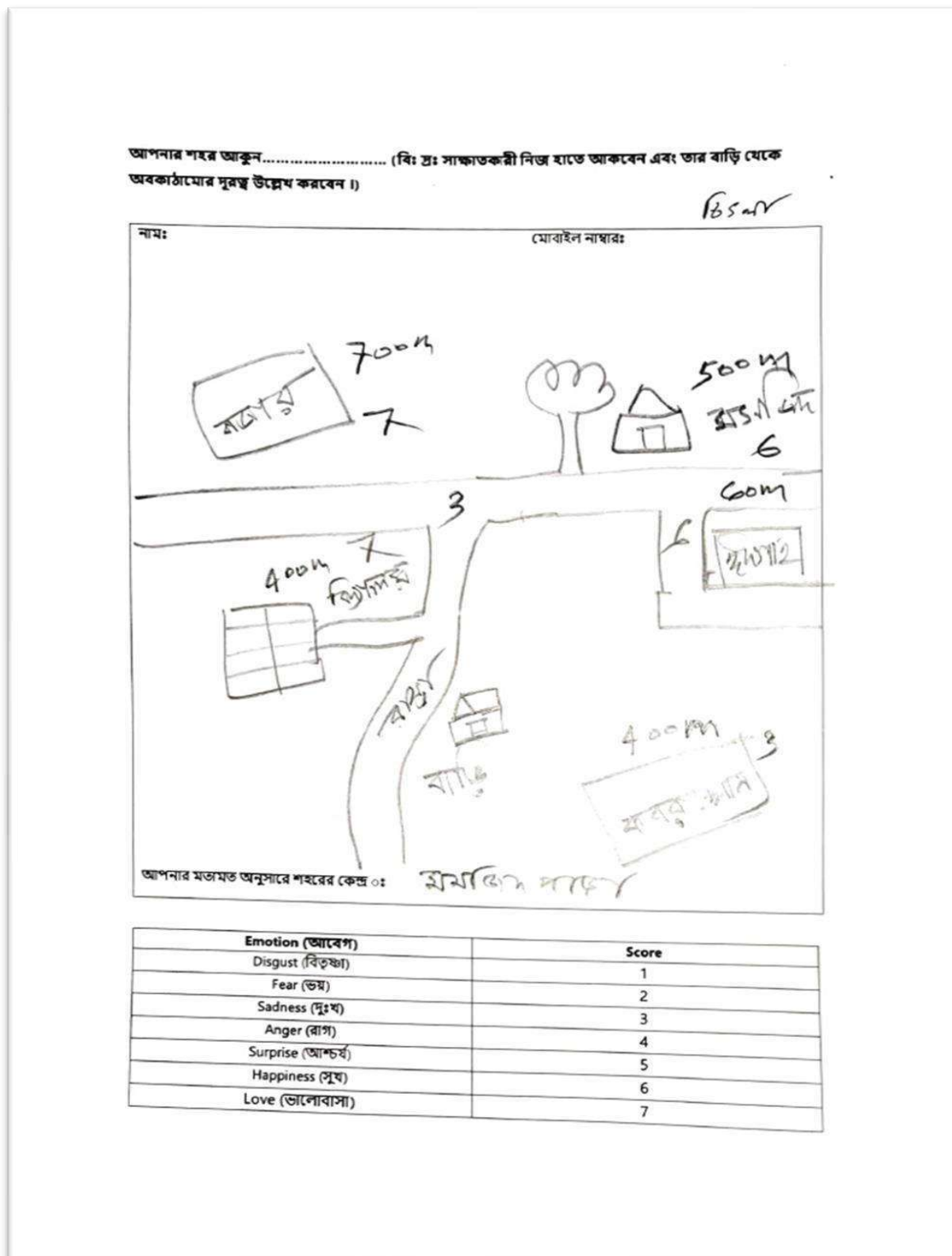


Figure 6-12: Mental Map



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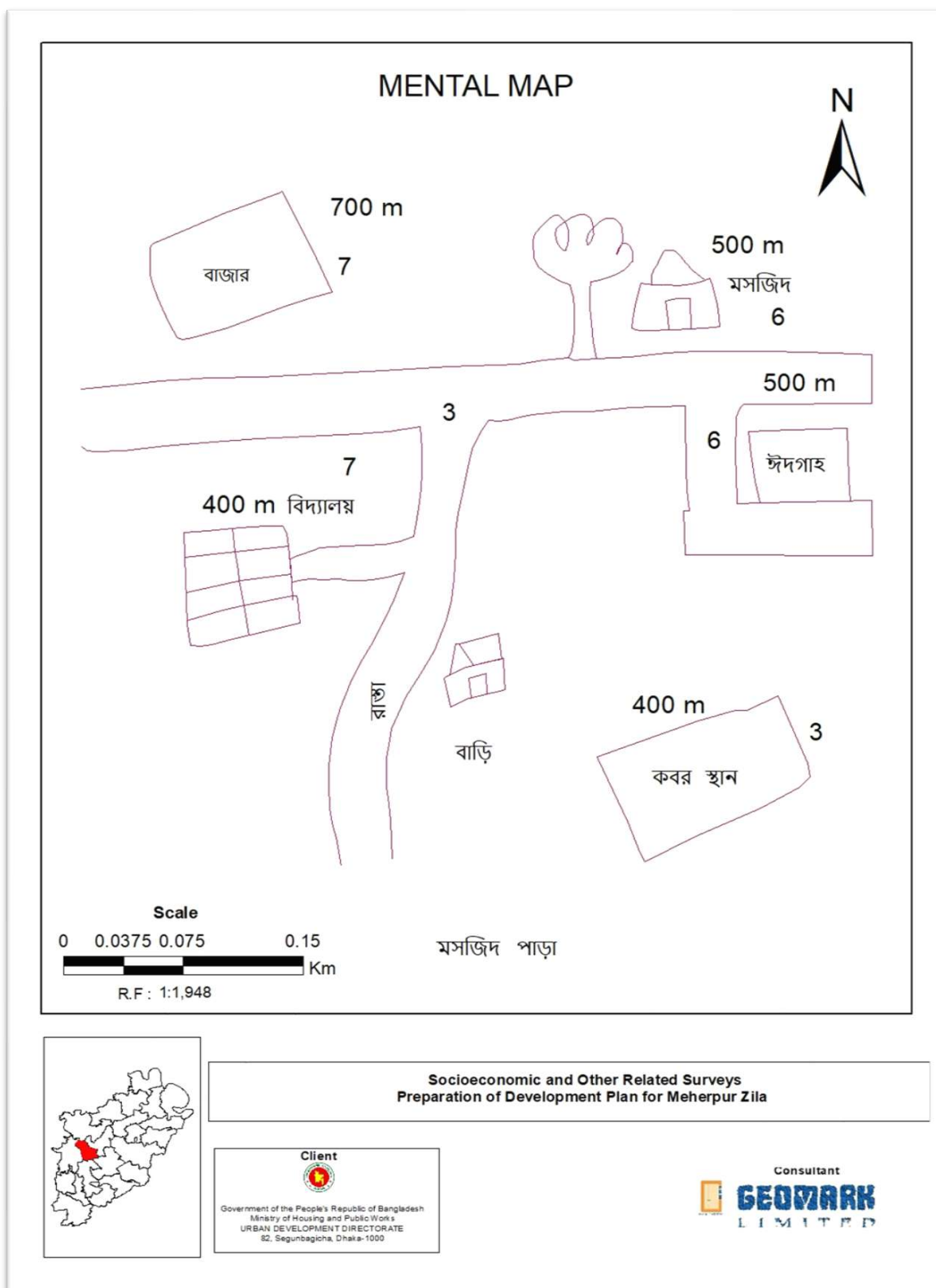


Figure 6-13: Digitize Mental Map

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### 6.7 Linkage with Physical Feature Survey Data

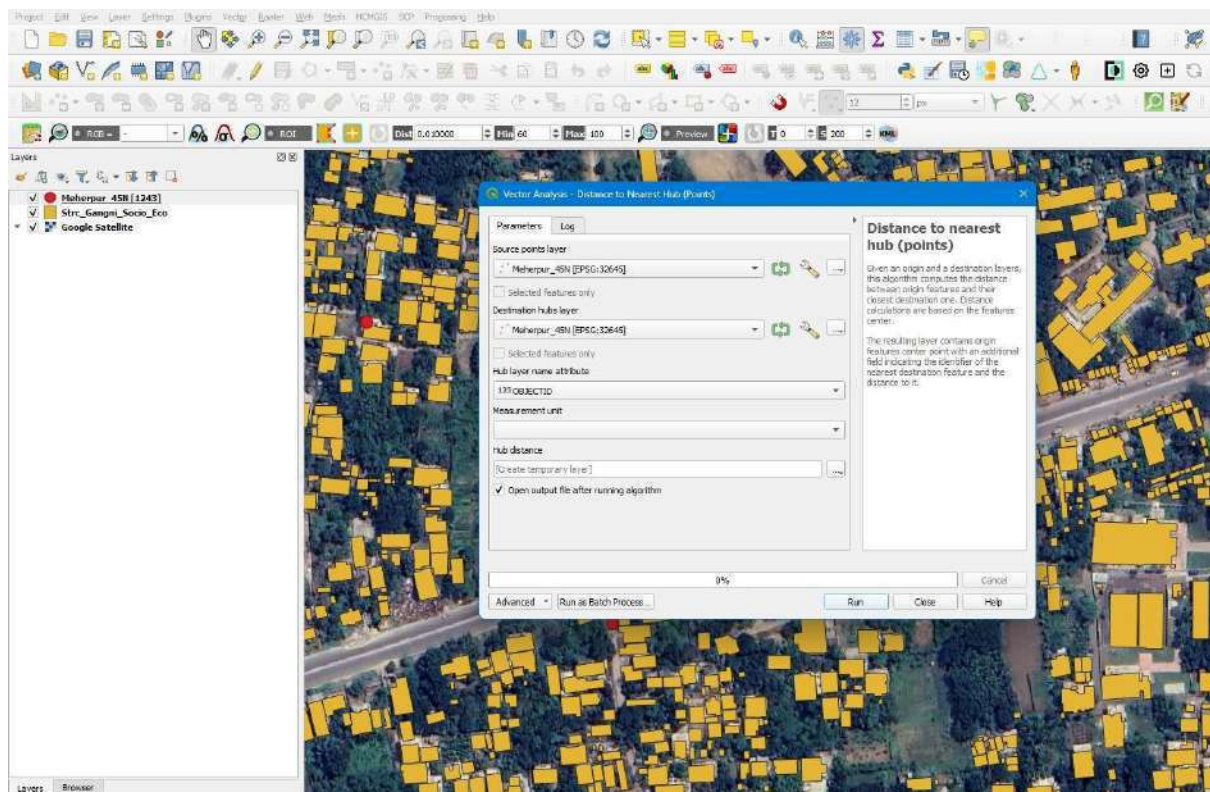
While collecting the socioeconomic data, the same Grid ID and Structure ID have been assigned to identify which structure the socioeconomic data belongs to. Later, using the Grid ID and Structure ID as attributes, a unique ID has been created to link the socioeconomic database with its physical feature counterpart. Using that unique ID, we managed to link both databases together. Figure 9.1 shows the red-marked structures from which socioeconomic data were collected.



*Figure 6-14: Location of Households that were surveyed for Socioeconomic data*

Both the physical features and socioeconomic attributes were embedded within the physical feature shapefile. The socioeconomic survey has been completed, but because the physical feature survey is still ongoing, not all physical feature data have been collected yet. Once the physical feature survey is completed, the entire physical feature database linked with socioeconomic data will be provided. For the time being, a sample has been provided in

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*Figure 6-15: Socio economic data within Physical feature shapefile's attribute*

## 6.8 CONCLUSION

The survey phase of the socio-economic study in Meherpur District has laid a robust foundation for achieving the project's strategic objectives. Through careful planning, effective resource deployment, and early stakeholder engagement, this phase has enabled a comprehensive understanding of the district's socio-economic dynamics.

Key achievements during this phase include the successful recruitment and training of a competent field team, along with the deployment of digital data collection tools such as KoBoToolbox, which ensured efficient and accurate data gathering. The implementation of reconnaissance surveys provided essential preliminary insights, helping to identify key socioeconomic and infrastructural issues across the district.

Notable findings from the reconnaissance activities highlight critical disparities in infrastructure, limited access to essential services, and unequal economic opportunities. These insights have been instrumental in shaping the design and scope of the detailed household and community-level surveys.

Moreover, the early interaction with community members and stakeholders has played a vital role in building trust and facilitating cooperation, factors that are essential for the continued success of the study. This engagement has also enhanced local awareness of the project's goals and reinforced its participatory approach.

As the project now moves into the detailed data collection phase, emphasis will be placed on methodological rigor, inclusivity, and transparency. The tools, systems, and relationships established during the survey phase have positioned the project to deliver high-quality data that will inform strategic development planning for Meherpur District.

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## **CHAPTER 7: AGRICULTURE**

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### **7.1 Introduction:**

Agriculture remains the cornerstone of the rural economy in Meherpur District, with crop production playing a vital role in sustaining livelihoods and ensuring food security. The district comprises three upazilas—Meherpur Sadar, Gangni, and Mujib Nagar—each exhibiting distinct patterns of land use and cropping intensity based on agro-ecological conditions, irrigation availability, and farmer practices. Analyzing the cropping patterns across these upazilas provides critical insights into land utilization efficiency, seasonal crop diversity, and the potential for agricultural intensification.

This section presents a detailed assessment of the current cropping patterns in each upazila, highlighting the distribution of single, double, triple, and four-crop farming practices. It also examines crop combinations and seasonal cycles that characterize each region, offering a foundation for identifying opportunities and constraints in agricultural planning under the Meherpur District Development Plan.

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## 7.2 Meherpur Sadar Upazila:

The cropping pattern in Meherpur Sadar Upazila reflects a highly intensive use of agricultural land, with the majority of areas cultivated multiple times each year. Out of a total of 64,823.39 acres of cultivable land, a substantial 86.7% is under triple cropping, and an additional 4.9% is cultivated four times annually. In contrast, single-cropped and double-cropped areas account for only 6.3% and 2.1% of the total area, respectively. This clearly indicates a strong focus on maximizing agricultural productivity through intensive land use.

Among the individual unions, Pirojpur Union has the highest area under triple cropping with 12,614.98 acres, followed closely by Kutubpur Union and Amjhupi Union, both with over 12,000 acres in the same category. Amjhupi Union also leads in four-cropped land, with 1,649.18 acres, highlighting its prominence in high-intensity farming. While Buripota Union shows a relatively higher amount of single-cropped land (1,331.69 acres), it still contributes significantly to the triple-cropped area. Meherpur Paurashava stands out for having all of its 3,378.59 acres under triple cropping, with no land reported under single, double, or four-cropped categories—likely a result of limited rural agricultural land within the urban administrative area.

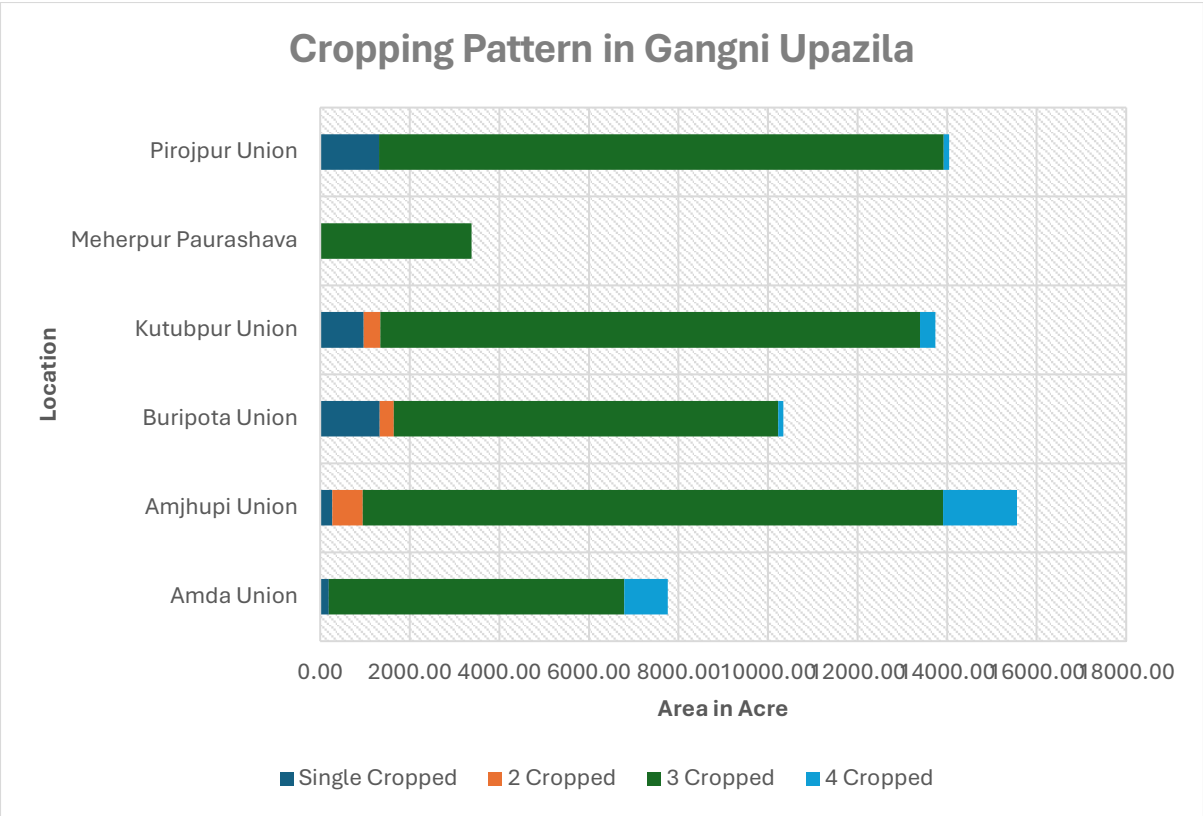
In summary, Meherpur Sadar Upazila demonstrates a pattern of intensive agriculture, with most of its farmland cultivated at least three times a year. This suggests favorable conditions and effective farming practices aimed at increasing agricultural output.

*Table 7-1: Cropping Pattern in Meherpur Sadar Upazila*

Location	Single Cropped	2 Cropped	3 Cropped	4 Cropped	Grand Total
Amda Union	194.82		6593.92	974.87	7763.62
Amjhupi Union	270.12	680.91	12958.54	1649.18	15558.75
Buripota Union	1331.69	308.62	8587.66	112.22	10340.19
Kutubpur Union	972.01	367.44	12054.56	343.80	13737.80
Meherpur Paurashava			3378.59		3378.59
Pirojpur Union	1311.73		12614.98	117.73	14044.44
Grand Total	4080.38	1356.97	56188.24	3197.80	64823.39

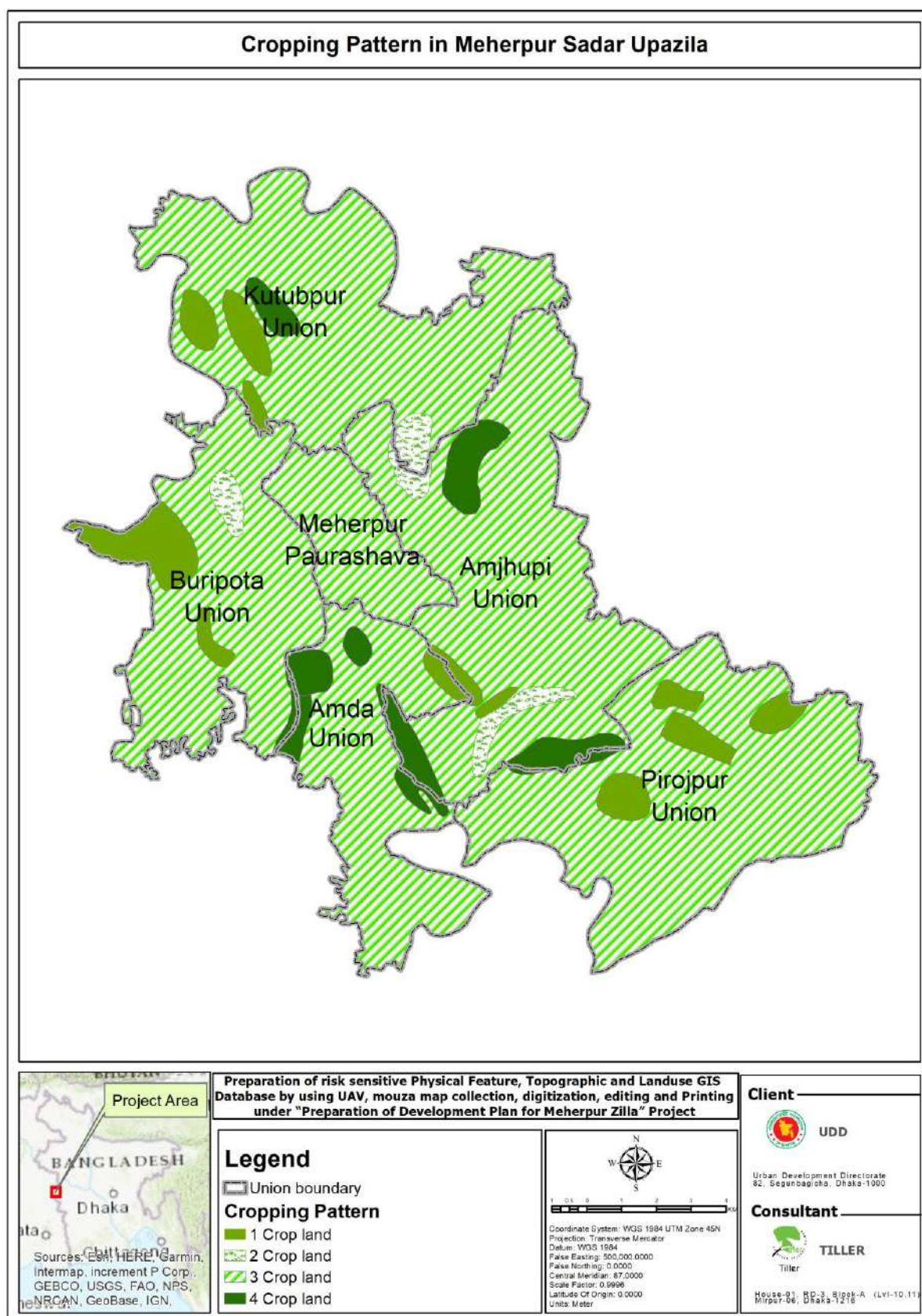


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*Figure 7-1: Cropping Pattern in Meherpur Sadar Upazila*

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*Map 7-1: Cropping Pattern in Meherpur Sadar Upazila*

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### 7.3 Gangni Upazila:

The cropping pattern in Gangni Upazila reflects a moderately high level of agricultural intensity, with a dominant share of land under triple cropping. Out of a total 70,597.40 acres of cultivable land in the upazila, approximately 89% (62,808.97 acres) is cultivated three times a year, while only 3.1% (2,207.20 acres) is double-cropped. Notably, 5,581.24 acres, or around 7.9%, are cultivated four times annually, indicating pockets of highly intensive agriculture. There are no reported single-cropped areas in Gangni, underscoring the prevalent use of multiple cropping systems across the upazila.

Union-wise, Dhankhola, Matmura, Tentulbaria, and Shola Taka show large areas exclusively under triple cropping, suggesting consistent and widespread adoption of intensive agricultural practices. Shaharbati stands out as the only union where four cropping cycles are recorded, accounting for all of its 5,581.24 acres—a clear indicator of exceptionally high land productivity. Kazipur is the only union that reports areas under all three categories—double, triple, and four cropping—which reflects diversified land use practices and varying intensity levels within the same location.

In terms of crop diversity, the unions and municipal wards of Gangni demonstrate an extensive range of cropping combinations. Farmers cultivate both traditional and high-value crops in mixed sequences. Common crops include Boro, Aman, Aush, wheat, jute, lentil (moshur), maize (vutta), and various vegetables. The cropping patterns also reflect a mix of food and cash crops such as tobacco, banana, sugarcane, mustard (shorisha), onion, garlic, and chilli.

For instance, Bamandi shows a rich mix of combinations such as Moshur–Jute–Vegetable–Ropa Aman, and Wheat–Jute–Ropa Aman–Chilli, demonstrating the integration of pulses and spices into cereal-based systems. Dhankhola features combinations like Corn–Jute–Paddy, and Wheat–Paddy–Lentil, showcasing a balance of staple cereals with legumes. In Matmura, some cropping patterns include up to five or more crops in rotation, including high-value crops like banana, turmeric (holud), tobacco, and vegetables, which reflect advanced and market-oriented agricultural practices. Shaharbati, with its notable four-cropped area, features highly diversified cycles such as Vegetable–Aush–Aman, and Wheat–Jute–Ropa Aman, further confirming the intensity of cultivation.

Municipal wards of Gangni Paurashava show relatively smaller but still significant land areas under triple cropping, involving typical combinations of Paddy–Jute–Wheat, Vegetable–Paddy–Wheat, and other mixed cropping systems suited to peri-urban settings.

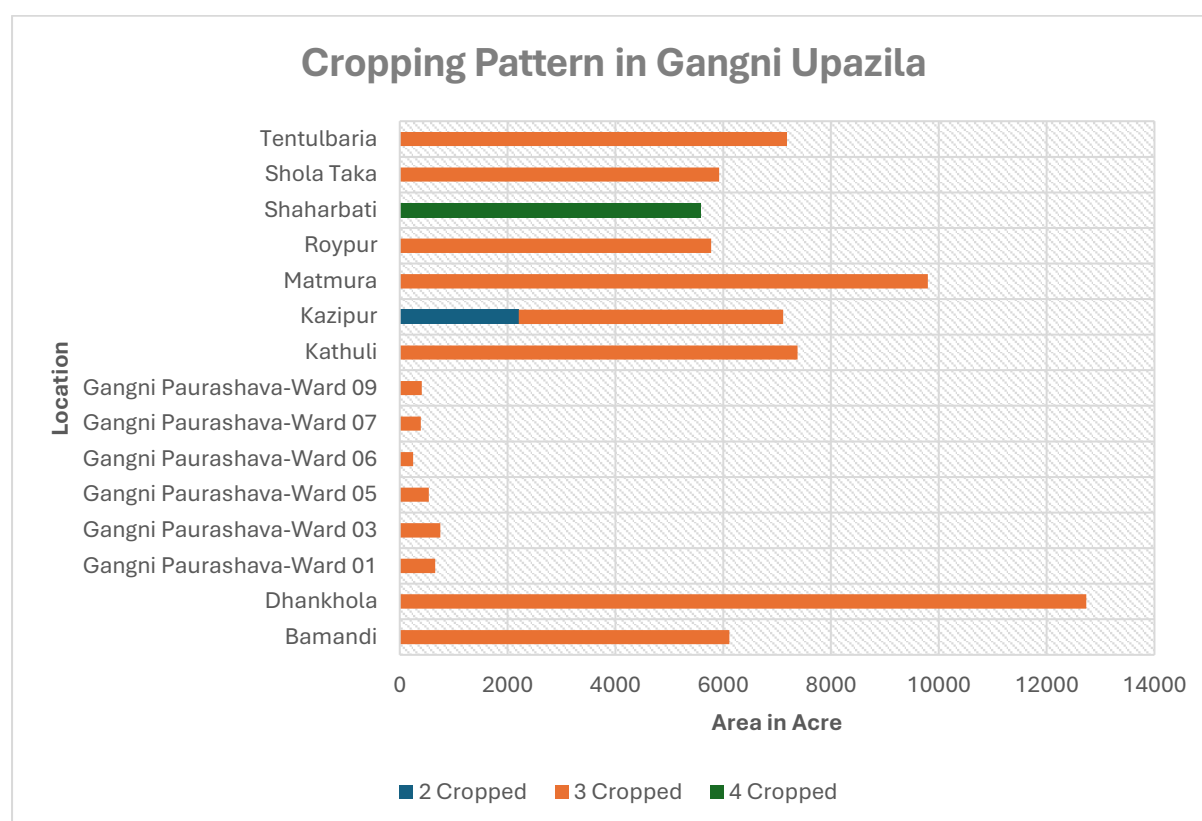
Overall, the cropping pattern in Gangni Upazila highlights a strong trend toward multi-cropping, especially triple cropping, with considerable diversity in crop selection and sequencing. While the overall intensity is slightly lower compared to Meherpur Sadar Upazila, the presence of high-value and diversified crop combinations across unions and wards suggests a progressive approach to land use, balancing food security and commercial agriculture.

*Table 7-2: Cropping Pattern in Gangni Upazila*

Location	2 Cropped	3 Cropped	4 Cropped	Grand Total
Bamandi		6115.41		6115.41
Dhankhola		12733.38		12733.38

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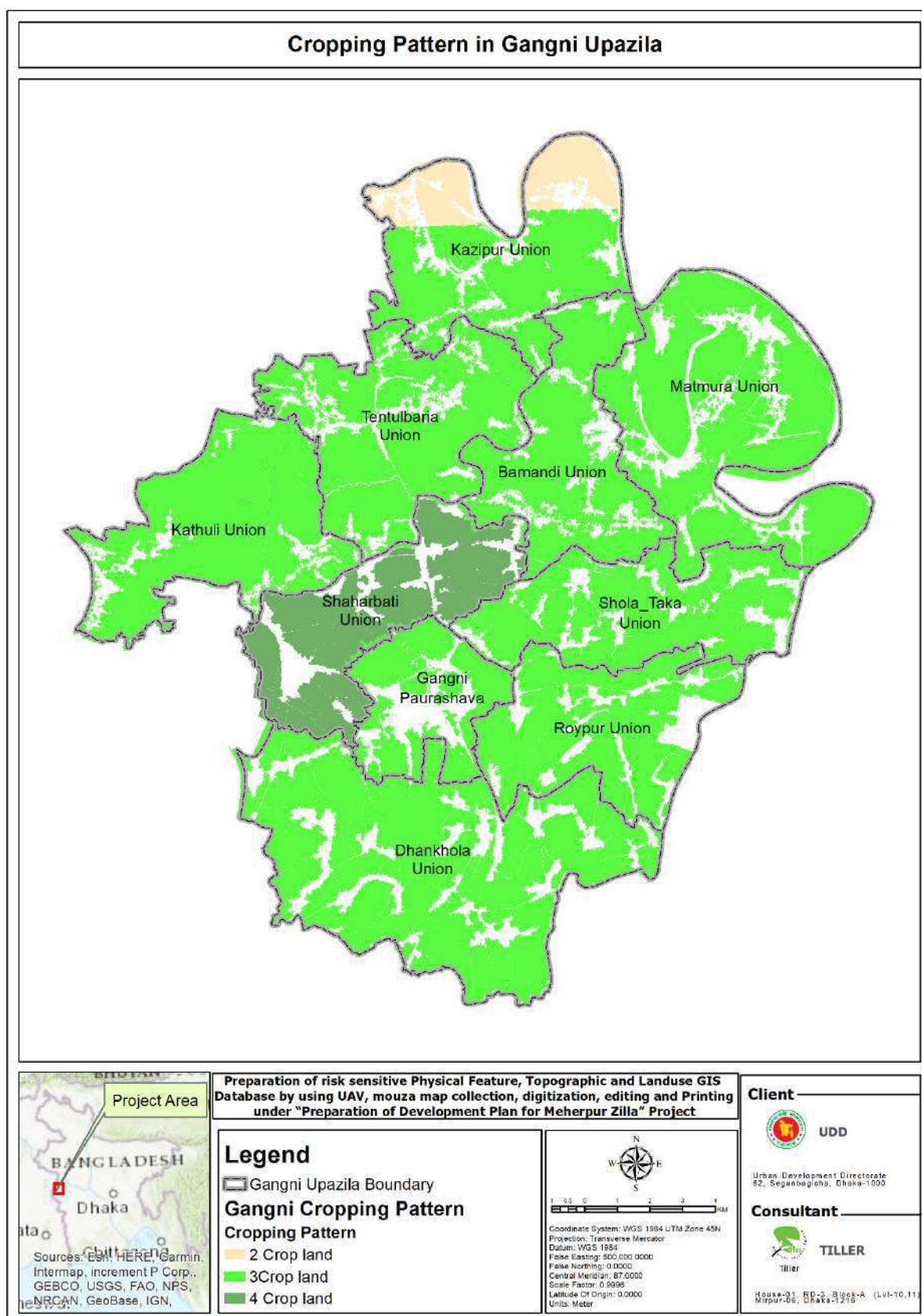
Gangni Paurashava-Ward 01		656.37		656.37
Gangni Paurashava-Ward 03		753.51		753.51
Gangni Paurashava-Ward 05		540.26		540.26
Gangni Paurashava-Ward 06		247.33		247.33
Gangni Paurashava-Ward 07		391.54		391.54
Gangni Paurashava-Ward 09		408.38		408.38
Kathuli		7380.92		7380.92
Kazipur	2207.20	4905.01		7112.22
Matmura		9796.61		9796.61
Roypur		5776.74		5776.74
Shaharbati			5581.24	5581.24
Shola Taka		5922.18		5922.18
Tentulbaria		7181.32		7181.32
Grand Total	2207.20	62808.97	5581.24	70597.40



*Figure 7-2: Cropping Pattern in Gangni Upazila*



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*Map 7-2: Cropping Pattern in Gangni Upazila*



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#### 7.4 Mujib Nagar Upazila:

The cropping pattern in Mujib Nagar Upazila indicates a moderately diverse intensity of agricultural land use, with a significant portion of land under triple and four cropping systems, alongside a notable share of single-cropped areas. Out of a total of 11,624.32 acres of cultivable land, the majority—68.9% (8,009.35 acres)—is under triple cropping, followed by 10.3% (1,197.35 acres) under four crops annually. About 7.2% (841.86 acres) is cultivated twice a year, while a relatively substantial 13.6% (1,575.75 acres) remains single cropped, marking the highest proportion of single-cropped land among the three upazilas of Meherpur district.

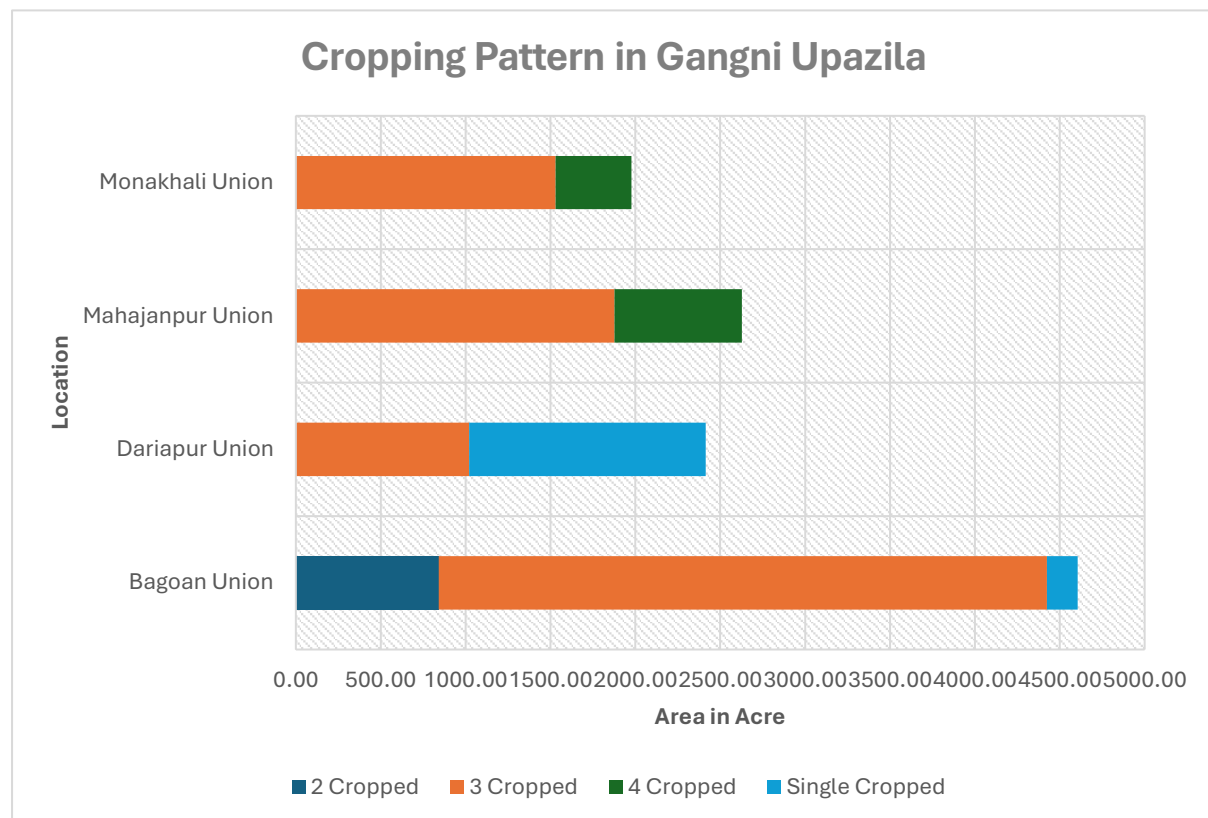
At the union level, Mahajanpur Union leads in cropping intensity, with 749.21 acres under four cropping and 1,877.68 acres under triple cropping, showing a strong emphasis on intensive cultivation. Monakhali Union also reflects a similar trend with 1,529.27 acres under triple and 448.14 acres under four cropping. In contrast, Dariapur Union is notable for having no land under double or four crops, but a significant 1,393.55 acres (approximately 57.7% of its cultivable area) is single cropped, indicating relatively lower land use intensity. Bagoan Union presents a balanced profile with land distributed across all cropping intensities, including the only recorded area under double cropping (841.86 acres) in the upazila.

The presence of both highly intensive agricultural practices (especially in Mahajanpur and Monakhali) and more traditional, less intensive patterns (as seen in Dariapur) indicates spatial variation in land use intensity within Mujib Nagar. Factors such as soil fertility, irrigation availability, and access to agricultural inputs and markets likely contribute to these differences. In summary, Mujib Nagar Upazila demonstrates a mixed cropping pattern, with a dominant share of land under triple and four cropping systems but also a relatively higher percentage of single-cropped land compared to the other upazilas in Meherpur district. This suggests both potential for agricultural intensification in certain areas and the need for targeted support to enhance productivity in the less intensively cultivated zones.

*Table 7-3: Cropping Pattern in Mujib Nagar Upazila*

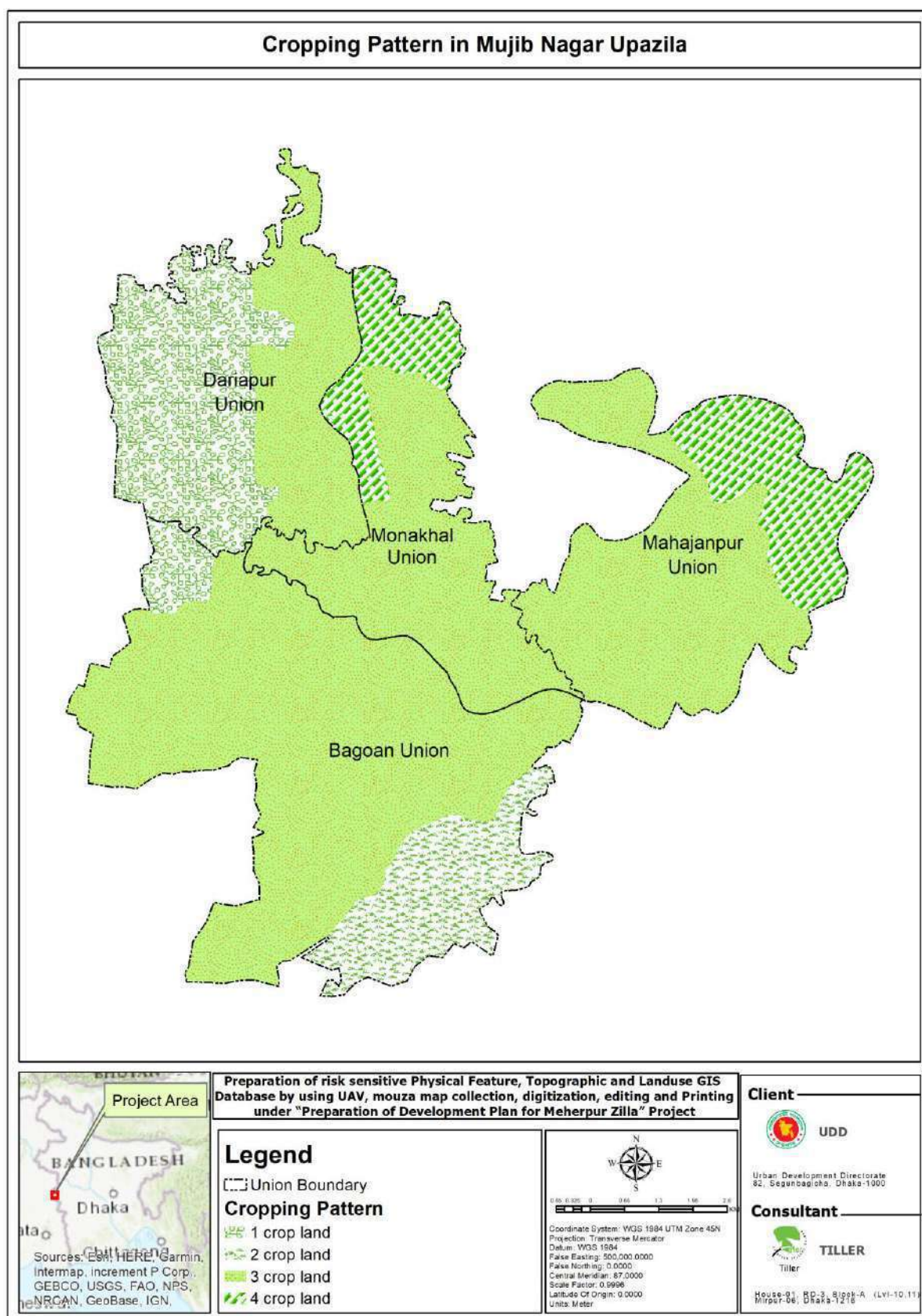
Location	2 Cropped	3 Cropped	4 Cropped	Single Cropped	Grand Total
Bagoan Union	841.86	3582.07		182.20	4606.14
Dariapur Union		1020.33		1393.55	2413.88
Mahajanpur Union		1877.68	749.21		2626.89
Monakhali Union		1529.27	448.14		1977.41
Grand Total	841.86	8009.35	1197.35	1575.75	11624.32

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*Figure 7-3: Cropping Pattern in Mujib Nagar Upazila*

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*Map 7-3: Cropping Pattern in Mujib Nagar Upazila*

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### **7.5 Conclusion:**

The analysis of cropping patterns across the upazilas of Meherpur District reveals significant variation in land use intensity and crop diversity. Meherpur Sadar Upazila demonstrates the highest level of agricultural intensification, with a substantial share of land under triple and even four crop cycles annually. Gangni Upazila, while slightly less intensive overall, showcases widespread triple cropping and notable crop diversity, reflecting a dynamic and market-responsive agricultural system. In contrast, Mujib Nagar Upazila presents a more mixed profile, with both intensive cropping in some unions and a relatively higher proportion of single-cropped land in others, suggesting uneven access to inputs and infrastructure.

These findings underscore the importance of targeted, location-specific agricultural interventions. Enhancing irrigation facilities, improving access to high-yielding crop varieties, and promoting sustainable farming practices could significantly boost productivity in less intensive areas, particularly in parts of Mujib Nagar. At the same time, measures to maintain soil health and manage resource use will be essential in the more intensively farmed regions of Meherpur Sadar and Gangni. Understanding these cropping patterns provides a vital foundation for planning and implementing effective agricultural development strategies under the broader district development framework.

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## **CHAPTER 8: UTILITIES AND SERVICES INCLUDING WATER SUPPLY, SANITATION, SEWERAGE DISPOSAL**

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### **CHAPTER 8:**

#### **8.1 Introduction**

##### **8.1.1 Background:**

Utilities and services form the backbone of urban functionality and directly influence the quality of life, public health, environmental sustainability, and economic productivity within a municipality. In the context of Meherpur Paurashava, the assessment and planning of utilities such as water supply, sanitation, solid waste management, public toilets, electricity, fuel supply, firefighting, and other essential urban services are critical for ensuring inclusive and resilient urban development. As the town gradually expands and urban demands evolve, a comprehensive understanding of the existing infrastructure and service provisions is necessary to identify gaps, set priorities, and inform long-term planning decisions aligned with national development goals and local aspirations.

##### **8.1.2 Objectives:**

The primary objectives of this working paper are as follows:

- To analyze the existing condition of utility and service infrastructure in Meherpur Paurashava based on primary and secondary data.
- To identify spatial and functional gaps in key services including water supply, sanitation, waste disposal, public toilets, electricity, fuel, and emergency services.
- To provide a foundation for strategic interventions that promote equitable service delivery, environmental sustainability, and improved urban governance.

##### **8.1.3 Rationale:**

A reliable and inclusive system of utilities and services is essential for supporting healthy living conditions, reducing urban inequalities, and enhancing resilience against environmental and infrastructural shocks. In small to medium-sized towns like Meherpur Paurashava, strategic investment in essential services can play a transformative role in promoting balanced urbanization and regional development. The rationale for this study lies in the need to understand existing conditions, challenges, and opportunities within the utility service domain, which is often underprioritized despite being fundamental to sustainable urban growth. By documenting current infrastructure, identifying underserved areas, and analyzing system efficiencies, this working paper provides a data-driven basis for recommending improvements that align with both local needs and national urban development objectives.



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## 8.2 Urban Area

### 8.2.1 Meherpur Paurashava:

#### 8.2.1.1 Waste Disposal:

The waste disposal infrastructure in Meherpur Paurashava demonstrates a heavy reliance on informal disposal practices, highlighting both infrastructural deficiencies and potential environmental risks. Based on the physical feature survey data, a total of 194 formal dustbins are distributed across the nine wards, while informal disposal points significantly outnumber them at 274 locations, indicating a critical imbalance in the waste management system. Furthermore, only two Secondary Transfer Stations (STS) have been identified—one each in Ward No. 07 and Ward No. 09—underscoring the limited capacity for intermediate waste handling and transportation.

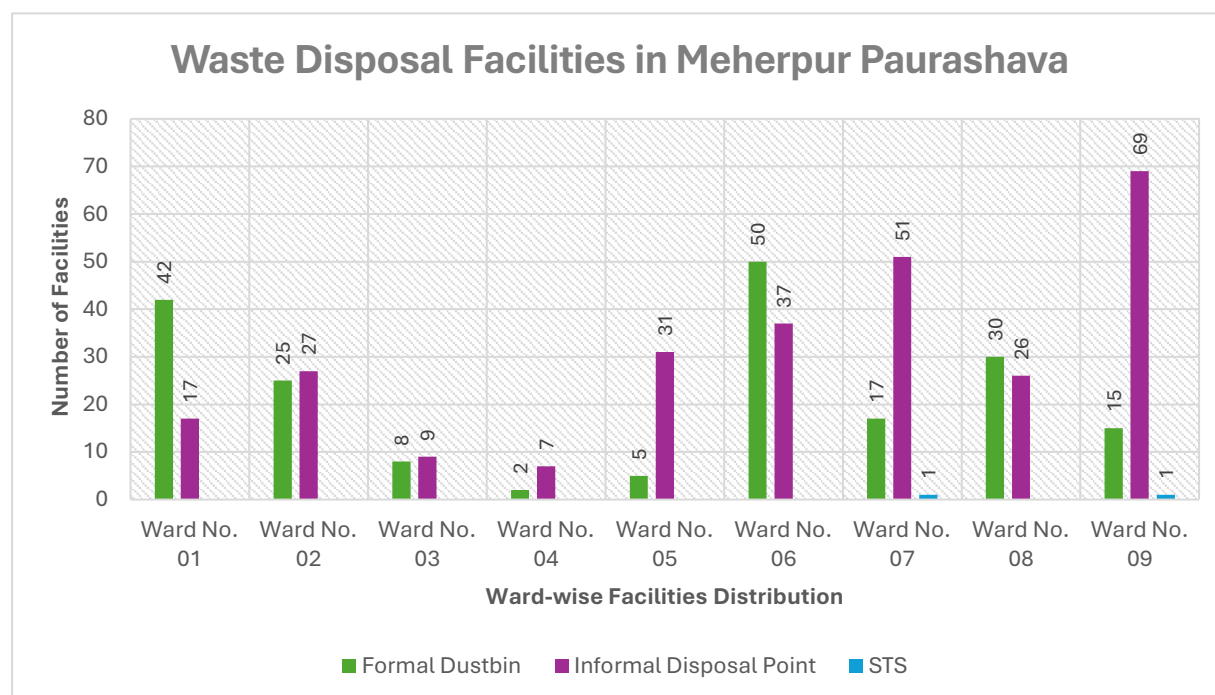
A ward-wise breakdown reveals that Ward No. 06 has the highest number of formal dustbins (50) but still accommodates 37 informal points, suggesting inadequacies in collection frequency or coverage. Conversely, Ward No. 09, with only 15 formal dustbins, shows the highest number of informal disposal points (69), making it one of the most underserved areas in terms of waste management infrastructure. Wards No. 05 and 07 also show high informal usage, indicating urgent need for formal service expansion.

The prevalence of informal disposal points suggests that public awareness, regular collection services, or physical accessibility to waste bins may be inadequate. The lack of sufficient STS units further implies challenges in the waste collection cycle, possibly leading to overflow, improper disposal, and environmental degradation. This imbalance between formal and informal systems reveals a pressing need for strategic interventions, including increasing the number of formal dustbins, establishing more STS facilities, and improving public outreach and waste collection logistics to ensure environmental sustainability and urban health standards.

*Table 8-1: Waste Disposal in Meherpur Paurashava*

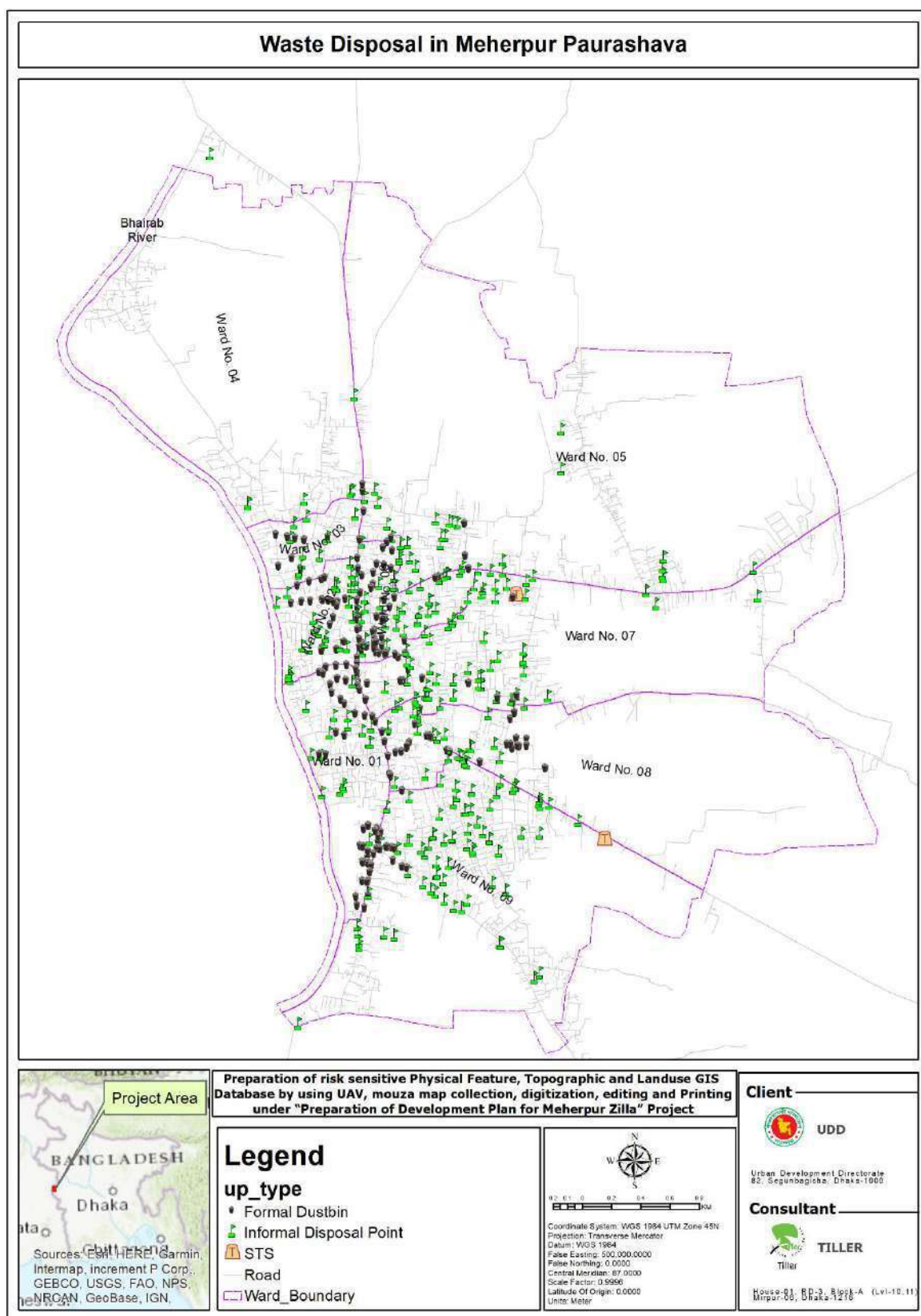
Location	Formal Dustbin	Informal Disposal Point	STS
Ward No. 01	42	17	
Ward No. 02	25	27	
Ward No. 03	8	9	
Ward No. 04	2	7	
Ward No. 05	5	31	
Ward No. 06	50	37	
Ward No. 07	17	51	1
Ward No. 08	30	26	
Ward No. 09	15	69	1
Total	194	274	2

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*Figure 8-1: Waste Disposal in Meherpur Paurashava*



*Map 8-1: Waste Disposal in Meherpur Paurashava*

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#### **8.2.1.2 Water Supply:**

The current state of water supply infrastructure in Meherpur Paurashava reflects a heavy dependence on decentralized community tap systems, with 57 community taps serving the urban population across various wards. In contrast, only two overhead water tanks exist—located in Ward No. 05 and Ward No. 06—suggesting limited capacity for centralized water storage and pressurized distribution.

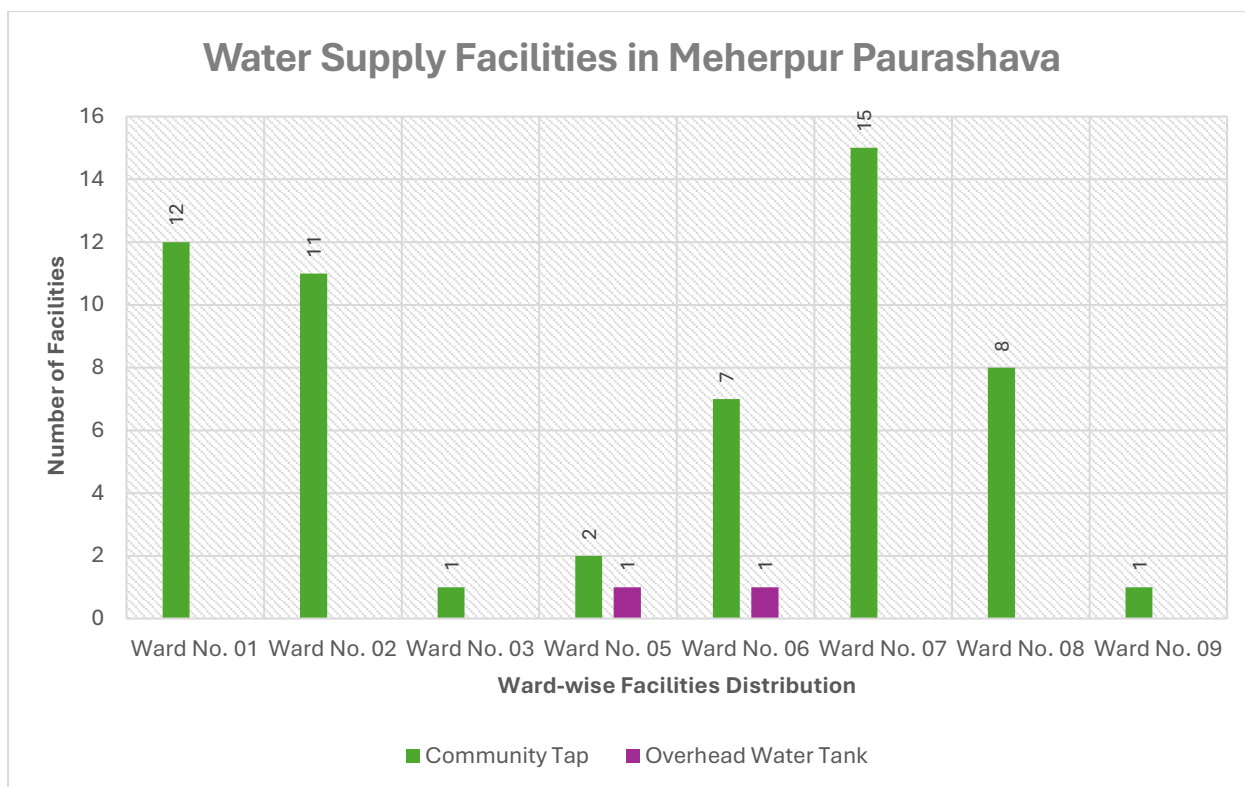
Ward No. 07 leads with 15 community taps, followed by Ward No. 01 and Ward No. 02 with 12 and 11 taps, respectively. This implies relatively better access in those areas. However, Ward No. 03 and Ward No. 09 show clear service deficits, each having only one community tap, and no overhead tank coverage, flagging them as priority areas for infrastructure upgrades. The minimal presence of overhead tanks raises concerns about the ability to maintain water pressure and ensure round-the-clock supply. The reliance on community taps points to an absence of individual or household-level piped water connections, which may contribute to inequitable access, especially in densely populated or peripheral zones.

This uneven distribution and the scarcity of centralized water storage systems indicate a need for targeted interventions. Recommendations include the construction of additional overhead tanks in underserved wards, expansion of community tap networks in low-coverage areas, and, where feasible, transitioning to more sustainable piped distribution systems to support both equity and efficiency in urban water supply.

*Table 8-2: Water Supply Facilities in Meherpur Paurashava*

Location	Community Tap	Overhead Water Tank
Ward No. 01	12	
Ward No. 02	11	
Ward No. 03	1	
Ward No. 05	2	1
Ward No. 06	7	1
Ward No. 07	15	
Ward No. 08	8	
Ward No. 09	1	
Total	57	2

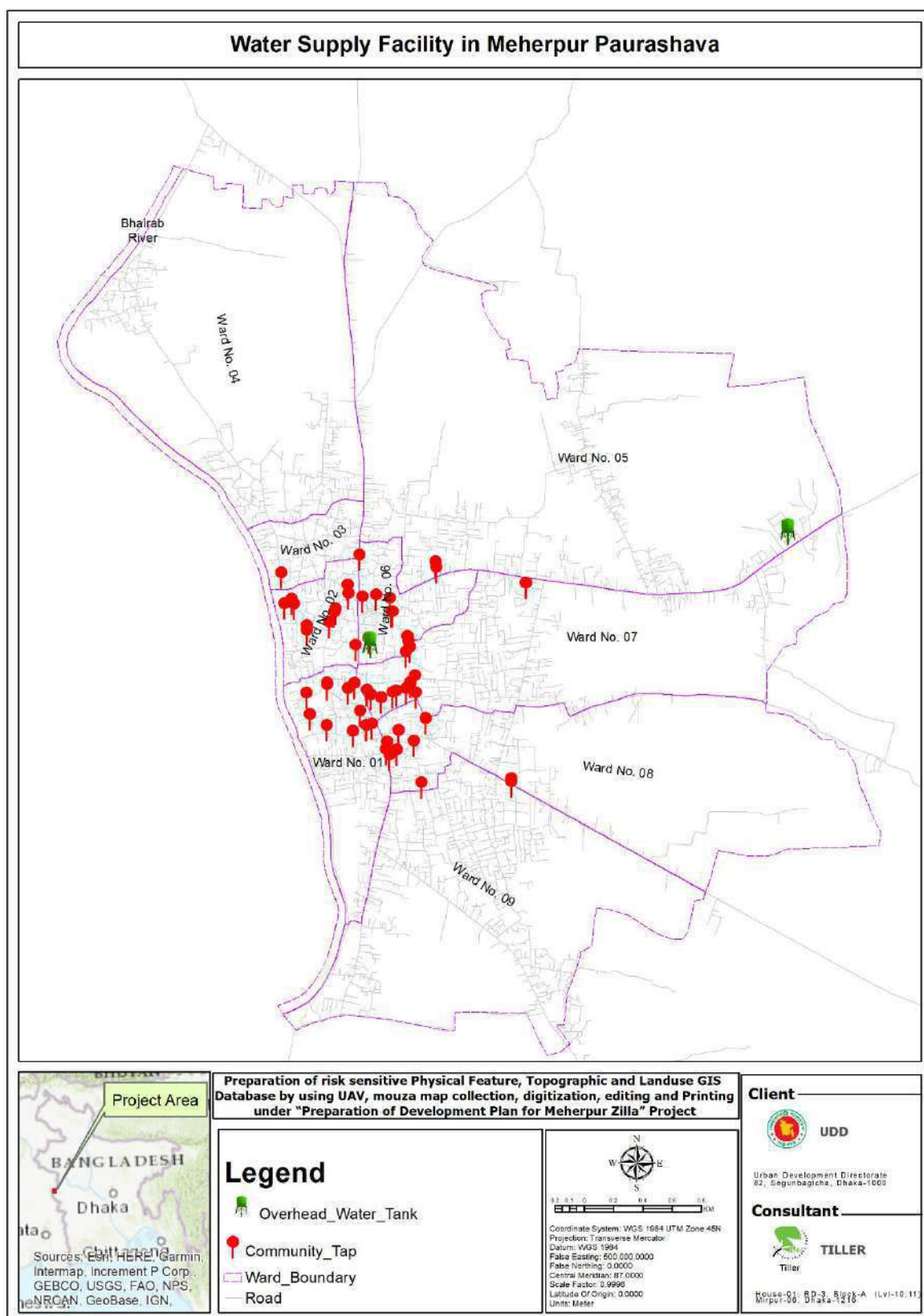
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*Figure 8-2: Water Supply Facilities in Meherpur Paurashava*



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Map 8-2: Water Supply Facilities in Meherpur Paurashava

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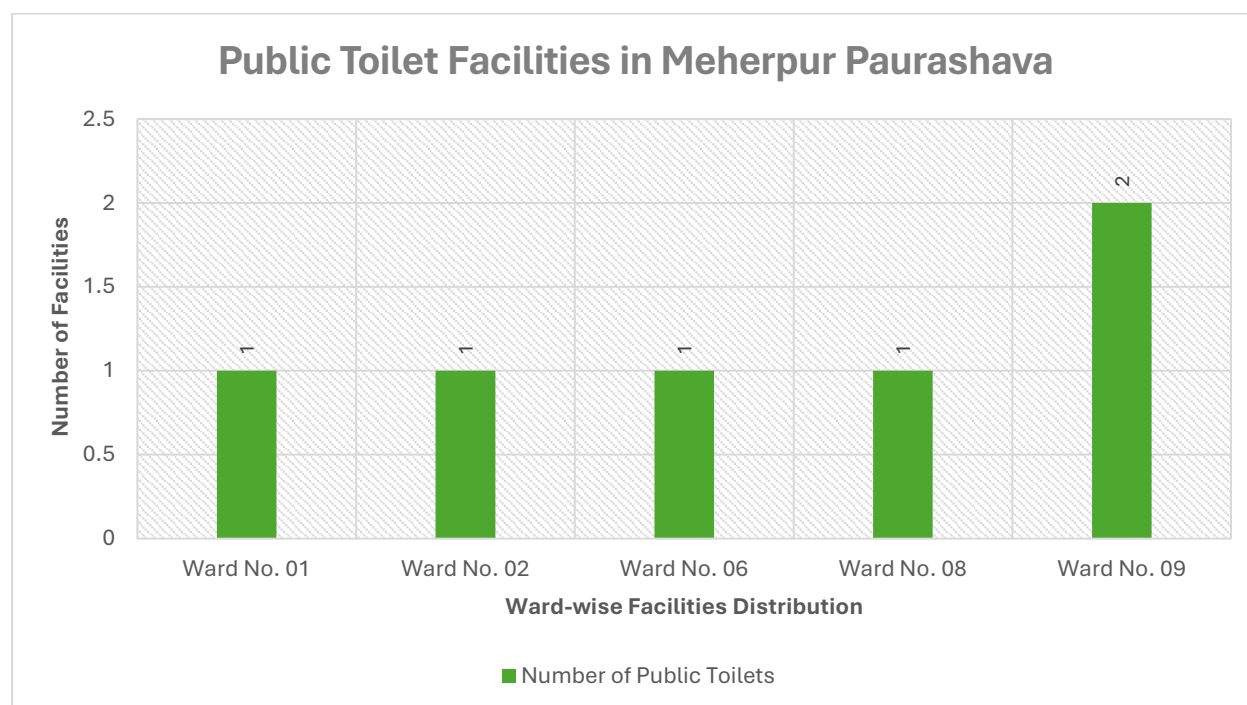
### 8.2.1.3 Public Toilet Facility:

The availability of public toilet facilities in Meherpur Paurashava is notably limited, with only six public toilets spread across five wards. This sparse distribution points to a significant shortfall in essential sanitation infrastructure, particularly in public and high-traffic areas. Ward No. 09 has the highest provision, with two public toilets, while Wards No. 01, 02, 06, and 08 each contain only one unit. Critically, Wards No. 03, 04, 05, and 07 have no recorded public toilet facilities, indicating major service gaps that could lead to open defecation, especially in markets, parks, transit hubs, and other communal areas. The limited number of public toilets may disproportionately affect vulnerable groups, including women, children, the elderly, and those with disabilities, by restricting their access to safe and hygienic sanitation options. It also raises public health and environmental concerns, especially in areas with high footfall or limited private sanitation options.

To address these challenges, planning should prioritize the construction of additional gender-sensitive, inclusive, and accessible public toilets in the underserved wards, along with proper maintenance systems and public awareness campaigns. Integration of smart sanitation facilities in markets, bus terminals, and parks should be considered under future urban infrastructure initiatives.

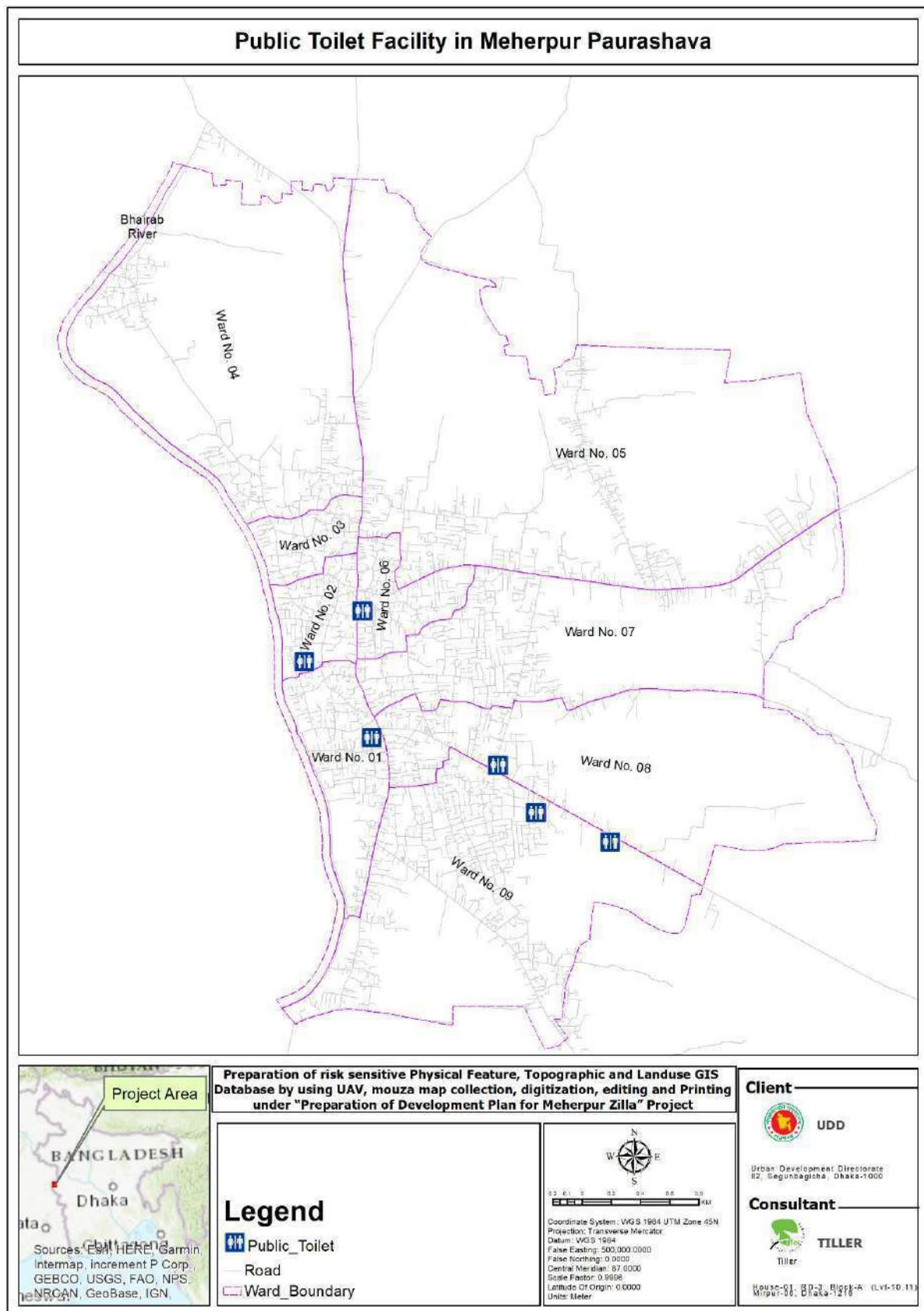
*Table 8-3: Public Toilet Facilities in Meherpur Paurashava*

Location	Number of Public Toilets
Ward No. 01	1
Ward No. 02	1
Ward No. 06	1
Ward No. 08	1
Ward No. 09	2
Total	6



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*Figure 8-3: Public Toilet Facilities in Meherpur Paurashava*



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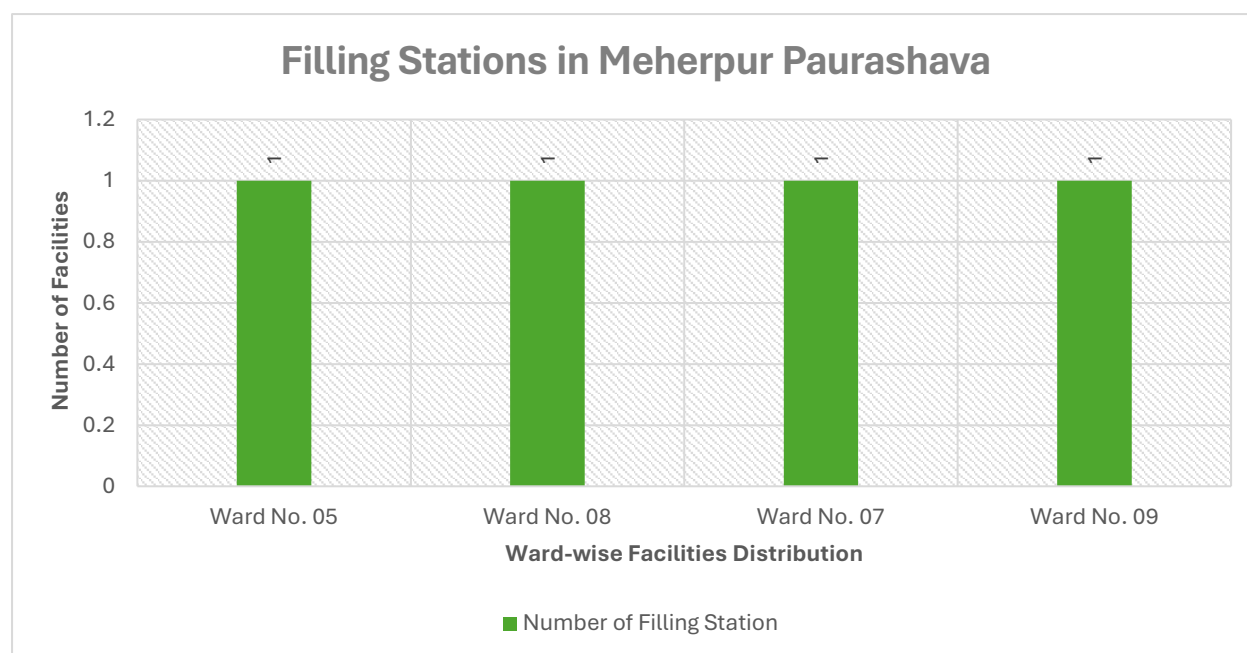
*Map 8-3: Public Toilet Facilities in Meherpur Paurashava*

#### 8.2.1.4 Filling Station:

he distribution of filling stations in Meherpur Paurashava is limited, with only four stations located across four different wards. These include Z. K. Filling Station in Ward No. 05, Joha Filling Station in Ward No. 08, BM LPG Auto Gas in Ward No. 07, and Meherpur Filling Station in Ward No. 09. This spatial allocation ensures some coverage across the town but leaves several wards—particularly Wards No. 01 through 04 and Ward No. 06—without direct access to such facilities. The presence of BM LPG Auto Gas is notable as it indicates the availability of cleaner fuel alternatives, supporting environmental sustainability and fuel diversification. However, the overall number of filling stations remains low in relation to the growing urban and transportation demands of the municipality. As urbanization intensifies and the number of vehicles increases, the current infrastructure may struggle to meet fuel needs efficiently, potentially leading to congestion and accessibility issues. It is therefore essential to plan for the establishment of additional filling stations in strategically suitable and underserved areas, ensuring compliance with safety standards, environmental regulations, and urban land use compatibility.

*Table 8-4: Filling Stations in Meherpur Paurashava*

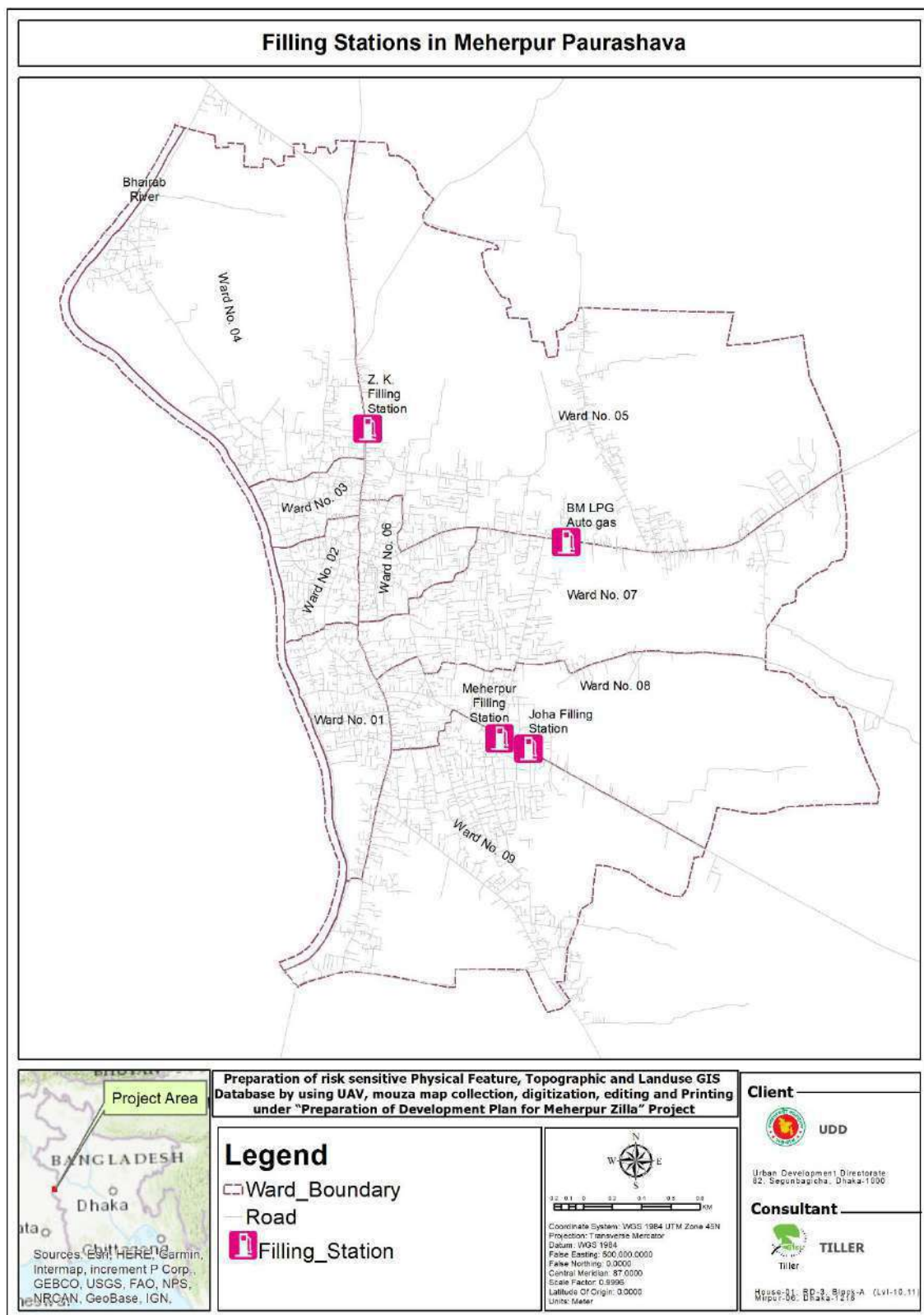
Location	Name	Number of Filling Station
Ward No. 05	Z. K. Filling Station	1
Ward No. 08	Joha Filling Station	1
Ward No. 07	BM LPG Auto gas	1
Ward No. 09	Meherpur Filling Station	1
Total		6





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*Figure 8-4: Filling Stations in Meherpur Paurashava*



*Map 8-4: Filling Stations in Meherpur Paurashava*



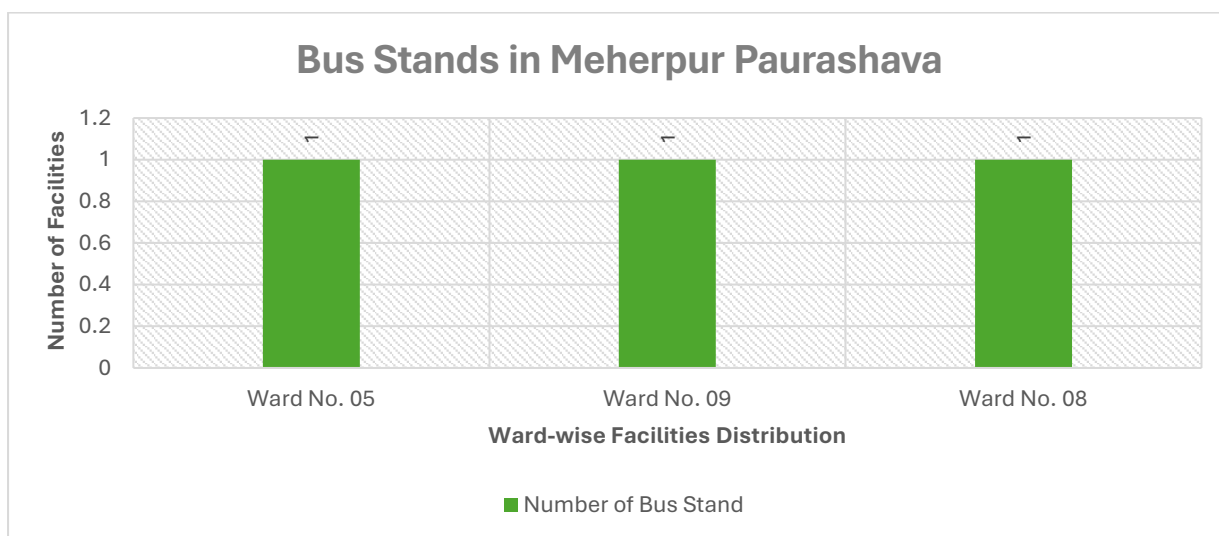
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#### 8.2.1.5 Bus Stand:

Meherpur Paurashava has a modest network of bus stands, with three primary facilities distributed across Wards No. 05, 08, and 09. These include the Kathuli Bus Stand in Bel Para (Ward No. 05), the Meherpur Old Bus Stand (Ward No. 08), and the centrally located Meherpur Bus Terminal (Ward No. 09). These transport hubs play a vital role in inter-district and intra-town connectivity, accommodating daily passenger movement and regional trade flow. Among them, the Meherpur Bus Terminal likely functions as the main formal terminal, while the old bus stand and local points like Kathuli serve as secondary or feeder nodes. However, the limited number of bus stands and their spatial concentration in specific wards suggest a need for expanded transit infrastructure, especially to improve accessibility in peripheral and underserved areas such as Wards No. 01–04 and Ward No. 06. As the town continues to grow, strategic upgrades and decentralization of public transport hubs will be essential to reduce traffic congestion, improve commuter convenience, and strengthen the municipality’s transport resilience. Future development should also consider amenities such as shelters, lighting, seating, and digital schedule systems to enhance service quality and user experience.

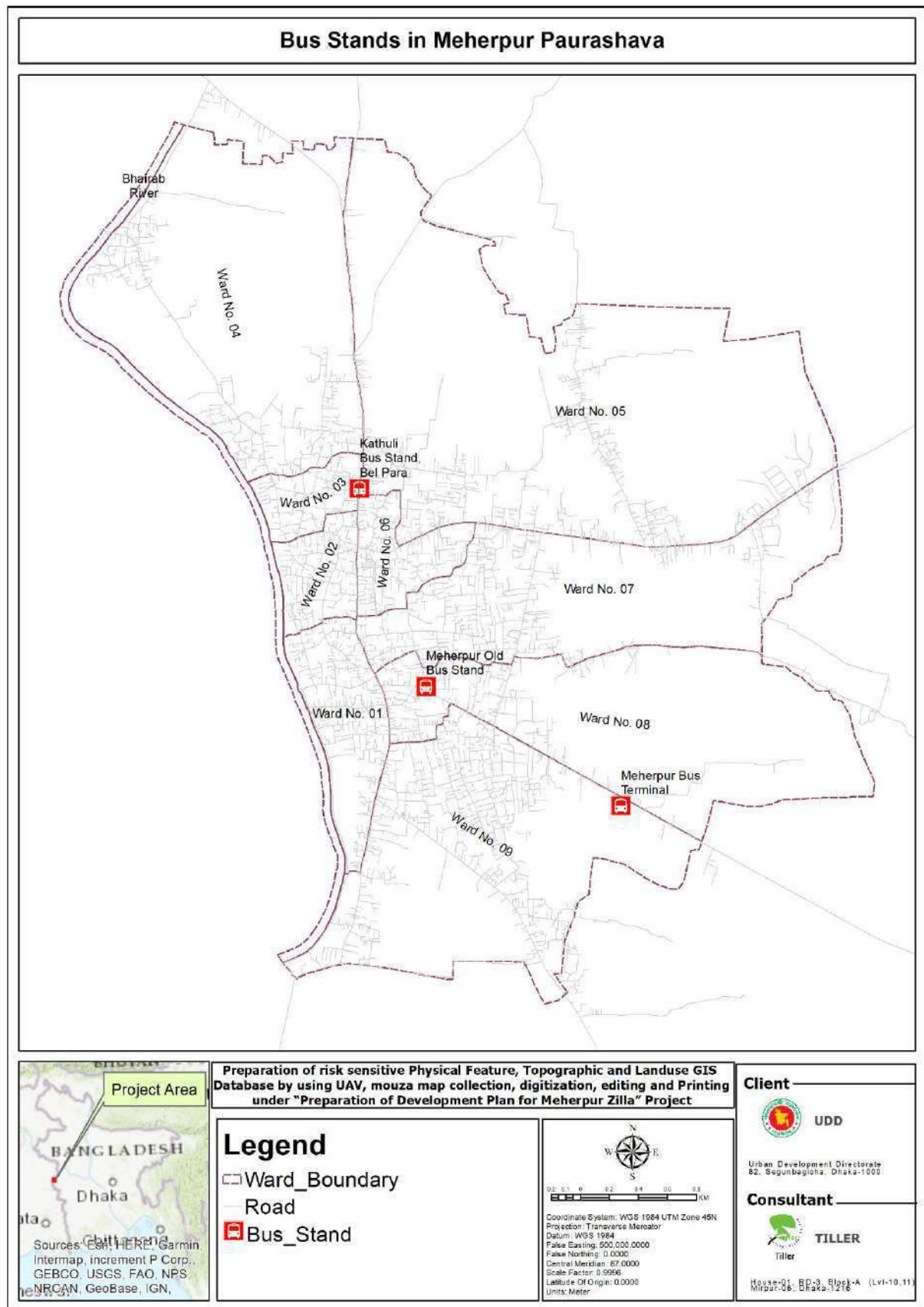
*Table 8-5: Bus Stands in Meherpur Paurashava*

Location	Name	Number of Bus Stand
Ward No. 05	Kathuli Bus Stand, Bel Para	1
Ward No. 09	Meherpur Bus Terminal	1
Ward No. 08	Meherpur Old Bus Stand	1
Total		6



*Figure 8-5: Bus Stands in Meherpur Paurashava*

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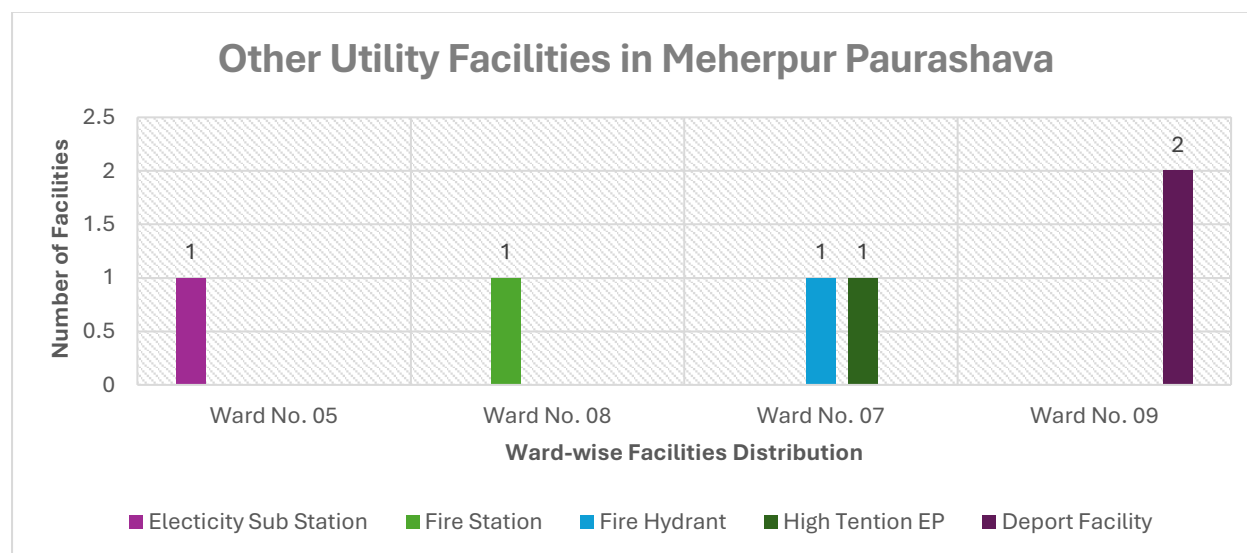
#### 8.2.1.6 Other Utility Services:

Given the compact urban scale of Meherpur Paurashava, essential utility services are concentrated rather than dispersed across all wards, yet remain sufficient to meet the general service demands of the town. The municipality hosts a single electricity substation, Meherpur Electric Supply (WZPDCL, Meherpur), located in Ward No. 05, which functions as the central node for the distribution of electricity throughout the Paurashava. Fire protection services are similarly centralized, with Meherpur Fire Station located in Ward No. 08, providing emergency response capabilities for the entire area. Additionally, one fire hydrant is installed in Ward No. 07, enhancing localized firefighting capacity, and high-tension electricity poles are also located in this ward, likely serving institutional or high-load users. Ward No. 09 is home to two major depot facilities operated by British American Tobacco Bangladesh, namely Meherpur Depot 1 and Meherpur Depot 2.

While the number of facilities appears limited in numerical terms, their strategic placement enables adequate service coverage across Meherpur Paurashava. Future planning efforts should focus on regular maintenance, safety compliance, and service reliability of these existing installations, rather than prioritizing spatial redistribution.

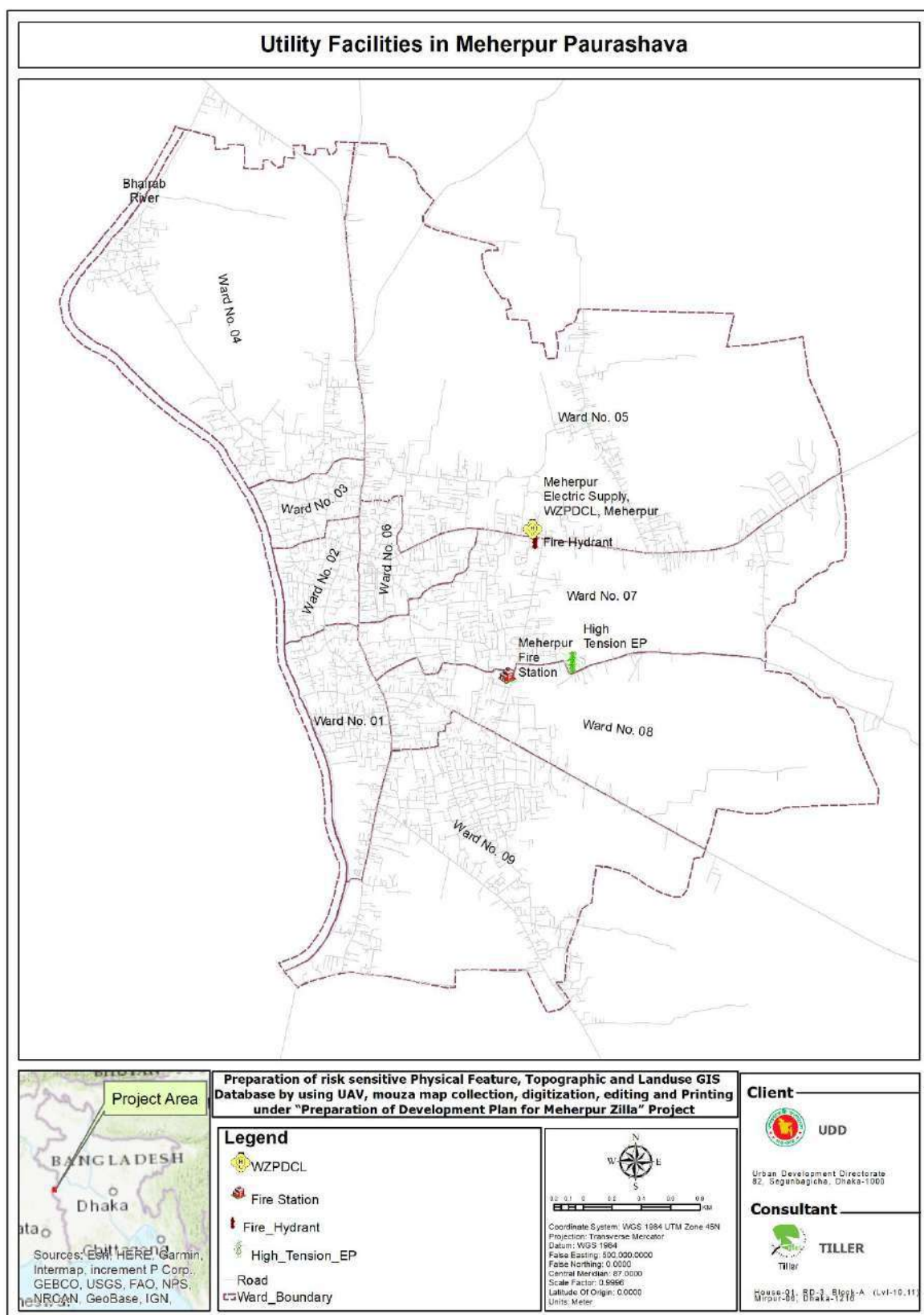
*Table 8-6: Other Utility Facilities in Meherpur Paurashava*

Location	Electricity Sub Station	Fire Station	Fire Hydrant	High Tension EP	Deport Facility
Ward No. 05	1				
Ward No. 08		1			
Ward No. 07			1	1	
Ward No. 09					2
Total	1	1	1	1	2



*Figure 8-6: Other Utility Facilities in Meherpur Paurashava*

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Map 8-6: Other Utility Facilities in Meherpur Paurashava

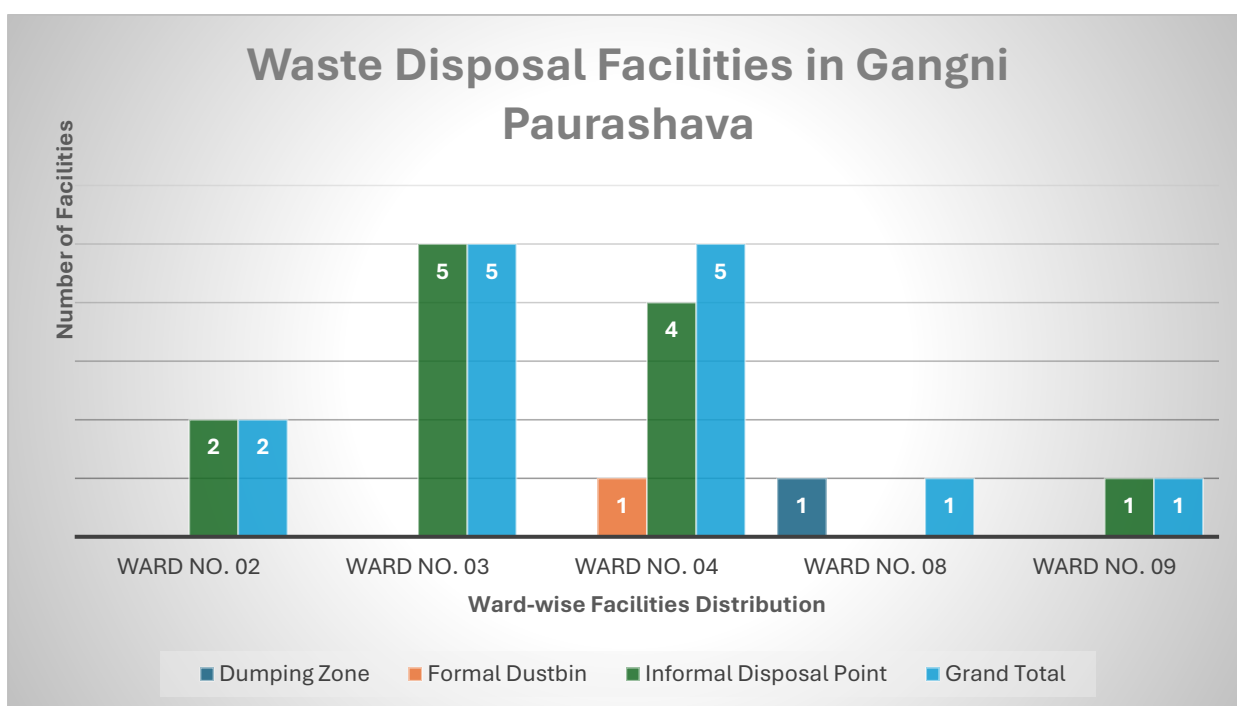
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## 8.2.2 Gangni Paurashava

### 8.2.2.1 Waste Disposal

*Table 8-7: Waste Disposal in Gangni Paurashava*

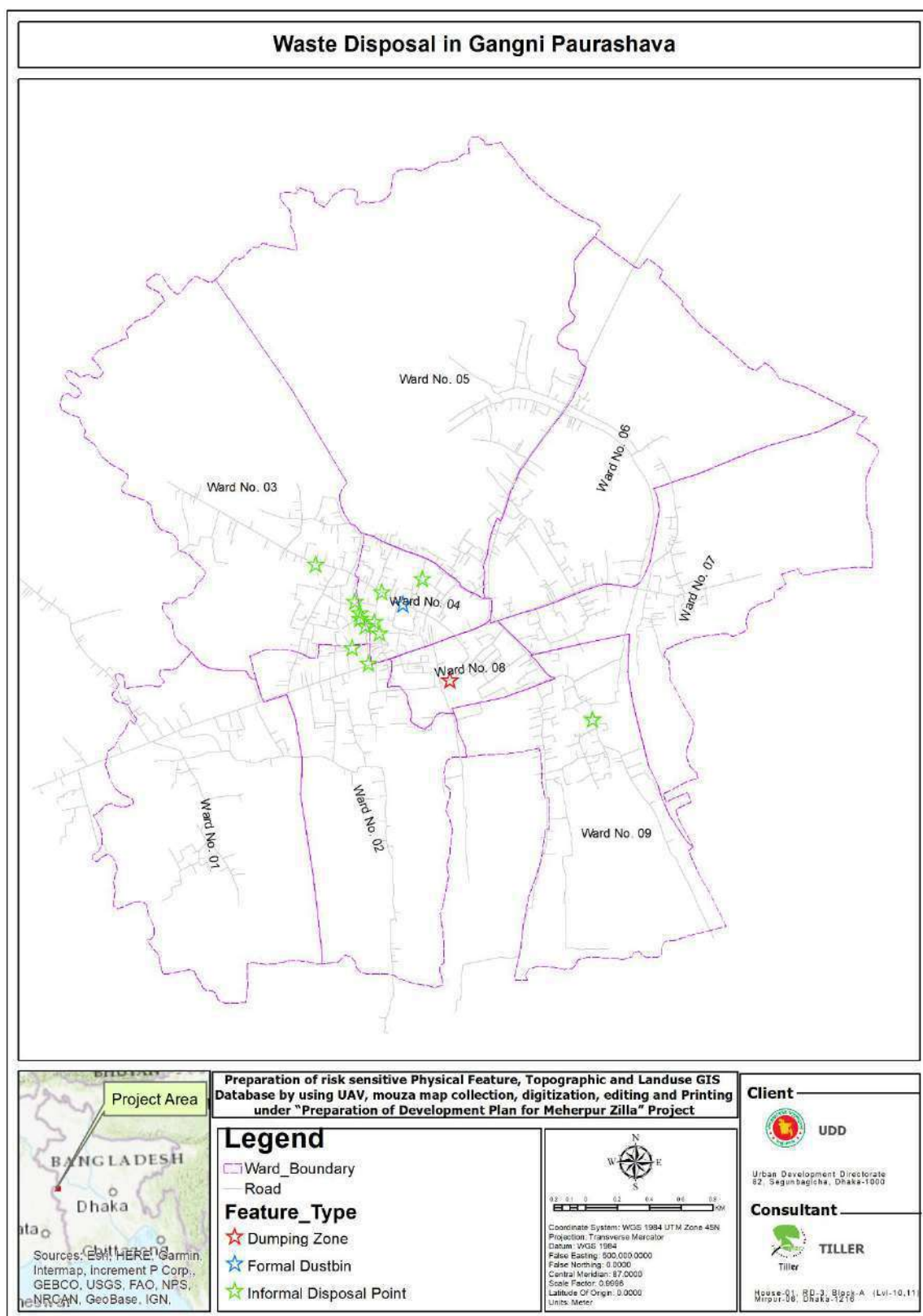
Location	Dumping Zone	Formal Dustbin	Informal Disposal Point	Grand Total
Ward No. 02			2	2
Ward No. 03			5	5
Ward No. 04		1	4	5
Ward No. 08	1			1
Ward No. 09			1	1
Total	1	1	12	14



*Figure 8-7: Waste Disposal in Gangni Paurashava*



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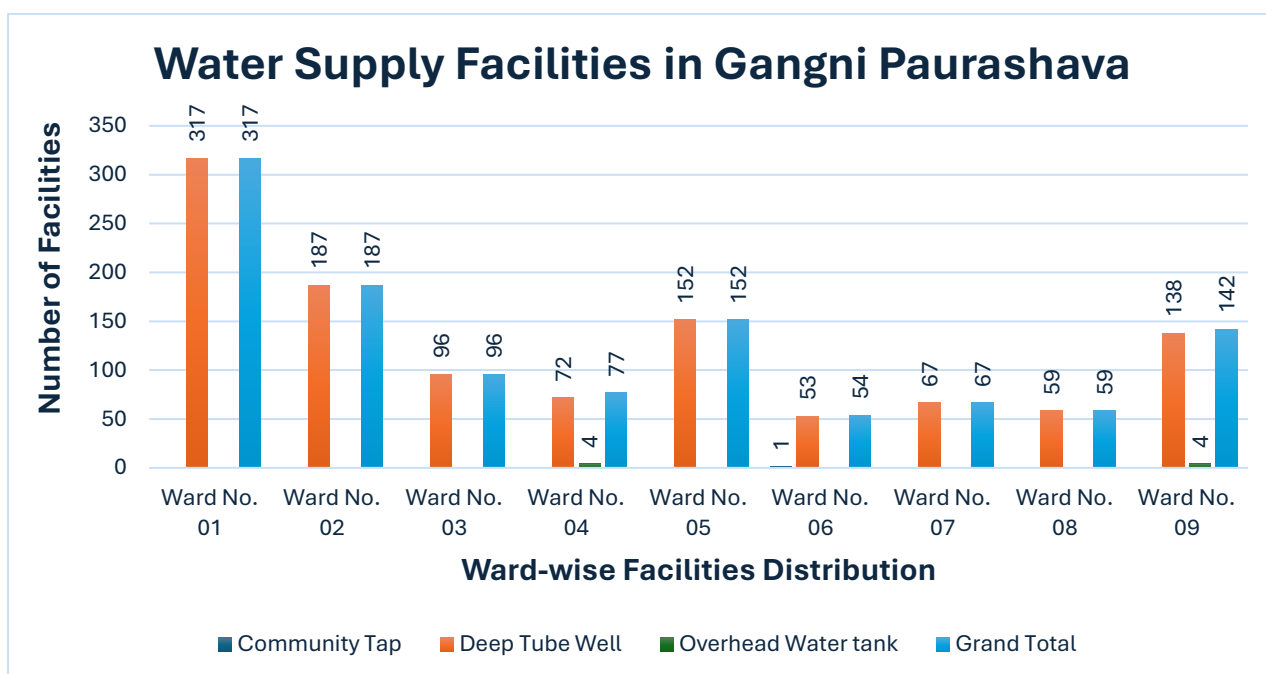
Map 8-7: Waste Disposal in Gangni Paurashava

### 8.2.2.2 Water Supply

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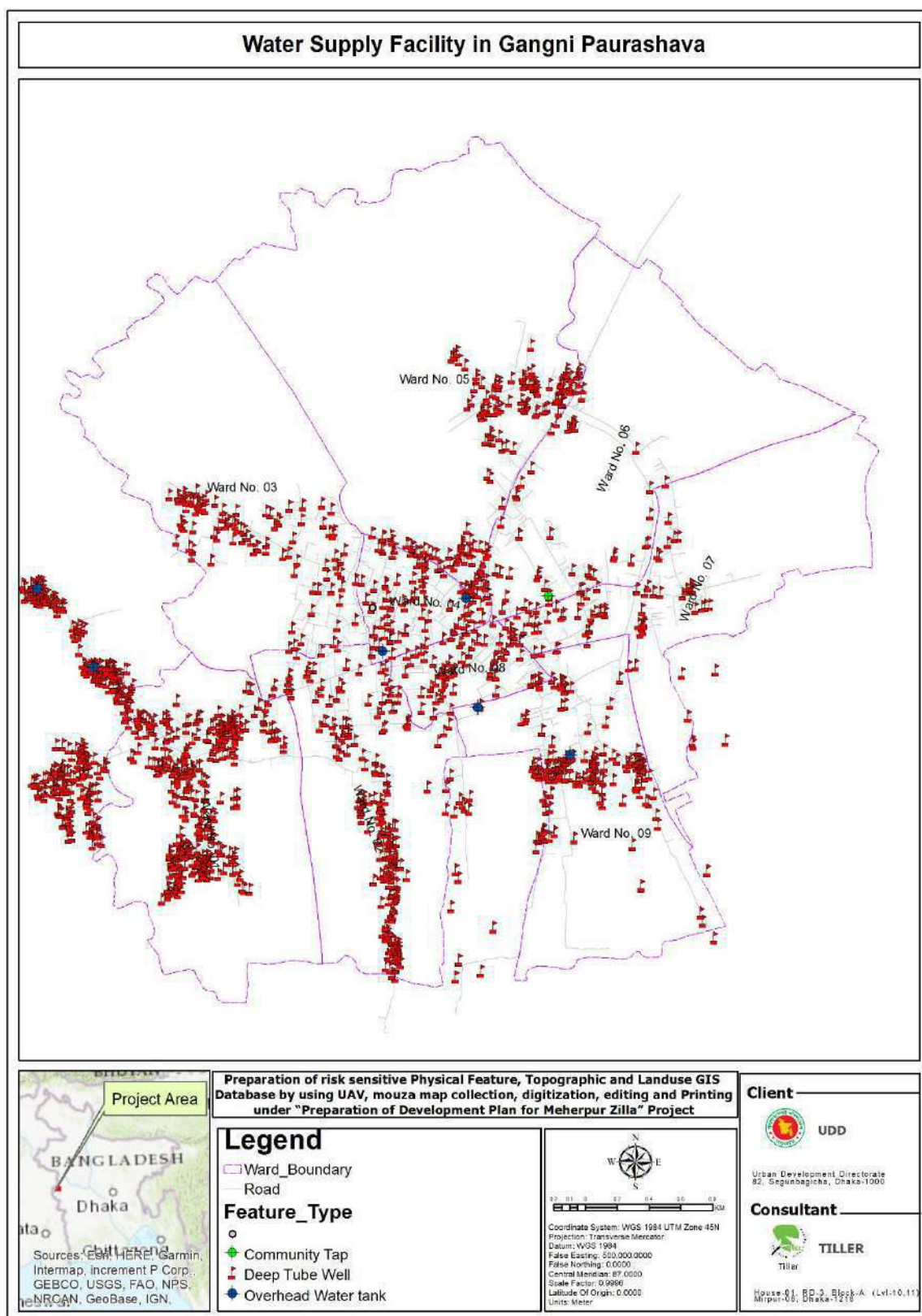
*Table 8-8: Water Supply Facilities in Gangni Paurashava*

Location	Community Tap	Deep Tube Well	Overhead Water tank	Grand Total
Ward No. 01		317		317
Ward No. 02		187		187
Ward No. 03		96		96
Ward No. 04		72	4	77
Ward No. 05		152		152
Ward No. 06	1	53		54
Ward No. 07		67		67
Ward No. 08		59		59
Ward No. 09		138	4	142
Total	1	1141	8	1151



*Figure 8-8: Water Supply Facilities in Gangni Paurashava*

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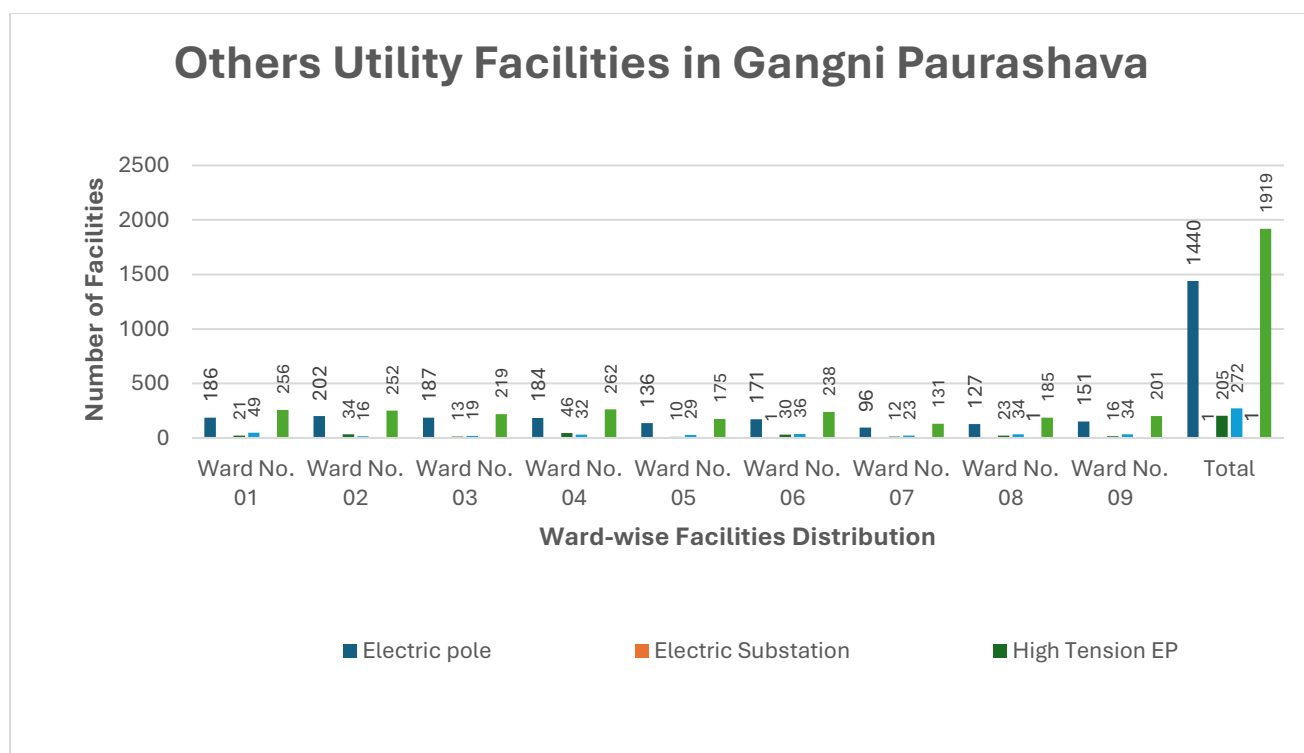
Map 8-8: Water Supply Facilities in Gangni Paurashava

### 8.2.2.3 Other Utility Services

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*Table 8-9: Other Utility Facilities in Gangni Paurashava*

Location	Electric pole	Electric Substation	High Tension EP	Streetlight	Telephone Substation	Grand Total
Ward No. 01	186		21	49		256
Ward No. 02	202		34	16		252
Ward No. 03	187		13	19		219
Ward No. 04	184		46	32		262
Ward No. 05	136		10	29		175
Ward No. 06	171	1	30	36		238
Ward No. 07	96		12	23		131
Ward No. 08	127		23	34	1	185
Ward No. 09	151		16	34		201
Total	1440	1	205	272	1	1919

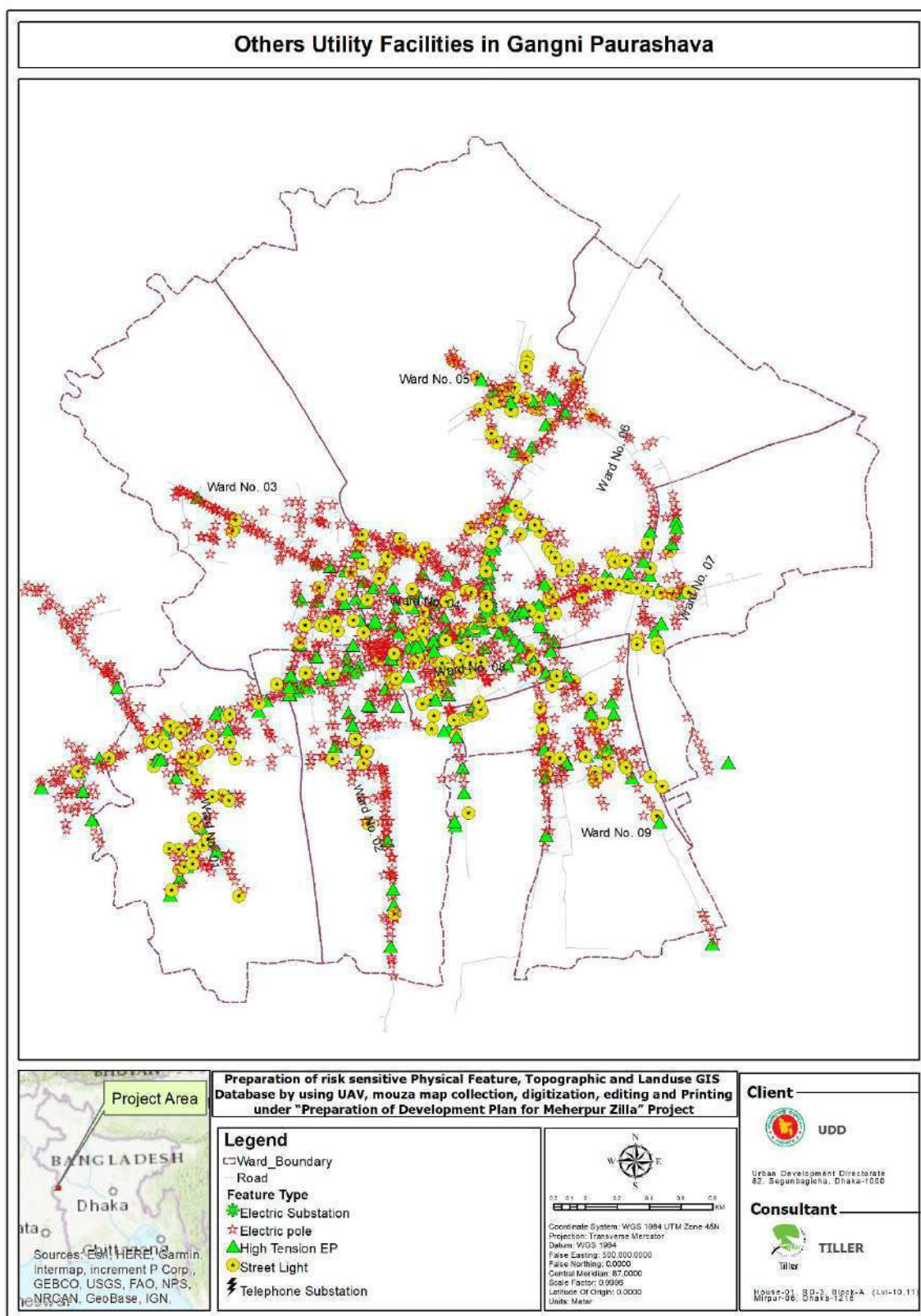


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*Figure 8-9: Other Utility Facilities in Gangni Paurashava*



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Map 8-9: Other Utility Facilities in Meherpur Paurashava

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### 8.3 Concluding Remarks

The assessment of utilities and services in Meherpur Paurashava reveals a foundational yet unevenly developed infrastructure landscape. While the municipality benefits from core facilities such as electricity supply, firefighting services, fuel stations, and public transport nodes, critical service gaps persist in waste management, water supply, and sanitation. The predominance of informal waste disposal points, limited number of formal dustbins and Secondary Transfer Stations, and the scarcity of public toilets highlight urgent challenges in ensuring hygienic and environmentally sustainable urban living conditions.

Water supply infrastructure remains predominantly decentralized, relying on community taps with minimal overhead tank capacity, which constrains continuous and equitable access, particularly in underserved wards. Similarly, the limited number of filling stations and bus stands, although currently functional, require strategic expansion to accommodate anticipated urban growth and mobility demands.

Despite the compact size of Meherpur Paurashava allowing for centralized placement of key utilities such as the electric substation, fire station, and depots, ongoing maintenance, safety compliance, and service reliability remain critical for sustaining urban resilience.

To achieve a more sustainable and inclusive urban environment, targeted interventions are essential. These include scaling up formal waste management facilities and services, expanding water supply networks with a focus on household connectivity, increasing public sanitation amenities, and improving transport and fuel infrastructure coverage. Moreover, community engagement and awareness-raising will be pivotal in ensuring the effective use and maintenance of these services.

Ultimately, this working paper underscores the need for integrated planning and coordinated investments in utilities and services to foster equitable access, environmental health, and improved quality of life for the residents of Meherpur Paurashava.

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## **CHAPTER 9: HYDROLOGY AND BATHYMETRIC STUDIES**

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### **9.1 Background**

Meherpur District located in the northwestern region of Bangladesh, is a historically significant and agriculturally productive district that shares an international boundary with West Bengal, India. As part of the Ganges River floodplain, the district exhibits gently undulating terrain with slightly elevated ridges and scattered low-lying depressions. It consists of fertile alluvial soils that are both agriculturally rich and hydrologically sensitive, making it fertile for agriculture production. The hydrological network of the project area comprises with river, natural canals (khals), man-made drainage structures, and seasonal wetlands that support agriculture and biodiversity.

However, over the past few decades, Meherpur has experienced increasing urbanization without corresponding proper development in its stormwater and surface drainage systems. This has led to frequent urban flooding, prolonged waterlogging, and associated socio-economic disruptions. Climate variability has further influenced the local hydrology of project area. Understanding the hydrological context of the area is therefore essential for urban and regional integrated land use planning.

This report aims to provide the necessary hydrological insights that can support resilient development and inform the formulation of a sustainable drainage and flood management strategy for the project area.

### **9.2 Objectives**

The objectives of this study focus on understanding the hydrological characteristics of Meherpur District through systematic data analysis and evaluation. This involved collecting historical rainfall and surface water level data from respective authorities, followed by data processing, statistical analysis and hydrological interpretation which will be helpful for flood mitigation, urban drainage planning and long-term climate resilience regional, structural, urban and rural planning for the district.

- To Collect and compile historical rainfall data from the Bangladesh Meteorological Department (BMD) and surface water level data from the Bangladesh Water Development Board (BWDB)
- To preprocess and validate hydrological datasets for consistency and accuracy
- To perform statistical and frequency analysis for rainfall and flood return periods
- To develop Intensity-Duration-Frequency (IDF) curves to support drainage infrastructure design

### **9.3 Methodology**

Drainage and flood management are important considerations for assessing the development prospects of Meherpur Zilla. The hydrological assessment in this study is based on both flood level and drainage analysis.

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Flood analysis focuses on the estimation of the design flood level, which involves conducting frequency analysis using Probability Distribution Functions (PDFs) for selected return periods (i.e., 1.11, 2, 5, 10, 20,50 and 100 years). Historical data on annual peak water levels have been collected from the nearest BWDB gauge stations to assess flood magnitudes and recurrence. There are 5 BWDB gauge stations are available for Bhairab and Mathabhanga River surrounding the project area. These water level records are essential for evaluating and mapping the extent and frequency of inundation in project areas.

In parallel, rainfall data were collected from the Bangladesh Meteorological Department (BMD). Since there is no rainfall gauge station available in Maherpur district, the nearest gauge station i.e., Chuadanga station is considered in this study. This station measures 3 hourly and daily rainfall data. The 3-hourly rainfall data is available since 2004. So, 3-hourly rainfall records from 2004 – 2024 were collected, preprocessed, cleaned for missing data and analyzed for intensity and frequency using statistical methods. The rainfall analysis supports the development of IntensityDuration-Frequency (IDF) curves. The IDF curves were developed using the Least Square Method to estimate rainfall intensities for various return periods and durations. This approach allows for estimating the design rainfall intensity corresponding to any given duration and return period, which is essential for hydrological design and flood risk assessment in the project area.

#### 9.4 Characteristics of Rainfall in the Project Area

Rainy season is very prominent in the project area like other regions of the country. Maherpur district generally experiences a climate that is heavily influenced by the tropical monsoon system. Rainfall shows considerable variability from year to year, both in amount and distribution which can lead to periods of drought or excessive rain. The pre-monsoon season from March to May brings some rainfall often accompanied by thunderstorms locally known as "Kalbaishakhi" which can be intense but short-lived. The district receives the major amount of its rainfall during the monsoon season, which typically lasts from June to September. Post-monsoon rainfall, occurring between October and November, gradually declines as the monsoon withdraws. As per analysis of rainfall data of Chuadanga Meteorological Station, the mean annual rainfall in Project area is 1420 mm which is lower than the national average of 2300 mm. Since 2004, the maximum yearly rainfall ever recorded is 353 mm (daily maximum) in the year 2008.

Table 9-1: Annual Rainfall at Chuadanga Meteorological Station (2004-2024).

Year	Daily Maximum (mm)	Annual Total (mm)
2004	250.3	1896.7
2005	225.20	1706.2
2006	124	1445.5
2007	272.2	1744.5
2008	353.2	1861.7
2009	125.10	1239.2

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2010	56	850.2
2011	106.2	1622.1
2012	81.8	1138.6
2013	98.3	1163.1
2014	108.2	1091
2015	105.6	1460.4
2016	168.1	1391.9
2017	102.2	1475.4
2018	93.8	1222.5
2019	86	1293.5
2020	204	1748
2021	98.80	1683.4
2022	136.2	1217.8
2023	168.60	1085.1
2024	130.4	1486.3
Max	353.2	1896.7
Average	147.34	1420.147

From the above table, the annual daily maximum and annual total rainfall recorded are 353.2 mm and 1896.7 mm and average daily and annual rainfall are 147.34mm and 1420.14. Figure 9-1 represented the graphical distribution of mean monthly rainfall at Chuadanga Meteorological Station.



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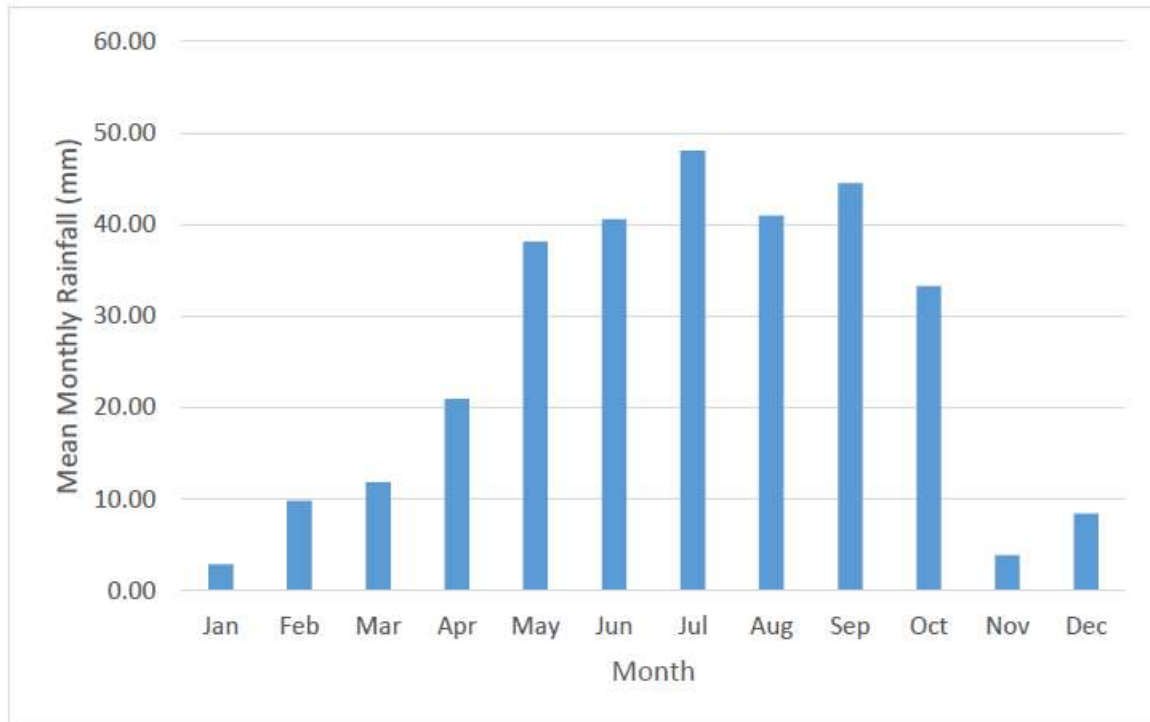


Figure 9-1: Distribution of mean monthly rainfall at Chuadanga

#### Rainfall Analysis

To determine the design rainfall for the project area, statistical techniques including frequency analysis are used. This process estimates the probability of a given rainfall event occurring based on a selected recurrence interval or return period. The recurrence interval is based on the probability that the given event will be equaled or exceeded in any given year.

The rainfall analysis results in developing Intensity-Duration-Frequency (IDF) curves that are essential for infrastructure design, flood risk management and urban drainage planning. The IDF curve graphically represents the relationship between rainfall intensity, rainfall duration, and the frequency (or return period) of rainfall events. One of the most important uses of IDF curves is in the design of drainage and stormwater management systems especially in urban areas. In urban areas, where impermeable surfaces prevent rainfall from naturally infiltrating the ground, effective drainage is critical to prevent flooding and waterlogging. The IDF curve helps to estimate the intensity of rainfall for specific storm durations, ensuring that drainage systems are appropriately sized to handle peak flows. The peak flows rate would be estimated by the Rational Method.

The Rational method is an empirical relationship of rainfall intensity, contributing drainage area, and a runoff coefficient that reflects land use and surface characteristics. The rainfall intensity used in the calculation of peak flow is obtained from the IDF curves for a rainfall duration equal to the time of concentration. The time of concentration ( $T_c$ ) is the time required for runoff from the most distant point of the drainage area to reach the outlet. The Kirpich equation is applied to estimate this time of concentration based on the physical characteristics of the watershed. The rational method is expressed as

$$Q = CIA/360 \dots\dots\dots (i)$$

Where,  $Q$  = Peak discharge ( $m^3/s$ ),  $C$  = a dimensionless runoff coefficient whose value depends on hydrologic characteristics of the drainage area,  $I$  = rainfall intensity in  $mm/hr$  for a duration

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equal to or greater than the time of concentration of the drainage basin, and A = area of the drainage basin in hectares.

The time of concentration can be estimated by Kirpich equation (1940) as

$$T_c = 0.01947 L^{0.77} S^{-0.385} \dots\dots\dots (ii)$$

Where,  $t_c$  = time of concentration (hr), L = maximum length of travel of water (m), S = Average catchment slope (m/m)

However, the peak runoff rate would be needed for the drainage design such as the size of the storm drain, retention pond and pumping station. The required size of the storm drains to convey the peak runoff would be designed by Manning's equation.

#### 9.4.1 Development of IDF Curve

A statistical analysis of 3-hourly maximum annual rainfall data from Chuadanga station was conducted using the Least Squares Method to develop Intensity-Duration-Frequency (IDF) curves. The analysis was based on 21 years of observed data, where maximum 3-hour rainfall of each year value was ranked and corresponding return periods were calculated using the Weibull formula,  $T = (N+1)/m$ . The return periods were then transformed using a logarithmic function to fit a linear regression model, producing a relationship between rainfall depth and return period in the form  $y = A + Bx$ . This equation was used to estimate rainfall depths for various return periods ranging from 1.1 to 100 years. To determine the corresponding 1-hour rainfall intensities from 3 hours duration rainfall, an empirical formula was applied which is expressed as follow  $I_c = F \frac{I_3}{T^{(T+1)}} \dots\dots\dots (iii)$

**$T (tc+1)$**

Where,  $I_c$  = Rainfall intensity (mm/hr) corresponding to the selected duration  $t_c$ , F = Estimated 3hour rainfall depth (mm) for a given return period obtained through frequency analysis; T = observed rainfall duration (i.e., 3 hour)

The IDF curves of the project area for different return periods are shown in Figure 9-2 and the design rainfall intensities for different return periods and durations are provided in Table 9-2: Design Rainfall Intensity (mm/hr) for different return periods and durations.

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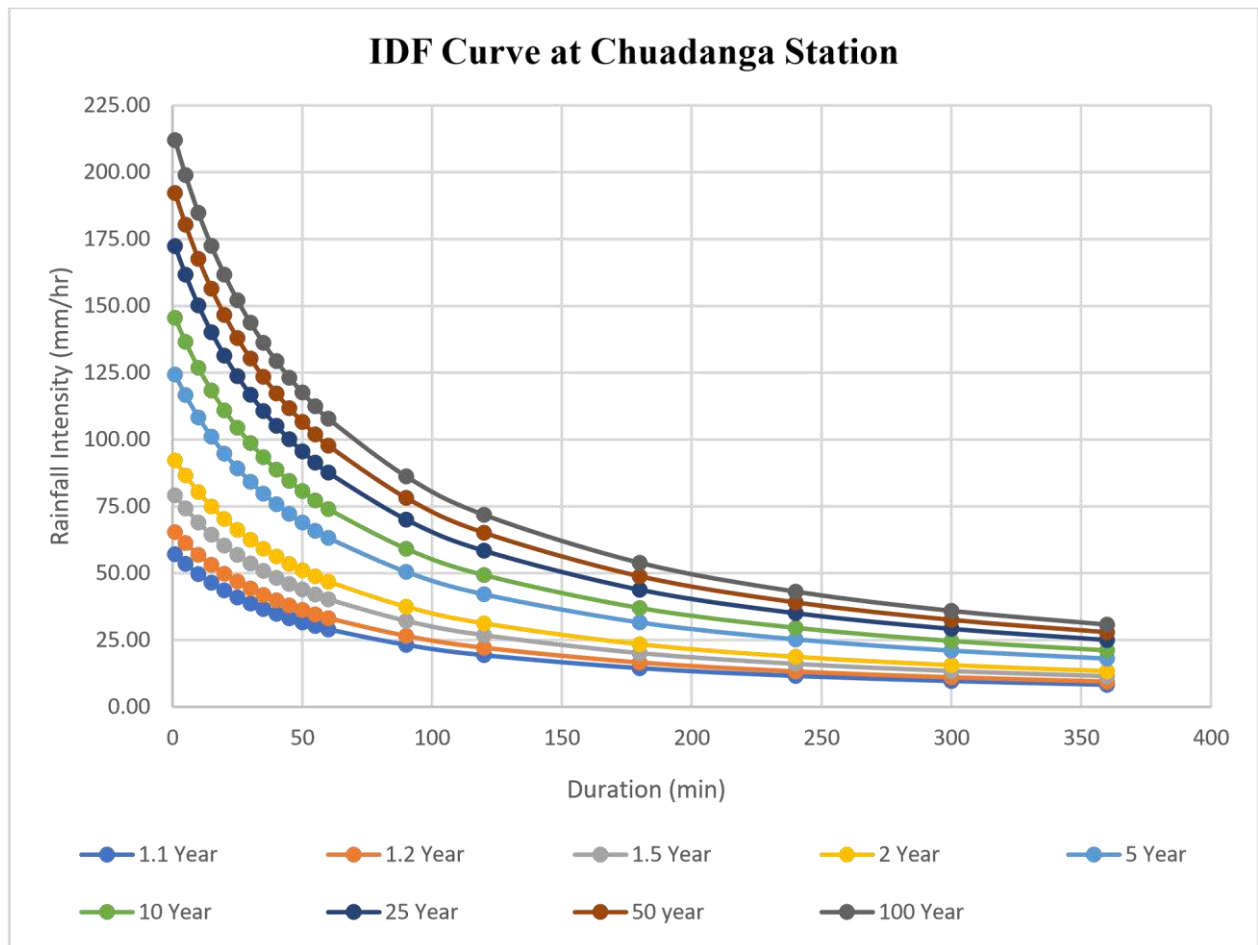


Figure 9-2: Intensity-Duration-Frequency (IDF) curve for different return periods at Chuadanga Station

Table 9-2: Design Rainfall Intensity (mm/hr) for different return periods and durations

Duration (min)	Design Rainfall Intensity (mm/hr)								
	1.1 Yr	1.2 Yr	1.5 Yr	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
1	57.10	65.34	79.18	92.22	124.29	145.52	172.35	192.26	212.01
5	53.58	61.32	74.31	86.54	116.64	136.57	161.75	180.43	198.97
10	49.76	56.94	69.00	80.36	108.31	126.81	150.19	167.54	184.76
15	46.44	53.15	64.40	75.00	101.09	118.36	140.18	156.37	172.44
20	43.54	49.82	60.38	70.32	94.77	110.96	131.42	146.60	161.66
25	40.98	46.89	56.83	66.18	89.20	104.43	123.69	137.97	152.15
30	38.70	44.29	53.67	62.50	84.24	98.63	116.82	130.31	143.70
35	36.66	41.96	50.84	59.21	79.81	93.44	110.67	123.45	136.14
40	34.83	39.86	48.30	56.25	75.82	88.77	105.14	117.28	129.33
45	33.17	37.96	46.00	53.57	72.21	84.54	100.13	111.69	123.17
50	31.66	36.24	43.91	51.14	68.92	80.70	95.58	106.62	117.57
55	30.29	34.66	42.00	48.92	65.93	77.19	91.42	101.98	112.46
60	29.02	33.22	40.25	46.88	63.18	73.97	87.61	97.73	107.77
90	23.22	26.57	32.20	37.50	50.54	59.18	70.09	78.18	86.22

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120	19.35	22.14	26.83	31.25	42.12	49.32	58.41	65.15	71.85
180	14.51	16.61	20.13	23.44	31.59	36.99	43.81	48.87	53.89
240	11.61	13.29	16.10	18.75	25.27	29.59	35.05	39.09	43.11
300	9.67	11.07	13.42	15.63	21.06	24.66	29.20	32.58	35.92
360	8.29	9.49	11.50	13.39	18.05	21.14	25.03	27.92	30.79

#### 9.4.2 Water Level

There are two water level gauge station data available within the project area named Kazipur (ID: SW205) on the Mathabhanga river and Kathuli (ID: SW32) on the Bhairab River. Nearby the project area, BWDB also operates and maintains three additional stations (SW206, SW207, SW208) on the Mathabhanga River. For this study, data from two of these stations (SW206 and SW208) were collected and analyzed effectively. Table 9-3 and Table 9-4 represents the historical annual maximum and minimum water level data of the Mathabhanga and Kathuli River at different gauge station.

Table 9-3: Annual maximum and minimum water levels in the Mathabhanga River at different stations

Year	SW 205		SW 206		SW208	
	Max (m MSL)	Min (m MSL)	Max (m MSL)	Min (m MSL)	Max (m MSL)	Min (m MSL)
2003	13.34	7.76	11.23	6.13	8.00	2.50
2004	12.04	7.57	11.10	6.18	9.27	2.92
2005	13.72	7.93	10.66	6.15	9.10	3.98
2006	11.98	7.98	10.16	5.96	8.30	3.21
2007	12.78	7.99	10.79	6.12	8.27	3.24
2008	12.26	7.97	10.53	6.16	8.89	2.26
2009	11.63	7.68	9.49	6.04	6.12	2.21
2010	11.28	7.37	9.57	5.89	7.28	3.56
2011	12.58	7.47	10.85	5.60	9.50	3.51
2012	11.76	7.33	9.98	5.89	7.44	2.41
2013	12.92	7.45	11.07	5.93	7.75	3.22
2014	12.00	7.53	10.15	6.57	8.12	4.07
2015	11.44	7.71	10.15	6.64	8.02	2.51
2016	11.87	7.25	9.89	5.89	7.81	2.38
2017	11.37	7.52	9.24	5.98	6.74	3.09
2018	10.93	7.39	9.05	5.94	5.99	3.20
2019	12.16	7.44	9.74	5.92	7.69	2.33
2020	11.50	7.47	9.58	5.90	7.06	2.04
2021	11.87	7.43	10.33	5.94	7.85	2.17
2022	11.41	7.42	9.26	5.88	5.61	2.54

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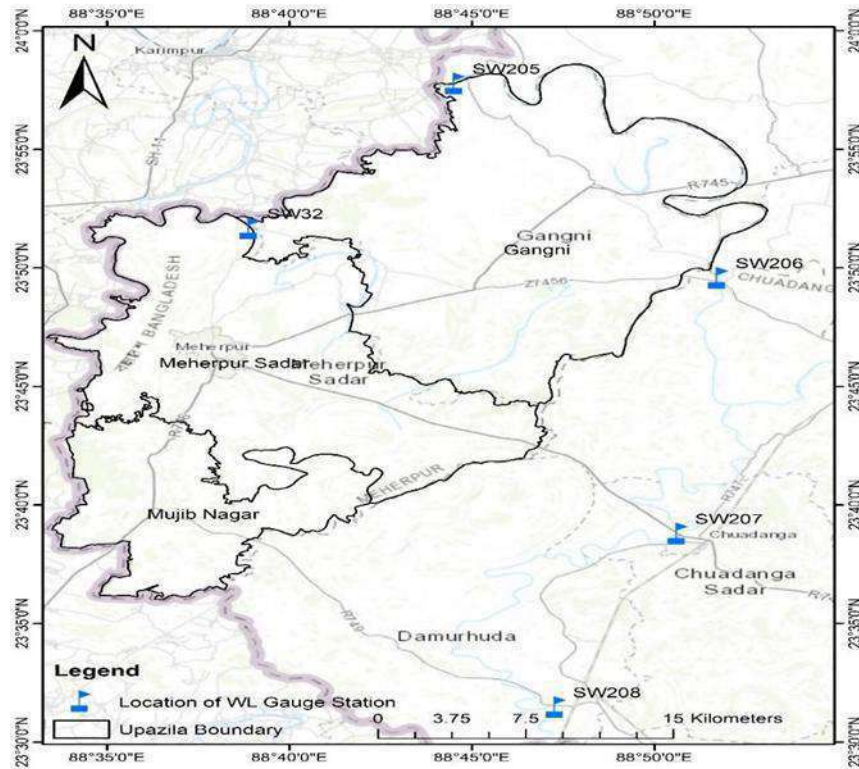
2023	10.43	7.25	8.35	5.59	5.60	2.21
2024	-	-	9.25	5.49	6.74	2.24

Table 9-4: Annual maximum and minimum water levels in the Bhairab River at Kathuli station

Year	SW32	
	Max (m MSL)	Min (m MSL)
2003	11.42	10.16
2004	11.26	9.11
2005	0.80	0.50
2008	11.84	10.19
2009	11.24	9.56
2010	10.46	9.99
2011	12.09	10.02
2012	10.54	9.81
2013	10.85	10.06
2014	10.70	9.97
2015	10.74	10.10
2016	10.55	9.72
2017	12.04	9.79
2018	10.52	9.63
2019	10.42	9.64
2020	11.24	9.55
2021	10.72	9.29
2022	10.03	9.30
2023	10.41	9.03



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Map 9-1: Water level Gauge station location map

### 9.4.3 Flood Frequency Analysis

Flood frequency analysis involves estimating the probability of flood events of varying magnitudes over different return periods using probability distribution functions (PDFs). Estimating of accurate flood frequency are critical for the design of hydraulic structures, floodplain mapping, and water resource planning. Flood frequency analysis was conducted for four stations namely SW32, SW205, SW206, and SW208 using the Hydrologic Engineering Center's Statistical

Software Package (HEC-SSP). Different PDFs were applied and compared in this study including

- **Generalized Extreme Value (GEV)** with L-Moments (LM), Maximum Likelihood Estimation (MLE), and Probability-Matching (PM)
- Log-Pearson Type III (LP III) with LM, PM and MLE
- **Pearson Type III** with LM, PM and MLE
- Log-Normal (Ln-Normal) with LM, PM and MLE
- **Normal** distribution with LM, MLE, and PM
- **Exponential** distribution with LM, MLE, and PM

The performance of each distribution was assessed using two statistical goodness-of-fit tests: the Kolmogorov-Smirnov (KS) test and the Anderson-Darling (A-D) test. Based on these tests, distributions were ranked separately and then given a combined rank to determine the most appropriate fit. Lower values in both tests indicate better agreement with observed data and thus more reliable flood frequency estimates. The fitted PDFs and the corresponding values of KS and A-D test are presented in Table 9-5: Fitted PDFs for SW32 and their combined rank

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based on KS and A-D test, Table 9-5 Table 9-6, Table 9-7, Table 9-8 for SW 32, SW205, SW206, SW208 respectively.

Table 9-5: Fitted PDFs for SW32 and their combined rank based on KS and A-D test

Distribution	Goodness of Fit Test (KS Test)	Rank	Goodness of Fit Test (A-D Test)	Rank	Combined Rank
Generalized Extreme Value (LM)	0.133	1	0.369	1	1
Log-Pearson III (PM)	0.15	3	0.432	2	2
Generalized Extreme Value (MLE)	0.136	2	0.44	3	2
Ln-Normal (PM)	0.133	1	0.62	5	3
Generalized Extreme Value (PM)	0.153	4	0.44	3	4
Pearson III (PM)	0.153	4	0.443	4	5
Ln-Normal (MLE)	0.185	5	0.62	5	6
Normal (LM)	0.191	6	0.672	6	7
Normal (MLE)	0.191	6	0.677	7	8
Normal (PM)	0.191	6	0.677	7	8
Log-Pearson III (MLE)	0.492	7	4.656	8	9
Pearson III (MLE)	0.499	7	4.787	9	10
Exponential (LM)	0.6	8	7.449	10	11
Exponential (MLE)	0.6	8	7.449	10	11
Exponential (PM)	0.6	9	7.449	10	12

Table 9-6: Fitted PDFs for SW205 and their combined rank based on KS and A-D test

Distribution	Goodness of Fit Test (KS Test)	Rank	Goodness of Fit Test (A-D Test)	Rank	Combined Rank
Log-Pearson III (PM)	0.099	1	0.214	1	1
Generalized Extreme Value (PM)	0.099	1	0.216	2	2
Pearson III (PM)	0.099	1	0.219	4	3
Generalized Extreme Value (LM)	0.101	2	0.218	3	3
Generalized Extreme Value (MLE)	0.102	3	0.221	5	4

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Pearson III (LM)	0.104	4	0.235	6	5
Ln-Normal (MLE)	0.116	5	0.255	7	6
Ln-Normal (PM)	0.116	5	0.255	7	6
Ln-Normal (LM)	0.117	6	0.256	8	7
Normal (PM)	0.129	7	0.311	9	8
Normal (MLE)	0.129	7	0.311	9	8
Normal (LM)	0.129	7	0.312	10	9
Log-Pearson III (MLE)	0.484	8	6.124	11	10
Pearson III (MLE)	0.488	9	6.199	12	11
Exponential (LM)	0.582	10	8.501	13	12
Exponential (PM)	0.582	10	8.501	13	12
Exponential (MLE)	0.582	10	8.501	13	12

Table 9-7: Fitted PDFs for SW206 and their combined rank based on KS and A-D test

Distribution	Goodness of Fit Test (KS Test)	Rank	Goodness of Fit Test (AD Test)	Rank	Combined Rank
Generalized Extreme Value (LM)	0.075	1	0.185	1	1
Normal (LM)	0.076	2	0.197	3	2
Generalized Extreme Value (PM)	0.081	4	0.188	2	3
Ln-Normal (LM)	0.079	3	0.21	6	4
Normal (MLE)	0.082	5	0.208	5	5
Normal (PM)	0.082	5	0.208	5	5
Log-Pearson III (PM)	0.086	6	0.206	4	5
Ln-Normal (MLE)	0.081	4	0.217	8	6
Ln-Normal (PM)	0.081	4	0.217	8	6
Pearson III (PM)	0.089	7	0.213	7	7
Generalized Extreme Value (MLE)	0.106	8	0.227	9	8
Log-Pearson III (MLE)	0.335	9	4.372	10	9
Pearson III (MLE)	0.345	10	4.621	11	10
Exponential (PM)	0.565	11	8.675	12	11
Exponential (MLE)	0.565	11	8.675	12	12

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Exponential (LM)	0.565	11	8.675	12	13
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Table 9-8: Fitted PDFs for SW206 and their combined rank based on KS and A-D test

Distribution	Goodness of Fit Test (KS Test)	Rank	Goodness of Fit Test (AD Test)	Rank	Combined Rank
Log-Pearson III (PM)	0.106	1	0.218	2	1
Normal (MLE)	0.106	1	0.218	2	1
Normal (PM)	0.106	1	0.218	2	1
Normal (LM)	0.107	2	0.216	1	1
Pearson III (PM)	0.107	2	0.216	1	1
Generalized Extreme Value (PM)	0.113	3	0.22	3	2
Generalized Extreme Value (MLE)	0.116	4	0.25	5	3
Generalized Extreme Value (LM)	0.119	5	0.221	4	3
Ln-Normal (MLE)	0.13	6	0.273	7	4
Ln-Normal (PM)	0.13	6	0.273	7	4
Ln-Normal (LM)	0.131	7	0.271	6	4
Log-Pearson III (MLE)	0.428	8	4.786	8	5
Pearson III (MLE)	0.442	9	5.228	9	6
Exponential (PM)	0.536	10	7.129	10	7
Exponential (MLE)	0.536	10	7.129	10	7
Exponential (LM)	0.536	10	7.129	10	7

From the above table-5,6,7 and 8, it is shown that the best fitted PDFs are Generalized Extreme Value (LM), Log-Pearson III (PM), Generalized Extreme Value (LM), Log-Pearson III (PM) for station SW 32, SW205, Sw206, SW208 respectively. Estimated flood levels for return periods of

1.01, 2, 5,10,20,50,100 years were derived from the best-fit distributions and are presented in Table 9-9 below.

Table 9-9: Fitted PDFs and annual maximum flood levels (m MSL) for different return periods

Station	Best Fit PDF	Return Period (Year)						
		1.01	2	5	10	25	50	100

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SW32	GEV (LM)	9.87	10.82	11.37	11.74	12.14	12.74	13.29
SW205	LP III (PM)	10.25	11.91	12.59	12.99	13.35	13.82	14.19
SW206	GEV (LM)	8.02	10.03	10.71	11.04	11.3	11.62	11.84
SW208	LP III (PM)	5.47	7.79	8.62	9.06	9.45	9.92	10.28

The probability plot of all stations, along with 5% and 95% confidence interval for the annual maximum flood level, are shown in Figure-5, Figure-6, Figure-7 & Figure-8. It is seen that the observed values of all stations fall well within the 5% and 95% confidence interval indicating satisfactory fitted distribution for the annual maximum flood level.

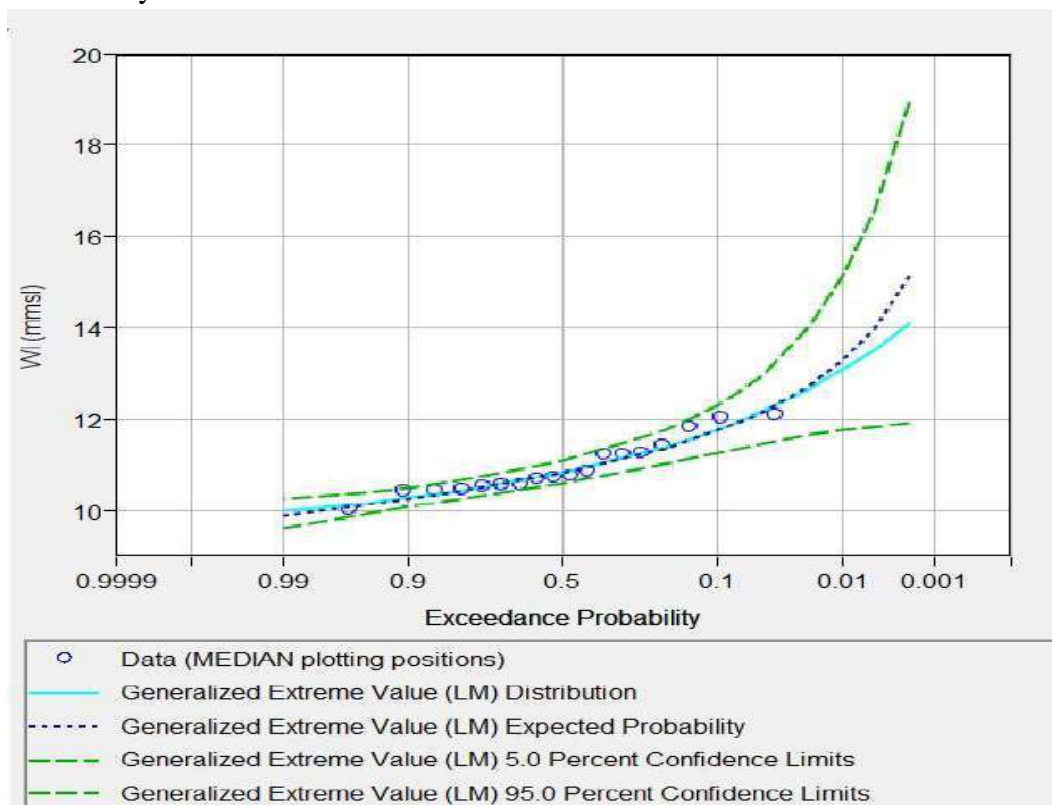


Figure 9-3: Probability plot along with 5% and 95% confidence interval of the GEV (LM) distribution fitted to the annual maximum water level data of SW32 station (Bhairab River)



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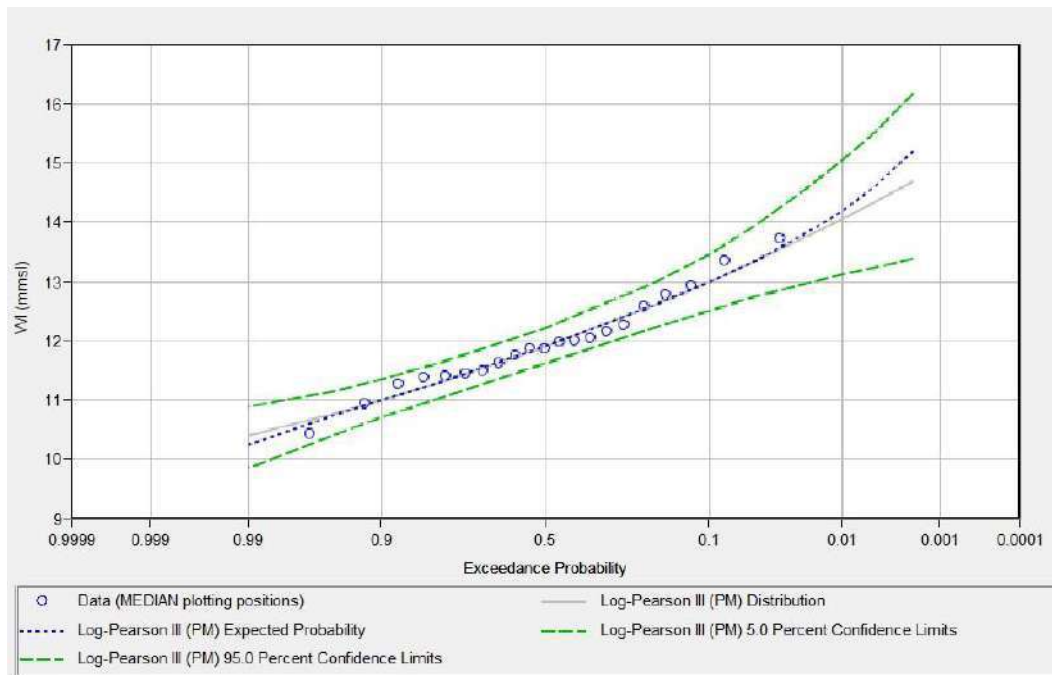


Figure 9-4: Probability plot along with 5% and 95% confidence interval of the LP III (PM) distribution fitted to the annual maximum water level data of SW205 station (Mathabhanga River)

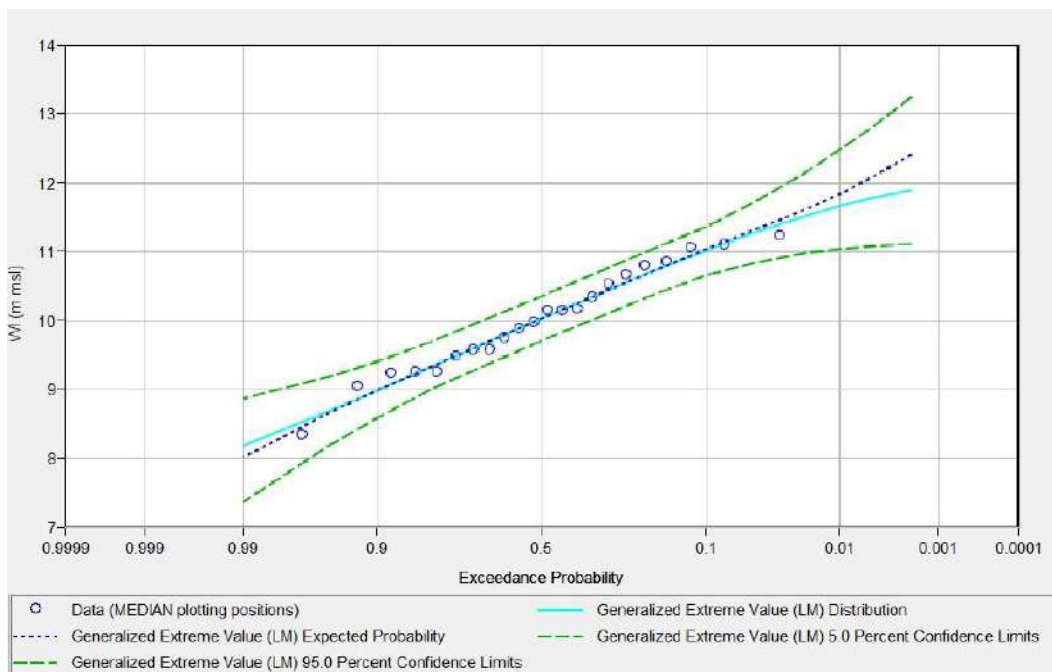


Figure 9-5: Probability plot along with 5% and 95% confidence interval of the GEV (LM) distribution fitted to the annual maximum water level data of SW206 station (Mathabhanga River)

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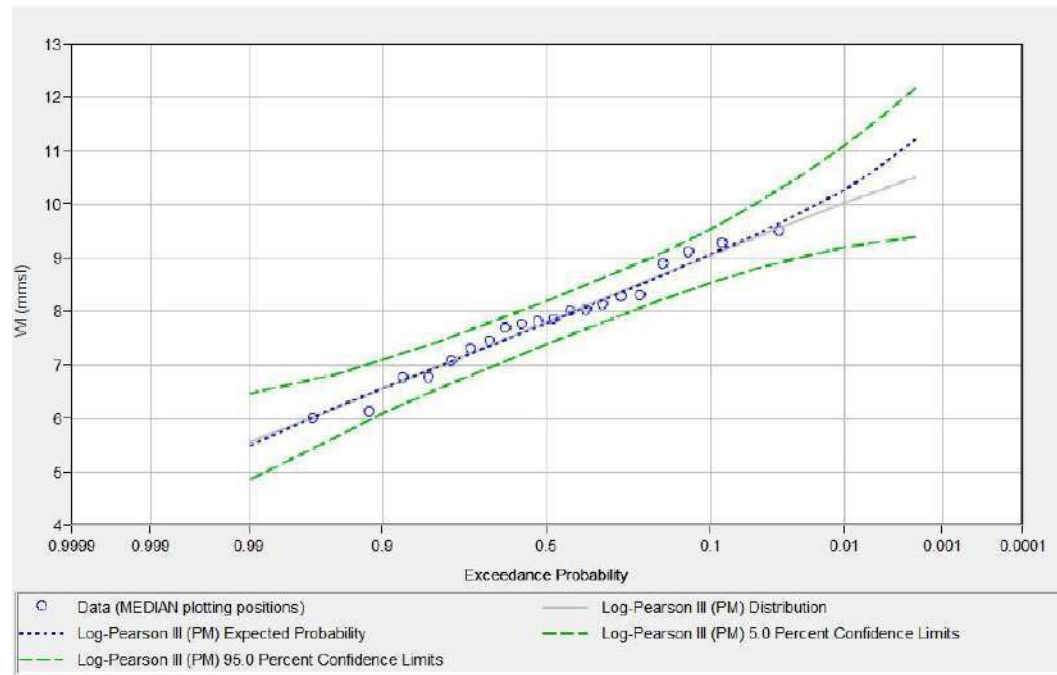


Figure 9-6: Probability plot along with 5% and 95% confidence interval of the LP III (PM) distribution fitted to the annual maximum water level data of SW208 station (Mathabhanga River)

## 9.5 Conclusion

The hydrological assessment in this study provides a critical understanding of rainfall patterns, flood risks, and drainage challenges in the project area which is essential for climate-resilient urban and regional planning. The mean annual rainfall in the project area is 1420 mm; however, extreme events like 353.2 mm daily rainfall in 2008 demonstrated that the region is highly vulnerable to intense, short-duration rainfall. Using 21 years of 3-hourly rainfall data from Chuadanga Station, IDF curves were developed through the Least Squares Method to calculate rainfall intensity for drainage system design. These curves provide essential inputs for peak runoff estimation using the Rational Method and inform hydraulic infrastructure sizing. Simultaneously, water level data from four BWDB gauge stations across the Bhairab and Mathabhanga rivers enabled a detailed assessment of flood risks. Frequency analysis using various probability distribution functions (PDFs) evaluated by goodness-of-fit tests (KS and A-D) helped in selecting the best-fit models for each station. These were used to estimate flood levels for return periods ranging from 1.01 to 100 years. The estimated flood levels will be further used to develop flood zonation maps, which is essential for identifying high-risk areas, informing planners to formulating climate-resilient land use policies and supporting decisions

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## CHAPTER 10: GEOLOGY INCLUDING BOTH ENGINEERING AND HYDRO-GEOLOGY

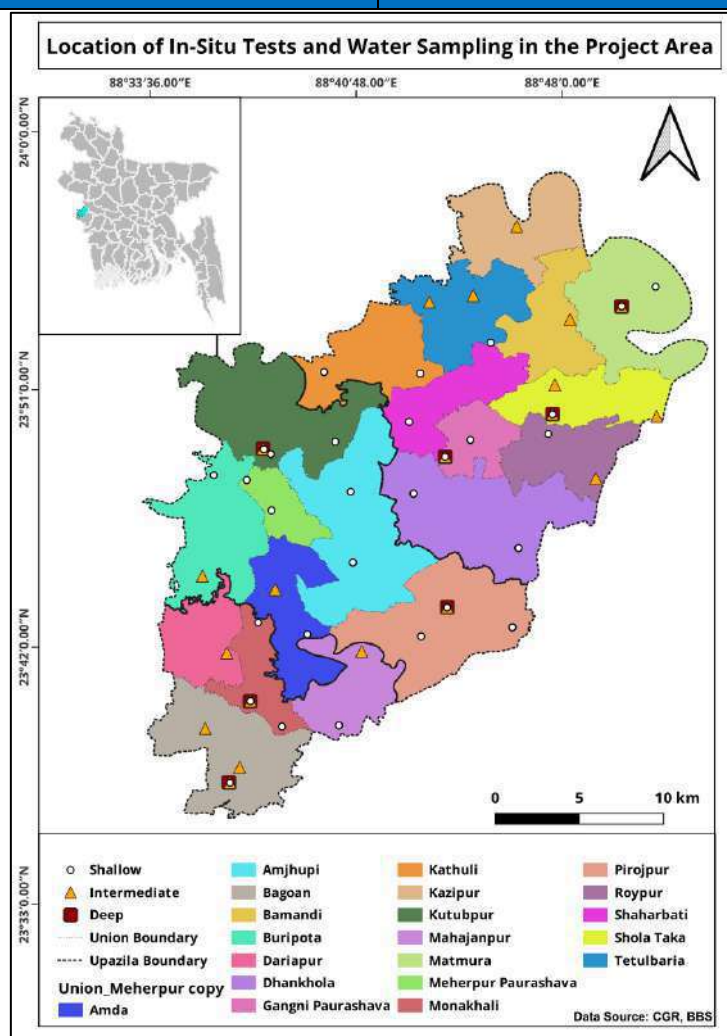
### 10.1 In-Situ Test Analysis in Meherpur Districts

In January 2025, CGR initiated in-situ testing at 35 existing production wells located across 18 unions and 2 municipalities (paurashavas) prior to the commencement of drilling for the installation of monitoring wells. The field investigations included measurements of electrical conductivity (EC), total dissolved solids (TDS), pH, and arsenic concentrations, as well as slug tests and water sampling for subsequent ion analysis at a laboratory in Dhaka.

Upon completion of the drilling campaign, CGR conducted the same suite of in-situ tests at 21 newly constructed monitoring wells in Meherpur district. In total, 56 wells were investigated, categorized as follows:

*Table 10-1: Type of Well*

Type of Well	Number of Wells
Shallow	29
Intermediate	20
Deep	7
Total Well	56



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*Map 10-1: Location of In-Situ Tests and Water Sampling in the Project Area*

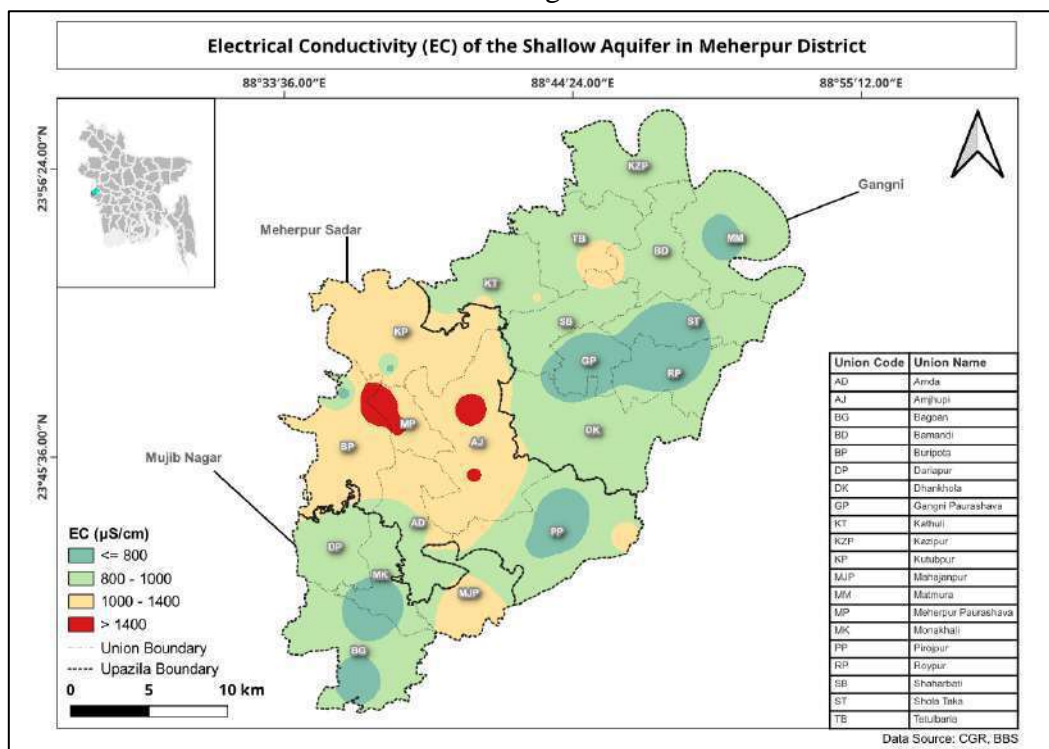
This report presents the analytical results of EC, TDS, pH, and arsenic concentrations obtained from both the existing production wells and the newly developed monitoring wells.

## 10.2 Electrical Conductivity (EC) Distribution:

Electrical Conductivity (EC) reflects the sum of the contribution from all the dissolved ions; it is a good proxy measurement of salinity. Plots of lab measured TDS vs EC shows that  $EC = 1.4 \times TDS$ . Both Bangladesh drinking water standard and WHO guideline value for TDS is set to a maximum of 1000 mg/L, which is equivalent to an EC value of 1400  $\mu S/cm$ .

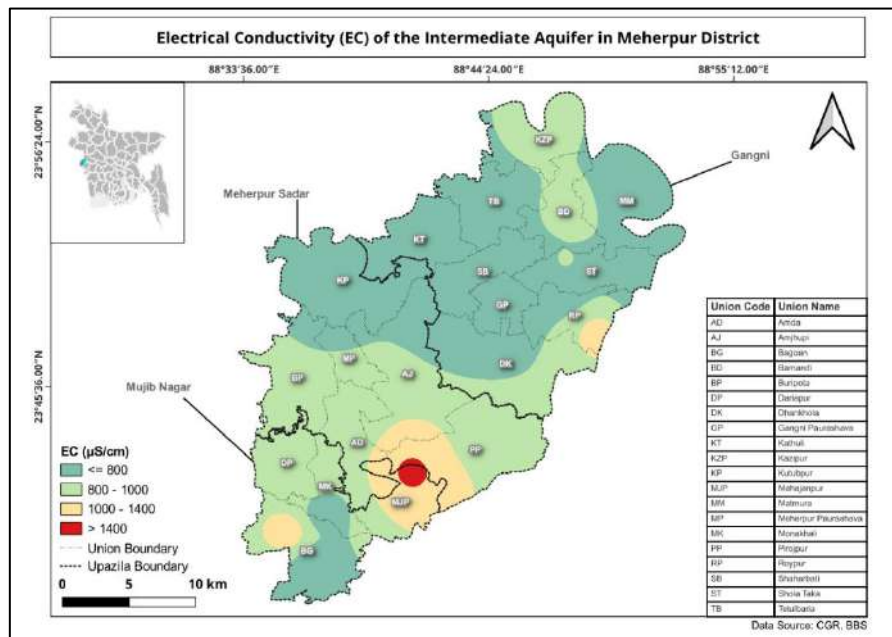
### 10.2.1 Spatial Variations:

In the groundwater sample of the study area EC ranges from 561  $\mu S/cm$  to 2000  $\mu S/cm$  in shallow well, 465  $\mu S/cm$  to 1507  $\mu S/cm$  in intermediate well and 523  $\mu S/cm$  to 736  $\mu S/cm$  in deep well. Highest EC found in a shallow well at Meherpur Paurashava that is 2000  $\mu S/cm$  and lowest EC found in an Intermediate well at Gangni Paurashava.

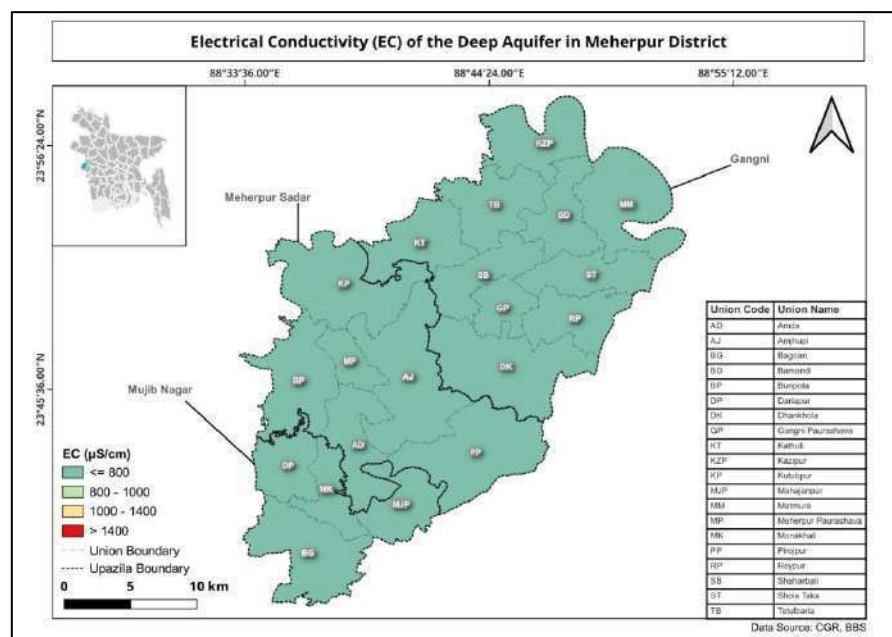


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*Map 10-2: EC of the Shallow Aquifer in Meherpur District*



*Map 10-3: EC of the Intermediate Aquifer in Meherpur District*



*Map 10-4: EC of the Deep Aquifer in Meherpur District*

Based on the spatial distribution maps (Figure 2–4), it is evident that the shallow and intermediate aquifers exhibit higher electrical conductivity (EC) values compared to the deep aquifer. In many locations, EC values in the shallow and intermediate aquifers exceed 1000  $\mu\text{S}/\text{cm}$ , occasionally surpassing 1400  $\mu\text{S}/\text{cm}$ . Although laboratory confirmation is pending, the elevated EC observed in these aquifers may be attributed to the presence of ions such as calcium ( $\text{Ca}^{2+}$ ), magnesium ( $\text{Mg}^{2+}$ ), bicarbonate ( $\text{HCO}_3^-$ ), sulfate ( $\text{SO}_4^{2-}$ ), and nitrate ( $\text{NO}_3^-$ ). Field observations indicate that the groundwater in these zones lacks a salty taste, suggesting that sodium ( $\text{Na}^+$ ) and chloride ( $\text{Cl}^-$ ) concentrations are likely low, and the water remains relatively

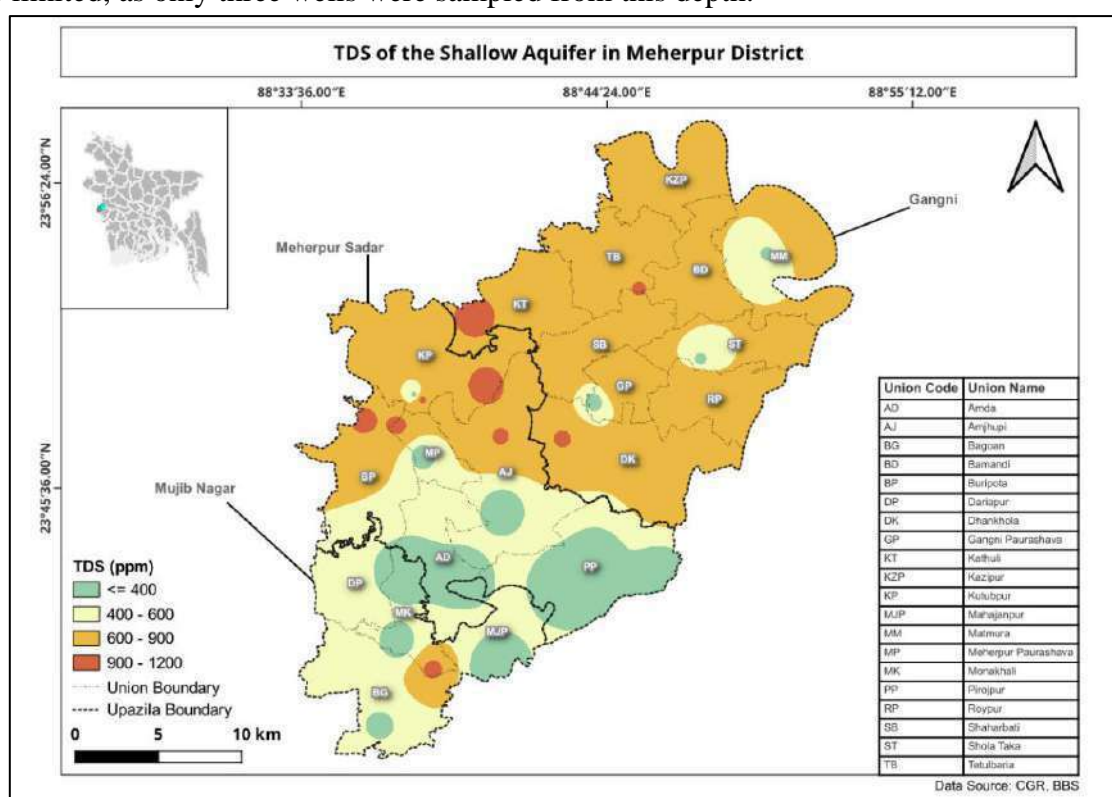


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fresh in Meherpur Sadar Upazila. The corresponding total dissolved solids (TDS) values are estimated to be in the range of 900–1,000 mg/L. In contrast, EC values in the deep aquifer predominantly remain below 800  $\mu\text{S}/\text{cm}$ .

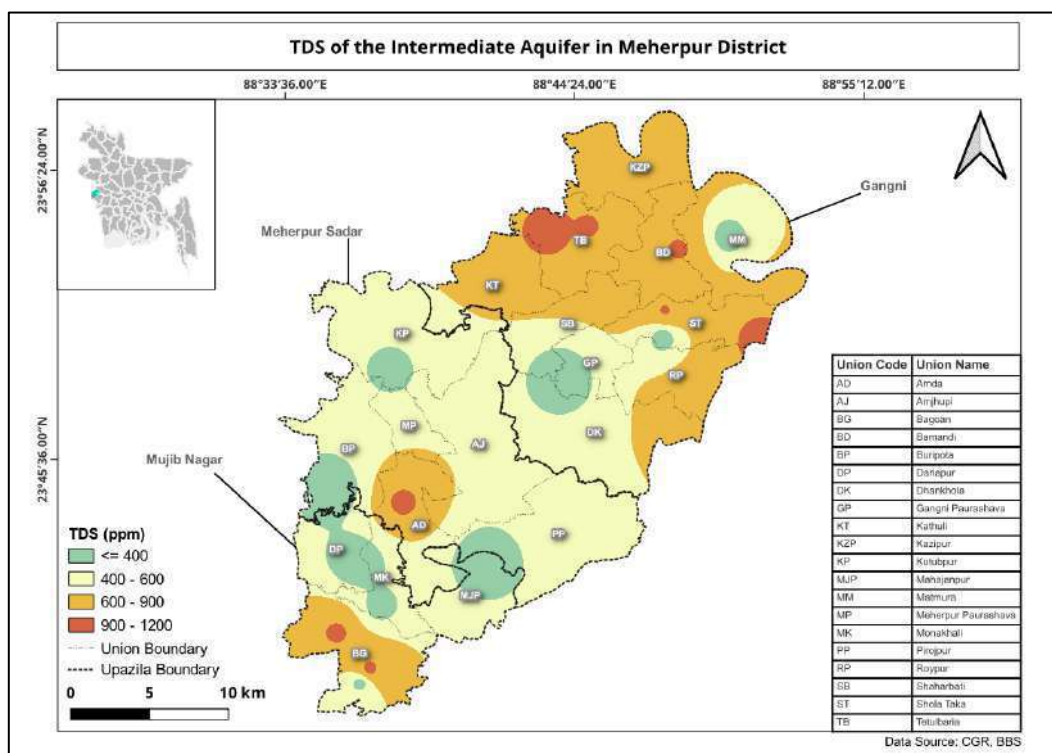
### 10.3 Total Dissolved Solids (TDS) Distribution:

In Bangladesh, the Bangladesh Standards and Testing Institution (BSTI) has set the maximum permissible limit for Total Dissolved Solids (TDS) in drinking water at 1000 ppm. In the present study, TDS levels were measured in groundwater samples collected from shallow, intermediate, and deep aquifers. The observed TDS concentrations ranged from 262 to 366 ppm in the deep aquifer, 238 to 1010 ppm in the shallow aquifer, and 233 to 950 ppm in the intermediate aquifer. These results indicate comparatively higher TDS concentrations in the intermediate aquifer. However, it is important to note that the data for the intermediate aquifer are limited, as only three wells were sampled from this depth.

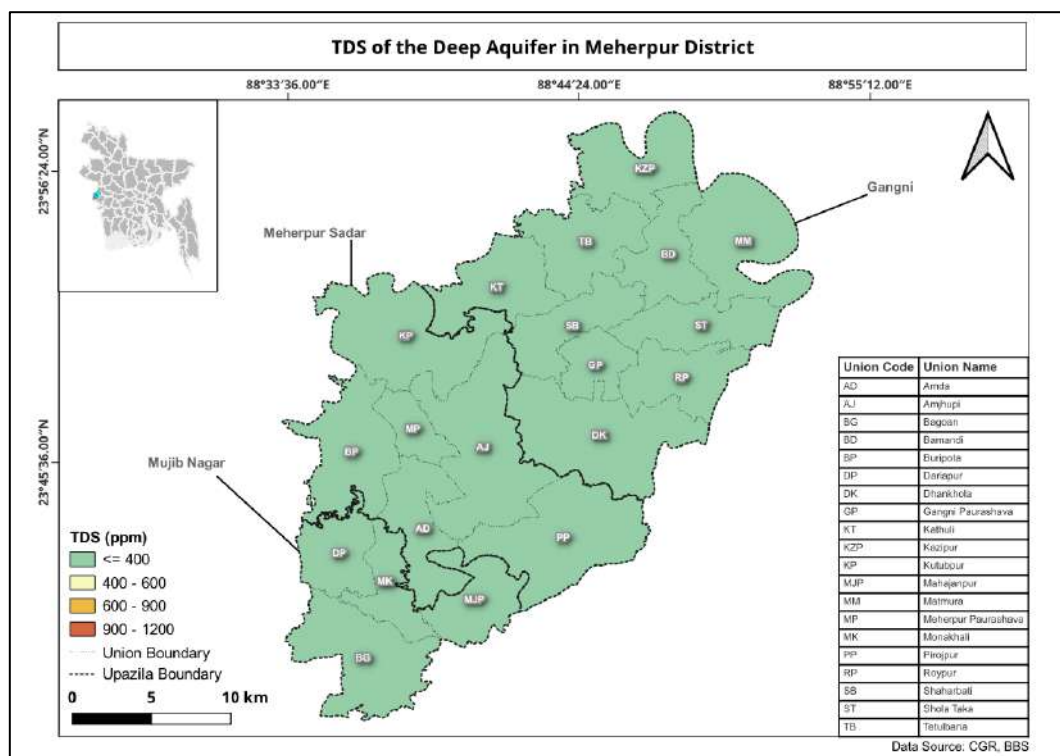


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*Map 10-5: TDS of the Shallow Aquifer in Meherpur District*



*Map 10-6: TDS of the Intermediate Aquifer in Meherpur District*



*Map 10-7: TDS of the Deep Aquifer in Meherpur District*

The spatial distribution maps (Figure 5–7) indicate that total dissolved solids (TDS) concentrations are generally higher in the shallow and intermediate aquifers than in the deep

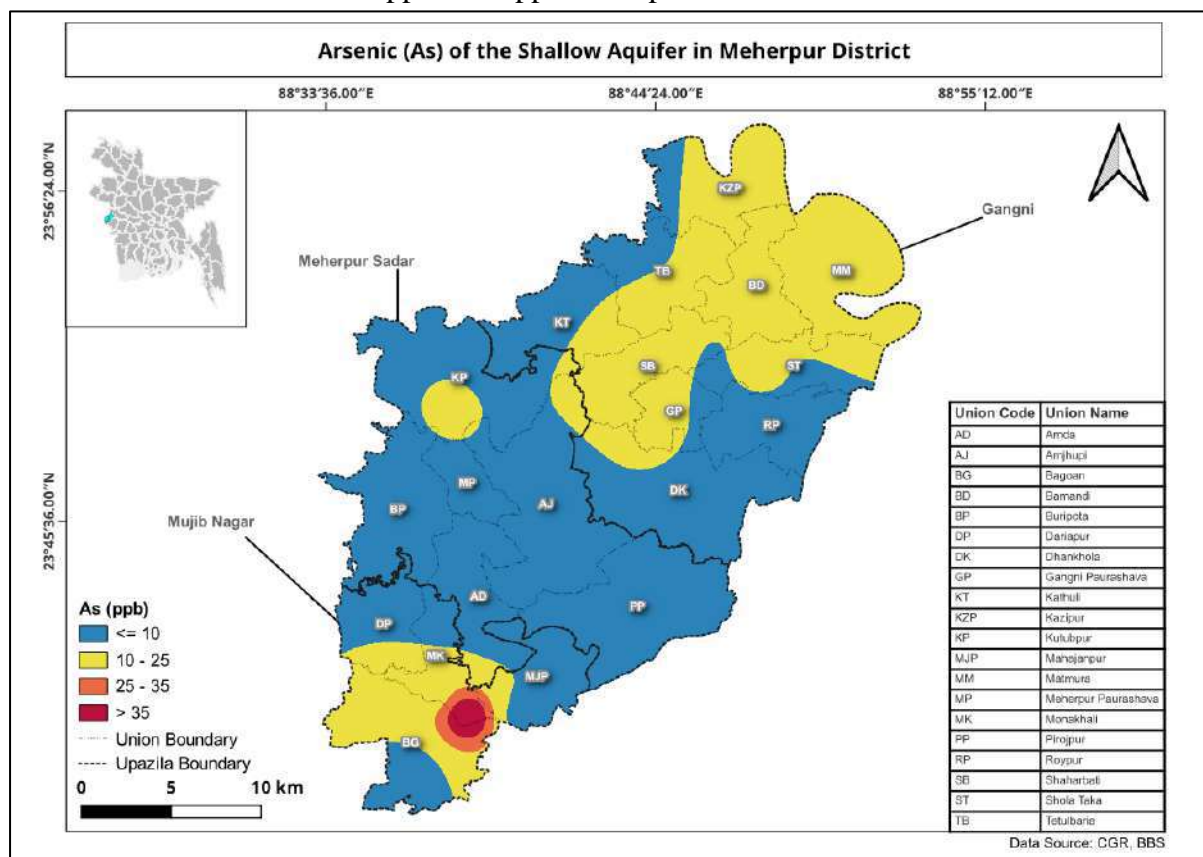
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aquifer. In the majority of sampled locations, TDS levels in the shallow and intermediate zones range between 600 and 900 ppm, with some areas recording values above 900 ppm. In contrast, TDS concentrations in the deep aquifer typically remain below 400 ppm.

#### 10.4 Arsenic Distribution:

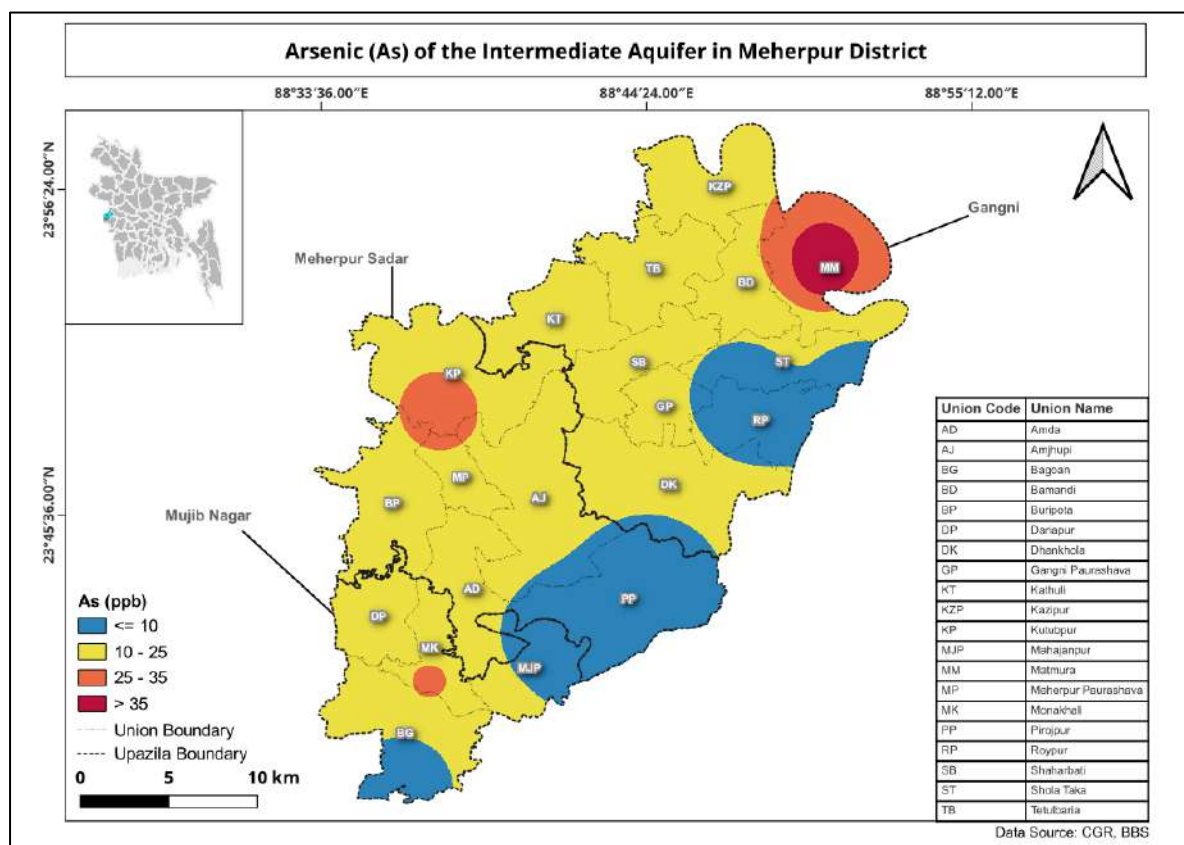
The Bangladesh Standards and Testing Institution (BSTI) has set the maximum allowable limit for arsenic in drinking water at 10 ppb (parts per billion). This standard reflects the country’s current mitigation capabilities and resource constraints, despite being higher than the World Health Organization (WHO) guideline of 10 ppb.

In the groundwater sample of the study area As ranges from 0 ppb to 50 ppb in shallow and intermediate well and from 5 ppb to 30 ppb in deep well.

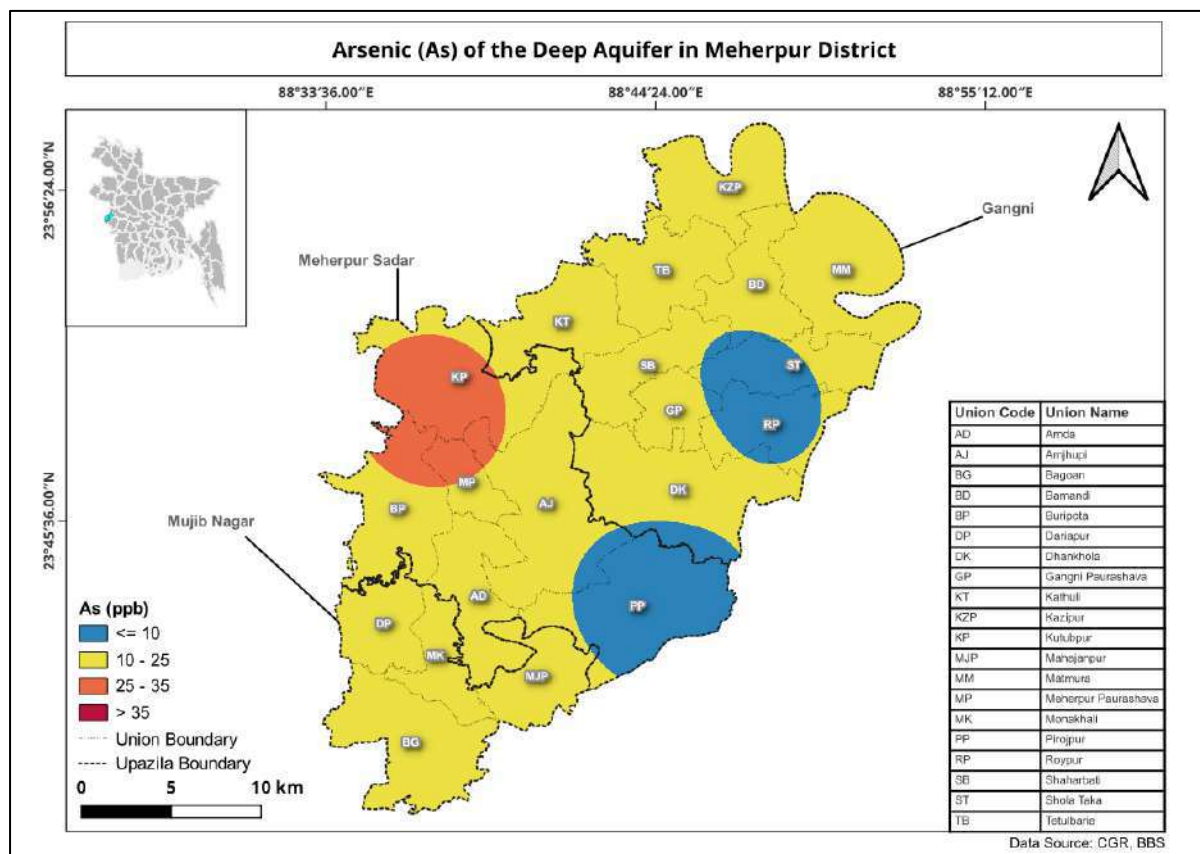


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*Map 10-8: Arsenic (As) of the Shallow Aquifer in Meherpur District*



*Map 10-9: Arsenic (As) of the Intermediate Aquifer in Meherpur District*





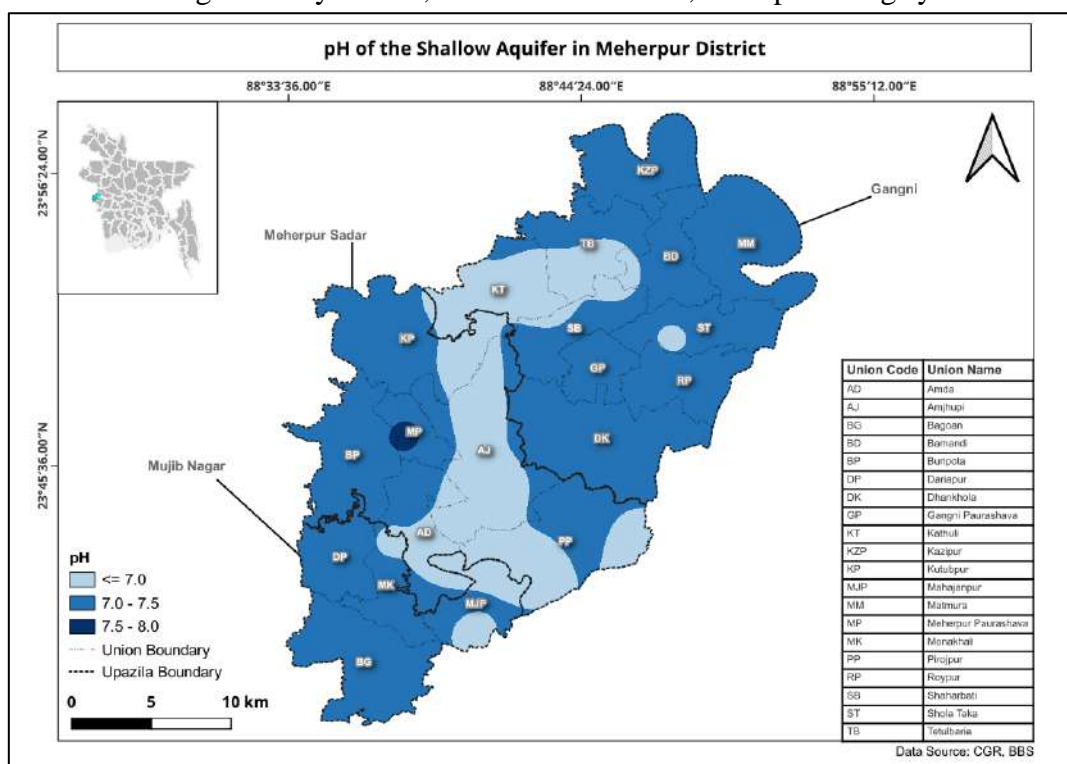
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#### *Map 10-10: Arsenic (As) of the Deep Aquifer in Meherpur District*

The spatial distribution maps (Figure 8–10) indicate that Arsenic (As) concentrations are generally higher in the shallow and intermediate aquifers than in the deep aquifer. In shallow and Intermediate aquifers exceeds 35 ppb of arsenic. Generally, If your water has arsenic levels above 35 ppb (0.035 ppm), **young children, especially infants, should stop drinking it immediately**, because this level has been associated with health effects in children after very short-term exposures (2 weeks or less).

### 10.5 pH Distribution:

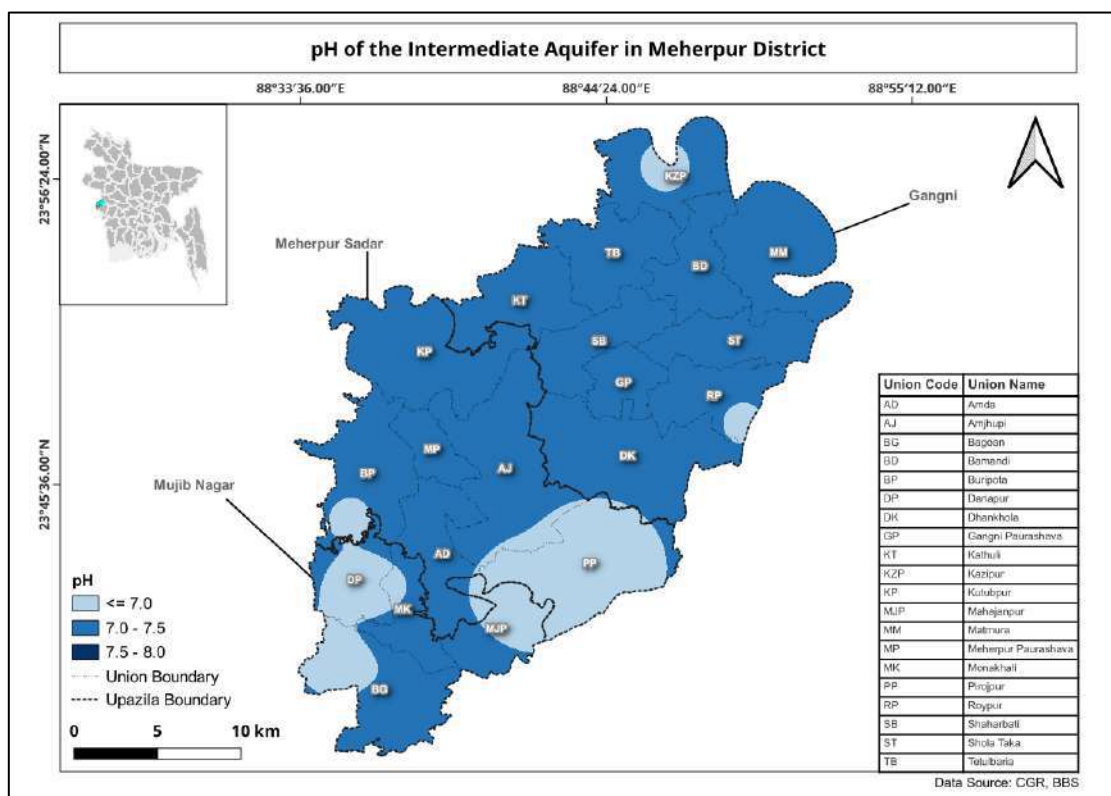
The Bangladesh Standards and Testing Institution (BSTI) has established the permissible pH range for drinking water between 6.5 and 8.5. In the current study, pH values ranging from 6.5 to 8. A pH below 6.5 indicates acidic conditions, which can result in the corrosion of pipes and promote the leaching of heavy metals, such as iron or lead, from plumbing systems.



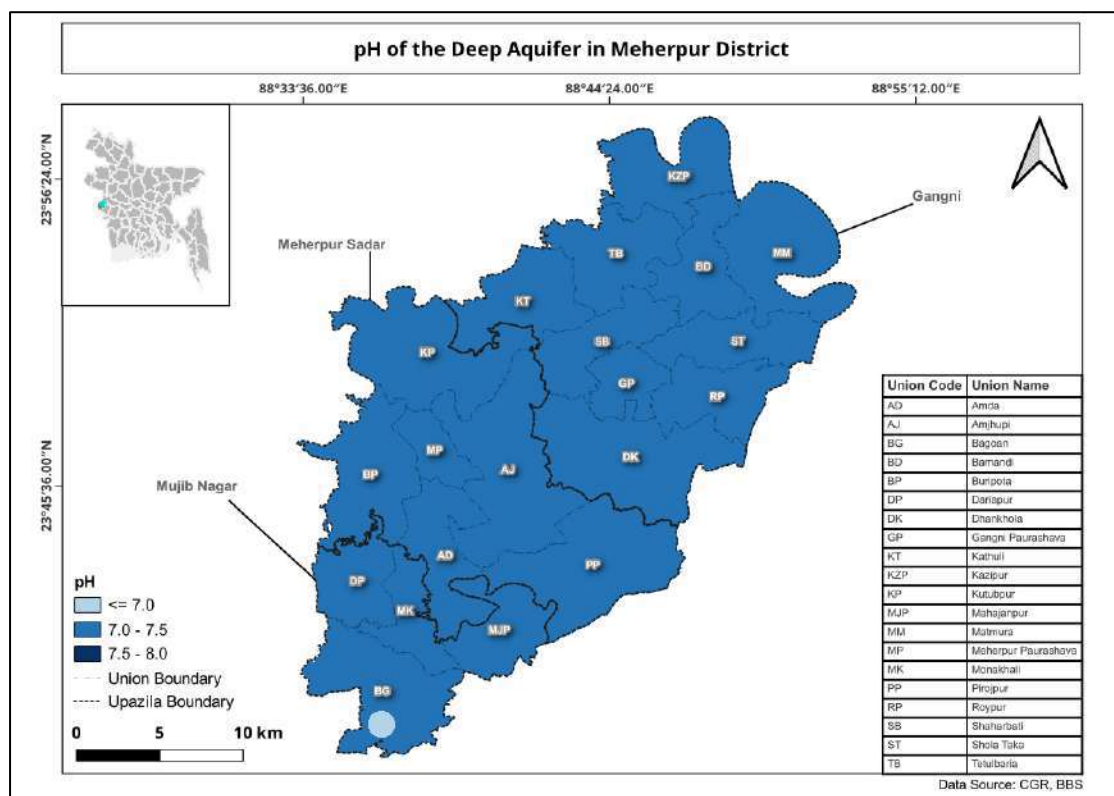


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*Map 10-11: pH of the Shallow Aquifer in Meherpur District*



*Map 10-12: pH of the Intermediate Aquifer in Meherpur District*



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*Map 10-13: pH of the Deep Aquifer in Meherpur District*

Based on the spatial distribution map, pH values in the shallow and intermediate aquifers of certain areas within Meherpur District range from 6.5 to 7.0, indicating slightly acidic to neutral conditions. In contrast, the deep aquifer consistently exhibits pH values between 7.0 and 7.5 across the entire district, which falls within the optimal range for drinking water quality.

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## **CHAPTER 11: BOTH SPATIAL AND ATTRIBUTE DATA OF EXISTING FLORA AND FAUNA**

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### **11.1 Introduction**

#### **11.1.1 Project Background**

Bangladesh is not only the world's fastest-growing populous country, but also a country with immense potential in the near future. As the world's population grows, so does urbanization. Without suitable standards, it is difficult to manage the developing urban areas as a result of urbanization. Urbanization includes the expansion of houses and other infrastructure. Nobody can deny that the housing and infrastructure situation in metropolitan areas is deteriorating day by day. It must be arranged in order to be properly guided. Meanwhile, the honorable Prime Minister issued significant instructions for the country's spatial and sectoral planning at different levels. Bangladesh is one of the world's most densely populated countries, and it has had tremendous population increase over the last century, however the rate of growth has recently slowed to a reasonable level. Over the next decade, the country will see a rapid development of urbanization. According to an estimate, by 2020, nearly every other man, woman and child will live in an urban area (World Bank ed., Bangladesh 2020). Bangladesh's urban population has been growing at a yearly average rate of 6 percent since independence, at a time when the national population growth was 2.2 percent. As a result, urban population has grown six-fold, compared with a 70 percent increase in rural population (World Bank, 2007). As per recent UN data, approximately 25 percent of Bangladesh's current population currently lives in urban areas. Of this urban population, more than half lives in the four largest cities: Dhaka, Chittagong, Khulna and Rajshahi.

Urbanization refers to the increase in the number of people living in urban areas such as towns and cities. In the course of urbanization, urban expansion is unavoidable. People in Bangladesh are increasingly preferring to reside in and around cities and towns in recent years. People in our country primarily migrate from rural to cities in pursuit of a variety of opportunities. Urbanization, on the other hand, is frequently used as an indicator of development. Unplanned urbanization, on the other hand, poses a hazard to developing countries like Bangladesh. Bangladesh's urbanization has recently been complicated by a number of new issues. Such growing difficulties, as well as their impact, can be mitigated with proper planning and actions. Bangladesh would undoubtedly attain its targeted sustainable urban growth goal through planned urbanization. In 2008, humankind has crossed a socio-demographic milestone for the first time in history by having half of its population living within the urban areas (UNFPA, 2007).

In developing countries, urbanization has now become a powerful force. Cities are important drivers of growth and development, providing jobs, infrastructure, and services. With the unplanned expansion, the growing number of people, assets, and economic activities increase the exposure of cities to the impacts of disasters and climate change. However, in low and lower-middle income countries, new urban development is increasingly more likely to occur on hazard-prone land, namely in floodplains and other low-lying areas, along fault lines, and on steep slopes. In addition to settling in hazard-prone areas, much of the building construction

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that occurs is unregulated and unplanned, placing vulnerable populations, who settle on hazard-prone land, at increased risk. Besides, poor urban governance, declining ecosystems, and vulnerable rural livelihoods are among the main underlying risk drivers, which need to be addressed to build safer cities. Bangladesh has been experiencing a rapid increase in its urban population ever since its independence in 1971. Urban population as a percentage of total population increased from around 8.8% to nearly 23% during the 1974-2011 periods. It is estimated that by the year 2021 nearly one-third or 33% of the population of Bangladesh will be living in urban areas. More than 60% of the national GDP is derived from non-agricultural sectors that are mainly based in urban areas. This phenomenon indicates the increasing role of urban areas being played in the national economy.

Upazila Parishad is the lowest administrative level of local government in Bangladesh. The majority of Upazila Parishads are still unable to achieve planned rural-urban development, which involves physically and socioeconomically integrating rural and urban areas. Most of the time, land is used haphazardly, resulting in a low level of living for the population. In the present government's policy for administrative reorganization, the upazila is the most important tier of administration. In light of the foregoing, a comprehensive development plan is required to handle the mandatory land use transition in both urban and rural areas, while avoiding unauthorized and unplanned development. A comprehensive development strategy at the Upazila level appears to be necessary.

Urban Development Directorate under the Ministry of Housing and Public Works, has launched a project titled "Preparation of Development Plan for Meherpur Zilla Project". This initiative aims to formulate a development plan for the next 20 years, divided into essential sectors to create a risk-sensitive and sustainable strategy. To understand the socio-economic and demographic profile of the study area is pivotal step for understanding the immediate needs and forecast the future needs for the next 20 years. Existing data and features are instrumental in providing a clear spatial understanding of the project area, accurately reflecting the potentials and problems of the existing scoria economic related conditions, and facilitating the representation within the development plan. Overall, the scope of socio-economic project signifies a comprehensive and forward-looking approach to urban development, emphasizing sustainability and thoughtful planning over the next two decades.

**Existing Flora and Fauna survey** is one of the important development modules of this project. In this development plan, existing Floral and Faunal information is considered as an important tool for a durable and sustainable urbanization. Land use planning is an important component for a modern urban development. But practicing urban development using a proper land use plan is not developed in Bangladesh. Prior to land use planning it is very essential to access existing Flora and Fauna conditions and the relevant information in and around the site of future urban development. Therefore, a rigorous Flora and Fauna study is needed to carry out for a resilient urban development.

### **11.1.2 Description of the Study Area**

**Meherpur Zilla**, located in the southwestern part of Bangladesh, holds a significant place in the country's history and culture. Known for its rich heritage and pivotal role in the liberation war, Meherpur continues to thrive with its diverse economy, agricultural abundance, and growing infrastructure. This proposal aims to highlight the key aspects of Meherpur Zilla,

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focusing on its socio-economic landscape, cultural heritage, and potential for future development. The district comprises three Upazilas: Meherpur Sadar, Mujibnagar, and Gangni. Meherpur Sadar serves as the administrative and economic hub, with a diverse economy primarily based on agriculture and trade. Mujibnagar, formerly Bhaborpara, is renowned for its historical importance in the Liberation War, attracting many tourists to its memorial complex. Gangni Upazila is notable for its vibrant agricultural activities and emerging industrial potential. Collectively, these Upazilas contribute to the district's cultural richness, economic diversity, and historical legacy, positioning Meherpur Zilla as a region of significant importance and development potential in Bangladesh.

Meherpur Zilla is bordered by Kushtia to the east, Chuadanga to the south, and the Indian state of West Bengal to the west and north, situated in the Khulna Division. The district's strategic location offers significant advantages for cross-border trade and cultural exchange. The district is predominantly rural, with a diverse population comprising various ethnic and religious communities. The literacy rate is gradually improving, with ongoing efforts to enhance educational facilities and opportunities.

a) Gangni Upazila

Gangni Upazila (Meherpur district) area 363.95 sq km, located in between 23°44' and 23°52' North latitudes and in between 88°34' and 88°47' East longitudes. It is bounded by Daulatpur (Kushtia) upazila on the North, Alamdanga and Meherpur Sadar upazilas on the South, Daulatpur (Kushtia), Mirpur (Kushtia) and Alamdanga upazilas on the East, Meherpur Sadar upazila and West Bengal state of India on the West.

Population Total 299607; male 148250, female 151357; Muslim 295458, Hindu 2726, Christian 1313 and others 110. Water bodies Main rivers: Bhairab, Ichamati, Mathabhanga and Kazla; Elangi Beel, Nuner Beel and Elalgari Damash Beel are notable. Administration Gangni Thana was formed in 1923 and it was turned into an upazila on 24 February 1984. Gangni Upazila consist of one Municipality, 9 Unions, 90 Mouzas and 137 Villages.



Mathavanga river, Bamundi Union, Gangni Upazila

b) Meherpur Sadar Upazila

Meherpur Sadar Upazila (Meherpur district) area 276.15 sq km, located in between 23°40' and 23°52' North latitudes and in between 88°34' and 88°47' East longitudes. It is bounded by Gangni upazila and West Bengal state of India on the North, Damurhuda and Mujibnagar upazilas on the South, Gangni and Alamdanga upazilas on the East, West Bengal state of India on the West.



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Population Total 256642; male 127300, female 129342; Muslim 252323, Hindu 4199, Buddhist 1, Christian 114 and others 5. Water bodies Main rivers: Bhairab, Kazla; Bhatgari and Chand Beels are notable. Administration Meherpur Thana was turned into an upazila in 1984. Meherpur Municipality was formed in 1960. Meherpur Sadar consist of one Municipality, 5 Unions, 61 Mouzas and 104 Villages.



Kutubpur beel, Kutubpur Union, Maherpur Sadar Upazila

c) Mujibnagar Upazila

Mujibnagar Upazila (Meherpur district) area 111.51 sq km, located in between 23°36' and 23°45' North latitudes and in between 88°34' and 88°43' East longitudes. It is bounded by Meherpur Sadar upazila on the North, Damurhuda and Meherpur Sadar upazilas on the East, West Bengal of India on the South and on the West.

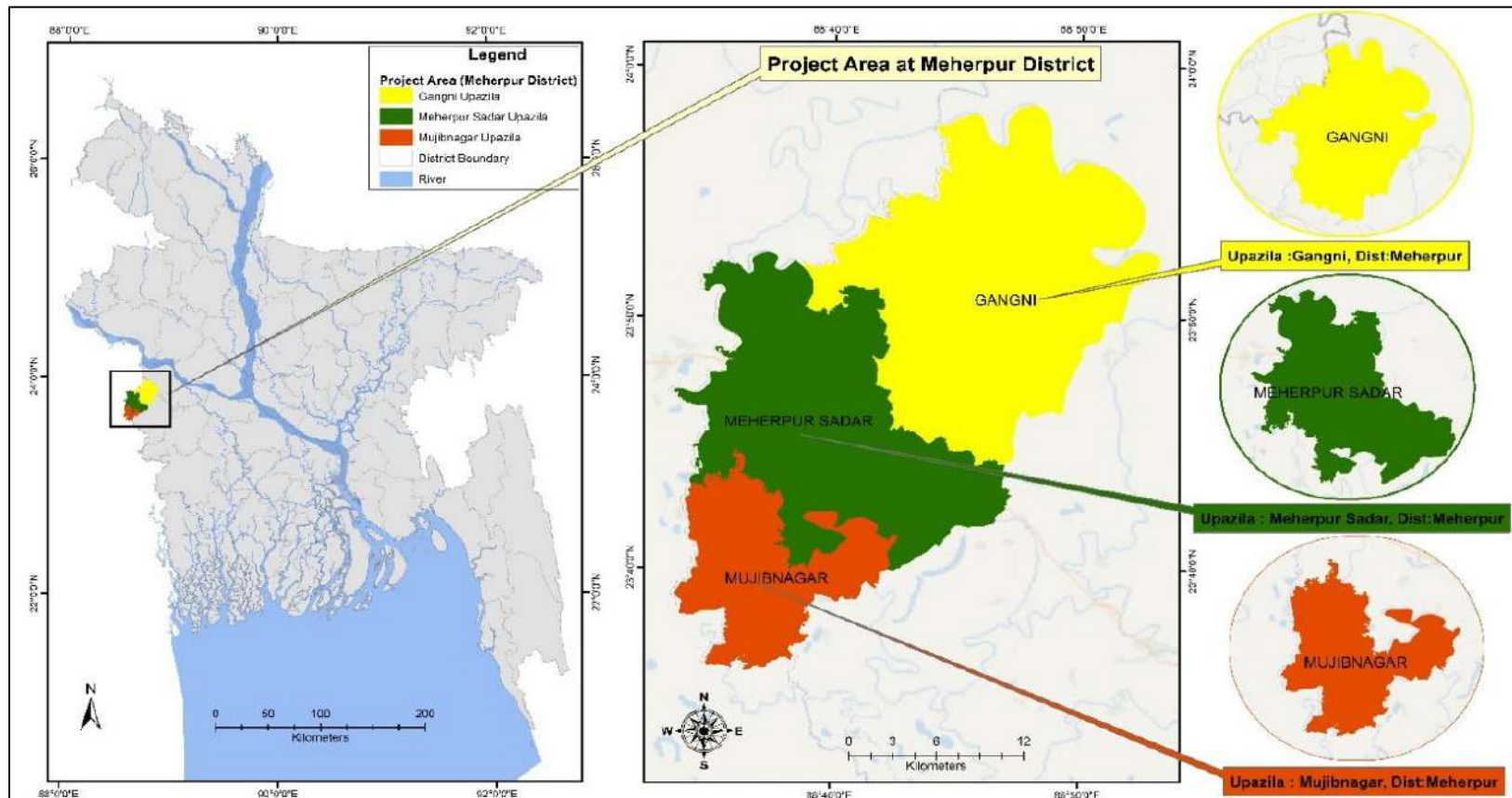
Population Total 99143; male 49084, female 50059; Muslim 92970, Hindu 945, Buddhist 13, Christian 5200 and others 15. Water bodies Bhairab River, Sarashati Canal and Datpur Beel are notable. Administration Mujibnagar upazila was formed on 24 February 2000. Mujibnagar Upazila consist of 4 Unions, 29 Mouza and 33 Villages.



*Dariapur beel, Dariapur Union, Mujibnagar Upazila*

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Map 11-1: Location map of project area of Meherpur District.

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### 11.1.3 Aims and Objectives

The baseline survey of existing flora and fauna will be conducted in project area of 3 upazilas of Meharpure district; i) Meherpur Sadar upazila, ii) Mujibnagar Upazila, and iii) Gangni Upazila.

### 11.1.4 Objectives:

#### *11.1.4.1 Main objectives of the project:*

The objective of the project is to optimize resources and activities for sustenance of marginal people. The urban and rural activities and resources are very important to the economy and life of the people of Bangladesh whose living conditions are inextricably linked to the productivity and sustainability of land use. There is no long-term Holistic Development Plan for the rural and urban area but it needs to be integrated with the mainstream of development process of the country. So, an interdisciplinary development planning approach is urgent to optimize livelihood of the project area.

#### *11.1.4.2 Specific objectives of present study as per scope of work:*

Baseline survey of existing flora and fauna in different place of the study area will be conducted to attain the following objectives:

- To develop an understanding of the existing flora and fauna based on available information, data gathering, literature searches, site visits and any baseline studies already carried out;
- To make an inventory of the species that are present on the spatial level of the survey and also the species that are frequent and also which are rare
- To identify the autecological characteristics, they possess and the communities they form
- To identify the characteristics and physical conditions of the sites that form their habitats
- To explore Historical aspects of habitats and biodiversity in the area
- To determine Underlying process of habitats dynamism — char formation, afforestation, forest clearing, settlements, growth centers, dykes, land reclamation, drainage system improvement, etc.
- To determine a threshold for selecting existing flora and fauna, based on their value, using measures;
- To identify those flora and fauna reaching the threshold value which could be affected by the project;
- To identify the spatial arrangements of habitats and the key processes that lead to the decline of endangered species (e.g., Fallowing, eutrophication, disturbance, intensification etc.)
- To determine the species including their habitat that might be threatened due to future development
- To identify the factors affecting the integrity of the existing flora and fauna in the ecosystems and the conservation status of relevant habitats and species;

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- To set forth recommendations on preserving the species of the project area and ecology sensitive land use planning to keep the ecological system sustainable.
- To develop an interactive digital model for the ecological system for the project area

## 11.2 Methodology

### 11.2.1 An Inventory of the Flora and Fauna

Literature review was conducted to know the historical aspects of spatial distribution of habitats or species and compile habitat or species inventories on various scales, and also recognize the pattern of rarity. Status of habitats will also be known. Information of the underlying process of decline or increase can be achieved by an historical landscape analysis. Maps with the historical distribution of habitats from these sources should be drawn in the same resolution as the actual distribution. In addition to the secondary sources, primary data on existing flora and fauna will be collected using appropriate methods.

### 11.2.2 The comparative assessment of plant and animal communities

The comparative assessment of animals and plants has been conducting. Dependency of animals on particular plant species will be determined. Seasonal assemblage of animals in a particular habitat based on the phenology of the plant will be determined. Survey will be conducted in different seasons; thus, seasonal assemblage of flora and fauna will also be determined. All the information will be plotted on habitat map.

### 11.2.3 Sampling Technique for Inventory

To achieve the objectives of the project various methods will be used (Table 1).

Table 11-1: Survey methods in brief

Name of the Methods	Objectives to be fulfilled
Survey Methods for Flora	
<ol style="list-style-type: none"> <li>1. Literature Review</li> <li>2. Transect survey</li> <li>3. Quadrat survey</li> <li>4. Point Quarter Method</li> <li>5. Collection of plant parts</li> </ol>	<ul style="list-style-type: none"> <li>• To understand the existing floral distribution scenario and their significances in the ecosystem of the project area based on available secondary information from any baseline studies which already been carried out previously.</li> <li>• To prepare an inventory list of the species of the existing flora, their spatial distribution, the species that are frequent and also which are rare.</li> <li>• To identify the ecological characteristics of every ecological unit and the communities they form.</li> <li>• To identify the characteristics and physical conditions of the habitats.</li> <li>• To determine underlying process of habitats dynamism-char formation, afforestation, forest clearing, settlements, growth centers, dykes, land reclamation, drainage system improvement, etc.</li> </ul>



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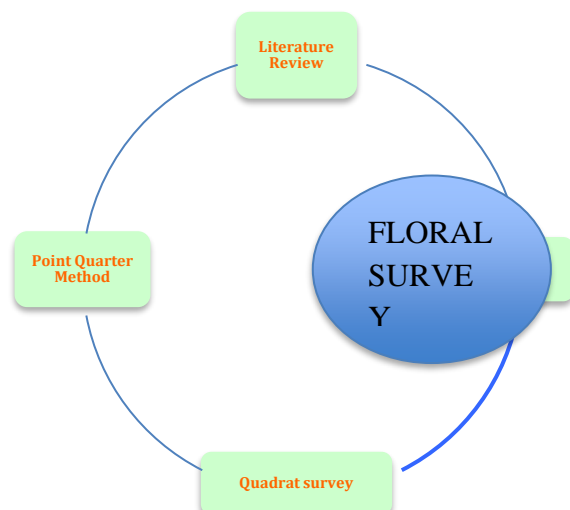
Name of the Methods	Objectives to be fulfilled
6. Questionnaire Survey	<ul style="list-style-type: none"> <li>To explore historical aspects of habitats and biodiversity in the area.</li> </ul>
<b>Survey Methods for Fauna</b>	
<b>Direct Survey Methods</b> <ol style="list-style-type: none"> <li>1. Line Transect Sampling</li> <li>2. Quadrat Sampling</li> <li>3. Use of different types of traps</li> <li>4. Counting at colonies and bat roosts</li> <li>5. Night survey</li> <li>6. Camera trap survey</li> <li>7. Questionnaire survey</li> <li>8. FGD</li> <li>9. Boat Survey through river system or lake for aquatic animals</li> <li>10. Survey on fish</li> </ol> <b>Indirect Survey Methods</b> <ol style="list-style-type: none"> <li>1. Pellet / scat / feces count</li> <li>2. Footprint / Pugmark count</li> <li>3. Other indices of presence</li> </ol>	<ul style="list-style-type: none"> <li>To understand the existing faunal distribution scenario and their significances in the ecosystem of the project area based on available secondary information from any baseline studies which already been carried out previously.</li> <li>To prepare an inventory list of the species of the existing fauna, their spatial distribution, the species that are frequent and also which are rare.</li> <li>To identify the ecological characteristics of every ecological unit and the communities they form.</li> <li>To identify the characteristics and physical conditions of their habitats.</li> <li>To determine underlying process of habitats dynamism-char formation, afforestation, forest clearing, settlements, growth centers, dykes, land reclamation, drainage system improvement, etc.</li> <li>To identify the flora and fauna reaching the threshold value which could be affected by the project.</li> <li>To identify the threats to the endangered species (e.g., Fallowing, eutrophication, disturbance, intensification).</li> <li>To determine the species including their habitat that might be threatened due to future development.</li> <li>To set forth recommendations on preserving the species of the project area and ecology sensitive land use planning to keep the ecological system sustainable.</li> <li>To develop an interactive digital model for the ecological system for the project area.</li> </ul>

#### 11.2.4 Detailed Survey Methods

##### i. Survey methods for flora

Plant community will be studied by following different methods. Parameters like frequency, density, abundance, presence, absence and dominance, diversity index will be quantified.

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a) Transect survey

Transect survey will be used to explore the existing floristic composition. Sample of the plant species will be collected to prepare herbarium in order to identify the plant species wherever necessary. The floristic composition includes the occurred species of under trees, shrubs, herbs, climbers, epiphytes, parasites and ferns.

b) Quadrat survey

The quadrat survey will be used for assessing plant community structure, tree species diversity and their regeneration status. The estimate of species contents of a habitat shall be determined by observing the plant species at different sample areas.

In the quadrats, trees of  $\geq 5\text{cm}$  diameter will be counted. Moreover, total height and diameter of the trees individuals of different species will also be recorded. The parameters that are commonly used to characterize the structure of the plant communities are: Density, Frequency, Abundance, Vegetation Coverage, Basal area, Dominance, Species richness index, Similarity index, Shannon-Wiener diversity index, Index of similarity etc.

ii. Survey methods for fauna

A combination of different methods will be applied for the project work. Some of the methods are as follows.

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### 11.2.5 Direct Survey Methods

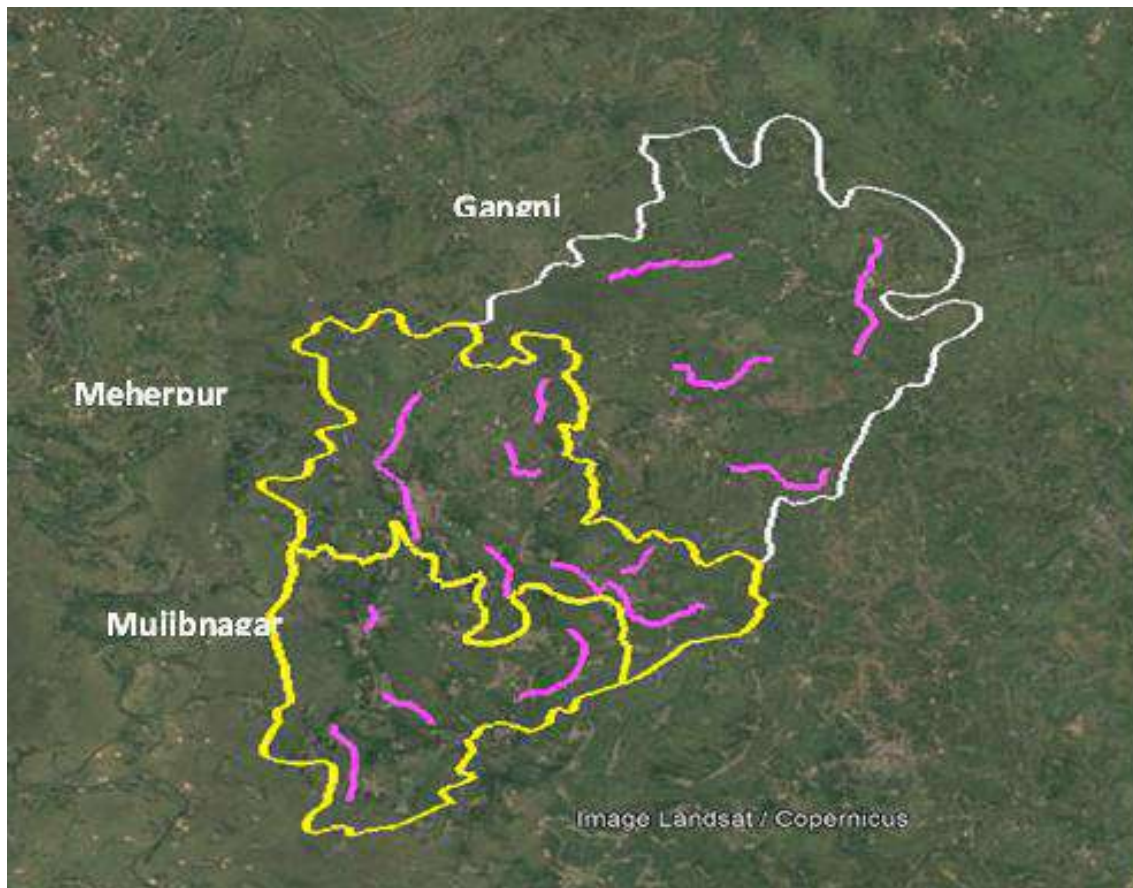
#### i. Line Transect Sampling

Both temporary and permanent transect lines were set randomly covering all types of habitats. Visual encounter survey was conducted on foot both in day and night. All the wild animals were recorded from the both side of transect. GPS coordination was used to calculate the total transect area covered for survey. During river habitat survey, the river was considered as a transect line. A total of 20 transect lines including 8 transects in Pirojpur sadar, 6 transects in Nazirpur and Nesarabad each were selected for the study (Map 2, Table 2).

*Table 11-2: Line Transect Sampling*

Upazila	Transect	Habitat	Length (Km)
Meherpur Sadar	Transect 1	Riverside/Riverine	8.92
	Transect 2	Homestead	3,41
	Transect 3	Homestead	5.6
	Transect 4	Agricultural	10.4
	Transect 5	Riverside/Riverine	3.5
	Transect 6	Riverside/Riverine	8.7
Gangni	Transect 1	Riverside/Riverine	2.8
	Transect 2	Homestead	2
	Transect 3	Homestead	1.3
	Transect 4	Agricultural	2.5
Mujibnagar	Transect 1	Homestead	3.4
	Transect 2	Homestead	4.6
	Transect 3	Riverside/Riverine	5.3
	Transect 4	Agricultural	7.3

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Map. Line transects set up in different habitats of the study area based on field

ii. Use of different types of traps

Pit fall trap, tube trap and box trap will be used to capture cryptic species. All these traps are designed to capture live animals. Appropriate baits will be used wherever necessary.



Setting up box trap for tree shrew and rodents at Amjhupi Union, Meherpur Sadar Upazila.

iii. Counting at colonies and bat roosts

Bats and some of the birds are colonial and some also build nests in colonies. Bird colony and bat roosts will be surveyed.



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Indian Flying Fox colony at Bagoan Dakshin para, Govipur, Meherpur Sadar Upazila



Bat colony at Meherpur Sadar police station, Meherpur Sadar Upazila.

#### iv. Night survey

Night survey will be conducted with the aid of high-power flashlight. Nocturnal wild animals will be encountered during night survey.



Reptiles and Amphibian survey at kajla river bank, Amjhupi, Meherpur Sadar Upazila

#### v. Camera trap

Automatic digital camera traps will be used to survey nocturnal and crepuscular animals. These camera traps are operated by motion sensor. The camera will be automatically activated and captured photos if anything moves in front of it.



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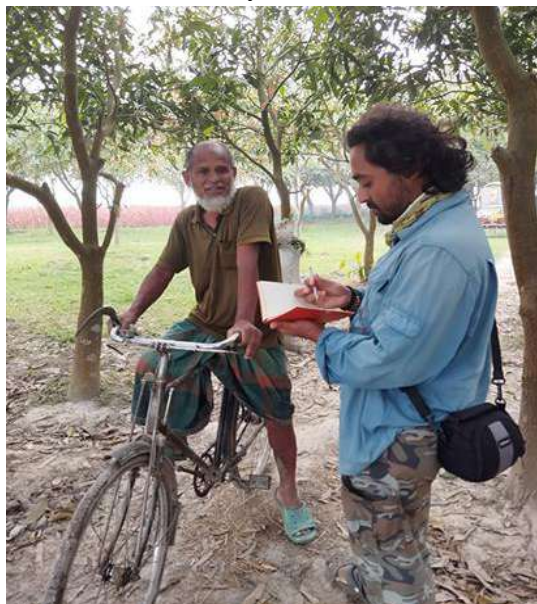


Setting up camera trap in a homestead garden of Pirojpur sadar upazila.

vi. Questionnaire survey

A pre-designed questionnaire will be used to know the status of wild animals and plants in the survey area based on the experience of the local people.

Questionnaire survey at different habitats in Meherpur district.



Questionnaire survey, Gourinagar, Mujibnagar, Meherpur

vii. River Habitat Surveys (RHS) & River Corridor Surveys (RCS) through Boat Survey for aquatic animals

Boat survey will be conducted in suitable sites to encounter aquatic animals like dolphins. Images of dolphins will also be used as a questionnaire among the local fishermen to know the past status of these aquatic mammals.

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Local fishermen will be visited to see their catch and types of available fishes. Local market will be surveyed. The team members will visit fish landing areas, fisher’s village and local markets to learn about beneficiary’s customs and attitudes. Direct observations and participation with the fishers for gear use, on-field surveillance, homestead drying of fishes, and selling at retail market of city, will be the most useful and meaningful way to confirm the abundance and marketing of fishes, and to know about beneficiary’s livelihood dynamics, work practices, vulnerabilities, and their indigenous knowledge in a social setting (Hossain *et al.* 2014; Deb and Haque 2011).



Local fish market survey at Kachabazar, Meherpur sadar, Meherpur

#### 11.2.6 Indirect Survey Methods

- i. Presence of Scat, feces and pellet

Presence of scat, feces and pellet indicate the presence of certain species in the area.

- ii. Footprint / Pugmark count

This method is used for identifying and counting wild animals. In addition, the data will allow one to determine sex ratio and age structure of the population.



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Shed skin of *Naja naja* (Spectacled Cobra) found at Moyamari Mango Orchard, Meherpur Sadar

#### ***11.2.6.1 Identification of critical Species***

During the survey any critical habitat (also why it is critical) and its significance needs to be identified, and protection status recorded in practice, a check of each individual species against the following will be required in order to be to determine its protection status:

- IUCN's threatened category (Red Data Book-both National and global threatened category);
- Species protected under Wildlife (Protection and Security) Act 2012;
- Species protected under any protocol, conventions and any other agreement;
- Species considered as flagship species, keystone species or other significant species; and
- Endemicity of the species.

#### ***11.2.6.2 Identification of critical ecosystem and wildlife habitats***

Habitats with high species diversity, population density of rare or threatened species will be determined from the field survey. Ecosystem services will also be determined from field observation and also by questionnaire survey and FGD. Critical ecosystem or habitats will be plotted on the maps using GPS coordinates.

#### ***11.2.6.3 Mapping of the Site***

As per survey findings, we will prepare ecosystem based thematic map for every task of the site of the flora and fauna in ARC GIS and prepare data base which can be provided as shape file or map format in desire scale by consultation with PD.

#### ***11.2.6.4 Development of an Interactive Digital Model***

From GIS based data base of the survey findings and their interpretation will be integrated in a GIS module and to develop an interactive digital model of existing habitat, decline of habitat and possible areas of conservation. Historical changes of vegetation cover will be evaluated from the previous 30 years image. Land use map will be prepared accommodating wildlife habitat, vegetation cover, waterbodies, forests and other landmarks.

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### 11.3 Work progress

Field surveys for flora and faunal survey have been conducting. During the field survey a total of 224 species of plants, 12 species of amphibians, 21 species of reptiles, 88 species of birds and 20 species of mammals have been recorded. The lists will be finalized after the field survey during wet season.

Table 11-3: List of amphibians recorded from Meherpur district

Sl. No.	Family	Common Name	Scientific Name	Local Status	IUCN Threat Status	
					Natio nal	Glo bal
1	Bufonidae	Common Toad	Duttaphrynus melanostictus	VC	LC	
2	Dicroglossidae	Asmat's Cricket Frog	Fejervarya asmatai	UC	LC	LC
3		Terai Cricket Frog	Fejervarya teraiensis	VC	LC	LC
4		Pierre's Cricket Frog	Fejervarya pierrei	C	LC	LC
5		Orissa Cricket Frog	Fejervarya orissaensis	C	LC	NE
6		Crab-eating Frog	Fejervarya cancrivora	UC	LC	LC
7		Syhadra Cricket Frog	Fejervarya syhadrensis	C	LC	LC
8		Skipper Frog	Euphlyctis cyanophlyctis	VC	LC	LC
		Green pond frog	Euphlyctis hexadactylus	UC	LC	LC
9		Indian Bullfrog	Hoplobatrachus tigerinus	UC	LC	LC
10	Rhacophoridae	Six-lined Tree Frog	Polypedates leucomystax	UC	LC	LC
11	Microhylidae	Ornate Microhylid Frog	Microhyla ornata	C	LC	LC
12		Mymensingh Microhylid Frog	Microhyla mymensinghensis	UC	LC	LC

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Duttaphrynus melanostictus	Euphlyctis cyanophlyctis

Table 11-4: List of reptiles recorded during the field survey in Meherpur district

Sl. No.	Family	Common Name	Scientific Name	Stat us	IUCN Threat Status	
					Natio nal	Glob al
1	Agamida e	Common Garden Lizard	Calotes versicolor	VC	LC	LC
2	Gekkonid ae	Common House Gecko	Hemidactylus frenatus	VC	LC	LC
3		Brook's House Gecko	Hemidactylus brookii	C	LC	LC
4		Yellow-green House Gecko	Hemidactylus flaviviridis	C	LC	LC
5	Scincidae	Bronze Grass Skink	Eutropis macularia	C	LC	LC
6		Keeled Grass Skink	Eutropis carinata	C	LC	LC
7		Many-lined Grass Skink	Eutropis multifasciata	UC	LC	LC
9	Varanida e	Bengal Monitor Lizard	Varanus bengalensis	C	LC	LC
14	Typhlopi dae	Common Blind Snake	Ramphotyphlops braminus	C	LC	LC
15	Colubrid ae	Checkered Keelback	Xenochrophis piscator	C	LC	LC
16		Stripped Keelback	Amphiesma stolata	UC	LC	LC
17		Common Smooth Water Snake	Enhydryis enhydryis	UC	LC	LC
18		Common Wolf Snake	Lycodon aulicus	UC	LC	LC
19		Indian Rat snake	Ptyas mucosa	C	LC	LC
20	Elapidae	Monocled Cobra	Naja kaouthia	R	NT	LC
21		Binocled Cobra	Naja naja	R	NT	LC



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Yellow-green House Gecko



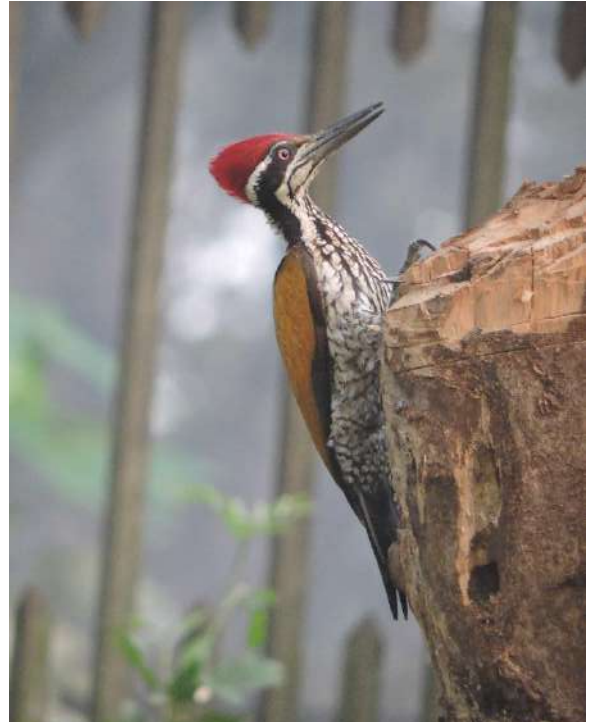
Common garden lizard

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Photographs of faunal species found in study sites



*Asian koel*



*Grater flame back*



*Plain prinia*



*Indian cormorant*





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Herpetofauna suvey in cropland at Amphibian taxnomy data collection at Kajal river bank, Amjhupi



Water bird survey at Isamoti beel, Kathuli, Gangni



Questionnaire survey at chuchukhola beel. Mujibnagar, Meherpur



Night survey at mango orchard at Meherpur Sadar



Night survey at Amjhupi, Meherpur Sadar



Northern Plains Langur

## 11.4 Conclusion

Baseline data collection of the project has been designed to cover at least two vital seasons; monsoon and winter. Monsoon is very important to acquire data on amphibians and reptiles as well as breeding birds. Winter is particularly important for the migratory birds. The field schedule of the project has been designed to cover all kinds of animal and plant communities. A dedicated expert team is involved with the project and we hope to deliver all kinds of deliverables on time. Data collection for winter months have been completed. Wet season data will be collected during June and July 2025.

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## CHAPTER 12: URBAN AND RURAL ECONOMY INCLUDING INFORMAL ECONOMIC AND INDUSTRIAL SECTOR

### 12.1 Street Vendors in Meherpur Paurashava:

The informal economic landscape of Meherpur Paurashava is notably active and diverse, as evidenced by the detailed classification of street vendors by type and commodity. The municipality supports a wide variety of vendors—ranging from fixed, semi-fixed, mobile to seasonal—who sell essential goods such as fruits, vegetables, fish, meat, fast food, pitha, sugarcane juice, jhalmuri, and other snacks, along with non-food items like clothing, shoes, electronics, and mobile SIM cards. This assortment of vendors reflects the adaptability of informal commerce to local demand and seasonality.

Ward-wise distribution shows that certain wards, particularly Ward Nos. 02, 06, 08, and 09, emerge as highly active commercial spaces. Ward No. 06, for instance, not only hosts the highest number of vendors overall but also demonstrates a concentration of semi-fixed and fixed vendors selling a wide range of products, from street food to electronics. Ward No. 02 follows closely, with a diverse mix of vendor types, particularly semi-fixed and fixed vendors selling fast food, fuska, pizza, and meat, alongside mobile and seasonal sellers of cloth and jhalmuri. Ward No. 09 also hosts a significant number of mobile vendors, many of whom trade in fruits, cloth, and cosmetics, reflecting its possible role as a circulation-heavy area or market-adjacent location.

The prominence of certain goods, such as fruits, pitha, jhalmuri, tea, and fast food, across multiple vendor types and wards underscores the centrality of everyday consumables in the informal economy. Furthermore, the presence of non-edible commodities, including cobbler services, mobile SIM sales, and clothing, signifies that informal trade is not limited to food-related activities but also fulfills essential service and retail needs in the community.

These findings highlight the critical need for integrated planning approaches that accommodate informal trade within urban design frameworks. Proper vendor zoning, provision of designated vending areas, and basic service access (water, sanitation, waste disposal) can enhance both the functionality and dignity of these economic actors. The integration of this detailed attribute data with spatial data from the Physical Feature Survey is essential for identifying high-density vending corridors, potential areas of conflict (e.g., pedestrian or vehicular interference), and opportunities for infrastructure support. Such data-driven insights will support inclusive planning and ensure that the informal economy remains a resilient and sustainable part of Meherpur’s urban structure.

Table 12-1: List of Street Vendor Locations in Meherpur Paurashava

Location	Fixed Vendors	Mobile Vendors	Seasonal Vendors	Semi Fixed Vendors	Grand Total
Ward No. 01	7	6	2	2	17
Ward No. 02	8	3	3	15	29
Ward No. 03	1				1
Ward No. 04			1		1
Ward No. 06	19	2	2	20	43

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Ward No. 07	4	7		3	14
Ward No. 08	2	5	4	6	17
Ward No. 09	7	15	1	2	25
Grand Total	48	38	13	48	147

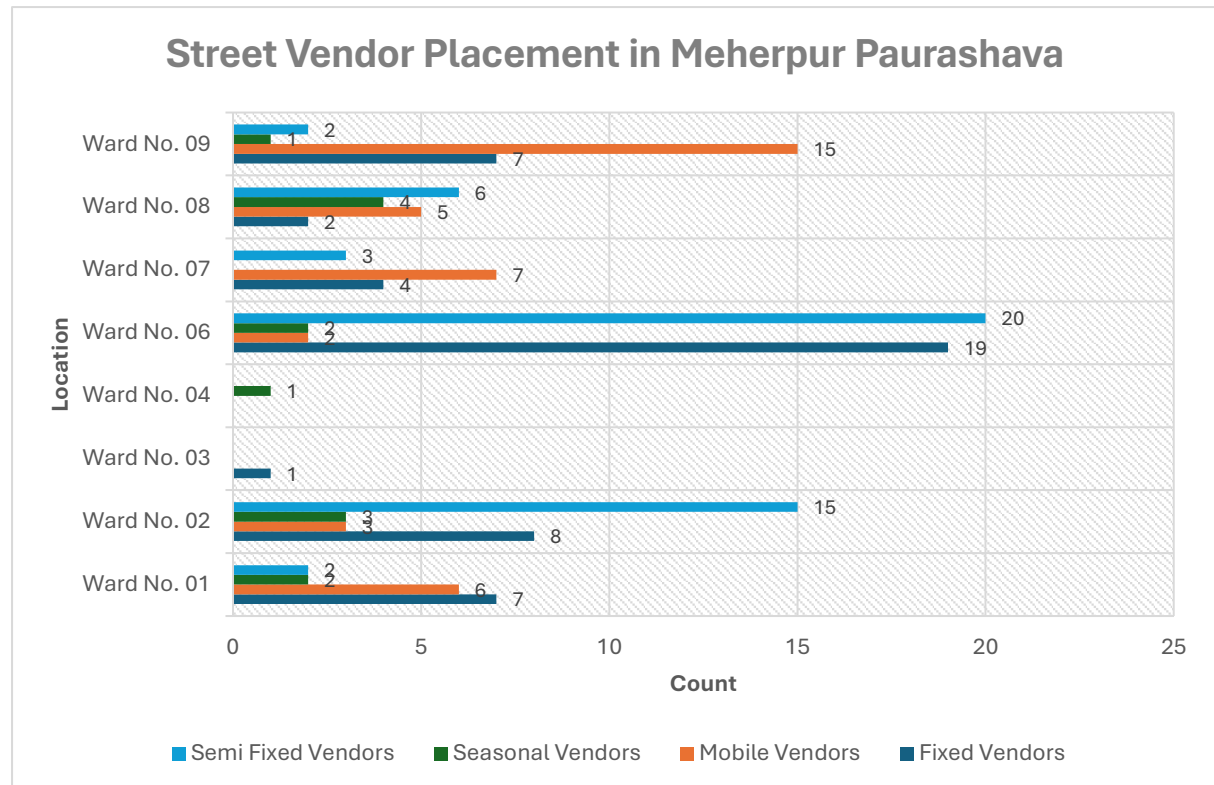
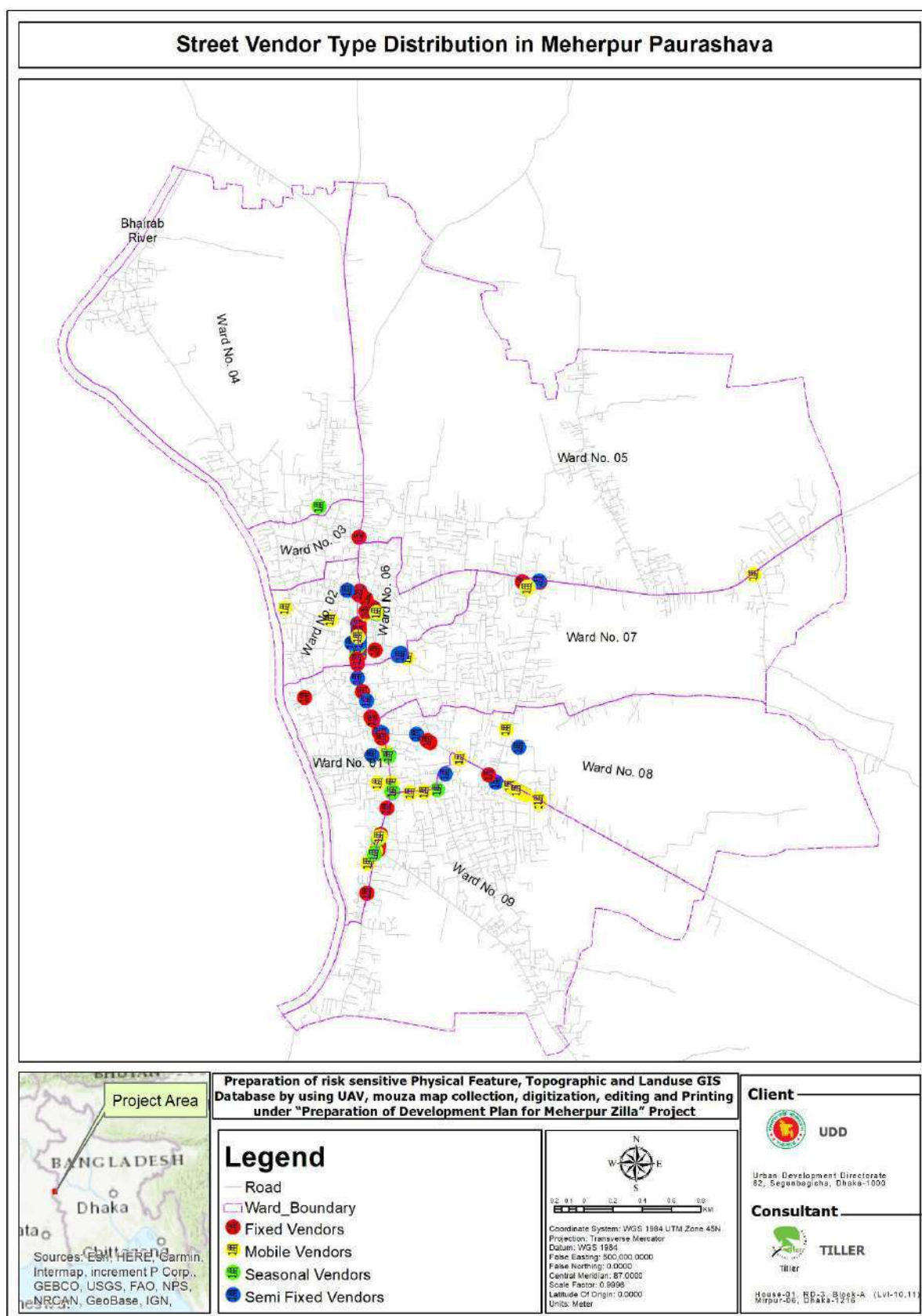


Figure 12-1: List of Street Vendor Locations in Meherpur Paurashava



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## 12.2 Street Vendors in Gangni Paurashava

Table 12-2: List of Street Vendor Locations in Gangni Paurashava

Location	Chicken Seller	Fish Seller	Jhalmuri Seller	Others	Vajapura Seller	Vegetable Van	Grand Total
Ward No. 04				16	1	2	19
Ward No. 06	1			1		1	3
Ward No. 08			1	6	2		9
Total	1		1	23	3	3	31

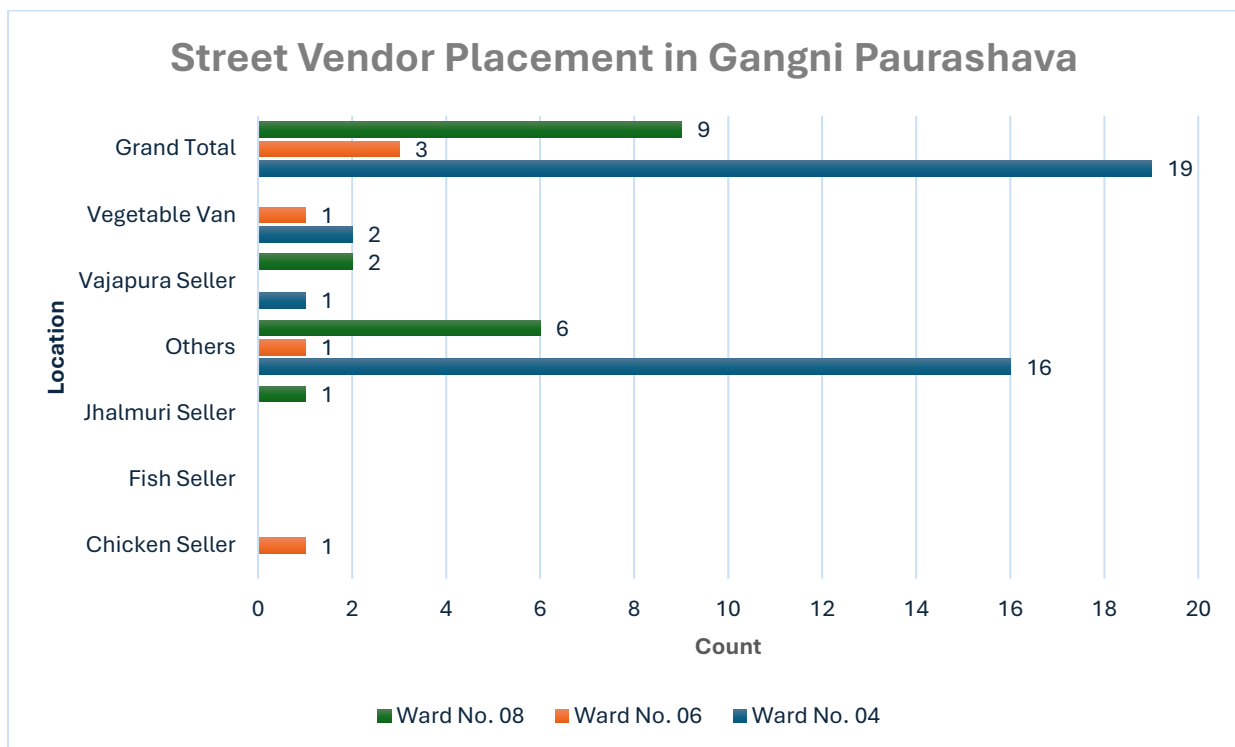
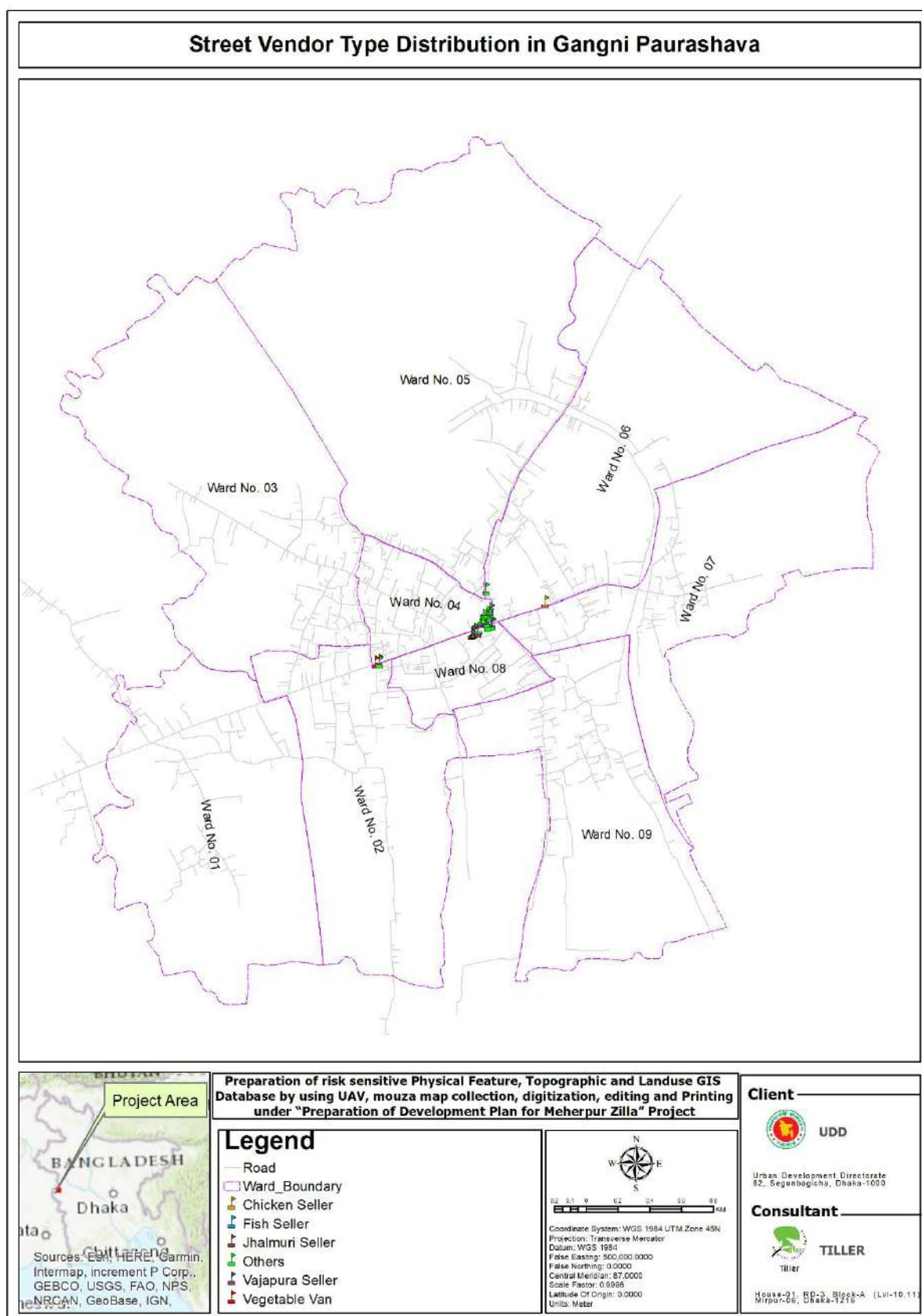


Figure 12-2: List of Street Vendor Locations in Gangni Paurashava

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Map 12-2: List of Street Vendor Locations in Gangni Paurashava

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## **CHAPTER 13: ENVIRONMENT, DISASTER RISK ASSESSMENT, WASTE MANAGEMENT AND POLLUTION**

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### **13.1 Introduction**

#### **13.1.1 Project Background**

Urban Development Directorate under the Ministry of Housing and Public Works, has launched a project titled "Preparation of Development Plan for Meherpur Zilla Project". This initiative aims to formulate a development plan for the next 20 years, divided into essential sectors to create a risk-sensitive and sustainable strategy. To understand the socio-economic and demographic profile of the study area is pivotal step for understanding the immediate needs and forecast the future needs for the next 20 years. Existing data and features are instrumental in providing a clear spatial understanding of the project area, accurately reflecting the potentials and problems of the existing scoria economic related conditions, and facilitating the representation within the development plan. Overall, the scope of socio-economic project signifies a comprehensive and forward-looking approach to urban development, emphasizing sustainability and thoughtful planning over the next two decades.

Environment is one of the important development modules of this project. In this development plan, 'environmental survey and studies' consider is an important tool for a durable and sustainable urbanization. Land use planning is an important component for a modern urban development. But practicing urban development using a proper land use plan is not developed in Bangladesh. Prior to land use planning it is very essential to access environmetal conditions (air, water, soil and noise) and the relevant information in and around the site of future urban development. Therefore, a rigorous environmental survey and study is needed to carry out for a resilient urban development.

#### **13.1.2 Description of the Study Area**

Meherpur Zilla, located in the southwestern part of Bangladesh, holds a significant place in the country's history and culture. Known for its rich heritage and pivotal role in the liberation war, Meherpur continues to thrive with its diverse economy, agricultural abundance, and growing infrastructure. This proposal aims to highlight the key aspects of Meherpur Zilla, focusing on its socio-economic landscape, cultural heritage, and potential for future development. The district comprises three Upazilas: Meherpur Sadar, Mujibnagar, and Gangni. Meherpur Sadar serves as the administrative and economic hub, with a diverse economy primarily based on agriculture and trade. Mujibnagar, formerly Bhaborpara, is renowned for its historical importance in the Liberation War, attracting many tourists to its memorial complex. Gangni Upazila is notable for its vibrant agricultural activities and emerging industrial potential. Collectively, these Upazilas contribute to the district's cultural richness, economic diversity, and historical legacy, positioning Meherpur Zilla as a region of significant importance and development potential in Bangladesh.

Meherpur Zilla is bordered by Kushtia to the east, Chuadanga to the south, and the Indian state of West Bengal to the west and north, situated in the Khulna Division. The district's strategic

location offers significant advantages for cross-border trade and cultural exchange. The district is predominantly rural, with a diverse population comprising various ethnic and religious communities. The literacy rate is gradually improving, with ongoing efforts to enhance educational facilities and opportunities.

#### ***13.1.2.1 Gangni Upazila***

Gangni Upazila (Meherpur district) area 363.95 sq km, located in between 23°44' and 23°52' North latitudes and in between 88°34' and 88°47' East longitudes. It is bounded by Daulatpur (Kushtia) upazila on the North, Alamdanga and Meherpur Sadar upazilas on the South, Daulatpur (Kushtia), Mirpur (Kushtia) and Alamdanga upazilas on the East, Meherpur Sadar upazila and West Bengal state of India on the West.

Population Total 299607; male 148250, female 151357; Muslim 295458, Hindu 2726, Christian 1313 and others 110. Water bodies Main rivers: Bhairab, Ichamati, Mathabhanga and Kazla; Elangi Beel, Nuner Beel and Elalgari Damash Beel are notable. Administration Gangni Thana was formed in 1923 and it was turned into an upazila on 24 February 1984. Gangni Upazila consist of one Municipality, 9 Unions, 90 Mouzas and 137 Villages.

#### ***13.1.2.2 Meherpur Sadar Upazila***

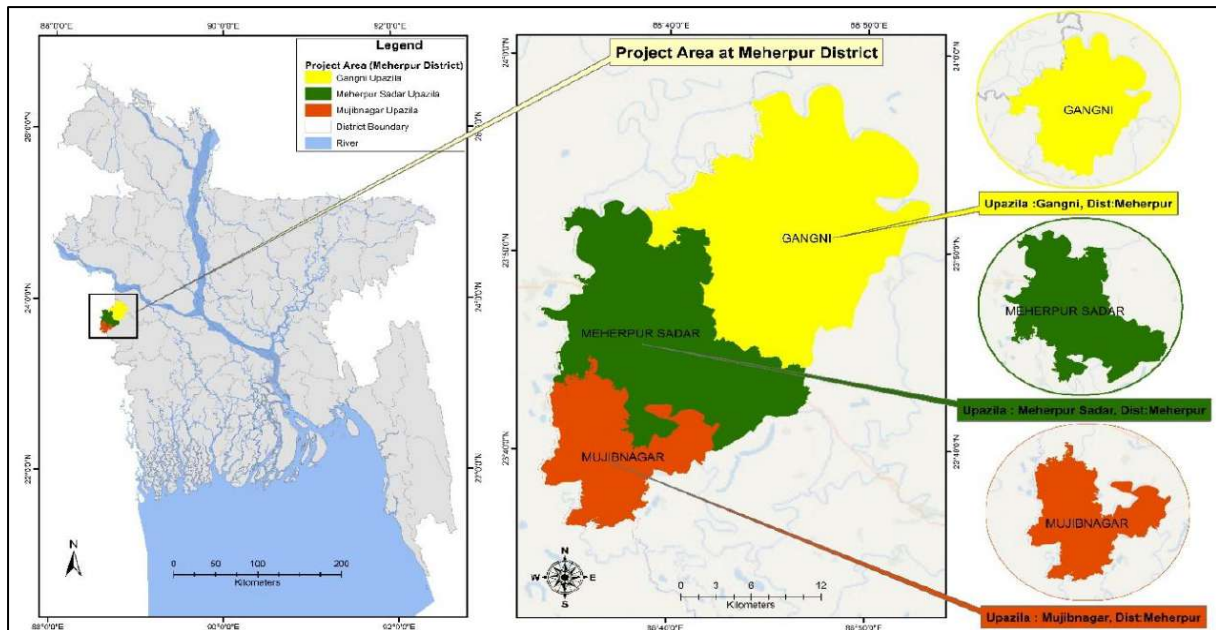
Meherpur Sadar Upazila (Meherpur district) area 276.15 sq km, located in between 23°40' and 23°52' North latitudes and in between 88°34' and 88°47' East longitudes. It is bounded by Gangni upazila and West Bengal state of India on the North, Damurhuda and Mujibnagar upazilas on the South, Gangni and Alamdanga upazilas on the East, West Bengal state of India on the West.

Population Total 256642; male 127300, female 129342; Muslim 252323, Hindu 4199, Buddhist 1, Christian 114 and others 5. Water bodies Main rivers: Bhairab, Kazla; Bhatgari and Chand Beels are notable. Administration Meherpur Thana was turned into an upazila in 1984. Meherpur Municipality was formed in 1960. Meherpur Sadar consist of one Municipality, 5 Unions, 61 Mouzas and 104 Villages.

#### ***13.1.2.3 Mujibnagar Upazila***

Mujibnagar Upazila (Meherpur district) area 111.51 sq km, located in between 23°36' and 23°45' North latitudes and in between 88°34' and 88°43' East longitudes. It is bounded by Meherpur Sadar upazila on the North, Damurhuda and Meherpur Sadar upazilas on the East, West Bengal of India on the South and on the West. Population Total 99143; male 49084, female 50059; Muslim 92970, Hindu 945, Buddhist 13, Christian 5200 and others 15. Water bodies Bhairab River, Sarashati Canal and Datpur Beel are notable. Administration Mujibnagar upazila was formed on 24 February 2000. Mujibnagar Upazila consist of 4 Unions, 29 Mouza and 33 Villages.





Map 13-1: Study Area Map

### 13.1.3 Objectives

#### 13.1.3.1 Main objectives of the project

The aim of Environmental study for urban areas of Meherpur Zilla is to identify the noise, water and air pollution condition of the project area including variation at day and nighttime. The study is also intended to examine the water quality, identify the noise level of the project area and the air pollution like particle matter ranges from 0.5 to 10.0, suspended particle matter and finally the air pollution index (API) determination which will be correlated to the development plan for the implementation of the project. The Environmental study data and information shall have to integrate with both spatial and attribute data of output of other components of planning package of "Preparation of Development Plan for Meherpur Zilla" in order to keep the environment sustainable.

#### 13.1.3.2 Specific objectives of present study as per scope of work:

With a view to attain the aim of Environmental study of the project areas, the objectives of the work comprise the following:

- To collect the noise level at major growth centers and road intersections
- To collect the air quality like PM 0.5, PM 2.5, PM 5, PM 10 and Suspended Particle Matter (SPM) at major growth centers and road intersections and spatial distribution maps, graphs and dataset.
- To determine the water quality
- Finally, determine the Air Pollution Index (API) of the project area to specify the tolerable limit of noise and air pollution with the international and national standard to predict the percussions needed for future development planning.

### 13.1.4 Scope of work

As per TOR, description of the field investigation is given in the Table-1 below.

Table 13-1: Description of Field Investigations

SI. No.	Description of Items	Unit	Total Number
1	Preparation of Intial land use and land cover map based on secondary source data.		1
2	Noise level	No	65 (-30 rural -35 urban)
3	Water sample colection point for examining the surface Water Quality from Major River, Haor & Baor, Canal water and pond water.	No	22
4	Location points of air sample for Air pollution Index determination and reporting	No	20
5	Climate and climate change impact assessment though FGD and KII	No	6
6	Desktop study of existing literature	No	1

Beside the above scope of work, agricultural soil quality data has to be colectd from SRDI (Soil resource development Institute). Climatic data also collected from weather station in and around the project area or nearby area to prepare climate change model.

### 13.1.5 Methodology For the Assignment

#### 13.1.5.1 Land Use And Land Cover Map Preparation

The methodology involved data preprocessing, training data preparation, classification, visualization, and export, implemented using the GEE JavaScript API.

##### 13.1.5.1.1 Data Preprocessing

The Sentinel-2 image collection was filtered to include images within Meherpur, acquired between April 1, 2024, and September 30, 2024. A cloud cover threshold of less than 20% ("CLOUDY\_PIXEL\_PERCENTAGE < 20") was applied to ensure high-quality images. Then a cloud-masking function used the Scene Classification Layer (SCL) band to mask pixels classified as clouds (SCL = 9) or cloud shadows (SCL = 8), retaining only clear pixels. After that the image collection was subset to include bands B2, B3, B4, B8, and B11, critical for land cover differentiation.

A median composite was generated from the filtered image collection to create a single, cloud-free image representing typical conditions. The composite was clipped to the Meherpur geometry.

##### 13.1.5.1.2 Pre LULC analysis

To get the training data for LULC analysis, some other analyses were done. Gathered satellite bands were used to do the Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Built-up Index (BUI), Indexed Built-up Index (IBI), and

Enhanced Built-up and Bareness Index (EBBI) to identify the temporal signature of different types of land use and collect them as training data.

#### **13.1.5.1.3 Training Data Preparation**

Each training sample was assigned a numeric land cover code given in Table 2.

Table 13-2: Each LULC Class and Its Class Code

Class name	Class code
Water body	1
Sparse vegetation or Agri land	2
Dense vegetation	3
Built-up area	4
Barren land	5

Then the training datasets were merged into a single FeatureCollection containing 2500 samples (500 per class). The median composite was sampled at the training point locations using a 10-meter scale (native resolution of Sentinel-2 bands B2, B3, B4, and B8). The sampled data included the land cover class and band values.

#### **13.1.5.1.4 Classification**

The CART algorithm, implemented as "ee.Classifier.smileCart", was used for classification due to its simplicity and effectiveness. The classifier was trained with:

- Features: The sampled training data.
- Class Property: The "landcover" property (values 1 to 5).
- Input Properties: Bands B2, B3, B4, B8, and B11.

The trained classifier was applied to the median composite to generate a classified image, assigning each pixel to one of the five land cover classes.

#### **13.1.5.1.5 Accuracy Assessment and Visualization**

The classified map was visualized in the GEE map viewer with the designated color code and then exported into the Google Drive to the local folder as a .tiff file. Then the exported raster file was imported into QGIS 3.40 to check the accuracy and visualization.

The accuracy assessment was done with the help of the semi-classification plugin in QGIS 3.40. The RGB composite of the real satellite images that were classified was used as reference data. The result showed an overall accuracy of 92.01% and kappa hat classification value was 0.8830.

Then the classified image was exported as png format for the visualization by using QGIS 3.40.

### **13.1.6 Noise Level Measurement**

#### **13.1.6.1 Sampling Method:**

Monitoring of ambient noise level will be carried out for a period of 1-24 hours (15 hours day-time (0600 – 2100) and 9 hours night-time (2100 – 0900) using a Class 1 Sound Level Meter (Model: SL – 4022 or upper version). The duration of noise level monitoring will be decided based on the consultation with the client.

A tripod/stand should be used for monitoring.

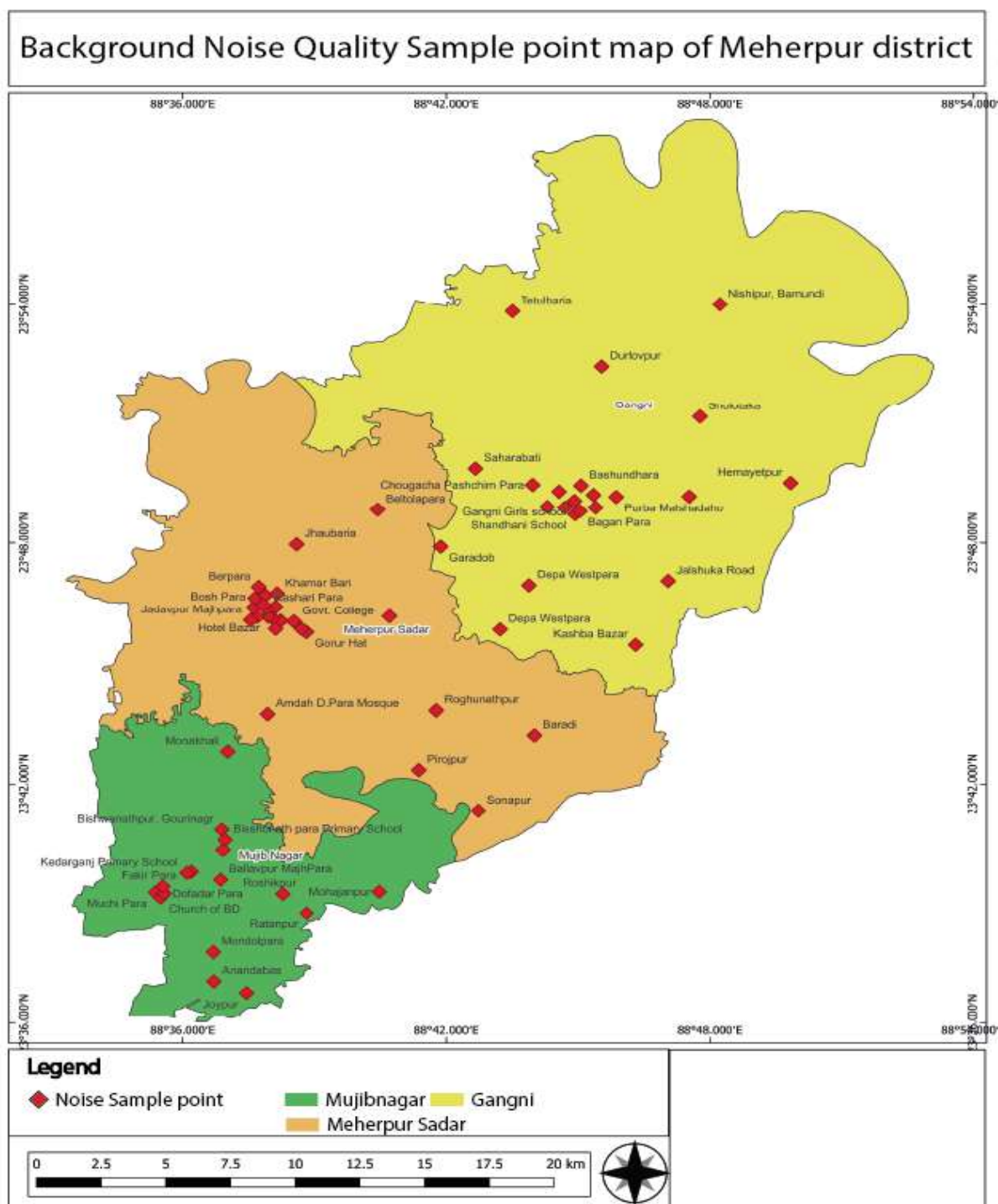
To obtain the most accurate data, hold out the SLM at arm's length and hold it out to inspector's side with the microphone pointed towards the source of the noise, to minimize sound reflecting off his body.

Noise reading should always be taken at the height of the receptor. If the receptor is at the ground level, take a measurement at the ground level (1.2–1.5m off the ground).

To prevent disturbance from reflecting surfaces, the noise meter microphone facing towards the noise source with clearance of around 3 meters from any structures will be ensured.



Figure 13-1: Noise Level Meter (Class 1)



Map 13-2: Background Noise quality sample point map of Meherpur District

### 13.1.7 Air Quality Measurement

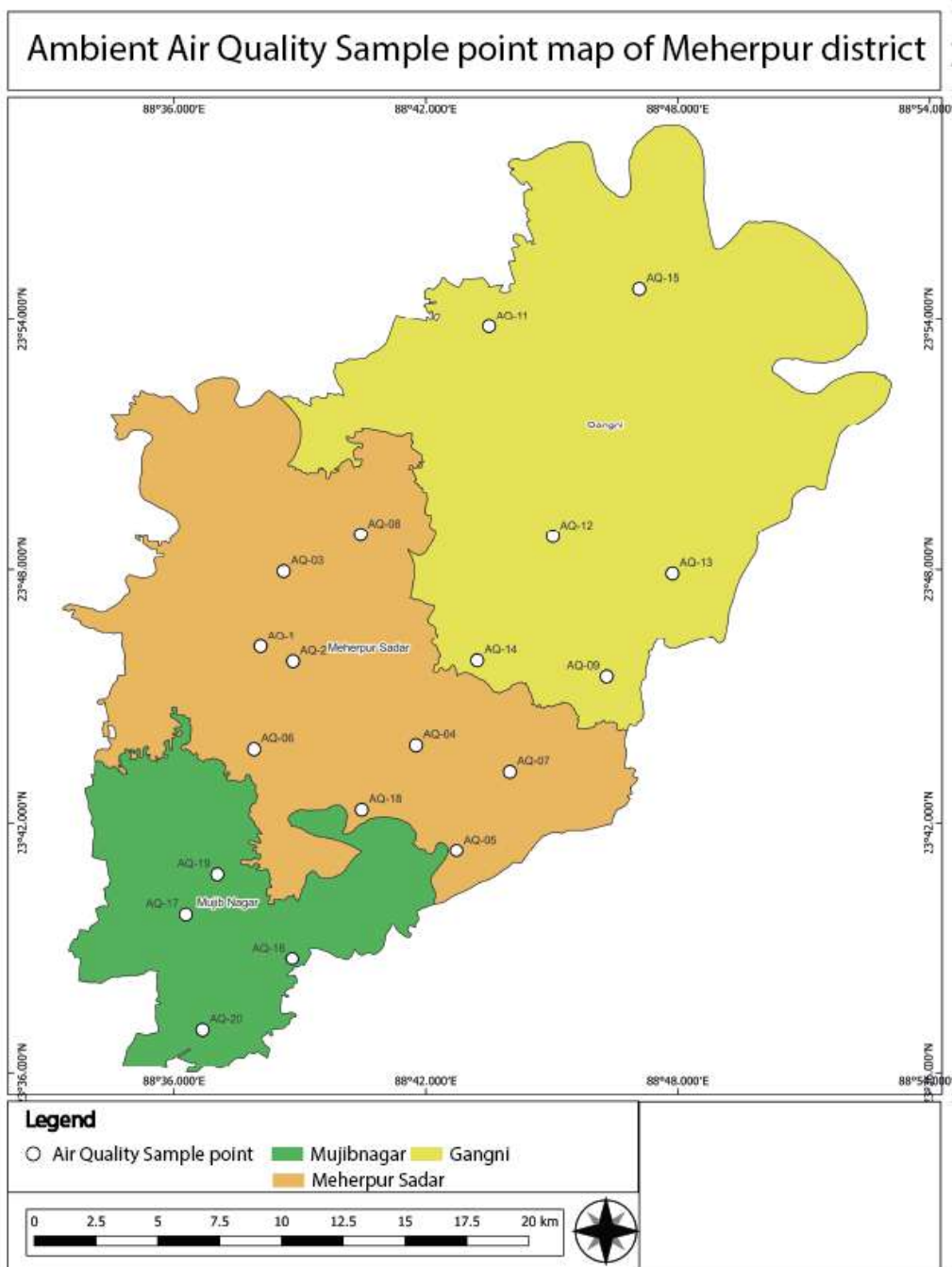
Parameters of Ambient air quality, sampling method and laboratory analysis methods are given below:

Table 13-3: Air Quality Measurement

Parameters	Sampling Method	Laboratory Analysis Method
------------	-----------------	-------------------------------



SPM	Sample of ambient air is to be carried out by Respirable Dust Sampler [Model 36C12] or portable air quality device (no lab analysis needed).	IS 11255 (Part 1):1985
PM10	<p>Sampling will be conducted for 1-24 hours (duration to be decided based on the discussion with the client).</p> <p>Sampler placed at an open area (minimum 20 m clearance from any tall structures or vegetations/trees/shrubs) to prevent disturbance.</p> <p>After completion of sampling, each filter paper with trapped PM shall be preserved in an airtight Polly packet and is again packed in an envelope. All samples are to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.</p>	IS 5182 (Part 23):2006 - Methods for Measurement of Air Pollution, Part 23: Respirable Suspended Particulate Matter (PM10), Cyclonic Flow Technique
PM2.5	<p>Sample of ambient air is to be carried out by fine particulate monitor [Model APS-302] or portable air quality device (no lab analysis needed).</p> <p>Sampling to be conducted for 1-24 hours (duration to be decided based on the consultation with the client).</p> <p>Sampler placed at an open area (minimum 20 m clearance from any tall structures or vegetations / trees / shrubs) to prevent disturbance.</p> <p>After completion of sampling, each filter paper with trapped PM shall be preserved in airtight Polly packet and is again packed in an envelope. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.</p>	In House Gravimetric Method



Map 13-3: Ambient Air Quality Sample Point Map of Meherpur District

### 13.1.8 Water Quality Measurement

Water sample has to be tested and the testing parameters of surface water are the Lab test for examining the ground water quality including (i) Hydro-Geological field parameter test (Arsenic, Ph, EC, TDS, etc) (ii) Major Cataion and Anaion (wet and dry seasons) of groundwater and surface water, (iii) Trace Element Analysis (wet and dry seasons) of groundwater and surface water. All parameters will be tested in APHA/USEPA/ISO/IS method except some in-situ parameters (Temperature, Salinity, and Turbidity) to be tested by the electromagnetic method.

#### 13.1.8.1 Sampling Method:

Sampling program will be undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance.

Sampling will be conducted using a vertical Van Dorn Water Sampler (Beta Plus) to collect the surface water samples.

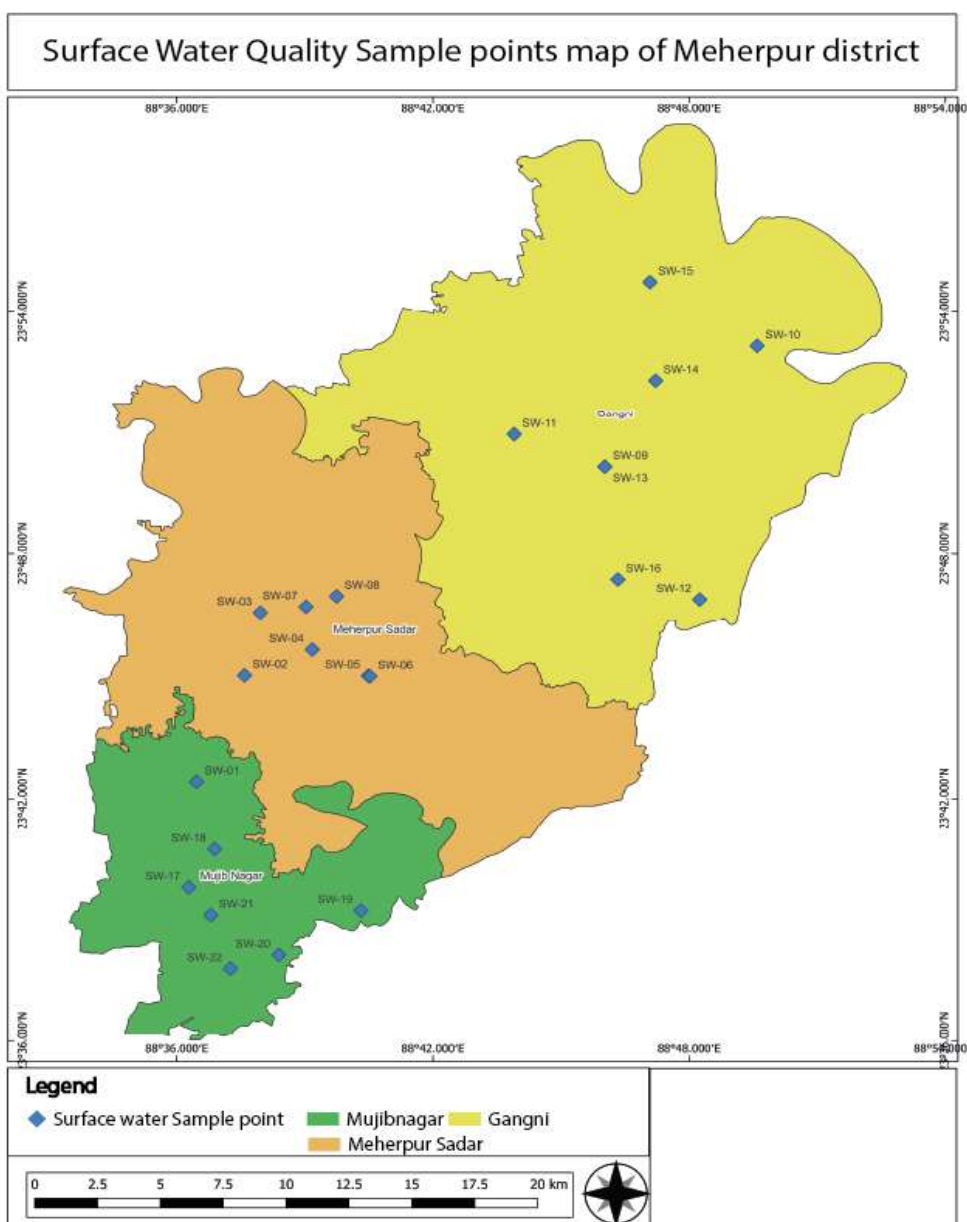
New sampling bottles will be rinsed with distilled water for three times and then two times with sample water.

2.5 liters of sample per location will be collected.

All sampling bottles will be properly labeled and transported in ice box (4°C) from site to SGS laboratory at Dhaka.

All samples will be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.

Water Sample Location:



### 13.1.9 Air Pollution Index

#### 13.1.9.1 Data Collection and Preparation

##### 13.1.9.1.1 Data Collection:

Ensure that the air pollution data for PM<sub>10</sub>, PM<sub>2.5</sub>, and SPM is collected using standardized equipment and methodologies as prescribed by national and international guidelines (e.g., WHO, EPA, NAAQS).

##### 13.1.9.1.2 Data Preparation:

Validate the collected data for any anomalies or missing values. Aggregate the data to a consistent time scale, such as daily averages, if not already done. Sample location point of Air and Noise.

### 13.1.10 Selection of Standards and Index Calculation

Reference Standards:

Choose appropriate reference standards for PM<sub>10</sub>, PM<sub>2.5</sub>, and SPM from both international (e.g., WHO Air Quality Guidelines, US EPA National Ambient Air Quality Standards) and national standards (e.g., NAAQS in India).

#### 13.1.10.1 Calculation of Sub-indices

Each pollutant's concentration is converted into a sub-index using a predefined scale. This can be done using linear interpolation between breakpoints.

Steps:

Determine the Breakpoints: Identify the concentration breakpoints for each pollutant according to the selected standards.

Linear Interpolation: For each pollutant, convert the observed concentration to a sub-index using the formula:

$$I_p = \frac{(I_{HI} - I_{LO})}{(BP_{HI} - BP_{LO})} \times (C_p - BP_{LO}) + I_{LO}$$

Where:

$I_p$  is the sub-index for pollutant  $p$

$C_p$  is the concentration of pollutant  $p$

$BP_{HI}$  and  $BP_{LO}$  are the upper and lower concentration breakpoints for the category in which  $C_p$  falls.

$I_{HI}$  and  $I_{LO}$  are the upper and lower index breakpoints corresponding to  $BP_{HI}$  and  $BP_{LO}$

#### 4. Calculation of Overall API

The overall API is determined by taking the highest sub-index value among the pollutants.

$$API = \max (IPM_{10}, IPM_{2.5}, ISPM)$$

#### 5. Reporting

Categorization:

Classify the API into categories (e.g., Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy, Hazardous) based on the sub-index values.

Groundwater status mapping using geo-spatial analysis: Groundwater table data will be collected from the water development board. They have an archive of monthly water table data.

We will map and identify the region vulnerable to ground water depletion using geospatial and geostatistical data processing. Any Other Activities in Consultation with PD

### 13.1.11 Work Progress

#### Contract Signing

After successful negotiation meeting, contract agreement has been signed among the both party (UDD and ECAL) in the presence of PEC committee members and the representatives of consulting firm on date 8 December 2024.

#### Kickoff meeting with PD office of Urban Development Directorate (UDD)

A consultation meeting has been occurred in UDD with project director and project manager about the program schedule, field mobilization and work procedure. From discussion we are outlined a tentative broad schedule for field operation.

Mobilization report will be submitted by 31 December, 2024.

A reconnaissance field visit has been planned to conduct 12-13 January, 2025.

Inception report will be submitted 22 February, 2025.

Detail field survey schedule will be designed after reconnaissance field visit of the project area and which is included in the inception report.



Figure 13-2: Kickoff meeting with PD office of Urban Development Directorate (UDD) and SGS and ECAL representative.

### 13.1.12 Reconnaissance Field Visit and Stake Holder Consultation

A reconnaissance field visit has been completed on 23 February 2025 and attend a consultation meeting in project area in DC office at 24 February 2025. This consultation meeting is conducted by UDD and attend different Stake holder from different GO and NGO who are related with this project. From consultant part we also attend on this consultation meeting and get the valuable information and suggestion from this meeting which will be very helpful to execute the field work.





Figure 13-3: Consultation Meeting at DC Office

### 13.2 Initial Land Use and Land Cover Map Preparation

Methodology for conducting land cover classification in Meherpur, Bangladesh, using Sentinel-2 satellite imagery processed within the Google Earth Engine (GEE) platform. The goal was to map five land cover classes—waterbody, sparse vegetation or agricultural land, dense vegetation, built-up areas, and barren land—for the year 2024. The workflow employs the Classification and Regression Tree (CART) algorithm (Timofeev, 2004) to classify a median composite image derived from Sentinel-2 data, addressing phenological variability and cloud cover challenges.

The primary data source was the Sentinel-2 Surface Reflectance (SR) Level-2A product ("COPERNICUS/S2\_SR") available in GEE. Sentinel-2 provides multispectral imagery with spatial resolutions of 10–60 meters across 13 bands. The following bands were used:

- B2 (Blue, 10m)
- B3 (Green, 10m)
- B4 (Red, 10m)
- B8 (Near-Infrared, 10m)
- B11 (Short-Wave Infrared, 20m)

These bands were selected for their effectiveness in distinguishing vegetation, water, and built-up areas. Imagery was filtered for the period from April 1, 2024, to September 30, 2024, to capture seasonal phenological changes.

#### 13.2.1 Accuracy Assessment and Visualization

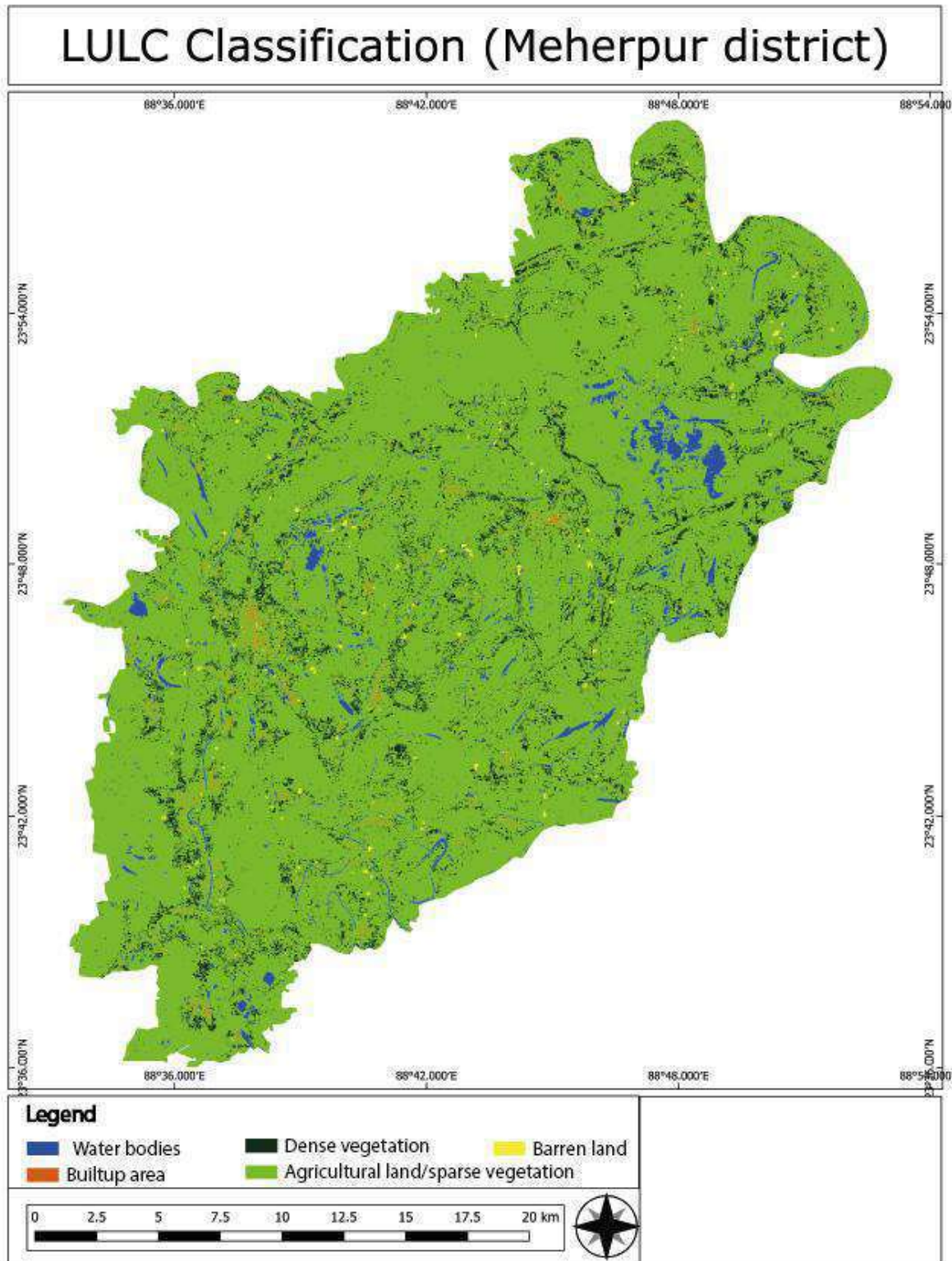
The classified map was visualized in the GEE map viewer with the designated color code and then exported into the Google Drive to the local folder as a .tiff file. Then the exported raster file was imported into QGIS 3.40 to check the accuracy and visualization.

The accuracy assessment was done with the help of the semi-classification plugin in QGIS 3.40. The RGB composite of the real satellite images that were classified was used as reference data. The result showed an overall accuracy of 92.01% and kappa hat classification value was 0.8830. Then the classified image was exported as png format for the visualization by using QGIS 3.40.

From this study following class of land use and land cover type are identified which are showing table-2.

Table 13-4: Land Use and Land Cover Type

Class name	Percentage %	Area [metre^2]	Area (Sq km)
Water bodies	2.57	18685420.39	18.68542039
Agricultural or sparse vegetation	87.53	637562190.7	637.5621907
Dense vegetation	8.51	61959309.15	61.95930915
Builtup area	1.07	7767298.68	7.76729868
Barren land	0.34	2452657.42	2.45265742



Map 13-5: Landuse and Land Cover Map Of The Meherpure District (Source-Prepared From Online Image)





Deep vegetation (Orchad) cover



Agricultural or sparse vegetation cover



Water body (river)



Water body (standing water body)



Urban area



Road type

Figure 13-4: Some Picture of Field Observation Regarding Land Use And Land Cover

### 13.3 Water, Noise And Air Pollution Data Collection

#### 13.3.1 Water Sample Collection and Test Report:

Water sample has to be tested and the testing parameters of surface water are the Lab test for examining the ground water quality including (i) Hydro-Geological field parameter test (ii) Major Cataion and Anaion (dry seasons) of and surface water, (iii) Trace Element Analysis (dry seasons) of groundwater and surface water. All parameters will be tested in

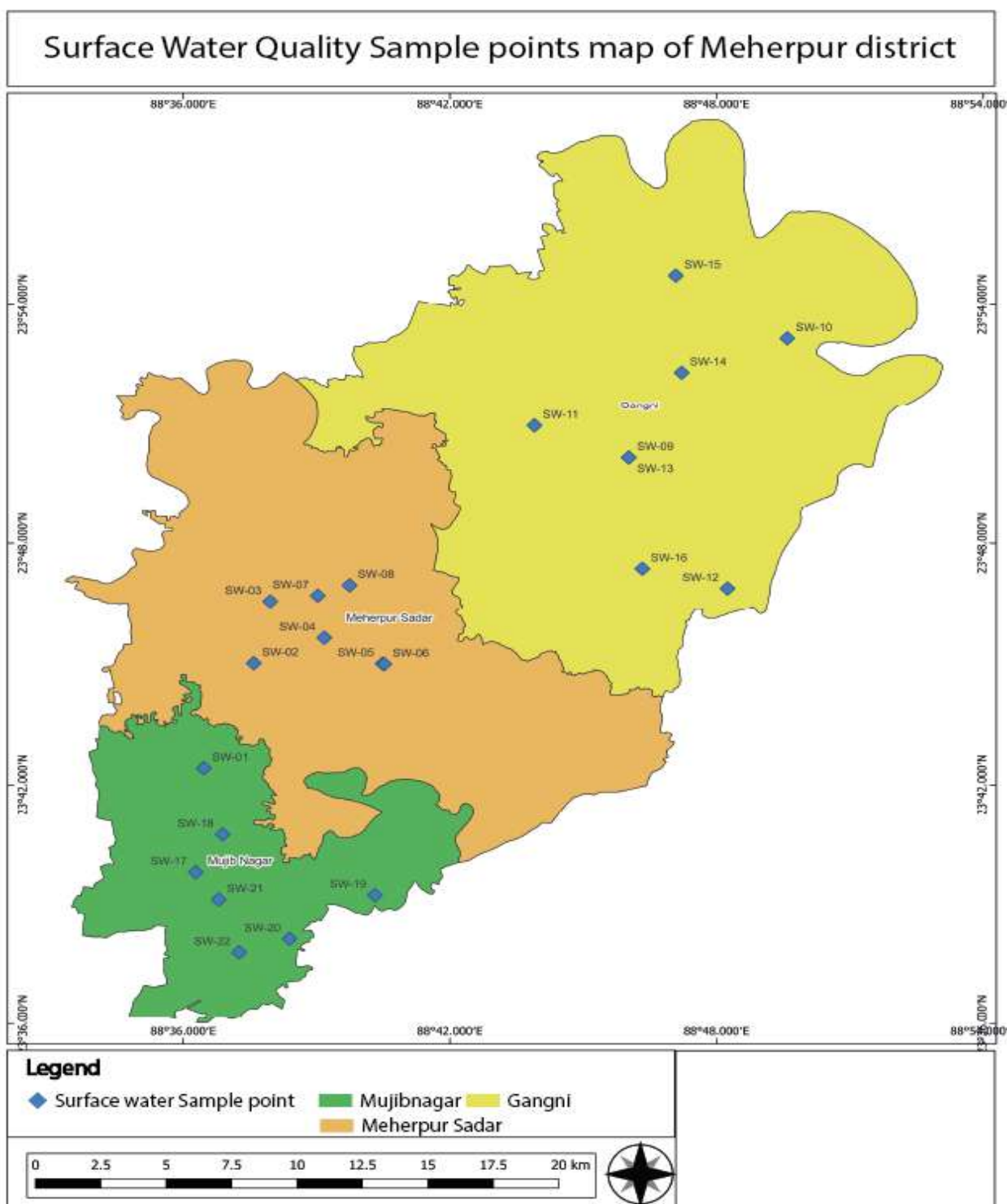
APHA/USEPA/ISO/IS method except some in-situ parameters (Temperature, Salinity, and Turbidity) to be tested by the electromagnetic method. In this study, 22 sample has been tested for this study among them 6, 7 and 7 sample has been collected from Meherpure sadar Upazila, Ganni Upazila and Mujibnagar Upazila respectively. Location points are given bellow respect to the sample ID.

Table 13-5: Surface Water Sampling Collection point

Sl No	ID	Location	Latitude	Longitude
1	SW-01	Dariapur	23°42'25.078"	88°36'27.69"
2	SW-02	Bondor Muzibnagar Road	23°45'0.407"	88°37'35.307"
3	SW-03	GOR Pond	23°46'33.51"	88°37'57.522"
4	SW-04	Near BAT Meherpur	23°45'38.148"	88°39'10.518"
5	SW-05	Chandbil Meherpur	23°44'59.706"	88°40'29.4"
6	SW-06	Amjhupi Meherpur	23°44'59.076"	88°40'31.428"
7	SW-07	Dighipara Meherpur	23°46'42"	88°39'1.686"
8	SW-08	Gopalpur Meherpur	23°46'57.468"	88°39'44.602"
9	SW-09	Malshadaha	23°50'8.72005"	88°46'1.57303"
10	SW-10	Baot	23°53'9.174"	88°49'35.694"
11	SW-11	Malshadaha	23°50'56.37678"	88°43'54.2226"
12	SW-12	Arpara-Chandmari Road	23°46'52.726"	88°48'14.944"
13	SW-13	Gangni Biswaspara Jame Mosque	23°50'8.75371"	88°46'1.54513"
14	SW-14	Terail	23°52'18.03"	88°47'13.05"
15	SW-15	Harbhanga	23°54'43.752"	88°47'5.136"
16	SW-16	Jalshuka-Arpara Road	23°47'22.16476"	88°46'19.9759"
17	SW-17	Kedarganj	23°39'49.17"	88°36'17.01"



18	SW- 18	Biswanathpur	23°40'45.144"	88°36'53.236"
19	SW- 19	Mohajonpur	23°39'15.174"	88°40'18.848"
20	SW- 20	Taranagar	23°38'8.64"	88°38'23.484"
21	SW- 21	Ballovpur	23°39'8.514"	88°36'48.078"
22	SW- 22	Taranagar	23°37'48.639"	88°37'15.487"



Map 13-6: Surface Water Quality Sampling Points Map of Meherpur District

Table 13-6: Surface Water Quality Test Reports

Parameter	Location	GPS Coordinates	Temperature	pH	Salinity	Turbidity	Dissolved Oxygen (DO)	Total Dissolved Solids (TDS)	Electrical Conductivity (EC)	Total alkalinity	Total Suspended Solid (TSS)	Chloride	Biological Oxygen Demand (BOD)	Chemical Oxygen Demand (COD)
Unit			°C	-	ppt	NTU	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L
SW-01	Dariapur	23°42'25.078"N 88°36'27.69"E	30.27	6.7	0.02	64.1	5.3	170	214	170	10	19.99	6	40
SW-02	Bondor Muzibnagar Road	23°45'0.407"N 88°37'35.307"E	30.2	6.9	0.02	12.7	5.8	224	372	420	64	12	10	84
SW-03	GOR Pond	23°46'33.51"N 88°37'57.522"E	30.3	7.6	0.01	51	5.9	210	351	200	6	29.99	7	44
SW-04	Near BAT, Meherpur	23°45'38.148"N 88°39'10.518"E	27.8	7.71	0.01	34.12	5.4	137	259	370	12	27.99	8	48
SW-05	Chandbil Meherpur	23°44'59.706"N 88°40'29.4"E	28	6.9	0.01	29.2	5.7	184	291	260	104	17.99	12	88
SW-06	Amjhupi Meherpur	23°44'59.076"N 88°40'31.428"E	28.4	7.2	0.01	34.5	6.2	178	252	280	98	6	9	68
SW-07	Dighipara, Meherpur	23°46'42"N 88°39'1.686"E	28.5	7.7	0.01	16.8	5.9	212	371	270	58	21.99	10	76
SW-08	Gopalpur, Meherpur	23°46'57.468"N 88°39'44.602"E	29.4	7.8	0.02	40.17	6.0	143	310	220	44	< 0.50	5	32
SW-09	Malshadaha	23°50'8.72005"N 88°46'1.57303"E	30.9	9.38	0.02	112	5.2	201	406	210	78	6	7	56
SW-10	Baot	23°53'9.174"N 88°49'35.694"E	30.1	8.4	0.01	41.47	5.9	134	269	110	50	14	6	56
SW-11	Malshadaha	23°50'56.37678"N 88°43'54.2226"E	29.7	9.4	0.01	29.32	9.0	172	345	170	60	14	8	56
SW-12	Arpara-Chandmari Road	23°46'52.726"N 88°48'14.944"E	31.9	7.87	0.02	40.27	6.3	212	426	200	38	10	12	92
SW-13	Gangni, Biswaspara Jame Mosque	23°50'8.75371"N 88°46'1.54513"E	31.9	7.64	0.03	36.79	6.9	370	743	340	36	14	6	36
SW-14	Terail	23°52'18.03"N 88°47'13.05"E	23.8	7.4	0.04	70	5.8	522	780	370	120	45.99	8	56
SW-15	Harbhanga	23°54'43.752"N 88°47'5.136"E	32.0	7.84	0.03	42.68	6.2	357	723	240	26	51.98	6	40
SW-16	Jalshuka-Arpara Road	23°47'22.16476"N 88°46'19.9759"E	30.9	7.32	0.02	17.31	5.5	293	588	280	6	12	7	44
SW-17	Kedarganj	23°39'49.17"N 88°36'17.01"E	26.8	6.51	0.01	12.1	6.2	150	299	170	4	< 0.50	5	24
SW-18	Biswanathpur	23°40'45.144"N 88°36'53.236"E	28.6	9.7	0.01	17.84	3.4	228	343	150	16	16	6	28
SW-19	Mohajonpur	23°39'15.174"N 88°40'18.848"E	28.9	9.44	0.01	33.32	5.0	125	254	120	6	10	4	12
SW-20	Taranagar	23°38'8.64"N 88°38'23.484"E	32.4	9.07	0.01	177	5.5	131	259	110	420	12	20	200
SW-21	Ballovpur	23°39'8.514"N 88°36'48.078"E	27.2	7.1	0.01	23.2	5.8	117	228	300	14	19.99	7	44
SW-22	Taranagar	23°37'48.639"N 88°37'15.487"E	28.9	7.3	0.02	14.3	5.9	154	202	150	16	4	5	32
n followed as per E.C.R'23(BD), Inland Surface Water Star			6.5-8.5					1000	2250			0.1 ≤12		100





Figure 13-5: picture of Water Sampling process in the Project Area

### 13.4 Ambient Air Quality

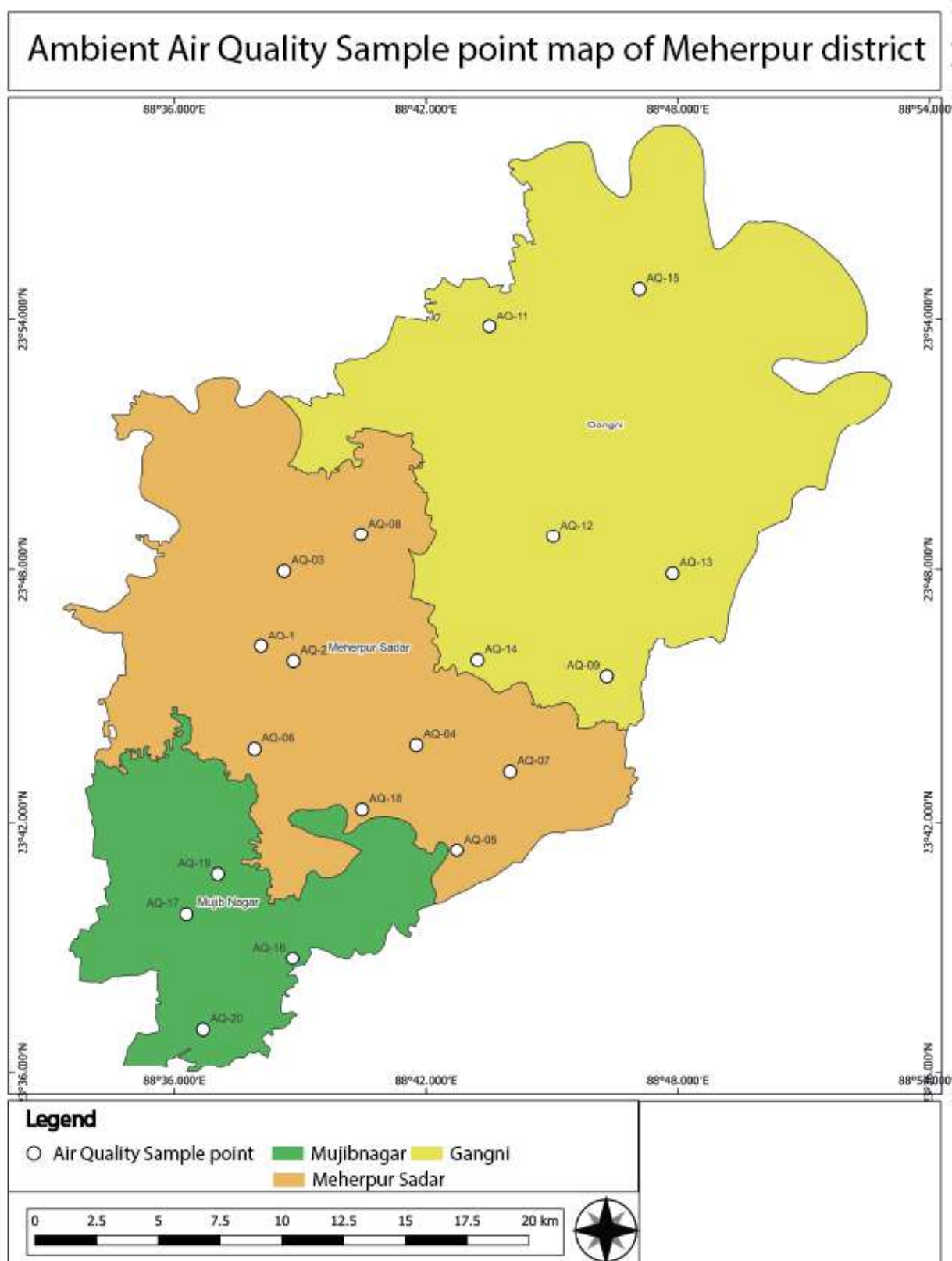
Ambiant air quality data has been collected from different location of the study area. Total numbers of sample was 20 among them 9 from Meherpure Sadar, 7 from Gangni and 4 from Mujib Nagar. Following air quality data has been tested which are CO, O<sub>3</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>x</sub>, NO<sub>x</sub> and Pb. Table -7 and Table-8 are showing location point description and test result as per location point respectively.

Table 13-7: Ambient air quality sampling points map of Meherpur District

Sl No	ID	Location	Latitude	Longitude
1	AQ-1	Mollickpara Road Meherpur Sadar	23°46'10.12"	88°38'3.82"
2	AQ-2	BAT DPO-1 Meherpur Sadar	23°45'48.58"	88°38'50.20"
3	AQ-03	Mondol Bari Mor Meherpur Sadar	23°47'57.79"	88°38'36.84"
4	AQ-04	Roghunathpur Jame Mosque Meherpur Sadar	23°43'49.87"	88°41'46.0775"
5	AQ-05	Sonapur malithapara bajar Meherpur	23°41'20.426"	88°42'43.965"

6	AQ-06	Amdah D: Para Jame Masjid Meherpur	23°43'44.434"	88°37'54.5893"
7	AQ-07	Baradi Bazar Meherpur	23°43'12.56"	88°44'0.209"
8	AQ-08	Beltolapara Government Primary School Meherpur	23°48'50.33"	88°40'27.02"
9	AQ-09	Kasba Bazar	23°45'27.100"	88°46'18.536"
10	AQ-10	Agrani Bank PLC Bamundi Bazar Branch Gangni	23°53'59.958"	88°48'73.74"
11	AQ-11	Tetulbaria westpara jame mosque Gangni	23°53'49.512"	88°43'30.512"
12	AQ-12	Bagan Para 08 No. Ward Gangni	23°48'47.845"	88°45'1.687"
13	AQ-13	Garadob High School Gangni	23°47'54.382"	88°47'52.551"
14	AQ-14	Depa Westpara Jame Mosque Gangni	23°45'49.929"	88°43'13.463"
15	AQ-15	Jalshuka-Arpara-Jalshuka road Gangni	23°54'43.752"	88°47'5.136"
16	AQ-16	Church Of Christ Road Gangni	23°38'45.835"	88°38'49.045"
17	AQ-17	Mohajanpur bazar Mujib Nagar	23°39'49.17"	88°36'17.01"
18	AQ-18	Monakhali Moddo Para Jame Masjid Mujib Nagar	23°42'18.944"	88°40'28.519"
19	AQ-19	Bishwanathpur Monakhali Mujib Nagar	23°40'45.85"	88°37'2.05"
20	AQ-20	Anandabas Bazar Mujib Nagar	23°37'4.395"	88°36'40.859"





Map 13-7: Ambient Air Quality Sampling Points Map of Meherpur District

Table 13-8: Concentration of Pollutants in Ambient Air Quality

SL NO	ID of Sample Location	Concentration of Pollutants in Ambient Air						
		CO	O <sub>3</sub>	PM2.5	PM10	SOx	NOx	Pb
1	AQ-1,Mollickpara Road Meherpur Sadar, GPS Coordinates: 23°46'10.12"N 88°38'3.82"E	0.498	<0.1	12.13	58.14	< 2.50	< 5.00	< 0.30
2	AQ-2, BAT DPO-1 Meherpur Sadar, GPS Coordinates: 23°45'48.58"N 88°38'50.20"E	0.843	<0.1	6.85	28.25	< 2.50	5.76	< 0.30
3	AQ-03, Mondol Bari Mor, Meherpur Sadar GPS Coordinates: 23°47'57.79"N 88°38'36.84"E	0.536	<0.1	9.21	73.52	< 2.50	< 5.00	< 0.30
4	AQ-04 Roghunathpur Jame Mosque, Meherpur Sadar GPS Coordinates: 23°43'49.87"N 88°41'46.0775"E	0.421	<0.1	< 5.00	49.59	< 2.50	< 5.00	< 0.30
5	AQ-05 Sonapur malithapara bajar, Meherpur GPS Coordinates: 23°41'20.426"N 88°42'43.965"E	0.575	<0.1	6.3	45.65	< 2.50	< 5.00	< 0.30
6	AQ-06 Amdah D: Para Jame Mosjid, Meherpur GPS Coordinates: 23°43'44.434"N 88°37'54.5893"E	0.766	<0.1	14.68	147.79	< 2.50	< 5.00	< 0.30
7	AQ-07 Baradi Bazar, Meherpur GPS Coordinates: 23°43'12.56"N 88°44'0.209"E	0.460	<0.1	8.7	62.25	< 2.50	< 5.00	< 0.30
8	AQ-08 Beltolapara Government Primary School, Meherpur GPS Coordinates: 23°48'50.33"N 88°40'27.02"E	0.843	<0.1	10.79	69.68	< 2.50	< 5.00	< 0.30
9	AQ-09 Kasba Bazar GPS Coordinates: 23°45'27.100"N 88°46'18.536"E	0.383	<0.1	25.79	25.9	< 2.50	< 5.00	< 0.30
10	AQ-10 Agrani Bank PLC, Bamundi Bazar Branch,Gangni GPS Coordinates: 23°53'59.958"N 88°48'73.74"E	0.000	<0.1	10	45.6	< 2.50	< 5.00	< 0.30
11	AQ-11 Tetulbaria westpara jame mosque, Gangni GPS Coordinates: 23°53'49.512"N 88°43'30.512"E	0.766	<0.1	15.79	37.75	< 2.50	< 5.00	< 0.30
12	AQ-12 Bagan Para 08 No. Ward, Gangni GPS Coordinates: 23°48'47.845"N 88°45'1.687"E	0.728	<0.1	20.79	35	< 2.50	< 5.00	< 0.30
13	AQ-13 Garadob High School, Gangni GPS Coordinates: 23°47'54.382"N 88°47'52.551"E	0.460	<0.1	12.22	30.56	< 2.50	< 5.00	< 0.30
14	AQ-14 Depa Westpara Jame Mosque, Gangni GPS Coordinates: 23°45'49.929"N 88°43'13.463"E	1.226	<0.1	17.27	52.53	< 2.50	< 5.00	< 0.30
15	AQ-15 Jalshuka-Arpara-Jalshuka road, Gangni GPS Coordinates: 23°54'43.752"N 88°47'5.136"E	0.536	<0.1	14.86	24.73	< 2.50	< 5.00	< 0.30
16	AQ-16 Church Of Christ Road, Gangni GPS Coordinates: 23°38'45.835"N 88°38'49.045"E	1.073	<0.1	8.06	27.74	< 2.50	< 5.00	< 0.30
17	AQ-17 Mohajanpur bazar, Mujib Nagar GPS Coordinates: 23°39'49.17"N 88°36'17.01"E	0.651	<0.1	17.45	42.77	< 2.50	5.42	< 0.30
18	AQ-18 Monakhali Moddo Para Jame Mosjid , Mujib Nagar GPS Coordinates: 23°42'18.944"N 88°40'28.519"E	0.000	<0.1	28.66	75.01	< 2.50	< 5.00	< 0.30
19	AQ-19 Bishwanathpur, Monakhali, Mujib Nagar GPS Coordinates: 23°40'45.85"N 88°37'2.05"E	0.000	<0.1	18.13	33.73	< 2.50	< 5.00	18.52
20	AQ-20 Anandabas Bazar, Mujib Nagar GPS Coordinates: 23°37'4.395"N 88°36'40.859"E	0.460	<0.1	10.69	18.13	< 2.50	< 5.00	< 0.30
Units		mg/m <sup>3</sup>	µg/m <sup>3</sup>					
Method of Analysis		Real-Time Electrochemical Sensor (In- House, in-situ)		In-House method based on Gravimetric Method	In-House method based on IS 5182-6:2006			
Test Duration (Hours)		12 Hr						
Bangladesh Standard (According to Air Pollution Control Rules 2022, Schedule 1, Published Date 26 July 2022)		20	180	65	150	80	80	0.5

SL NO	ID of Sample Location	AQI (PM2.5)	AQI (PM10)	API (Overall)	API category
1	AQ-1,Mollickpara Road Meherpur Sadar, GPS Coordinates: 23°46'10.12"N 88°38'3.82"E	51.06	52.55	<b>52.55</b>	Moderate
2	AQ-2, BAT DPO-1 Meherpur Sadar, GPS Coordinates: 23°45'48.58"N 88°38'50.20"E	28.54	26.16	<b>28.54</b>	Good
3	AQ-03, Mondol Bari Mor, Meherpur Sadar GPS Coordinates: 23°47'57.79"N 88°38'36.84"E	38.38	60.17	<b>60.17</b>	Moderate
4	AQ-04 Roghunathpur Jame Mosque, Meherpur Sadar GPS Coordinates: 23°43'49.87"N 88°41'46.0775"E	20.83	45.92	<b>45.92</b>	Good
5	AQ-05 Sonapur malithapara bajar, Meherpur GPS Coordinates: 23°41'20.426"N 88°42'43.965"E	26.25	42.27	<b>42.27</b>	Good
6	AQ-06 Amdah D: Para Jame Masjid, Meherpur GPS Coordinates: 23°43'44.434"N 88°37'54.5893"E	56.43	96.93	<b>96.93</b>	Moderate
7	AQ-07 Baradi Bazar, Meherpur GPS Coordinates: 23°43'12.56"N 88°44'0.209"E	36.25	54.59	<b>54.59</b>	Moderate
8	AQ-08 Beltolapara Government Primary School, Meherpur GPS Coordinates: 23°48'50.33"N 88°40'27.02"E	44.96	58.27	<b>58.27</b>	Moderate
9	AQ-09 Kasba Bazar GPS Coordinates: 23°45'27.100"N 88°46'18.536"E	79.79	23.98	<b>79.79</b>	Moderate
10	AQ-10 Agrani Bank PLC, Bamundi Bazar Branch,Gangni GPS Coordinates: 23°53'59.958"N 88°48'73.74"E	41.67	42.22	<b>42.22</b>	Good
11	AQ-11 Tetulbaria westpara jame mosque, Gangni GPS Coordinates: 23°53'49.512"N 88°43'30.512"E	56.39	36.91	<b>56.39</b>	Moderate
12	AQ-12 Bagan Para 08 No. Ward, Gangni GPS Coordinates: 23°48'47.845"N 88°45'1.687"E	70.55	34.16	<b>70.55</b>	Moderate
13	AQ-13 Garadob High School, Gangni GPS Coordinates: 23°47'54.382"N 88°47'52.551"E	41.44	29.86	<b>41.44</b>	Good
14	AQ-14 Depa Westpara Jame Mosque, Gangni GPS Coordinates: 23°45'49.929"N 88°43'13.463"E	71.88	50.98	<b>71.88</b>	Moderate
15	AQ-15 Jalshuka-Arpara-Jalshuka road, Gangni GPS Coordinates: 23°54'43.752"N 88°47'5.136"E	56.27	24.03	<b>56.27</b>	Moderate
16	AQ-16 Church Of Christ Road, Gangni GPS Coordinates: 23°38'45.835"N 88°38'49.045"E	30.58	26.97	<b>30.58</b>	Good
17	AQ-17 Mohajanpur bazar, Mujib Nagar GPS Coordinates: 23°39'49.17"N 88°36'17.01"E	66.55	38.97	<b>66.55</b>	Moderate
18	AQ-18 Monakhali Moddo Para Jame Mosjid , Mujib Nagar GPS Coordinates: 23°42'18.944"N 88°40'28.519"E	98.14	74.61	<b>98.14</b>	Moderate
19	AQ-19 Bishwanathpur, Monakhali, Mujib Nagar GPS Coordinates: 23°40'45.85"N 88°37'2.05"E	62.08	33.39	<b>62.08</b>	Moderate
20	AQ-20 Anandabas Bazar, Mujib Nagar GPS Coordinates: 23°37'4.395"N 88°36'40.859"E	36.64	18.13	<b>36.64</b>	Good





Figure 13-6: Ambient Air Quality Sampling in The Project Area

#### 13.4.1 Noise Data Collection (Urban and Rural)

Ambiant noise level data has been collected from 65 location point; among them 30 point was selected for continus noise level recording which are mostly rural side of the study area and 35 locations are belonging under urban environment of three municipality area.

In the urban area, data has been collected for work day and holiday situation; on the other hand, data has been collected for 4 time per day situation, data has been recorded 6am, 12 pm, 18 pm and 24am. Table-9 and table-10 are showing noise level data for both urban and rural environment with respective location point.

Table 13-9: Average Noise Data with Location

Sl. No	Location	City	Lat	Long	Total avg (dB)
1	Gorur Hat	Meherpur	23.76277778	88.64694444	45.88
2	Govt. College	Meherpur	23.76722222	88.64222222	46.495
3	Stadium Para	Meherpur	23.7675	88.63722222	52.85625
4	Stadium Para 2	Meherpur	23.76416667	88.63527778	47.7025
5	Kazi Para	Meherpur	23.76861111	88.63416667	54.48625
6	Hotel Bazar	Meherpur	23.76916667	88.6325	63.95375
7	Jadavpur Ghat	Meherpur	23.76916667	88.62833333	46.90625
8	Jadavpur Majhpara	Meherpur	23.76777778	88.62583333	45.6075
9	Bosh Para	Meherpur	23.77305556	88.62694444	45.505
10	Haldar Para	Meherpur	23.77694444	88.6275	48.2575
11	Bara Bazar	Meherpur	23.77805556	88.63138889	55.7475
12	Khamar Bari	Meherpur	23.77888889	88.63583333	48.0475
13	Berpara	Meherpur	23.78166667	88.62888889	45.22
14	Mallik Para	Meherpur	23.77333333	88.63527778	42.5175
15	Kashari Para	Meherpur	23.77277778	88.63166667	46.49375
16	Bose Para	Meherpur	23.77416667	88.63055556	51.02
17	Gangni Girls school	Gangni	23.8175	88.74861111	50.8875
18	Chougacha Pashchim Para	Gangni	23.82416667	88.73277778	41.10375
19	Masjid Para	Gangni	23.82138889	88.74277778	44.84125
20	Notun Para Moor	Gangni	23.815	88.73833333	45.29
21	Bashundhara	Gangni	23.82388889	88.75111111	40.22875
22	Eid ga Para	Gangni	23.82	88.75583333	42.2725
23	Purba Malshadaho	Gangni	23.81916667	88.76444444	42.7425
24	Oli Para	Gangni	23.81472222	88.75666667	42.67
25	Shandhani School	Gangni	23.81194444	88.74888889	41.63625
26	Krishi unnoyon Corporation	Gangni	23.81472222	88.745	45.4
27	Bisshonath para– Primary School	Mujibnagar	23.67666667	88.61611111	43.16375
28	Shibpur Ideal School	Mujibnagar	23.6725	88.61527778	43.83875
29	Ballavpur MajhPara	Mujibnagar	23.66027778	88.61444444	43.55375
30	Muchi Para	Mujibnagar	23.655	88.58972222	40.68375
31	Church of BD	Mujibnagar	23.65277778	88.59166667	41.3875



32	Dofadar Para	Mujibnagar	23.65444444	88.59305556	42.25875
33	Fakir Para	Mujibnagar	23.6575	88.5925	41.9025
34	Kedarganj Primary School	Mujibnagar	23.66361111	88.60333333	50.46
35	Kedarganj Primary School	Mujibnagar	23.66305556	88.60166667	43.4975
36	Mollickpara Road	Meherpur	23.769425	88.67846222	56.8708333
37	BAT-01	Meherpur Sadar	23.76403667	88.64515333	59.3722222
38	Jhaubaria	Meherpur	23.79939167	88.6432475	58.1486111
39	Roghunathpur	Meherpur	23.73044789	88.69617667	56.8763889
40	Sonapur	Malithapara Bazar Meherpur	23.68889639	88.71219139	55.3069444
41	Amdah D.Para Mosque	Meherpur	23.72892333	88.63223333	57.6208333
42	Baradi	Meherpur	23.72016028	88.73346694	56.35
43	Beltolapara	Meherpur	23.81391	88.6739775	58.0305556
44	Kashba Bazar	Gangni	23.75747417	88.77183194	59.6875
45	Nishipur, Bamundi	Gangni	23.89997806	88.80382167	58.2319444
46	Tetulbaria	Gangni	23.89708667	88.72514222	56.4523611
47	Bagan Para	Gangni	23.813185	88.75067694	58.6569444
48	Garadob	Gangni	23.79845056	88.69788667	70.0888889
49	Depa Westpara	Gangni	23.76389278	88.72041833	63.4888889
50	Jalshuka Road	Gangni	23.78416361	88.78418917	67.4194444
51	Ratanpur	Gangni	23.64615583	88.64705944	66.5736111
52	Mohajanpur	Muzibnagar	23.65526167	88.67459111	66.8402778
53	Monakhali	Muzibnagar	23.71350167	88.61714	67.0138889
54	Bishwanathpur, Gourinagr	Muzibnagar	23.68091333	88.61486167	65.3819444
55	Anandabas	Muzibnagar	23.61781556	88.61183806	65.2472222
56	Roshikpur	Muzibnagar	23.65436417	88.63805917	60.7666667
57	Hemayetpur	Muzibnagar	23.82497306	88.83061417	61.6694444
58	Mondolpara	Muzibnagar	23.62995333	88.61165694	65.0861111
59	Joypur	Muzibnagar	23.61300417	88.62423111	64.525
60	Shimultala Gangni	Gangni	23.81936778	88.792145	64.7152778
61	Durlovpur	Gangni	23.87408694	88.7589175	64.7152778
62	Pirojpur	Muzibnagar	23.70586722	88.689565	64.5541667
63	Saharabati	Gangni	23.83098167	88.71108861	65.8402778
64	Sholotaka	Gangni	23.85259083	88.79623194	65.8402778
65	Depa Westpara	Gangni	23.78236139	88.73136528	64.3847222

Table 13-10: Equivalent Continuous Sound Level Data

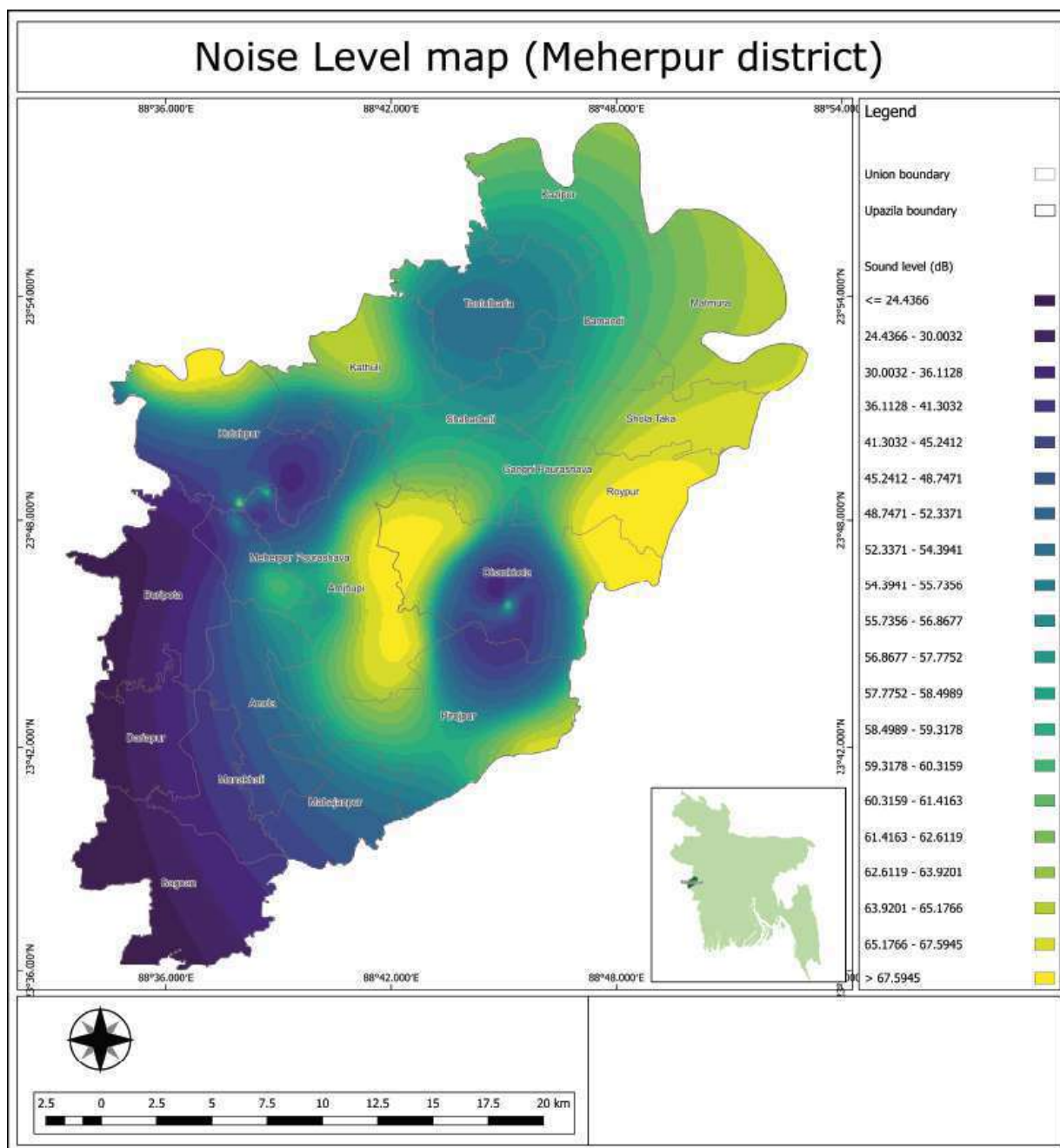
SL No	ID of Monitoring Location	Location & GPS Coordinate	Equivalent Continuous Sound Level	Day-Night Average Sound Level	Maximum Noise Level
			(Leq) dB A	(Ldn) dB A	(Lmax) dB A
1	ANL-01	Mollickpara Road, Meherpur 23°46'9.93"N 38°10'42.464"E	59.93	56.87	68.70
2	ANL-02	BAT-01, Meherpur Sadar 23°45'50.532"N 88°38'42.552"E	61.72	59.37	69.90
3	ANL-03	Jhaubaria, Meherpur 23°47'57.810"N 88°38'35.691"E	59.12	58.15	68.70
4	ANL-04	Roghunathpur, Meherpur 23°43'49.6124"N 88°41'46.236"E	59.70	56.88	78.30
5	ANL-05	Sonapur, Malithapara Bazar Meherpur 23°41'20.027"N 88°42'43.889"E	59.49	55.31	80.20
6	ANL-06	Amdah D. Para Mosque, Meherpur 23°43'44.124"N 88°37'56.04"E	61.29	57.62	71.40
7	ANL-07	Baradi, Meherpur 23°43'12.577"N 88°44'0.481"E	59.25	56.35	73.20
8	ANL-08	Beltolapara, Meherpur 23°48'50.076"N 88°40'26.319"E	60.87	58.03	72.40
9	ANL-09	Kashba Bazar, Gangni 23°45'26.907"N 88°46'18.595"E	64.24	59.69	77.30
10	ANL-10	Nishipur, Bamundi, Gangni 23°53'59.921"N 88°48'13.758"E	61.15	58.23	77.80
11	ANL-11	Tetulbaria, Gangni 23°53'49.512"N 88°43'30.512"E	59.62	56.45	70.20
12	ANL-12	Bagan Para, Gangni 23°48'47.466"N 88°45'2.437"E	61.29	58.66	71.90
13	ANL-13	Garadob, Gangni 23°47'54.422"N 88°41'52.392"E	71.99	70.09	78.2
14	ANL-14	Depa Westpara, Gangni 23°45'50.014"N 88°43'13.506"E	67.94	63.49	74.90
15	ANL-15	Jalshuka Road, Gangni 23°47'2.989"N 88°47'3.081"E	69.25	67.42	75.6
16	ANL-16	Ratanpur, Gangni 23°38'46.161"N 88°38'49.414"E	68.33	66.57	74.90
17	ANL-17	Mohajanpur, Muzibnagar 23°39'18.942"N 88°40'28.528"E	68.66	66.84	75.40
18	ANL-18	Monakhali, Muzibnagar 23°42'48.606"N 88°37'1.704"E	68.66	67.01	75.50
19	ANL-19	Bishwanathpur, Gourinagr, Muzibnagar 23°40'51.288"N 88°36'53.502"E	67.01	65.38	73.20
20	ANL-20	Anandabas, Muzibnagar 23°37'4.136"N 88°36'42.617"E	72.13	65.25	83.50
21	ANL-21	Roshikpur, Muzibnagar 23°39'15.711"N 88°38'17.013"E	65.96	60.77	72.30
22	ANL-22	Hemayetpur, Muzibnagar 23°49'29.903"N 88°49'50.211"E	66.93	61.67	73.30
23	ANL-23	Mondolpara, Muzibnagar 23°37'47.832"N 88°36'41.965"E	72.01	65.09	80.20
24	ANL-24	Joypur, Muzibnagar 23°36'46.815"N 88°37'27.232"E	71.44	64.53	79.60
25	ANL-25	Shimultala Gangni 23°49'09.724"N 88°47'31.722"E	71.69	64.72	80.30
26	ANL-26	Durlovpur, Gangni 23°52'26.713"N 88°45'32.103"E	71.69	64.72	80.30
27	ANL-27	Pirojpur, Muzibnagar 23°42'21.122"N 88°41'22.434"E	71.49	64.55	79.80
28	ANL-28	Saharabati, Gangni 23°49'51.534"N 88°42'39.919"E	72.84	65.84	81.00
29	ANL-29	Sholotaka, Gangni 23°51'09.327"N 88°47'46.435"E	72.84	65.84	81.00
30	ANL-30	Depa Westpara, Gangni 23°46'56.501"N 88°43'52.915"E	71.45	64.38	79.80



Figure 13-7: Noise Sampling in The Project Area

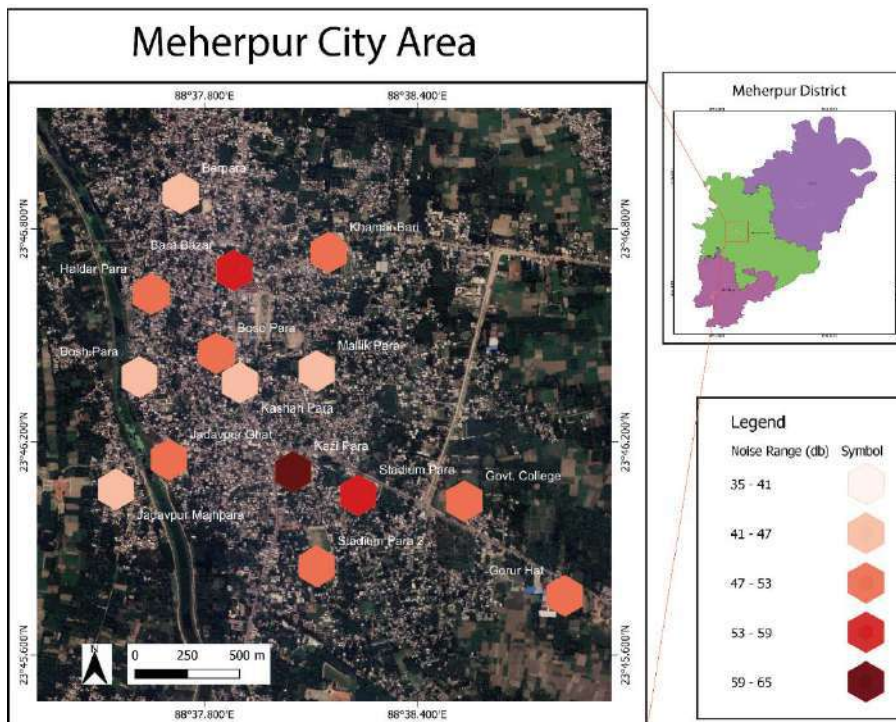
#### 13.4.2 Noise maps:

Noise level map of the whole study area:

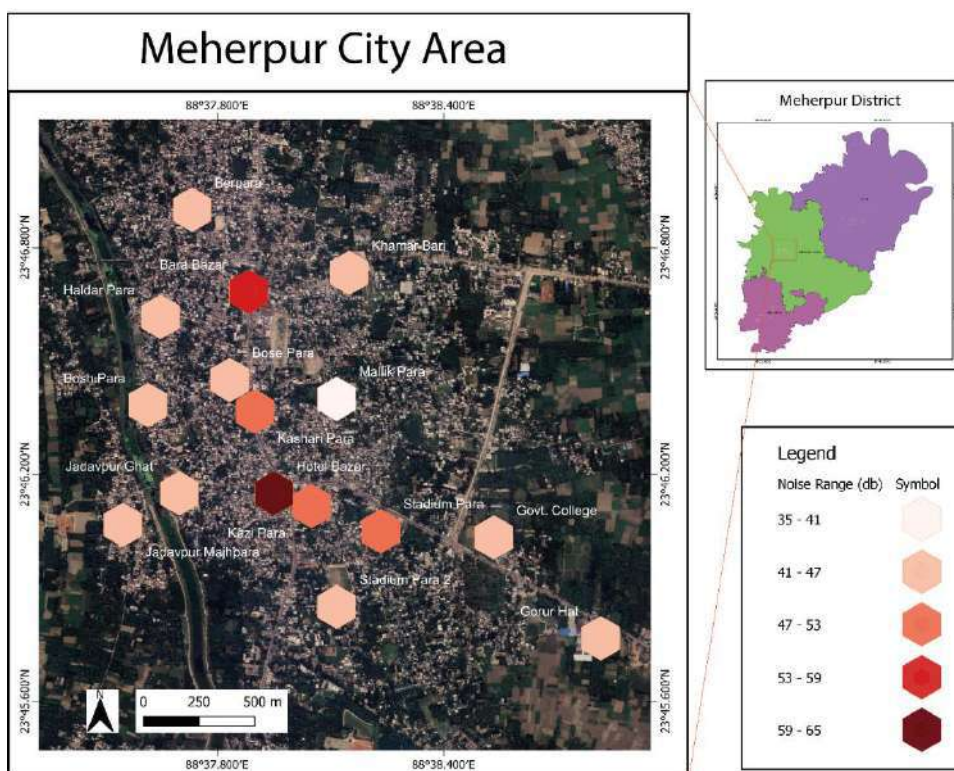


Map 13-8: Noise Level Map of Meherpur District



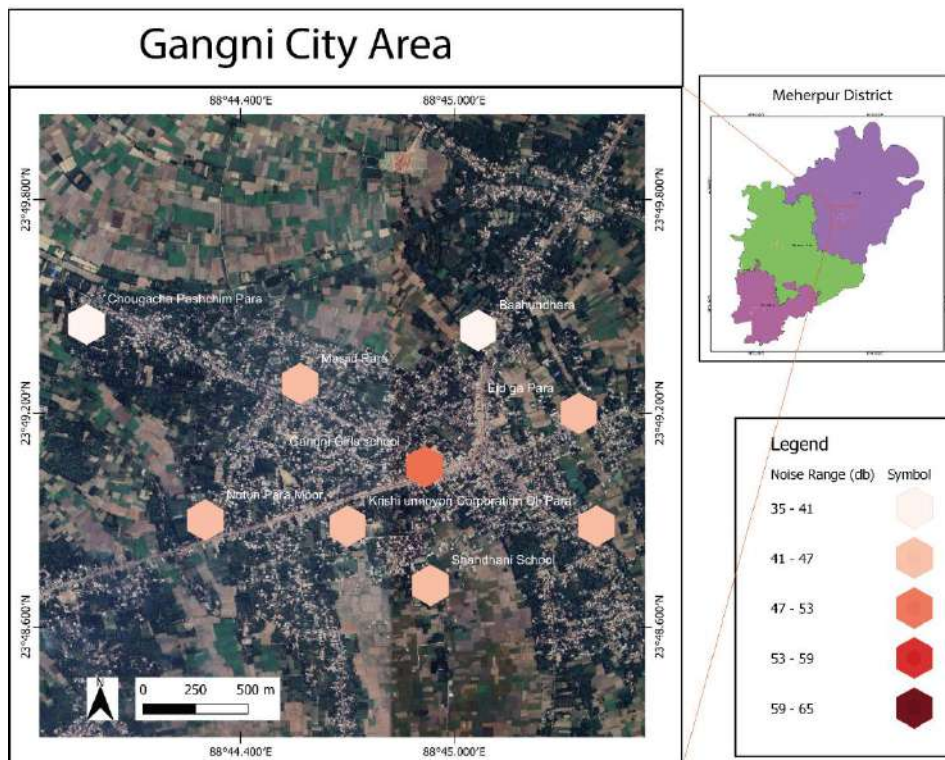


Map 13-9: Meherpur City Off Day (In Day Time)

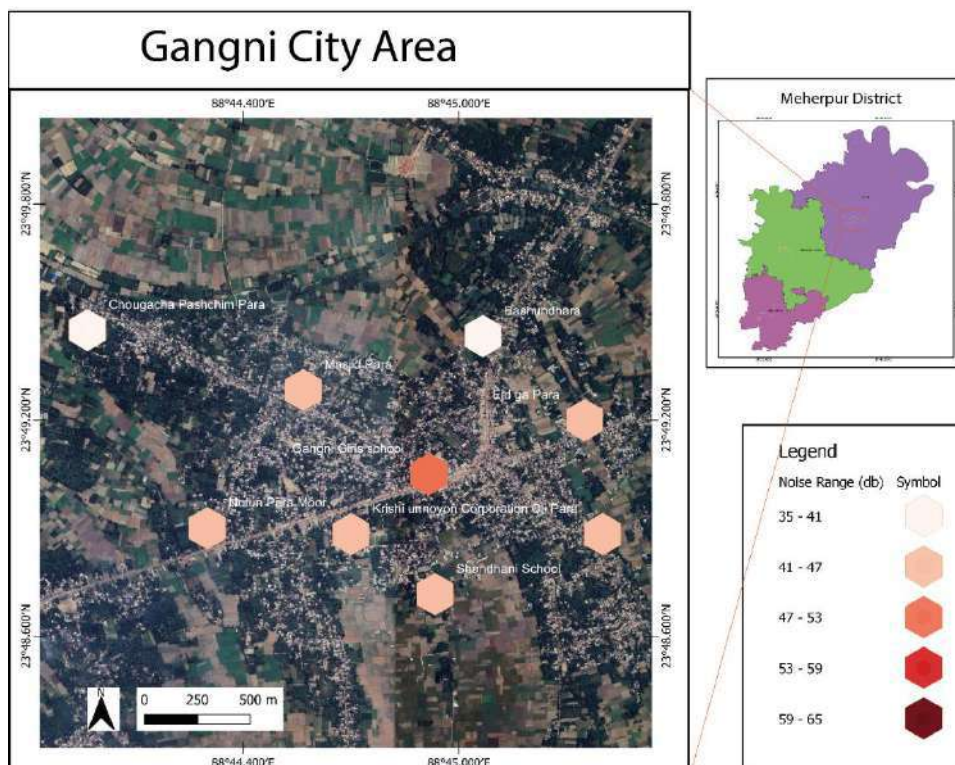


Map 13-10: Meherpur City Off Day (In Nighttime)

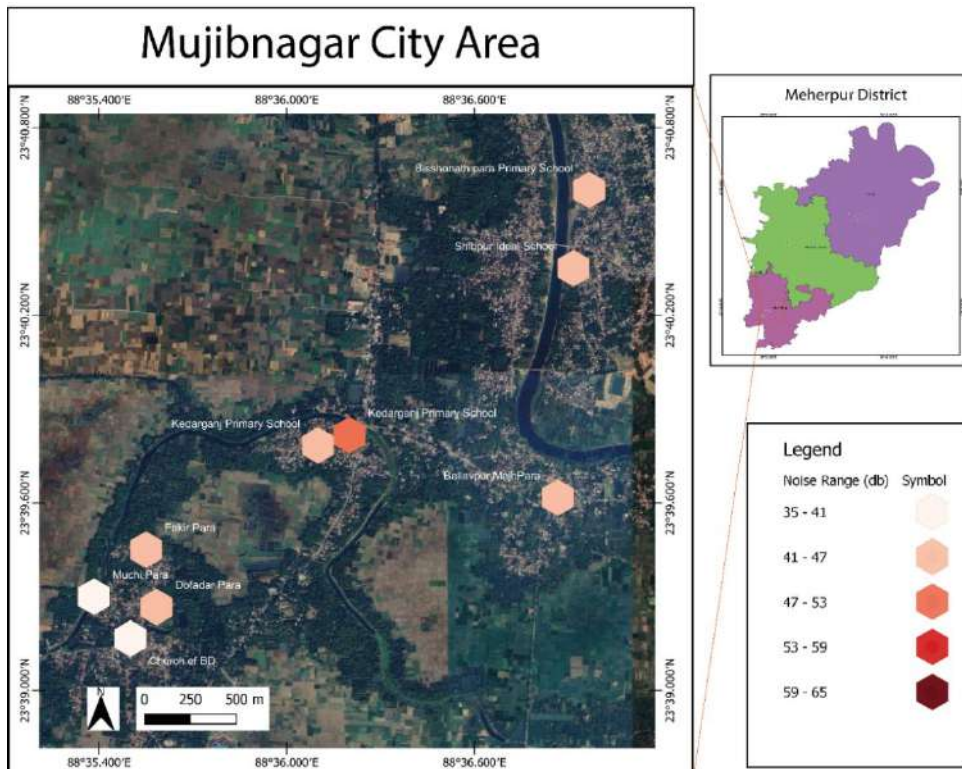




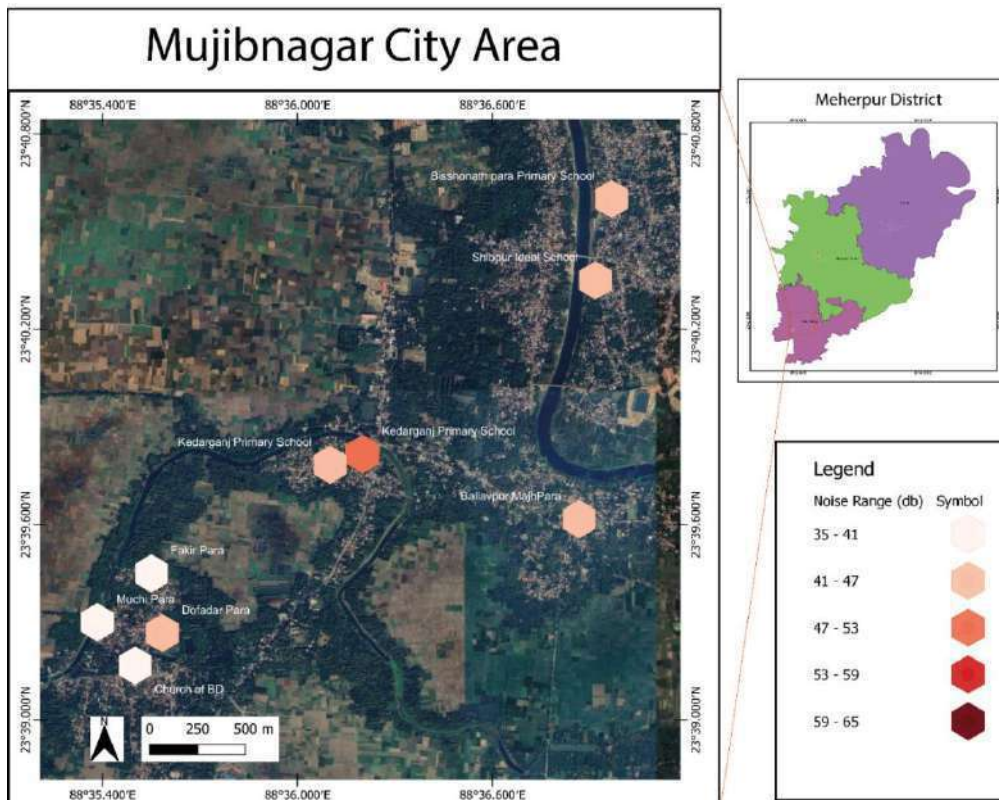
Map 13-11: Gangni City Off Day (In Day Time)



Map 13-12: Gangni City Off Day (In Nighttime)

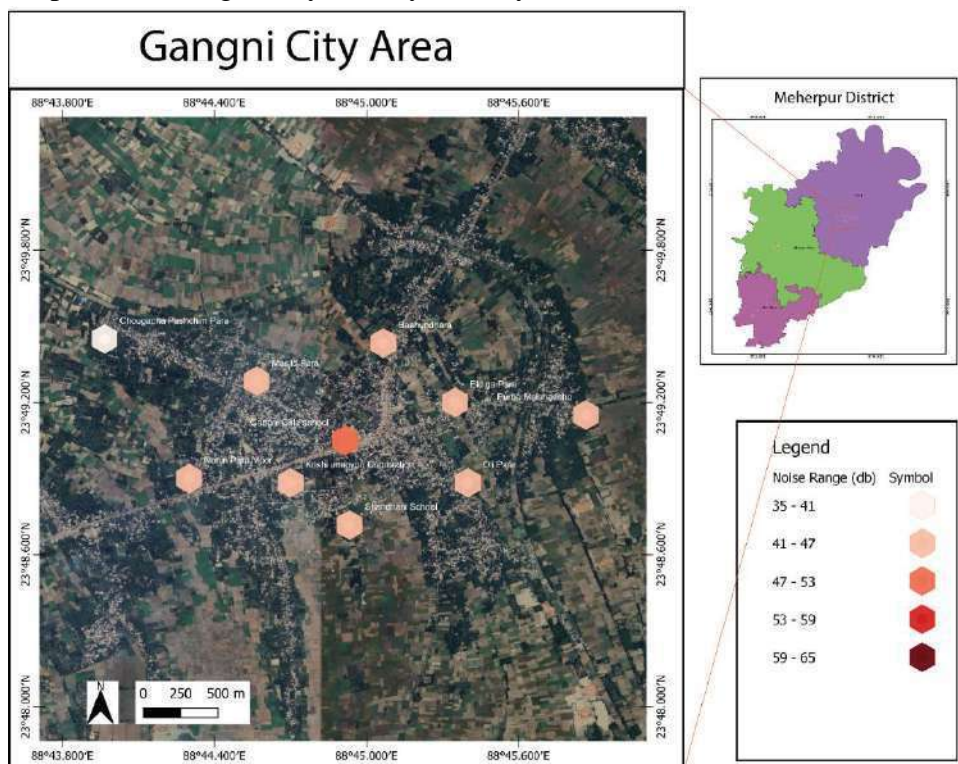
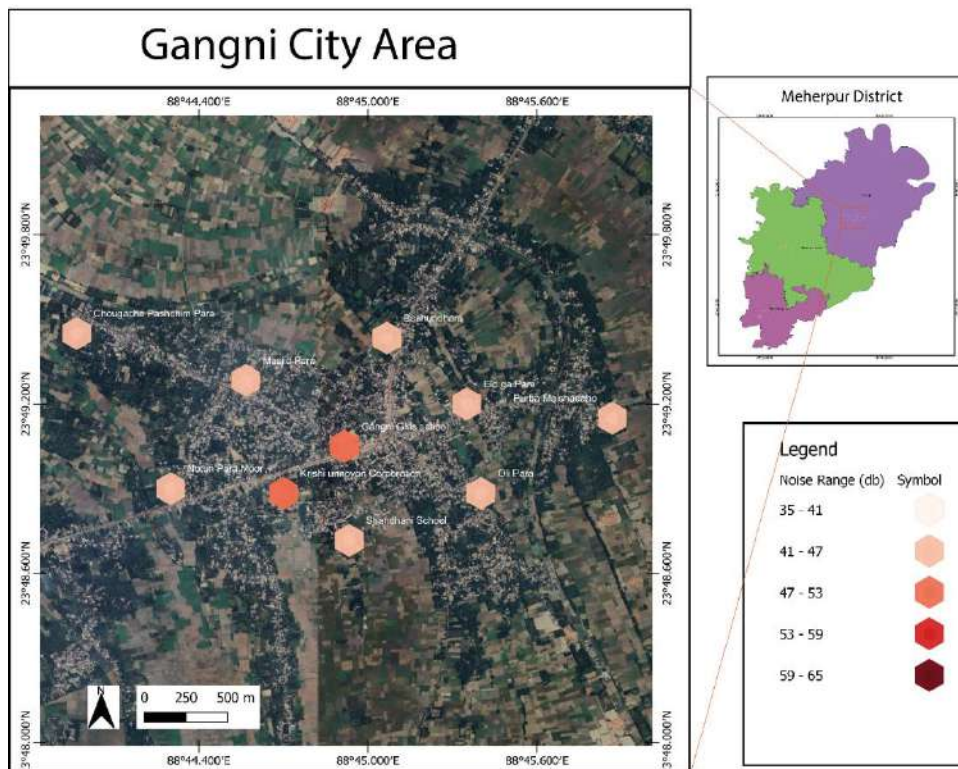


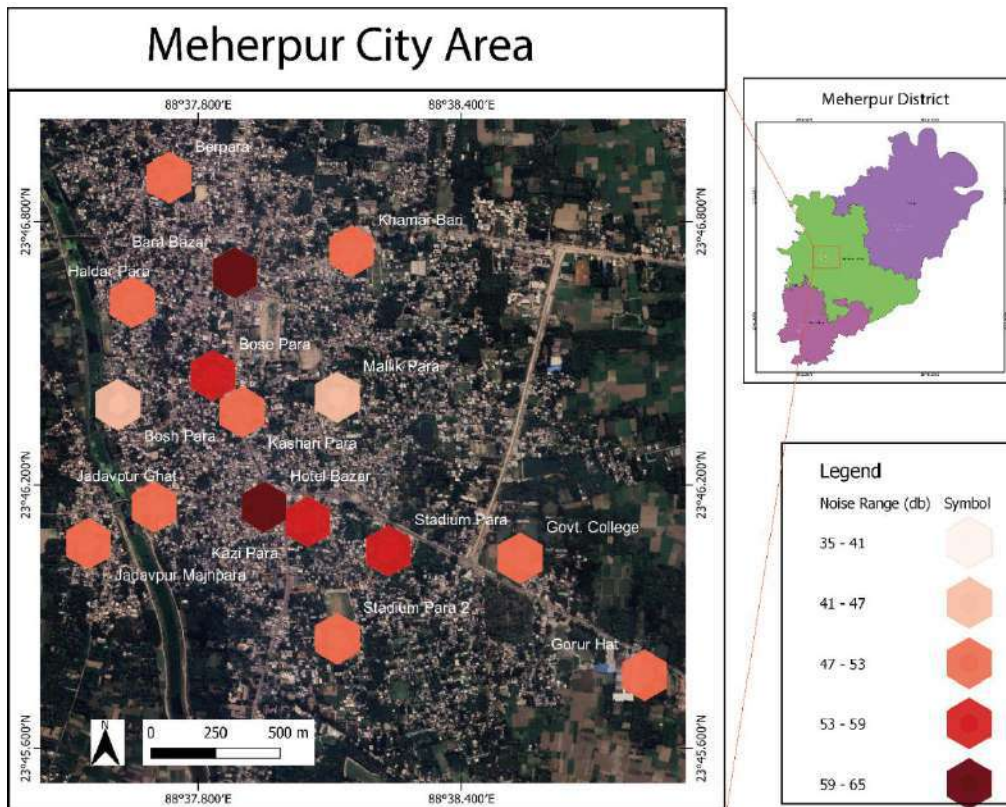
Map 13-13: Mujibnagar City Off Day (In Day Time)



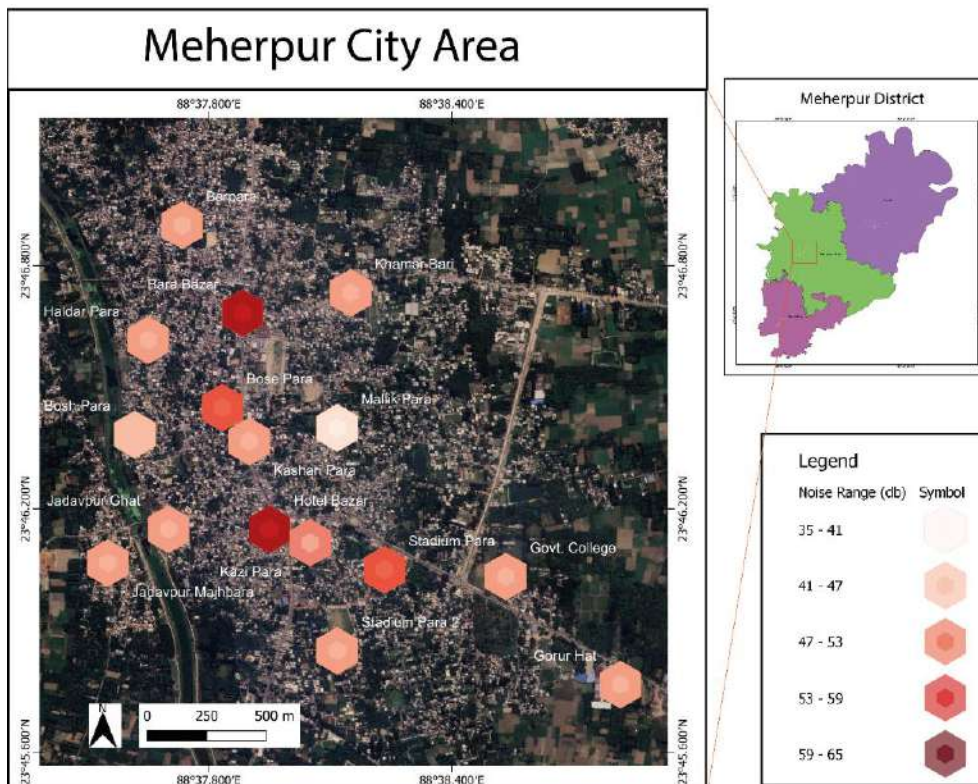
Map 13-14: Mujibnagar City Off Day (In Nighttime)





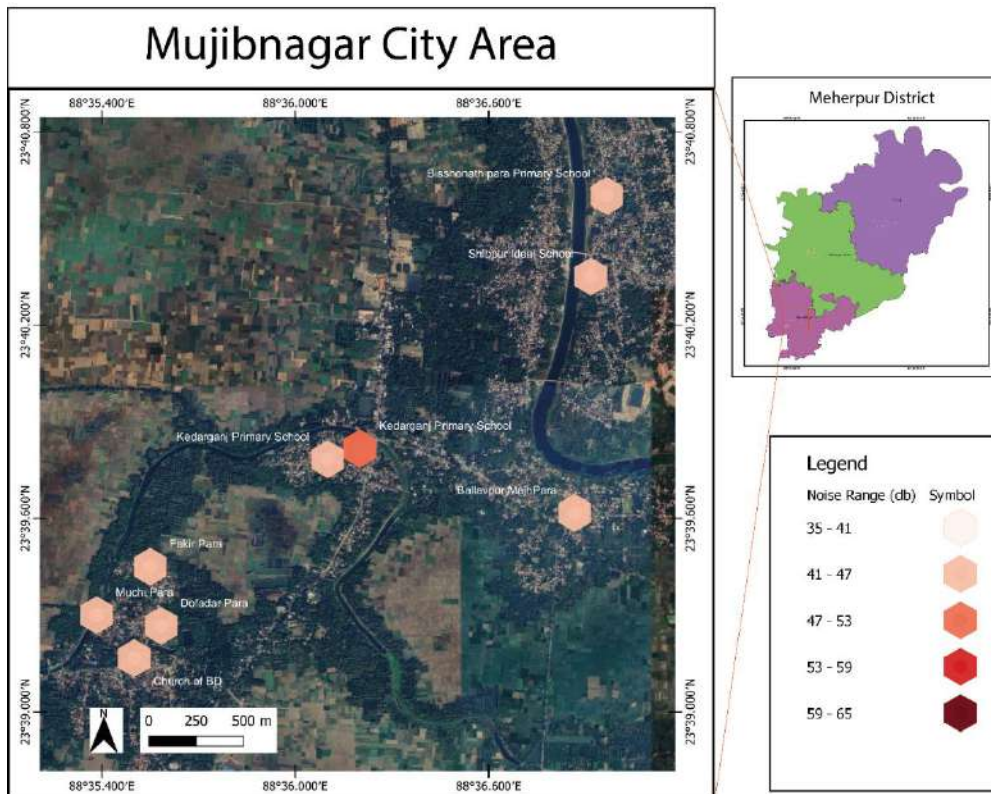


Map 13-17: Meherpur City on Day (In Day Time)

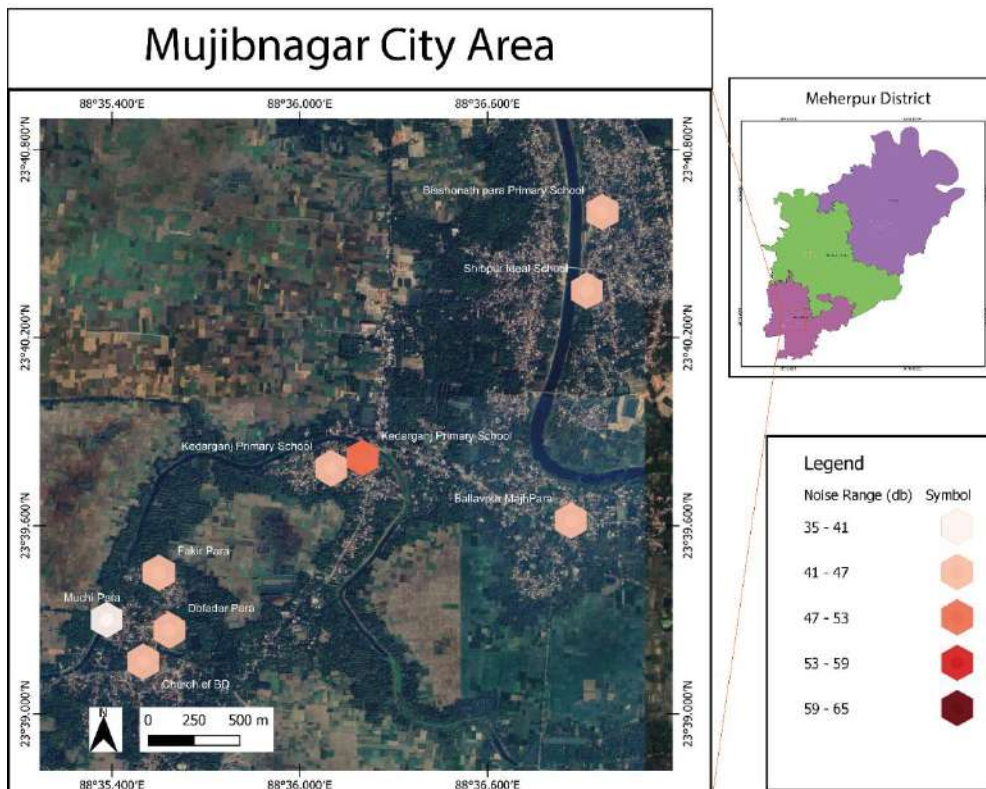


Map 13-18: Meherpur City on Day (In Night Time)





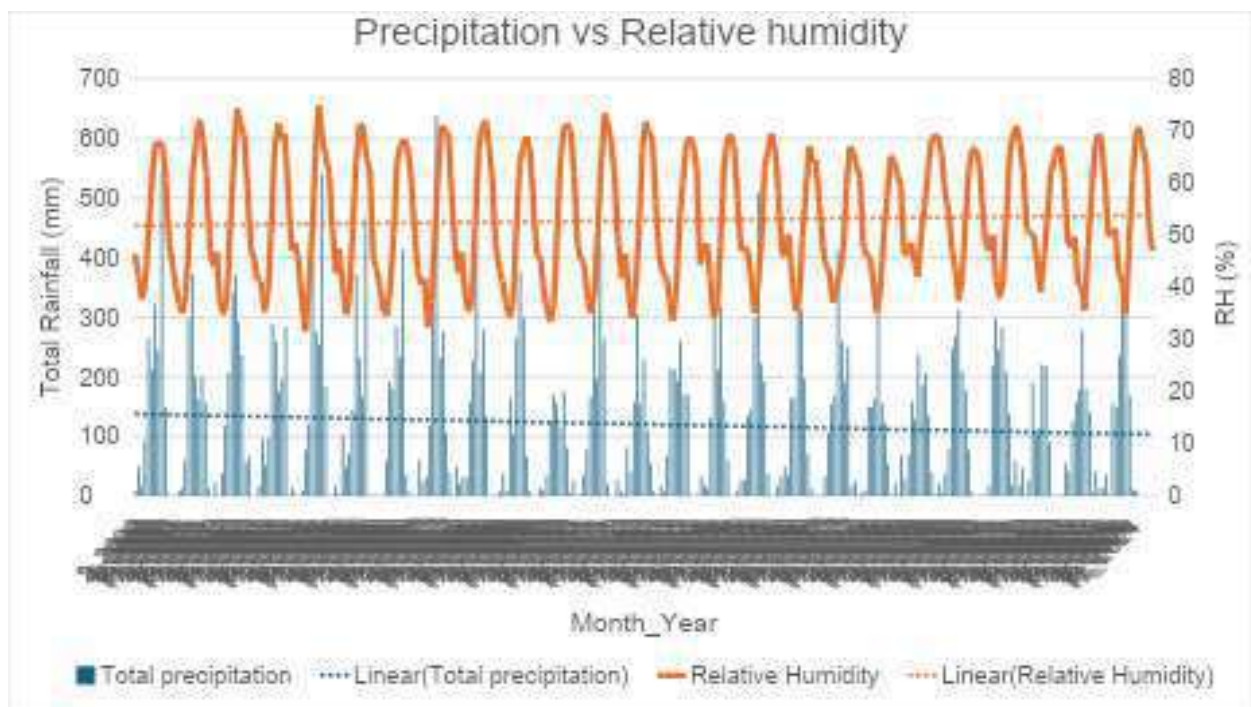
Map 13-19: Mujibnagar City on Day (In Day Time)



Map 13-20: Mujibnagar City on Day (In Nighttime)



### 13.4.3 Climatic Data Collection and Analysis



Map 13-21: Precipitation Vs Relative Humidity

### 13.4.4 Temperature Vs Relative Humidity

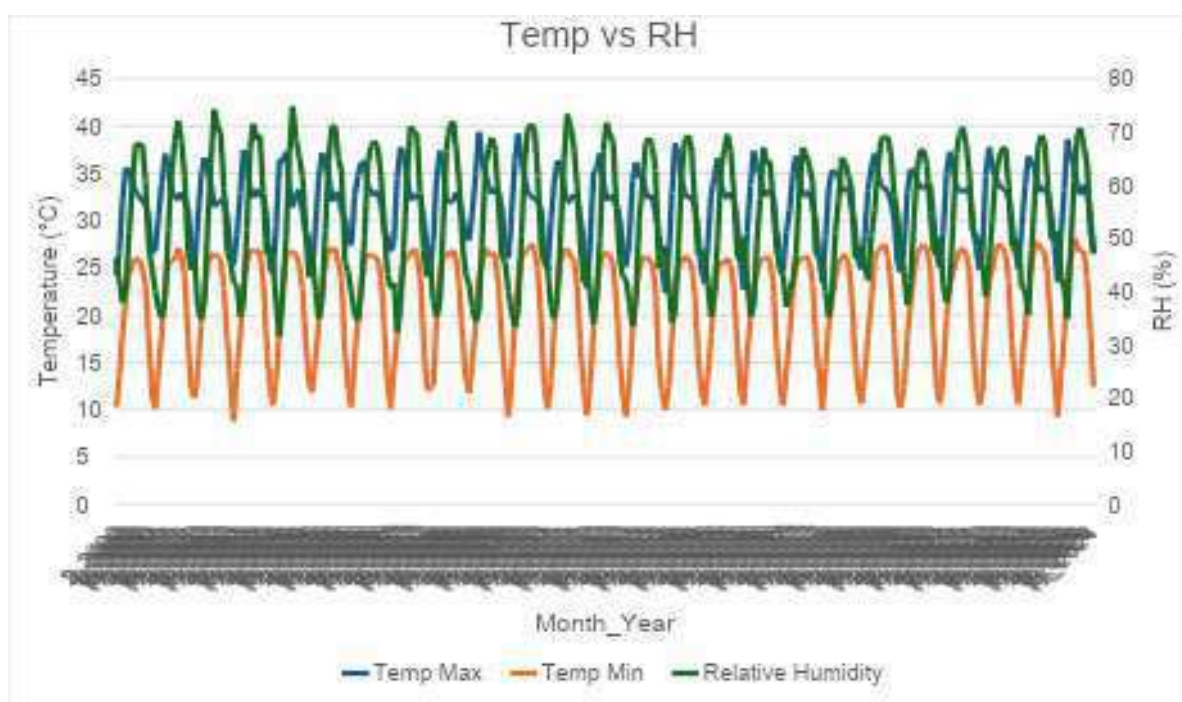


Figure 13-8: Temperature Vs Relative Humidity

### 13.4.5 Temperature (Min vs Max)

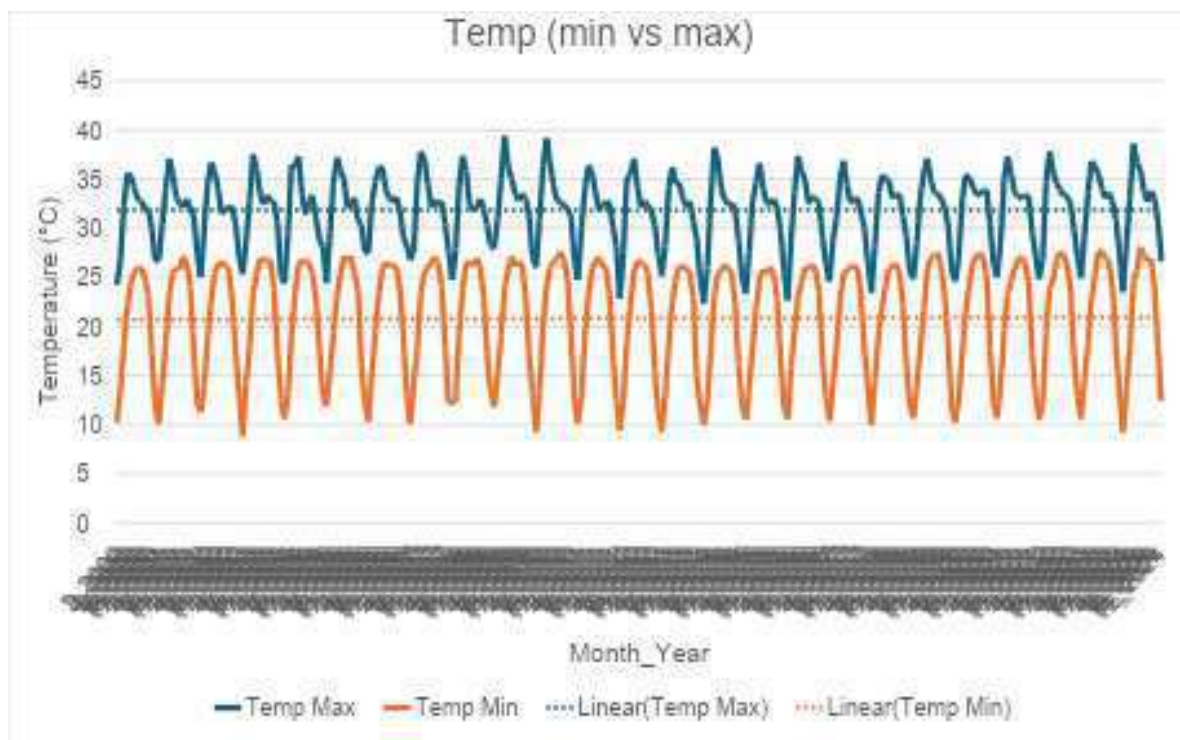


Figure 13-9: Temperature (Min vs Max)

### 13.4.6 Wind speed vs Temperature

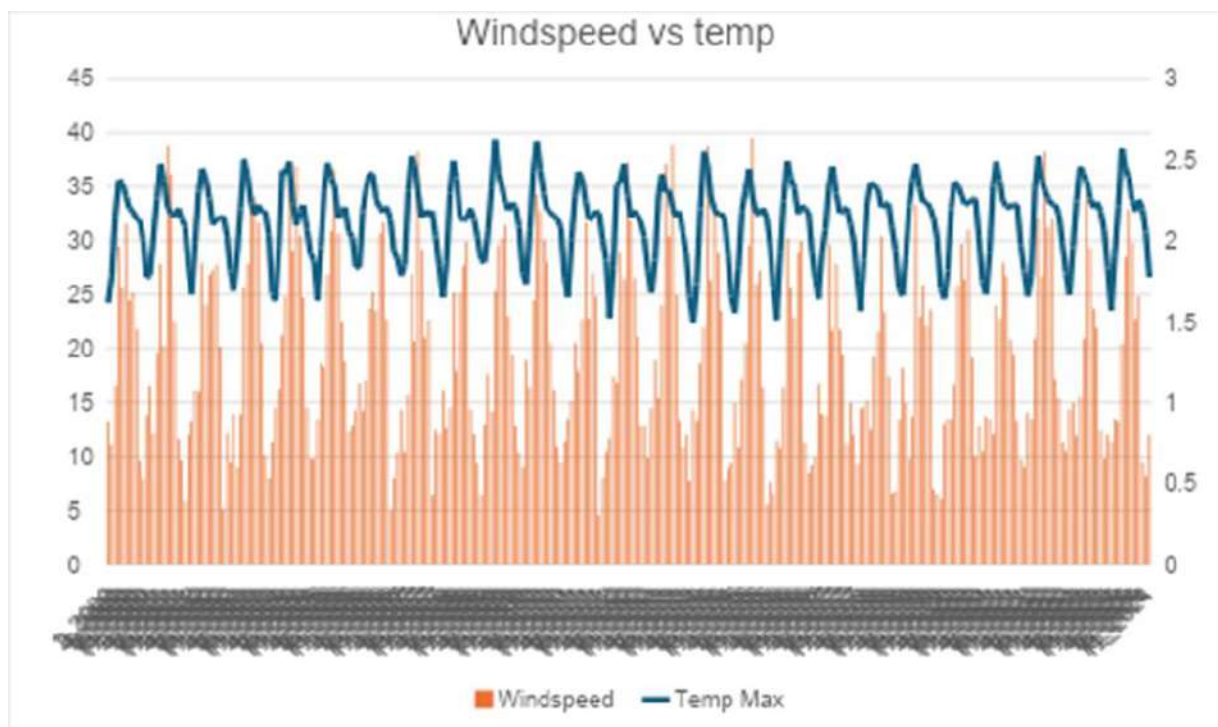


Figure 13-10: Windspeed vs Temperature

### 13.5 Conclusion

Based on image data from secondary sources, Land use and land cover map has been prepared. According to image interpretation, the land of the study area has been classified broadly. From interpretation, most of the area is covered by agricultural or sparse vegetation type (87.53%) and densely vegetated area (8.51%). Water body is belonging 2.57% and Built-up area 1.07%. Here water body may be underestimated due to aquatic vegetation cover or may be seasonal effect. Built-up area also underestimated because village house is sometime covered by social forest or trees. So, land use and land cover map may not be reflected true condition of the land use and land cover scenario in this case.

Surface Water, noise level, ambient air pollution and climatic data has been collected and some analysis also been done which are mentioning in this report. But data interpretation and map preparation will be done after wet season data collection.

**Interim Report** with integration of all database conducted by different surveys firms' and data processing, analysis, interpretation, presentation, and formulation of working papers.

## **CHAPTER 14: PEOPLE'S PARTICIPATION AND SOCIAL SPACE**

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### **14.1 Introduction**

#### **14.1.1 Background**

The Urban Development Directorate (**UDD**), Ministry of Housing and Public Works, Government of the people's Republic of Bangladesh has taken a great initiative to prepare development plan for Meherpur District under the project titled "**Preparation of Development Plan for Meherpur Zilla**" funded by the Government of Bangladesh. The aim of this project is to prepare Structure Plan, Urban Area Plan and Rural Area Plan including Pourashava, Union Level and Growth Center Plan. The preparation of the development plan requires existing situational analysis based on the existing physical, topographic and land supply of the project area. In this context, under the "Preparation of Development Plan for Meherpur District" project, we the consultant has been contracted to conduct physical feature, land use and topographic survey and to assist in preparation of the development plan. Along with the preparation of physical feature, land use and topographic database, the consultant would integrate data obtained from the other firms for the same project to develop a comprehensive database for the project. To develop a rational plan consultation with stakeholders are also necessary and, in this regard, comprehensive consultation session has been conducted with the stakeholders and local population too.

#### **14.1.2 Project Objective**

The objectives of the project are as follows:

- Developing a disaster risk-resilient land use plan.
- Protecting valuable agricultural land from unplanned conversion.
- Developing an integrated physical development plan for various civic amenities to implement the "My Village-My City" concept.

#### **14.1.3 Rationale for Plan Formulation**

To achieve the government's commitment to the goal of 'My Village-My Town,' it is essential to develop the upazilas composed of rural areas in the country. According to BNKR, 2015, In Meherpur district, 68.95% of the population is engaged in agriculture, 3.24% are non-agricultural workers, 0.87% are in industry, 13.83% are in business, 2.21% are in transport and communication, 1.03% are in construction, 0.14% are in religious services, 3.81% are in jobs, 0.59% are in rent and remittance, and 5.33% are in other sectors. This indicates that the region's economy and growth are primarily centered around agriculture. Despite being primarily agricultural, the "Comparative Study of Growth Centers in Bangladesh" by the Urban Development Directorate shows that, considering local infrastructure, ecosystems, and existing services, the project area is likely to come under urbanization soon. From the study by **UDD**, it is evident that while the growth of Meherpur district is primarily based on agriculture, it is also one of the areas likely to undergo urbanization soon. Therefore, to properly harness the opportunities of urbanization, it is necessary to formulate an integrated land-use plan for the project area by coordinating urban and rural systems.

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Meherpur district comprises three upazilas: Meherpur Sadar, Gangni, and Mujibnagar. The 1991 city-centric master plan for Meherpur Sadar has expired, and land-use plans for Mujibnagar and Gangni have exceeded their validity period. To develop an integrated land-use plan, it is crucial to re-conduct expired plans and review and update the remaining two upazilas. The 'Swadhinata Sarak', a road commemorating the Great Liberation War, has been declared an Independence Road. A customs station and a railway line project are also underway in the area. The Ministry of Education in Bangladesh has approved the establishment of a university in Meherpur, a district in the Barind and Drought-Prone Region. The project aims to address uncontrolled urbanization and unplanned development in the area, which is part of the Bangladesh Delta Plan 2100, which categorizes districts under six hotspots. Meherpur is included in the 2nd hotspot, the Barind and Drought-Prone Region. The proposed project proposal aims at "Ensuring the Best Integrated Use of Land and Water Resources," of the Delta Plan, and to implement objectives under the "Hotspot Specific Strategy" and "Interrelated Issues Strategy," such as sustainable land use and spatial planning. So, the Urban Development Directorate (**UDD**) has taken this project to achieve Sustainable Development Goals 11, 13, and 13, focusing on inclusive urbanization and climate change integration in rural areas, aiming to develop upazilas.

## 14.2 Project Area Profile

### 14.2.1 Location

Meherpur district, situated in Bangladesh, is bordered by Kushtia district to the north, Chuadanga district to the east and south, and India to the south and west. It covers a total area of **751.62 sq.km.** (290 sq.miles) and lies between 23°44' and 23°59' north latitude, and 88°34' and 88°53' east longitude. It is the border district of western part of Bangladesh. Before the partition (1947) Meherpur was a part of the Nadia district of India.

*Table 14-1 Meherpur District at a glance (Upazila, Union & Municipality)*

Sl. No.	Upazila (Area)	Union	Municipality (Area)
1	Meherpur Sadar (276.15 sq.km.)	Kutubpur, Buripota, Amjapi, Amdah, Pirojpur	Meherpur Municipality (17.60 sq.km.)
2	<b>Muiibnagar</b> (111.51 sq.km.)	Dariapur, Monkhali, Baguan, Mahajanpur.	-
3	Gangni (363.95 sq.km.)	Kathuli, Tetulbaria, Kazipur, Bamandi, Saharabati, Dhanakhola, Raipur, Matmura, Sholtaka.	Gangni Municipality (16.84 sq.km.)

Source: Bangladesh National Portal, 2024; Gangni Paurashava Master Plan: 2011-2031; Meherpur Paurashava Master Plan: 2017-2037

### 14.2.2 Urbanization and Settlement Type

The urban area in Meherpur district has a total population of 158,885, with 48.56% being male, 51.43% female, and 0.001% Transgender. Notably, the proportion of females is higher in both urban and rural areas.

Area	Total	Male	Female	Transgender
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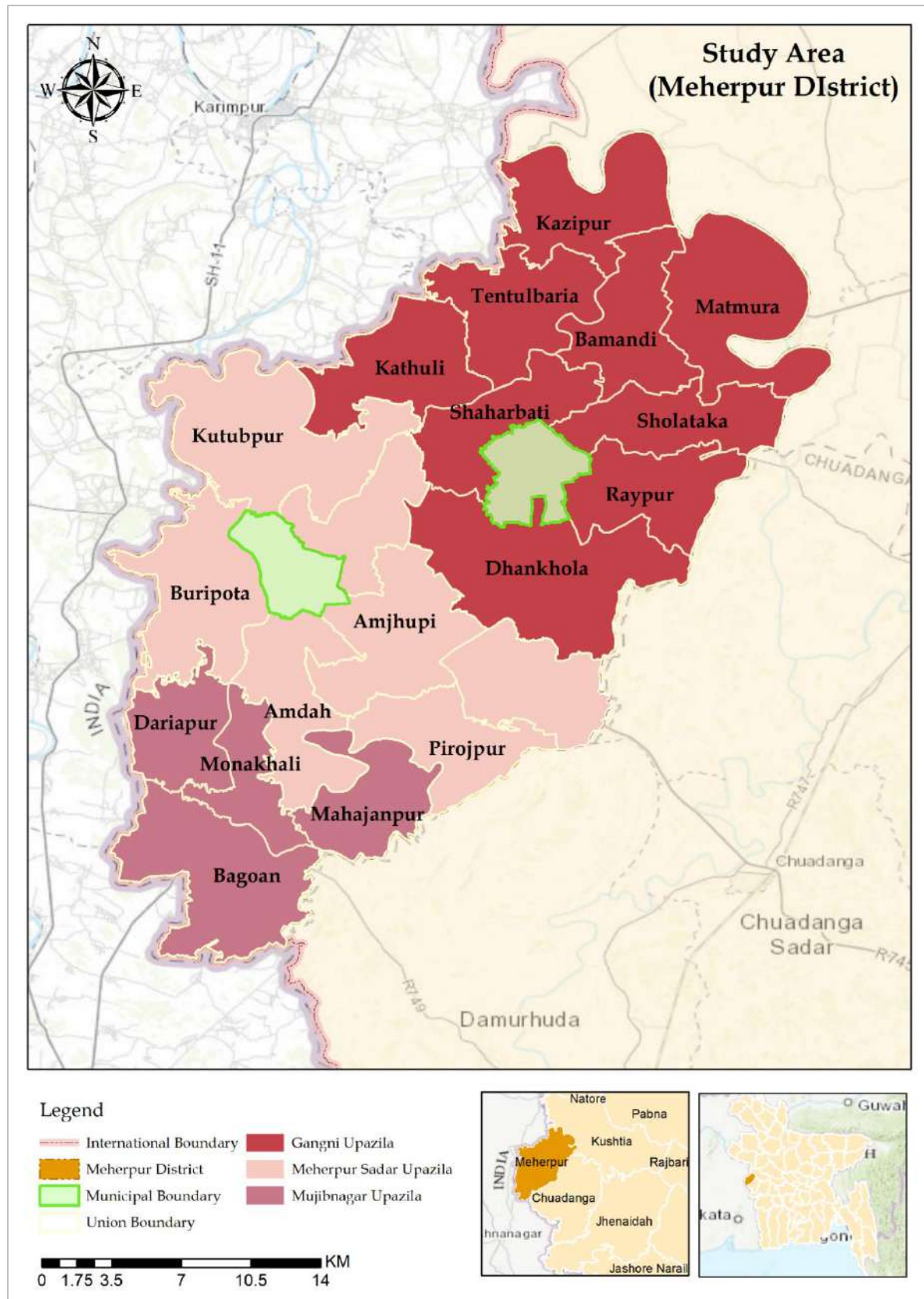
Rural	546471	262943 (48.12%)	283516 (51.88%)	12 (0.002%)
Urban	158885	77150 (48.56%)	81721 (51.43%)	14 (0.01%)
Total	705356	340093	365237	26

*Table 14-2: Population of Meherpur District by area and sex*

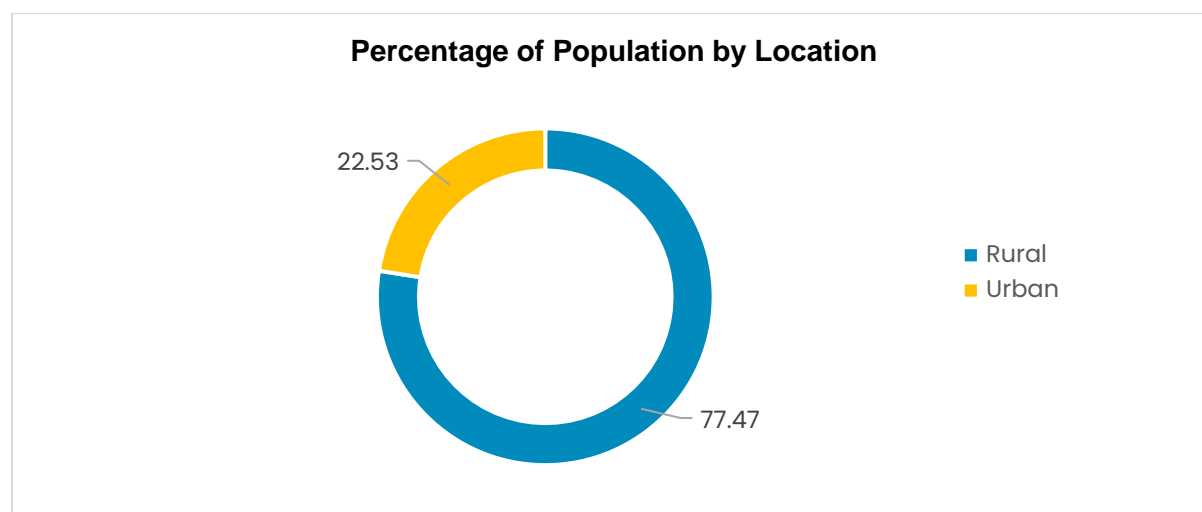
Source: Population and Housing Census 2022

The percentages of population living in the rural and the urban areas are 77.47% and 22.53% respectively.

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*Figure 14-1: Percentage of population in Meherpur district by location*

Source: Population and Housing Census 2022

According to the definition of BBS 2022, a structure is defined as Kancha if its floor is made of soil or wood or any other material except brick/cement/ concrete and roof is made of bamboo/golpata/palm leaves/chhan/straw etc. is defined as Knacha structure.

Nevertheless, if the floor is made of cement/concrete/brick/terracotta etc., but the wall and roof are made of any other material except cement/concrete/ brick/terracotta.

*Table 14-3: Structure Type in Meherpur District*

District	Type of Structure				
	Total	Pucca	Semi-pucca	Kancha	Jhupri
Meherpur	Number				
	194749	78975	30071	85041	662
	Percent				
	100.00	40.55	15.44	43.67	0.34

Source: Population and Housing Census 2022

In Meherpur district, it is evident from the figures that in the case of the main dwelling structure, kancha holds the highest share with 43.67% followed by pucca, 40.55%. and semi-pacca, 15.44%.

In the total general households of Meherpur District, the highest, 56.07% of the **floor of main dwellings** are made of cement/concrete/terracotta, followed by 41.24%, of soil/sand/mud. It is also evident that 75.8% of the households, have used cement/concrete/brick/terracotta as the **wall materials** of their main dwelling structure, followed by metal sheet/CI sheet/corrugated iron sheet, 13.32%. It is found that the highest 51.35% of the total households in the Meherpur district have used metal sheet/CI sheet/corrugated iron sheet as **roof materials** of main dwellings, followed by cement/concrete/tile, 47.49%.

In Meherpur Sadar, most of the houses consist of Kancha structures, while scattered pucca houses are found across the upazila. However, within the Meherpur Paurashava, there is a commendable effort to maintain the historic buildings of the region as part of its cultural heritage, despite the prevalent housing conditions dominated by Kancha structures. The significant housing type in Gangni Upazila consists mainly of Kancha structures. In addition,



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there are semi pucca dwellings, while only a limited number of structures are considered Pucca, with a notable concentration in Gangni Paurashava.



*Figure 14-2 Sample of Pucca Structure in Meherpur Sadara Upazila (Left: Boro Bazar Area, Right: Thana Road)*



*Figure 14-3 Sample of Kancha (Left) & Pucca (Right) Structure in Gangni Upazila*





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*Figure 14-4 Sample of Semi Pucca Structure in Mujibnagar Upazila*

Source: Field Survey, 2024

### 14.2.3 Infrastructure Development

Meherpur Sadar Upazila has a good road connectivity through highways leading to Kushtia, Khulna, Dhaka. There is a bus terminal used as the main transit station for the people. The internal roads of Sadar Upazila and Paurashava are relatively good. People uses auto rickshaw, rickshaw for their local transport. There is no railway communication system in Meherpur district. Two railway stations Chuadanga and Alamdanga are used for railway communication with all over Bangladesh. Chuadanga station is 29 KM far from Meherpur and Alamdanga station is 39 KM far from Meherpur Sadar.

*Table 14-4 Road network according to type of road in Meherpur Sadar Upazila*

Road Type	Earthen (KM)	Pavement (KM)	Total Length (KM)
Upazila Road:	0.00	70.63	70.63
Union Road:	0.00	47.29	47.29
Village Road A:	56.27	204.15	260.42
Village Road B:	84.49	126.50	210.99
Total Roads:	140.76	448.57	589.33

Source: LGED, 2020

In Gangni Upazila, the internal roads are wide and paved and the condition is very good. A large portion of village roads remains unpaved and consists of earthen surfaces, increase the difficulties, particularly during unfavorable weather conditions. Heavy rains or other adverse weather events turn these roads into muddy tracks, severely hindering traffic flow and causing problems for commuters and the transportation of goods. The poor road infrastructure not only inconveniences residents but also negatively impacts the economic activities of the entire region.



*Figure 14-5 Gangni Bus Stand and Passenger Shed*

Source: Field Survey, 2024

*Table 14-5 Road network according to type of road in Gangni Upazila*

Road Type	Earthen(km)	Pavement(km)	Total Length(km)
Upazila Road:	0.00	71.79	71.79



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Union Road:	0.20	138.76	138.96
Village Road A:	34.50	137.93	172.43
Village Road B:	168.70	194.33	363.04
Total Roads:	203.40	542.81	746.21

Source: LGED, 2020

The Upazila Road and the Union Road is in very good condition in Mujibnagar upazila. But the some of the village roads are unpaved and earthen. Particularly during adverse weather conditions, the roads become muddy. This situation hampers the smooth flow of traffic, causing difficulties for commuters and hampering the transportation of goods. The inadequate road infrastructure not only leads to inconveniences but also impacts the overall economic activities of the region.

*Table 14-6 Road network according to type of road in Mujibnagar Upazila*

Road Type	Earthen(km)	Pavement(km)	Total Length(km)
Upazila Road:	0.00	42.92	42.92
Union Road:	0.04	26.52	26.57
Village Road A:	35.34	59.50	94.84
Village Road B:	37.96	71.25	109.2
Total Roads:	73.34	200.19	273.53

Source: LGED, 2020

#### 14.2.4 Tourist Spot

Amjhupi Nilkuthi is a renowned tourist destination in Meherpur Sadar Upazila, attracting visitors from across the country. Originally functioning as a Nilkuthi, or indigo plantation house, it later transformed into the administrative office of the East India Company. It was established in the 1800s, adding to its historical significance. Tourists visit this archaeological site to explore its rich heritage, offering a glimpse into the region's colonial past.

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*Figure 14-6 Amjhupi Nilkuthi, Meherpur Sadar Upazila;*

Source: Field Survey, 2024

Gangni Upazila does not have many tourist attractions; however, one notable site is the Tepukhali Boddhovumi. This site holds significance for tourists who visit to pay their respects to the martyrs of the liberation war. While tourism in the area may be limited, the presence of Tepukhali Boddhovumi offers visitors an opportunity to connect with the historical and cultural heritage associated with the liberation war.

Mujibnagar has several significant tourist spots, including the Mujibnagar Liberation War Memorial Complex and Amrakanan. The Mujibnagar Liberation War Memorial Complex holds historical importance, commemorating the birth of Bangladesh as an independent nation. Visitors often come to pay homage to the martyrs and learn about the pivotal moments of the liberation war. Additionally, Amrakanan offers natural beauty, attracting tourists with its lush greenery and serene ambiance, providing a tranquil retreat for nature lovers and outdoor enthusiasts visiting Mujibnagar. These tourist spots contribute to the cultural and historical richness of the region, making Mujibnagar a noteworthy destination for travelers interested in exploring Bangladesh's heritage.

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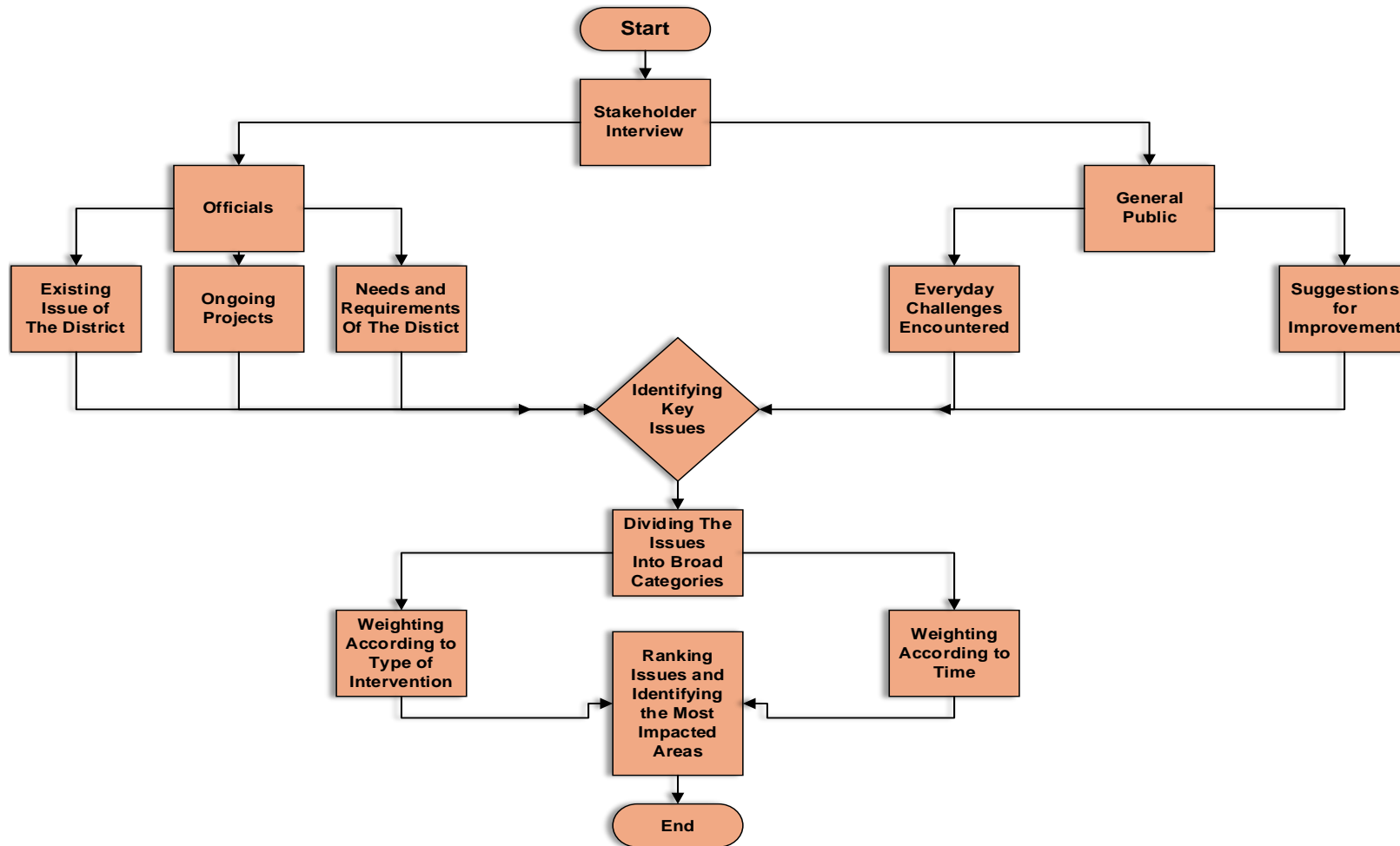
*Figure 14-7 Mujibnagar Liberation War Memorial Complex;*

Source: Field Survey, 2024

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### 14.3 Approach and Methodology

#### 14.3.1 Approach



*Figure 14-8 Workflow Diagram*



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The **flowchart** outlines a systematic stakeholder consultation process, beginning with interviews of two key groups: **Government Officials** from various organizations in Meherpur District and the **General Public**. From the officials, insights were gathered regarding the district's existing issues, ongoing projects, and specific needs and requirements. Simultaneously, the general public was consulted to understand their daily challenges and to gather their suggestions for improvement. Following the collection of this input, the key issues were identified and categorized into broad themes for further analysis. These issues were then weighted based on two criteria: **the type of intervention required (spatial, structural, or management)** and the **urgency of the resolution (urgent, moderate, average, long-term, or phased)**. Finally, the issues were ranked according to these weightings, and the most affected areas were identified. This comprehensive approach culminates in a clear prioritization of the district's problems and actionable solutions, providing a well-defined roadmap for addressing the most critical challenges.

### 14.3.2 Methodology

Numerous Problems of Meherpur District were mentioned during the stakeholder consultation with the general public. To understand these issues better we divided it into some major aspects and set a priority to them alongside an intervention timeframe. The issues were prioritized according to the combination of number of responses, existing situation and our engineering judgement on a scale from 1-5 with 1 being Minor Priority to 5 being Top Priority.

- **Minor Priority:** Issues that are not immediately pressing and have minimal impact on daily life. These can be addressed over time and do not require urgent attention.
- **Moderate Priority:** Problems that have a noticeable effect but do not demand immediate intervention. These can be scheduled for action in the medium term.
- **High Priority:** Significant issues that affect daily functioning or well-being. They require prompt action to prevent them from escalating.
- **Critical Priority:** Problems that pose a serious threat to public safety, health, or infrastructure. Immediate action is needed to address these issues to avoid further damage or risk.
- **Top Priority:** The most urgent and severe problems, requiring immediate and decisive intervention. These issues have the highest impact and demand top-level attention for swift resolution.

Below is a table outlining the socio-economic and transportation aspects of Meherpur District, along with the corresponding percentage of responses, priority, and intervention timeframe:

*Table 14-7 Priority Index*

Priority Index	
1	Minor Priority



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2	Moderate Priority
3	High Priority
4	Critical Priority
5	Top Priority

From our stakeholder interview, we were informed about different kinds of issues and problems. These sub-sectoral problems were later combined to form a broad sector problem for the ease of understanding. After categorizing the issues into broad sectors and ranking them by percentage, the problems were weighted and assessed based on the type and timing of the required interventions. They were then prioritized from the most critical to the least critical, as well as from the most affected areas to the least affected ones.

The **weights** that were assigned based on **type of intervention** and **time of intervention** is tabulated below:

*Table 14-8 Intervention Weight Index*

Type of Intervention	Intervention Weight
Spatial (Sp)	5
Structural (St)	3.5
Management (M)	2.5

*Table 14-9 Time Weight Index*

Time	Time Weight
Urgent (Ur) (1-3 years)	10
Moderate (M) (3-5 years)	5
Average (Av) (5-10 years)	2.5
Long Term (Lt) (10+ years)	1
Phase Wise (Ph) (Step by Step)	0.5

The **Type of Intervention** and its corresponding **Intervention Weight** reflect different approaches to solving issues, each with a distinct level of importance or impact. The assigned weights help prioritize interventions based on their effectiveness and necessity.

1. **Spatial (Sp) – Weight: 5:** Spatial interventions involve changes in land use, zoning, or urban planning. With the highest weight of 5, these are considered critical due to their significant and long-lasting impact on infrastructure and development, such as redesigning road layouts or reallocating land.
2. **Structural (St) – Weight: 3.5:** Structural interventions focus on physical improvements to infrastructure, such as constructing or upgrading roads, drainage systems, and solid waste management facilities. These are moderately important, with a weight of 3.5, and target enhancing the built environment.
3. **Management (M) – Weight: 2.5:** Management interventions refer to operational or administrative changes, such as improving waste collection, traffic management, or

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enforcing regulations. With a weight of 2.5, these are considered less impactful than spatial or structural changes but are still essential for maintaining smooth operations and efficiency.

The **Time** and corresponding **Time Weight** indicate the urgency of interventions based on their required implementation period. The weights reflect the level of priority, with higher values given to more immediate interventions.

1. **Urgent (Ur) – 1-3 years (Weight: 10)**: These are high-priority interventions requiring immediate action within 1 to 3 years. With a weight of 10, they address critical issues that, if delayed, could lead to severe consequences.
2. **Moderate (M) – 3-5 years (Weight: 5)**: Important but less urgent interventions that can be implemented within 3 to 5 years. With a moderate weight of 5, these actions are significant but allow for some flexibility in timing.
3. **Average (Av) – 5-10 years (Weight: 2.5)**: These interventions are less pressing and can be addressed over a 5 to 10-year period. With a weight of 2.5, they remain necessary but do not require immediate attention.
4. **Long Term (Lt) – 10+ years (Weight: 1)**: These are future-oriented interventions with a timeline of over 10 years. They have a lower weight of 1, indicating that while important, they are not urgent and can be planned for in the distant future.
5. **Phase Wise (Ph) – Step by Step (Weight: 0.5)**: Interventions that are implemented gradually, step by step, over time. With the lowest weight of 0.5, they are the least urgent, involving long-term, incremental progress, and providing flexibility in planning and execution.

## 14.4 Stakeholder Consultation

### 14.4.1 Local Stakeholders Perspective

The stakeholder consultation interviews with local officials were crucial in identifying the key issues, existing conditions, and needs of Meherpur District. These discussions provided valuable insights into the region’s challenges and helped shape the understanding of its priorities. The detailed outcomes of these interviews are provided below:

Stakeholder Interview

Preparation of Development Plan for Meherpur District (MZDP)

Serial No: TILLER/UDD/MZDP/08/2024/S1  
August, 2024

Date: 19

Time: 11:15

AM

Stakeholder Name: G. M. Obaidullah

Designation: Pouro Executive Officer

Interviewer name: Sajjad Hossain, Nahiyen Bazlul

Location: Meherpur Pouroshava

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#### Interview Overview

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. During the discussion, Mr. Obaidullah shared comprehensive insights about the challenges, issues & potential of the Meherpur Pouroshava & District.

While talking about the issues Mr. Obaidullah highlighted that-

- The Pouroshava suffers from a significant shortage of development funds, which severely hampers the region's overall progress.
- **Lack of adequate healthcare facilities and educational institutions** forces residents to seek services in neighboring districts like Chuadanga and Kushtia, or even Rajshahi.
- The Pouroshava **owns 450 shops** and land parcels offering immense potential however, development is stalled due to a lack of funding.
- Several initiatives are going on, including the near-completion of the Gor Pukur Beautification Project, the potential extension of the Meherpur Zilla Two Pouroshava Development Project, and the implementation **of UGIIP-3 (Urban Governance and Infrastructure Improvement Project - Phase 3).**
- Additional efforts and suggestion have been asked to us which includes a **solar power project**, a COVID-19 response project, and the **digitalization of tax assessment and online trade licensing systems** which will ease identification and tax collection.
- Limited availability of consumer goods, such as quality smartphones, requiring travel to Chuadanga for purchase.

Serial No: TILLER/UDD/MZDP/08/2024/S2

Date: 19

August, 2024

Time: 11:48 AM

Stakeholder Name: Abu Hena Mostafa Kamal

Designation: Assistant Engineer

Interviewer name: Sajjad Hossain, Nahiyan Bazlul

Location: Meherpur Pouroshava

#### Interview Overview

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. During the conversation, Mr. Kamal provided detailed perspectives on the challenges, concerns, and opportunities within Meherpur Pouroshava and District.

In the interview, Mr. Kamal provided several key insights:

- He identified waterlogging as the most critical issue facing the urban areas of the Pouroshava, particularly in Wards 5, 7, and 8. He explained that the Bhairab River

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serves as the sole outlet for water runoff, and the town’s inadequate drainage system makes the eastern wards—those farthest from the river—the most affected.

- Mr. Kamal highlighted the **frequent violation of building bylaws**, especially the lack of adequate setbacks, which has contributed to the **narrowing of major roads in the main town**. He attributed the ineffective monitoring and control of these issues to a **shortage of manpower**.
- For the town's overall development, he emphasized the need to **raise public awareness**.
- He also stressed the urgent requirement to **appoint a town planner**, as this position has been vacant for an extended period, and recommended developing a comprehensive Master Plan and a robust district development strategy.
- Regarding ongoing projects, Mr. Kamal’s response was consistent with that of Mr. Obaidullah, mentioning the Gor Pukur Beautification Project, the Meherpur Zilla Two Pouroshava Development Project, and efforts to digitalize tax assessment and online trade licensing systems.

Serial No: TILLER/UDD/MZDP/08/2024/S3

Date: 19

August, 2024

Time: 12:49 PM

Stakeholder Name: MD. Hannan Prodhan

Designation: Executive Engineer

Interviewer name: Sajjad Hossain, Nahiyan Bazlul

Location: Water Development Board, Meherpur

### Interview Overview

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. The objective was to gain a comprehensive understanding of the water network surrounding Meherpur District, evaluate the condition of its rivers, and identify their positions and characteristics.

Mr. Prodhan highlighted several key points:

- Meherpur is geographically a **drought-prone area**, with the Tropic of Cancer passing directly through the district. The average annual rainfall is approximately 700-800 mm, significantly below the national average of over 2,000 mm.
- The district is traversed by four rivers: the Bhairab, Mathabhanga, Kajla, and Chewtia. A few years ago, **the Bhairab River nearly dried up**, but a successful **two-phase re-excavation** project has restored its flow. It now maintains a water depth of 6-12 feet throughout the year, varying by location.
- Before the re-excavation project, farmers relied heavily on groundwater for irrigation. Now, surface water from the Bhairab River has become the primary resource. Low Lift Pumps (LLPs) have been provided to farmers to facilitate irrigation, and a walkway has been constructed to prevent illegal encroachment of the river.

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- Mr. Prodhan also addressed the critical issue of **the lack of a Sewerage Treatment Plant (STP)**. Currently, all waste collected by the Pourashava is dumped directly into the river, posing significant health risks to those who use the river water.
- An ongoing project aims to **build water reservoirs on the Bhairab River** to capture and store water, with plans for two structures in the Meherpur region and one in Chuadanga.
- He called for greater public cooperation and improved coordination among local authorities to address these ongoing challenges effectively.

Serial No: TILLER/UDD/MZDP/08/2024/S4

Date: 19

August, 2024

Time: 1:22 PM

Stakeholder Name: Alamgir Hossain

Designation: Sub Assistant Engineer

Interviewer name: Sajjad Hossain, Nahiyan Bazlul

Location: Water Development Board, Meherpur.

#### Interview Overview

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. The objective was to gain a thorough understanding of the water network surrounding the district, assess the conditions of its rivers, and identify their positions and characteristics.

During the discussion, Mr. Hossain emphasized several critical points:

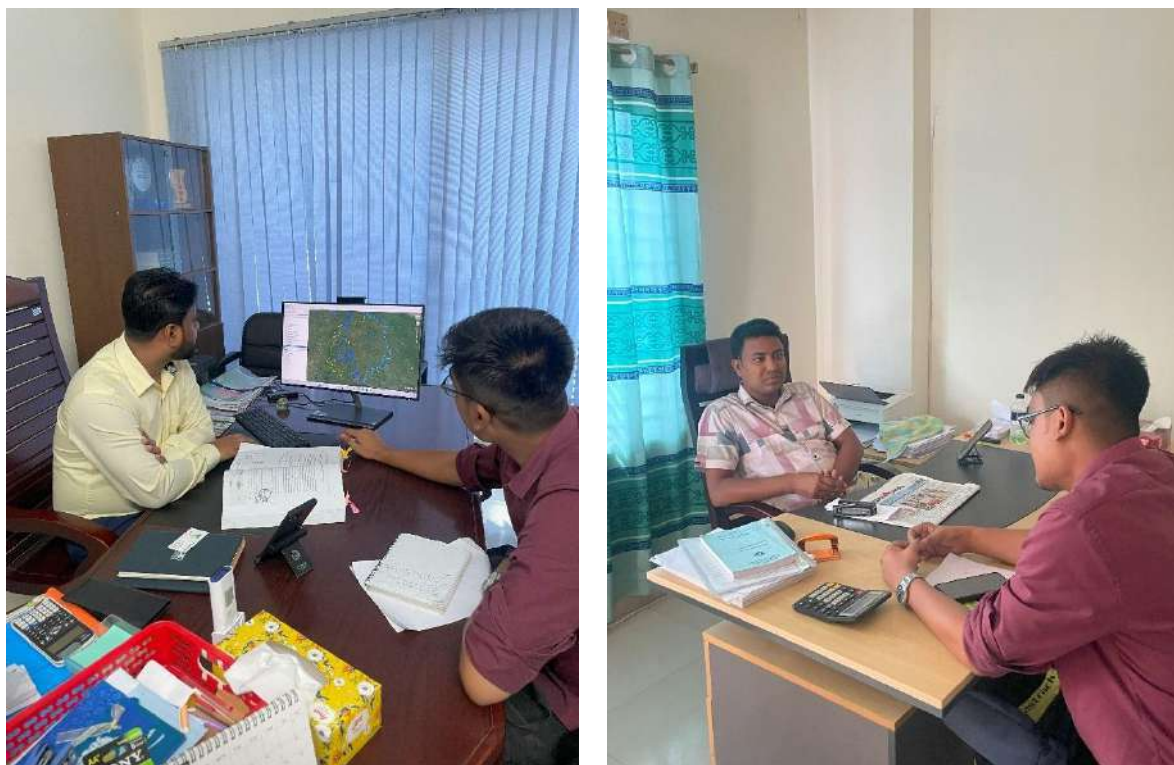
- The **direct discharge of untreated wastewater** into the Bhairab River is a major concern, posing significant health risks to residents along the riverbanks who depend on the river for drinking and washing.
- To address this issue, he called for increased motivation and cooperation from Meherpur Pouroshava to either find alternative waste dumping sites or improve existing waste management practices.
- Mr. Hossain’s comments on ongoing projects aligned with those of Mr. Prodhan. He noted the Bhairab River re-excavation project and the efforts **to construct two water reservoirs** within the river.



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*Figure 14-9 Stakeholder Consultation with Pouro Executive Officer and Asst. Engg. Meherpur Pouroshava*



*Figure 14-10 Stakeholder Consultation with Ex. Engg. and Sub Asst. Engg, WDB, Meherpur*

Figure 14-9 shows the ongoing discussion with the Pouro Executive officer and Assistant Engineer of Meherpur Pouroshava who gave us valuable insights about the existing problems

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and provided us with some key suggestions. Figure 14-10 illustrates consultation going on with Ex. Engg. And Sub Asst. Engg. Of Water Development Board of Meherpur.

Serial No: TILLER/UDD/MZDP/08/2024/S5

Date: 20

August, 2024

Time: 12:18 PM

Stakeholder Name: Shahriar Ahmed

Designation: Assistant Engineer

Interviewer name: Sajjad Hossain, Nahiyan Bazlul

Location: BADC Irrigation, Meherpur.

Interview Overview:

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. The primary objectives were to understand the irrigation practices of local farmers and gain insights into the district's catchment areas.

Mr. Ahmed informed that

- Due to low groundwater levels and minimal rainfall in Meherpur District, the Bhairab River has become the main water source. With the river currently lacking sufficient flow, constructing a water reservoir is crucial, although the construction is still ongoing and yet to be completed.
- Before the Bhairab River re-excavation project, groundwater was the primary source of irrigation. However, post-project, farmers have increasingly depended on surface water.
- **The government has provided seven deep tube-wells and 40 low lift pumps (LLPs) to farmers.** Each deep tube-well can irrigate approximately **300 bighas of land**. Many farmers also use shallow pumps purchased independently, with a government service available for an annual fee of **Tk. 23,500**.
- Several projects are underway to enhance the district's agricultural support infrastructure, including an Irrigation Development Plan, deep tube-well rehabilitation, LLP construction, and pipeline extension projects.
- The Mathabhanga River, while having some flow, is narrow and requires dredging to increase its capacity.
- Mr. Ahmed highlighted **Meherpur’s fertile land, which supports year-round crop production**. Primary crops include bananas and onions, with cauliflower and cabbage now cultivated in both winter and summer. The Gangni region also grows rice and chilies extensively, along with some tobacco cultivation and the **recent introduction of strawberry farming**.
- He emphasized on the importance of promoting all-season cropping to improve yields and called for greater transparency in agricultural loans provided to farmers.
- Additionally, Mr. Ahmed requested a few drone images for more accurate cropping analysis.

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Serial No: TILLER/UDD/MZDP/08/2024/S6

Date: 21

August, 2024

Time: 2:36 PM

Stakeholder Name: Pritam Saha

Designation: UNO Gangni

Interviewer name: Nahiyen Bazlul

Location: UNO Office, Gangni, Meherpur.

#### Interview Overview:

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. The goal was to gain a comprehensive understanding of the socio-economic conditions, primary challenges, and specific needs of the Gangni Upazila.

Mr. Saha highlighted several key issues facing Gangni:

- Insufficient water connectivity is a major problem. The existing rivers are shallow, narrow, and lack navigability, leading farmers to rely heavily on groundwater for irrigation. However, the groundwater level in the upazila is critically low and rapidly declining.
- There is a significant challenge due to the **absence of a modern waste management plan**, which poses serious health risks. Mr. Saha called for the establishment of an **incinerator or a comprehensive waste management facility**.
- He also highlighted the **lack of a slaughterhouse in the upazila**, which forces meat processing to occur under unhygienic conditions. He stressed the urgent need to establish a slaughterhouse to address this issue.
- The insufficient water in the rivers has also impacted fish production, resulting in a shortage of fish in the local market.
- Mr. Saha raised concerns about a **severe drug problem** affecting the younger generation in the upazila.
- Additionally, he pointed out several **social issues**, including **child marriage, illegal land acquisition**, and fraudulent schemes involving individuals taking money from poor families to send them abroad via unsafe boat routes, often leading to disasters.
- He further suggested that the upazila is **lacking in greenery and plantation efforts**. Mr. Saha recommended initiating tree planting programs through social services to improve the environmental conditions of the area.

Serial No: TILLER/UDD/MZDP/08/2024/S7

Date: 21

August, 2024

Time: 2:30 PM

Stakeholder Name: S. M. Nazmul Haque, Kamrul Ahsan

Designation: SP & ASP, Meherpur.

Interviewer name: Sajjad Hossain

Location: SP Office, Meherpur.

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#### Interview Information:

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. The goal was to gain a comprehensive understanding of the crime rate and types of crime in the Meherpur region.

During the interview, stakeholders provided the following key information:

- The district faces a **significant issue with drug-related crimes**, largely due to its proximity to the border, which has turned it into a drug hub.
- **Smuggling and trespassing** frequently occur across the neighboring Indian border.
- Stakeholders emphasized the need for public awareness programs to educate residents about these issues.
- Collaborating with the **Narcotics Control Department (NCD)** was suggested as a means to better manage the drug situation.
- The development of a traffic circulation plan was advised to improve road safety.
- There is a desire to arrange workshops focusing on law and order to better address drug related challenges.
- Stakeholders requested footage of locations where cameras will be installed to capture traffic data, to be included in the traffic circulation plan.
- Road accidents are a major concern throughout the district, primarily caused by non-compliance with traffic rules and safety guidelines, such as the failure to wear helmets on motorcycles.

Serial No: TILLER/UDD/MZDP/08/2024/S8

Date: 21

August, 2024

Time: 5:30 PM

Stakeholder Name: MEZDA

Designation:

Interviewer name: Sajjad Hossain, Nahiyan Bazlul

Location: Mohila College Road, Meherpur.

#### Interview Information:

This interview was conducted as part of the efforts to prepare a Development Plan for Meherpur District, under the “Preparation of Development Plan for Meherpur District (MZDP)” Project implemented by the Urban Development Directorate (UDD), MoHPW. The goal was to gain a comprehensive understanding of the key issues prevailing in the district and the overall conditions of the district.

The stakeholders stated that:

- **Drug Addiction** is a severe issue that has grasped the entire youth. With nearly every family having one drug addict.
- Some key hubs of drugs are:
  1. Meherpur Sadar
  2. Buripata Union



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### 3. Mukherjee Para

- There prevails a **huge problem of water logging**. Only one hour of rain can make the whole city water clogged. The key locations where the water clogging occurs the most are:
  1. Borobazar
  2. Pouroshava – community center road
  3. Shilpokola
  4. Tati Para
- There is a **severe arsenic contamination** issue and a shortage of drinking water in Mujib Nagar upazila.
- The stakeholders suggested that the large area owned by Bangladesh Small and Cottage Industries Corporation (BSCIC) have significant potential and proper utilization of it can make people grow small businesses.
- Handloom industries of Meherpur District also have some potential to grow with some nurturing and financial support
- Other key pieces of information which were shared is the proposed plan for ‘Mujib Nagar University’ is already gazetted. A potential location is needed to be identified. One possible location is near the Police Lines.





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*Figure 14-11 Stakeholder Consultation with Assistant Engg. BADC Irrigation, ASP Meherpur, MEZDA Meherpur & UNO Gangni*

Figure 14-11 illustrates the discussion going on with different stakeholders. Top left picture shows Assistant Engineer of BADC giving us valuable insight about the irrigation situation in Meherpur. Crime rate and insights about type of crimes were given by ASP Meherpur (Top Right), MEZDA gave information about existing socioeconomic conditions (Bottom Left) and UNO Gangni gave us information about problems faced in Gangni.

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#### 14.4.2 Local Community Perspective

To assess the existing conditions of the area and the challenges faced by residents, **stakeholder consultation** with general public was also conducted. This involved questionnaire survey targeting the general public.



*Figure 14-12 Questionnaire Survey with the general public of Meherpur District*

The Figure 14-12 above illustrates the stakeholder consultation process conducted through a questionnaire survey targeting the general public. This approach was designed to gather insights and perspectives on the various challenges that individuals encounter in their daily lives. By engaging the public directly, the consultation aimed to identify key issues, concerns, and priorities that may influence decision-making and policy development.

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Below is a table outlining the development issues of Meherpur District, along with the corresponding percentage of responses, priority, and intervention timeframe:

*Table 14-10 Preparing development issue matrix as per local participants*

Aspects	No. of Responses (%)	Priority	Intervention timeframe	Description
Traffic & Transport Affairs	18.18	3	Short	<ul style="list-style-type: none"> <li>• Narrow roads, frequent speeding, and overtaking lead to restricted traffic flow and accidents, with waterlogged potholes adding to the hazards.</li> <li>• Road obstructions from debris, waste, and heavy vehicles during unloading create further challenges.</li> <li>• Katcha (unpaved) roads are another issue, while congestion during school hours worsens traffic jams, especially at busy intersections during peak times.</li> </ul>
Sewerage and Drainage	18.18	5	Medium	<ul style="list-style-type: none"> <li>• Waterlogging resulting from drains that are not regularly cleaned, leading to blocked pathways for water runoff.</li> <li>• Inadequate drainage infrastructure, which fails to effectively manage and channel rainwater, further aggravating the problem.</li> <li>• The key locations where the water clogging occurs the most are: <ul style="list-style-type: none"> <li>▪ Borobazar</li> <li>▪ Pouroshava – community center road</li> <li>▪ Shilpokola</li> <li>▪ Tati Para</li> </ul> </li> </ul>
Solid Waste Management System	19.83	4	Short	<ul style="list-style-type: none"> <li>• Irregular waste collection due to inconsistent service by Pouroshava workers, combined with insufficient dustbins, results in unmanaged waste accumulation.</li> <li>• Roads are obstructed by cow dung, debris, and illegal encroachments, which impede waste clearance and contribute to sanitation problems.</li> </ul>

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Aspects	No. of Responses (%)	Priority	Intervention timeframe	Description
				<ul style="list-style-type: none"> <li>• Limited public awareness of the environmental and health impacts of improper waste disposal worsens the issue.</li> <li>• The Pouroshava has not established a system for door-to-door waste collection. Additionally, the waste is not segregated; instead, it is all dumped into the Bhairab River.</li> </ul>
Safety and Security	5.78	1	Long	<ul style="list-style-type: none"> <li>• Many areas lack functional street lamps, creating poorly lit environments that increase the risk of burglary and other criminal activities.</li> <li>• Maintenance of faulty street lights is often delayed by 3-4 months, leaving areas vulnerable at night.</li> <li>• There is a lack of CCTV coverage</li> </ul>
Pollution Issues	12.39	1	Long	<ul style="list-style-type: none"> <li>• Air quality is compromised by dust blowing in dry weather.</li> <li>• Continuous vehicle honking contributes to elevated noise levels, causing noise pollution.</li> <li>• In some areas, unpleasant odors arise from drains that are not regularly cleaned, adding to environmental pollution.</li> </ul>
Drug usage and Smuggling	9.09	3	Long	<ul style="list-style-type: none"> <li>• The primary cause of drug addiction is the lack of employment opportunities and inadequate recreational activities.</li> <li>• Some key hubs of drugs are: <ul style="list-style-type: none"> <li>▪ Meherpur Sadar</li> <li>▪ Buripata Union</li> <li>▪ Mukherjee Para</li> </ul> </li> </ul>

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Aspects	No. of Responses (%)	Priority	Intervention timeframe	Description
Unemployment	4.13	2	Long	<ul style="list-style-type: none"> <li>The main cause of unemployment is the absence of mills or factories in the area, leaving individuals without work when the farming season concludes and contributing to a lack of employment opportunities.</li> </ul>
Bazar Syndicate	4.13	1	Medium	<ul style="list-style-type: none"> <li>Bazar issues encompass price manipulation by syndicates, particularly affecting agricultural products, as well as the sale of counterfeit fertilizers and incorrect pricing on receipts.</li> <li>Additionally, shop owners frequently construct their establishments without proper setbacks, encroaching on roads and disrupting traffic flow.</li> </ul>
River and Irrigation Systems	2.47	4	Medium	<ul style="list-style-type: none"> <li>Meherpur is surrounded by four rivers: Bhairab, Mathabhanga, Kajla, and Chewtia. A few years ago, the Bhairab River was nearly dead, and the primary source of irrigation was rapidly depleting groundwater. To address this, the government initiated a re-excavation project to revive the Bhairab River, carried out in two phases. As a result, the river's depth now ranges from 6 to 12 feet, depending on the location, and surface water has become the main source of irrigation. This shift has significantly benefited farmers, leading to increased crop yields. Additionally, two water reservoirs are under construction in the Meherpur area to ensure water storage throughout the year.</li> </ul>
Trade, Commerce & Industrialization	4.13	3	Short	<ul style="list-style-type: none"> <li>Meherpur area has significant agricultural potential, supported by its vast expanses of fertile arable land. The region’s favorable soil conditions enable year-round cultivation. This adaptability maximizes land use and ensures a consistent and</li> </ul>



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Aspects	No. of Responses (%)	Priority	Intervention timeframe	Description
				diverse agricultural output. Key crops include banana and onion, with onion farming being particularly profitable for local farmers. In the Gangni area, cauliflower and cabbage are successfully cultivated in both summer and winter, further diversifying the region's agricultural output. Additionally, tobacco is grown in certain parts of the district, showcasing the land's versatility in supporting various crops. <ul style="list-style-type: none"> <li>• Meherpur has substantial potential for trade and industrial growth, supported by BSCIC. The district can benefit from BSCIC’s industrial parks, financial assistance, and technical support to optimize production, create jobs, and alleviate poverty. By leveraging local resources and improving infrastructure, BSCIC can drive balanced regional development and boost Meherpur’s socio-economic progress.</li> </ul>
Healthcare & Education Facilities	1.65	3	Short	<ul style="list-style-type: none"> <li>• Healthcare facilities in Meherpur district are inadequate, with only one 250-bed general hospital that has yet to begin operations. As a result, residents often travel to nearby districts like Chuadanga or Kushtia for advanced treatment.</li> <li>• Meherpur lacks quality educational institutions, with very few government colleges in the district, none of which offer excellent teaching or facilities. Consequently, students often relocate to districts like Khulna or Rajshahi for better higher education opportunities.</li> </ul>

By analyzing the table, it is evident that the majority of responses focused on the **‘Solid Waste Management System’**, followed by concerns related to **‘Transport and Traffic Affairs’** and **‘Sewerage and Drainage’**. Another significant issue raised was **‘Drug Usage and Smuggling’**. Additionally, many respondents expressed concerns about **‘Pollution’**, highlighting its impact on their daily lives.

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*Figure 14-13 Issues of Water logging on Roads*

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*Figure 14-14 Improper Solid Waste Disposal and Unpaved (Katcha) Road in Meherpur District*

In the Figure 14-13 Figure 14-14, several key issues in Meherpur District which were highlighted during the Stakeholder Consultation, are evident. These include waterlogging on roads, insufficient solid waste management, and the improper disposal of garbage and waste materials on roads under construction. The last image illustrates poor road conditions and illegal encroachment by auto-rickshaws, further contributing to traffic challenges.

#### **14.4.3 Categorization and Ranking of Issues**

Through our stakeholder interviews, we gathered insights into various issues and challenges. These specific problems were later grouped into broader categories for easier interpretation. The table below provides a summary of the problems identified by the general public in Meherpur District. It includes the percentage representation of each issue, their ranking, and the areas most affected. This cumulative analysis highlights the key areas of concern within the district. The data is tabulated below:



*Table 14-11 : Broad Categorization and Ranking of Problem from Stakeholder Consultation & Local Participation*

S/N	Broad category	Problems from Stakeholder Consultation & Local Participation	Meherpur Pouroshava	Meherpur Sadar Upz	Gangni Pouroshava	Gangni Sadar Upz	Mujibnagar	Sub-Sectoral Problems-01	Broad Sector Problems-02	Percentage of problems %	Broad category	Rank/ Problems
1	Drinking Water	Arsenic Contamination	0	1	0	0	1	2	4	2.37	Drinking Water	13
2		Drinking water supply	0	1	0	0	1	2				
3	Drainage	Water Logging	1	1	1	1	0	4	14	8.28	Drainage	4
4		Drainage congestion	1	1	1	1	0	4				
6		Khal Excavation & widening	1	1	0	1	0	3				
8		Connectivity of drains with khals	1	1	0	1	0	3				
9	Electricity	Street lighting	1	1	1	1	1	5	7	4.14	Electricity	11
10		Loadshedding	0	1	0	1	0	2				
12	Sanitation & Waste	Public Toilet	1	0	1	0	0	2	11	6.51	Waste	9
13		Medical & Construction Waste Disposal	1	1	1	1	1	5				
14		Dustbin or Garbage disposal center	1	0	1	0	0	2				
15		Mosquito Extinction	0	0	0	0	0	0				
16		Waste dumping station	1	0	1	0	0	2				
17	Recreational Facilities	Recreational facility	1	1	1	1	0	4	13	7.69	Recreational Facilities	8
18		Park	1	1	1	1	0	4				
19		Playground	1	1	1	1	1	5				
20	Road	Road-Bridge	1	1	1	1	1	5	25	14.79	Road	1
21		Construction of New Road	1	1	1	1	1	5				
22		Footpath construction & widening	1	1	0	0	0	2				
23		Foot over bridge	0	0	1	1	0	2				
24		Traffic speed controller (speed breaker/ island etc.)	1	1	1	1	1	5				
25		Car Parking	1	0	1	0	0	2				
26		City Road Bypass	1	1	1	1	0	4				
27	Health	Day care center	1	1	1	1	1	5	15	8.88	Health	5
28		Health Centre/clinic	1	1	1	1	1	5				
29		250 Beds Govt. Hospital	1	1	1	1	1	5				
30	Physical Infrastructure	Ward councilor's Office	1	0	1	0	0	2	19	11.24	Physical Infrastructure	3
0		Community Centre	1	0	1	0	0	2				
32		River Embankment/Walk Way	1	1	0	0	0	2				
33		Police Box/VDP BIT Office	1	1	1	1	0	4				
34		Night Shelter	1	0	1	0	0	2				
35		Old Age Home	1	0	1	0	0	2				
36		Eid gah	0	0	0	0	0	0				
37		Graveyard/Cremation Ground	0	0	0	0	0	0				

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S/N	Broad category	Problems from Stakeholder Consultation & Local Participation	Meherpur Pouroshava	Meherpur Sadar Upz	Gangni Pouroshava	Gangni Sadar Upz	Mujibnagar	Sub-Sectoral Problems-01	Broad Sector Problems-02	Percentage of problems %	Broad category	Rank/ Problems
38		Development/Revitalization of existing Bazar/Haats	1	1	1	1	1	5				
39	Education	Government primary school construction/ rebuilding	1	1	1	1	1	5	20	11.83	Education	2
40		Government College	1	1	1	1	1	5				
41		University	1	1	1	1	1	5				
42		Youth Development Centre	1	1	1	1	1	5				
43	Social Upliftment & Inclusion	Lack/Seeking of Job Opportunity	1	1	1	1	1	5	9	5.33	Social Infrastructure	10
44		Poor Rehabilitation (Ethnic Population)	0	0	1	1	0	2				
45		Temple/ Church	0	0	1	1	0	2				
46	Rules/ Awareness	Unplanned Residential Development	1	1	1	1	1	5	14	8.28	Rules/ Awareness	6
47		Grazing (Cow)	1	1	0	1	1	4				
48		Public awareness (Drug/EQ/Building Code etc.)	1	1	1	1	1	5				
49	Pollution	Air Pollution	1	0	1	0	0	2	4	2.367	Pollution	12
50		Noise Pollution	1	0	1	0	0	2				
51	Surface Water, Irrigation & Groundwater	Surface Water	1	1	1	1	1	5	14	8.284	Surface Water, Irrigation & Groundwater	7
52		Irrigation	1	1	1	1	1	5				
53		Groundwater level	1	0	1	1	1	4				
			41	33	39	33	23					
									169	100		
	Percentage of Problem		24.20	19.52	23.07	19.52	13.60					
	Rank/Wards		1	4	2	3	5					

The table highlights that **road-related issues** are the most frequently identified challenge by stakeholders, followed closely by concerns in the **education sector**. Other commonly reported problems, in descending order, include deficiencies in **physical infrastructure, drainage systems, healthcare services, awareness and enforcement of regulations, surface water management, irrigation and groundwater resources**, availability of **recreational facilities, waste management, social infrastructure, electricity supply, pollution**, and access to **drinking water**.

In terms of the most affected areas, **Meherpur Pouroshava** ranks highest in reported issues, followed by **Gangni Pouroshava, Meherpur Sadar, Gangni Sadar, and Mujibnagar**

4. Chapter 5: Issues Prioritization and Planning Intervention
- 5.1 Ranking and Intervention

After categorizing the issues into broad sectors and ranking them by percentage, the problems were weighted and assessed based on the type and timing of the required interventions. They were then prioritized from the most critical to the least critical, as well as from the most affected areas to the least affected ones.



Table 14-12 Problem Ranking and Intervention Matrix

Identified Problems from Stakeholder Consultation & Local Participation	Meherpur Pouroshava					Meherpur Sadar Upz					Gangni Pouroshava					Gangni Sadar Upz					Mujibnagar					Sub-Sectoral Problems-01	Broad Sector Problems-02	Percentage of problems %	Broad category	Rank/ Problems
	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X					
Arsenic Contamination					0	SP & ST	U_r	8.5	10	85					0					0	SP & ST	U_r	8.5	10	85	170	340	7.6	Drinking Water	6
Drinking water supply					0	SP & ST	U_r	8.5	10	85					0					0	SP & ST	U_r	8.5	10	85	170				
Water Logging	SP	U_r	5	10	50	SP	U_r	5	10	50	SP	U_r	5	10	50	SP	U_r	5	10	50					0	200	589	13.2	Drainage	3
Drainage congestion	SP & M	U_r	7.5	10	75	SP & M	U_r	7.5	10	75	SP & M	U_r	7.5	10	75	SP & M	U_r	7.5	10	75					0	300				
Khal Excavation & widening	SP & ST	A_v	8.5	2.5	21.2	SP & ST	A_v	8.5	2.5	21.2					0	SP & ST	A_v	8.5	2.5	21.2					0	63.7				
Connectivity of drains with khals	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5					0	SP & ST	Lt	8.5	1	8.5					0	25.5				
Street lighting	M	U_r	2.5	10	25	M	U_r	2.5	10	25	M	U_r	2.5	10	25	M	U_r	2.5	10	25	M	U_r	2.5	10	25	125	150	3.3	Electricity	11
Loadshedding					0	M	M	2.5	5	12.5					0	M	M	2.5	5	12.5					0	25				
Public Toilet	ST	M	3.5	5	17.5					0	ST	M	3.5	5	17.5					0					0	35	280	6.3	Sanitation & WaSTe	8
Medical & ConSTruction Waste DiSPosal	M	U_r	2.5	10	25	M	U_r	2.5	10	25	M	U_r	2.5	10	25	M	U_r	2.5	10	25	M	U_r	2.5	10	25	125				
Dustbin or Garbage disposal centre	SP & ST	M	8.5	5	42.5					0	SP & ST	M	8.5	5	42.5					0					0	85				
Mosqito Extinction					0					0					0					0					0	0				
Waste dumping Station	ST	M	3.5	5	17.5					0	ST	M	3.5	5	17.5					0					0	35				

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Identified Problems from Stakeholder Consultation & Local Participation	Meherpur Pouroshava					Meherpur Sadar Upz					Gangni Pouroshava					Gangni Sadar Upz					Mujibnagar					Sub-Sectoral Problems-01	Broad Sector Problems-02	Percentage of problems %	Broad category	Rank/ Problems
	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X	Type of Intervention	Time	Intervention	Time Weight	X					
Recreational facility	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5					0	34	110	2.4	Recreation al Facilities	12
Park	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5					0	34				
Playground	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	SP & ST	Lt	8.5	1	8.5	42.5				
Road-Bridge	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5	87.5	635	14.3	Road	2
Potential New Road/ Missing Links	SP	Lt	3.5	1	3.5	ST	Lt	3.5	1	3.5	ST	Lt	3.5	1	3.5	ST	Lt	3.5	1	3.5	ST	Lt	3.5	1	3.5	17.5				
Footpath construction & widening	ST	Lt	3.5	1	3.5	ST	Lt	3.5	1	3.5					0										0	7				
Foot over bridge					0					0	ST	U r	3.5	1	35	ST	U r	3.5	1	35					0	70				
Traffic Speed controller (Speed breaker/ island etc.)	SP & ST	U r	8.5	1	85	SP & ST	U r	8.5	1	85	SP & ST	U r	8.5	1	85	SP & ST	U r	8.5	1	85	SP & ST	U r	8.5	1	85	425				
Car Parking	SP & ST	P h	8.5	0.5	4.25					0	SP & ST	P h	8.5	0.5	4.25					0					0	8.5	250	5.6	Health	9
City Road Bypass	SP	Lt	5	1	5	SP	Lt	5	1	5	SP	Lt	5	1	5	SP	Lt	5	1	5					0	20				
Day care centre	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	62.5				
Health Centre/clinic	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	62.5	302	6.8	Physical InfraSTructure	7
250 Beds Govt. Hospital	M	U r	2.5	1	25	M	U r	2.5	1	25	M	U r	2.5	1	25	M	U r	2.5	1	25	M	U r	2.5	1	25	125				
Ward councilor's Office	ST	M	3.5	5	17.5					0	ST	M	3.5	5	17.5					0					0	35				
Community Centre	SP & ST	M	8.5	5	42.5					0	SP & ST	M	8.5	5	42.5					0					0	85				
River Embankment/Walk Way	ST	A v	3.5	2.5	8.75	ST	A v	3.5	2.5	8.75					0					0					0	17.5	302	6.8	Physical InfraSTructure	7
Police Box/VDP BIT Office	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5	ST	M	3.5	5	17.5					0	70				

Identified Problems from Stakeholder Consultation & Local Participation	Meherpur Pouroshava					Meherpur Sadar Upz					Gangni Pouroshava					Gangni Sadar Upz					Mujibnagar					Sub-Sectoral Problems-01	Broad Sector Problems-02	Percentage of problems %	Broad category	Rank/ Problems
	Type of Intervention	Time	Intervention	Time Weight	X Time Intervention	Type of Intervention	Time	Intervention	Time Weight	X Time Intervention	Type of Intervention	Time	Intervention	Time Weight	X Time Intervention	Type of Intervention	Time	Intervention	Time Weight	X Time Intervention	Type of Intervention	Time	Intervention	Time Weight	X Time Intervention					
Night Shelter	SP	Lt	5	1	5					0	SP	Lt	5	1	5					0					0	10				
Old Age Home	SP	Lt	5	1	5					0	SP	Lt	5	1	5					0					0	10				
Eid gah					0					0					0					0					0	0				
Graveyard/Cremation Ground					0					0					0					0					0	0				
Development/Revitalization of existing Bazar/Haats	SP & M	M	7.5		0	SP & M	M	7.5		0	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5					0	75				
Government primary school construction/ rebuilding	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	62.5	67.5	15.1	Education	1
Government College	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	SP	A v	5	2.5	12.5	62.5				
University	SP & ST	U r	8.5	10	85	SP & ST	U r	8.5	10	85	SP & ST	U r	8.5	10	85	SP & ST	U r	8.5	10	85	SP & ST	U r	8.5	10	85	425				
Youth Development Centre	SP	M	5	5	25	SP	M	5	5	25	SP	M	5	5	25	SP	M	5	5	25	SP	M	5	5	25	125				
Lack/Seeking of Job Opportunity	M	U r	2.5	10	25	M	U r	2.5	10	25	M	U r	2.5	10	25	M	U r	2.5	10	25	M	U r	2.5	10	25	125	160	3.6	Social Upliftment & Inclusion	10
Poor Rehabilitation (Ethnic Population)					0					0	M	M	2.5	5	12.5	M	M	2.5	5	12.5					0	25				
Temple/ Church					0					0	SP	Lt	5	1	5	SP	Lt	5	1	5					0	10				
Unplanned Residential Development	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	187.5	362	8.1	Rules/ Awarnes	5
Grazing (Cow)	M	M	2.5	5	12.5	M	M	2.5	5	12.5					0	M	M	2.5	5	12.5	M	M	2.5	5	12.5	50				
Public awareness (Drug/EQ/Building Code etc.)	M	U r	2.5	10	25	M	U r	2.5	10	25	M	U r	2.5	10	25	M	U r	2.5	10	25	M	U r	2.5	10	25	125				
Air Pollution	M	M	2.5	5	12.5					0	M	M	2.5	5	12.5					0					0	25	62	1.4	Pollution	13
Noise Pollution	M	M	2.5	5	12.5					0	M	M	5	5	25					0					0	37.5				
Surface Water	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	187.5	52.5	11.8	Surface Water, Irrigation &	4
Irrigation	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	187.5				

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Identified Problems from Stakeholder Consultation & Local Participation	Meherpur Pouroshava					Meherpur Sadar Upz					Gangni Pouroshava					Gangni Sadar Upz					Mujibnagar					Sub-Sectoral Problems-01	Broad Sector Problems-02	Percentage of problems %	Broad category		Rank/ Problems	
	Type of Intervention	Time	Intervention	Time Weight	Time Intervention X	Type of Intervention	Time	Intervention	Time Weight	Time Intervention X	Type of Intervention	Time	Intervention	Time Weight	Time Intervention X	Type of Intervention	Time	Intervention	Time Weight	Time Intervention X	Type of Intervention	Time	Intervention	Time Weight	Time Intervention X				Groundwater			
Groundwater level	SP & M	M	7.5	5	37.5					0	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	SP & M	M	7.5	5	37.5	150			Groundwater			
					945.25					913.5					993.25					858.75					732		444	100				
Percentage of Problem by places					21.276					20.5616					22.357					19.32924					16.4763							
Rank					2					3					1					4					5							

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Based on the table, it is **evident** that the **most critical issue** in Meherpur District, according to the **weightage of time** and **type of intervention**, is '**Education**', followed by '**Roads**' and the '**Drainage System**'. The subsequent issues, in **descending order of severity**, are '**Surface Water, Irrigation, and Groundwater**', '**Rules/Awareness**', '**Drinking Water**', '**Physical Infrastructure**', '**Sanitation & Waste**', '**Health**', '**Social Upliftment & Inclusion**', '**Electricity**', '**Recreational Facilities**', and '**Pollution**'.

In terms of **areas**, **Gangni Pouroshava** faces the **highest concentration** of problems according to the weightage, followed by **Meherpur Pouroshava**, **Meherpur Sadar**, **Gangni Sadar**, and **Mujibnagar**, respectively.

## 14.5 Conclusion

In conclusion, the **development plan** for **Meherpur District** represents a comprehensive and strategic approach aimed at addressing the district's most pressing challenges through a combination of **stakeholder engagement**, **local community participation**, and a thorough analysis of socio-economic conditions. This plan, crafted under the guidance of the **Urban Development Directorate (UDD)**, prioritizes a range of sectors critical to the district's overall growth and sustainability. Through comprehensive stakeholder consultations, the most critical issues have been identified and ranked to ensure that resources and efforts are focused on areas of **greatest need and urgency**.

The prioritization reveals that **Education**, **Roads**, and the **Drainage System** are the most urgent areas requiring immediate intervention. The **surface water and irrigation systems**, alongside the need for improved **awareness and regulatory enforcement**, follow closely in importance. These sectors are fundamental to the district's infrastructure, economic productivity, and overall public health. By addressing these areas, the plan seeks to rectify the long-standing deficiencies in **physical infrastructure** and improve basic services like **drinking water**, **sanitation**, and **waste management**, which are essential for sustainable development.

Moreover, the district's **geographical diversity** has been carefully considered, with **Gangni Pouroshava** identified as the area facing the highest concentration of problems, followed by **Meherpur Pouroshava**, **Meherpur Sadar**, **Gangni Sadar**, and **Mujibnagar**. This spatial analysis ensures that the interventions will be equitable and targeted, allowing for tailored solutions that cater to the specific needs of the different regions within Meherpur.

The development plan also emphasizes the importance of fostering **social upliftment and inclusion**, highlighting the necessity of improving **recreational facilities**, **health services**, and **electricity access**. These social dimensions are integral to enhancing the overall quality of life for residents and ensuring that urbanization does not come at the cost of social equity or environmental sustainability.

In conclusion, this development plan serves as a roadmap for **sustainable growth** and **resilient infrastructure** in Meherpur District. By focusing on critical sectors, aligning interventions with urgency and geographic need, and incorporating local insights, it aims to build a more **livable, equitable, and prosperous future** for the district's residents. The implementation of this plan will be pivotal in achieving the long-term vision of **inclusive development** and fulfilling the government's goals under the **Bangladesh Delta Plan 21**



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## **CHAPTER 15: HISTORICAL IMPORTANCE, ARCHAEOLOGY AND TOURISM**

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### **15.1 Archaeological Heritage and Relics**

Gosaidubi Mosque at Karamdi, Dargahs of Sheik Farid and Shah Enayet, Mazars of Barkat Bibi and Bagudewan, Ballavpur Mission, Teragharia Marrut, Shiva Mandir at Ballavpur, Alampur Mandir, Bhabanipur Mandir, Neelkuthis at Aamjhupi, Bhatpara and Saharbati.

### **15.2 Tourist Spots**

Amjhupi Nilkuthi is a renowned tourist destination in Meherpur Sadar Upazila, attracting visitors from across the country. Originally functioning as a Nilkuthi, or indigo plantation house, it later transformed into the administrative office of the East India Company. It was established in the 1800s, adding to its historical significance. Tourists visit this archaeological site to explore its rich heritage, offering a glimpse into the region's colonial past.



*Figure 15-1: Amjhupi Nilkuthi, Meherpur Sadar Upazila*

Source: Field Survey, 2024

Gangni Upazila does not have many tourist attractions; however, one notable site is the Tepukhali Boddhovumi. This site holds significance for tourists who visit to pay their respects to the martyrs of the liberation war. While tourism in the area may be limited, the presence of Tepukhali Boddhovumi offers visitors an opportunity to connect with the historical and cultural heritage associated with the liberation war.

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Mujibnagar has several significant tourist spots, including the Mujibnagar Liberation War Memorial Complex and Amrakanan. The Mujibnagar Liberation War Memorial Complex holds historical importance, commemorating the birth of Bangladesh as an independent nation. Visitors often come to pay homage to the martyrs and learn about the pivotal moments of the liberation war. Additionally, Amrakanan offers natural beauty, attracting tourists with its lush greenery and serene ambiance, providing a tranquil retreat for nature lovers and outdoor enthusiasts visiting Mujibnagar. These tourist spots contribute to the cultural and historical richness of the region, making Mujibnagar a noteworthy destination for travelers interested in exploring Bangladesh's heritage.



*Figure 15-2: Mujibnagar Liberation War Memorial Complex*

Source: Field Survey, 2024

### 15.3 Historical Significance

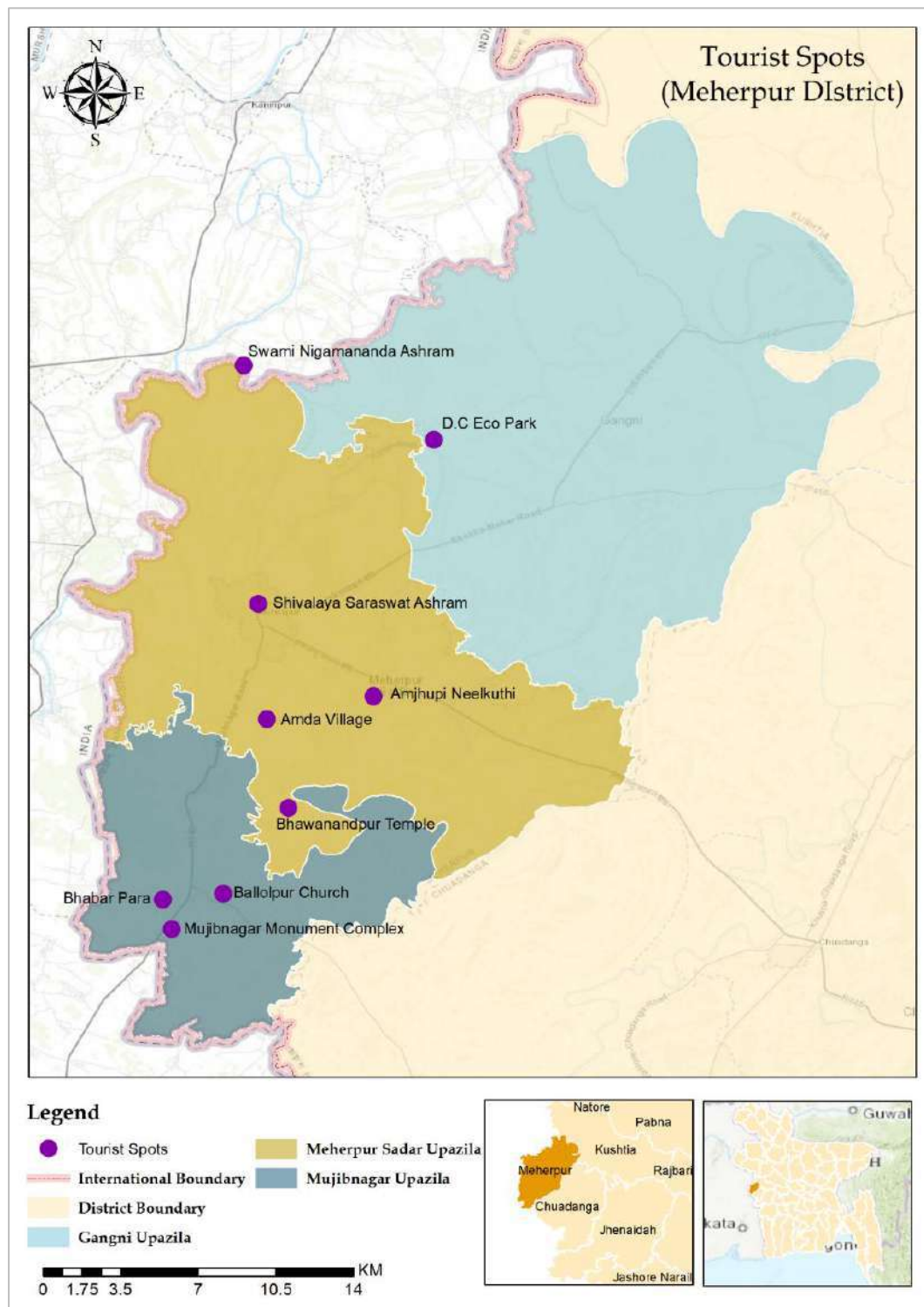
Meherpur is known as the first capital of Bangladesh as because the first temporary Government of Bangladesh was formed at Mujibnagar, Meherpur on 17 April 1971. The first cabinet of Bangladesh was formed and took their oath at historical "Ambagan" of Boddonathtala (Now Mujibnagar). Some of the **remarkable places of Meherpur District** are mentioned below:

- Mujibnagar Remembrance Complex
- Bhawanandpur Temple
- Amda Architecture of Amda Village
- Balaram Hari Temple
- Amzapi Nilkuthi



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- Nilkuthi of Bhatpara, Saharbat
- Swami Nigamananda Ashram
- The Ballolpur Church, Bhabar Para etc.



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## **CHAPTER 16: OTHER RELEVANT ATTRIBUTE AND SPATIAL DATA**

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### **16.1 Introduction**

#### **16.1.1 Background:**

The development of a comprehensive spatial planning framework for Meherpur Zilla necessitates the integration of a broad spectrum of spatial and attribute data beyond the conventional thematic categories. Working Paper 14 addresses this requirement by focusing on additional datasets that, while not categorized under core themes such as topography, land use, or infrastructure, are nonetheless critical for supporting spatial analysis, planning interpretation, and strategy formulation.

These supplementary datasets encompass a diverse range of features, including but not limited to public and institutional spaces, informal economic nodes, open lands, utilities, and other context-specific attributes that contribute to the spatial structure and functionality of the area. The inclusion of these elements enhances the planning process by enabling a more granular understanding of spatial relationships, land utilization patterns, and socio-economic dynamics. The relevance of this working paper lies in its role as a connective analytical layer—bridging insights from multiple sectors and feeding into key components of the planning process, such as land suitability analysis, infrastructure prioritization, zoning recommendations, and policy development. The spatial distribution, typology, and locational attributes of these features are essential for ensuring the plan responds effectively to both current conditions and projected needs.

Data utilized in this working paper are derived primarily from geospatial surveys, supported by secondary sources and institutional records where relevant. The compilation and structured analysis of these datasets contribute to the robustness of the spatial database and strengthen the overall evidence base for the planning package.

This working paper serves to consolidate and interpret additional attribute and spatial data that are vital for a holistic and contextually grounded development plan, aligning with the broader objectives and methodological framework of the project.

#### **16.1.2 Objectives:**

The primary objective of this working paper is to identify, compile, and analyze relevant spatial and attribute data that complement the core thematic areas of the development planning process for Meherpur Zilla. These datasets are essential for enhancing the depth and accuracy of spatial analysis, enabling a more integrated and context-responsive planning approach.

Specifically, the objectives of this working paper are to:

1. **Compile supplementary spatial and attribute datasets** that fall outside major thematic categories but are critical to understanding the spatial dynamics of the planning area.
2. **Support cross-sectoral integration** by aligning additional datasets with those from physical features, land use, infrastructure, and socio-economic components to enable comprehensive spatial analysis.

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### **16.1.3 Rationale:**

A well-informed development planning process requires not only thematic depth but also spatial completeness. While core components such as topography, land use, and infrastructure form the foundation of spatial analysis, there exists a category of supplementary spatial and attribute data that—although not classified under primary themes—play a pivotal role in shaping the built and social environment. Recognizing and incorporating these additional data layers is essential for ensuring that the spatial plan for Meherpur Zilla is comprehensive, inclusive, and grounded in local realities.

These "other relevant" datasets include features such as informal trade locations, community facilities, open and unused lands, secondary utility structures, and various socio-spatial assets that influence land value, access, mobility, and urban character. Their integration allows planners to better understand the nuanced functioning of space and to design interventions that are sensitive to both formal and informal systems.

Moreover, these datasets serve as critical inputs for advanced planning tools such as land suitability analysis, spatial accessibility assessments, and zoning strategies. Without their inclusion, the risk of overlooking localized dynamics increases, potentially resulting in spatial mismatches or inequities in service delivery.

The rationale for this working paper, therefore, lies in its function as a unifying and enhancing component—bringing together spatial attributes that might otherwise remain fragmented and ensuring their alignment with broader planning objectives. It addresses the complexity of spatial interactions within Meherpur Zilla and reinforces the evidence base required to formulate responsive, resilient, and equitable development policies.



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## 16.2 Urban Area

### 16.2.1 Meherpur Paurashava

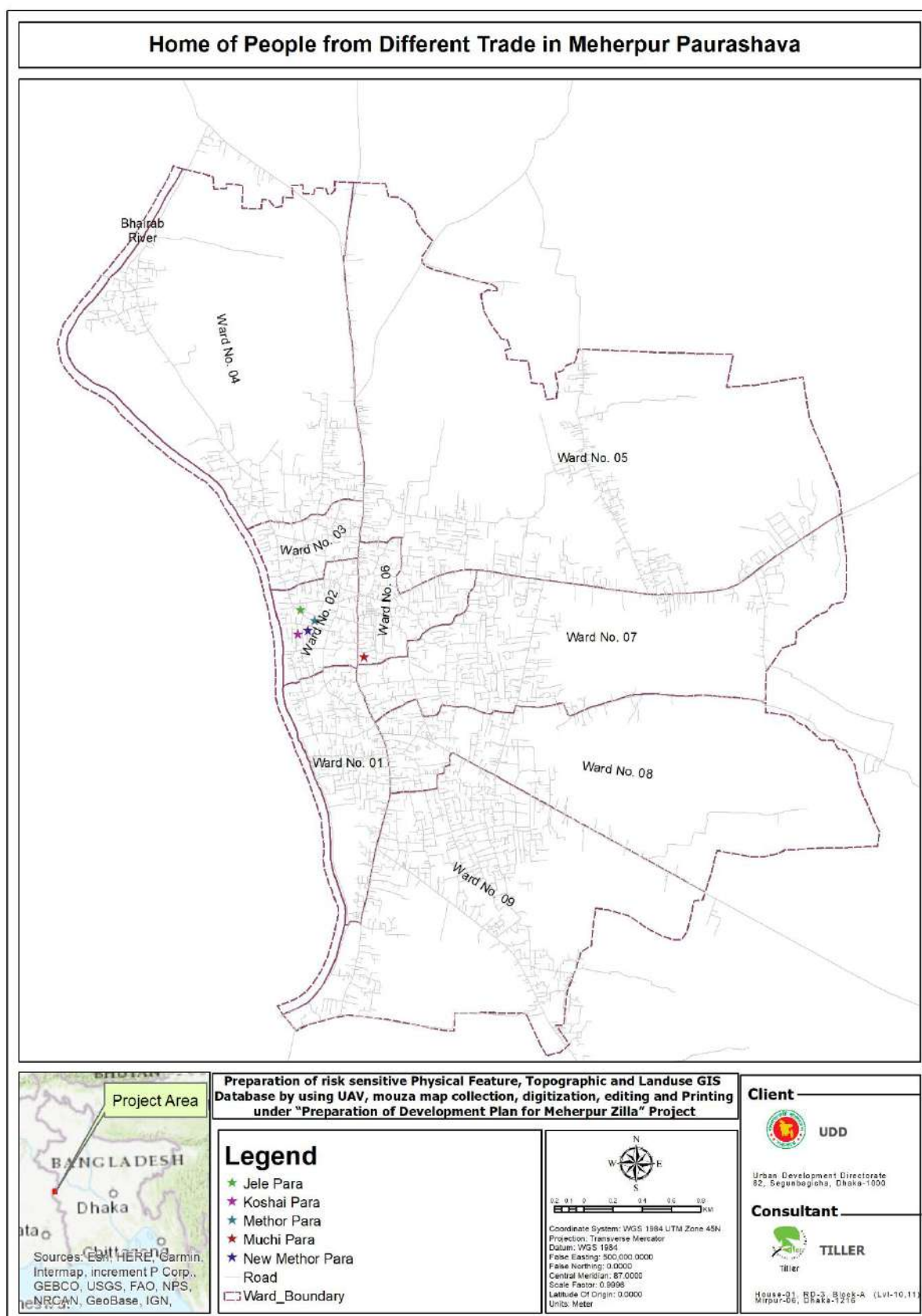
#### 16.2.1.1 Home of People from Different Trades:

The spatial arrangement of occupational communities within Meherpur Paurashava highlights distinct clusters of trade-based settlements, reflecting long-standing socio-economic patterns and cultural identities. Specific neighborhoods such as Muchi Para, Jele Para, Koshai Para, Methor Para, and New Methor Para are home to communities traditionally engaged in trades like leatherwork, fishing, butchery, and sanitation services. A notable concentration of these settlements is found in Ward No. 02, which accommodates four out of the five identified paras. This spatial clustering suggests a pattern of socio-economic segregation, where historically marginalized or lower-income occupational groups reside in concentrated areas of the town. From a planning perspective, this spatial pattern carries important implications. It underscores the need for inclusive and equitable development strategies that address the specific needs of these communities, including improved housing, access to services, and infrastructure upgrades. Additionally, these neighborhoods often carry unique cultural and structural features tied to the trades practiced, which should be acknowledged and preserved through sensitive planning approaches. The integration of this attribute information with spatial data from the ongoing Physical Feature Survey is critical in ensuring that development proposals are both contextually grounded and socially responsive.

Table 16-1: list of Different Trade Settlements in Meherpur Paurashava

Name of the Settlement	Location
Muchi Para	Ward No. 06
Jele Para	Ward No. 02
Koshai Para	Ward No. 02
Methor Para	Ward No. 02
New Methor Para	Ward No. 02

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Map 16-1: Different Trade Settlements in Meherpur Paurashava

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#### 16.2.1.2 Growth Center:

The spatial distribution of growth centers and rural markets around Meherpur Paurashava reveals critical nodes of economic and social activity that influence both intra-urban and peri-urban development. Within the Paurashava itself, two notable growth centers are located: Meherpur Cattle Market in Ward No. 09 and Meherpur Katcha Bazaar in Ward No. 06. These function as central trading hubs for agricultural goods, livestock, and daily commodities, serving not only local residents but also attracting traders and buyers from surrounding rural areas. Their location in densely populated wards further strengthens their role as urban anchors in the economic network.

In close proximity to the Paurashava boundary, several rural markets—Bamanpara Hat, Rajapur Hat, Uzalelpur Hat, Shubidpur Hat, Beltala Hat, Modundanga Hat, and Khoksha Hat—are situated within nearby unions such as Buripota, Amada, Kutubpur, and Amjhupi. Despite being administratively outside the municipal boundary, these markets are functionally connected to Meherpur Paurashava, influencing daily commuting patterns, informal trade flows, and cross-jurisdictional socio-economic interactions. Their proximity indicates a strong rural-urban linkage and highlights the need to consider these peripheral economic spaces in planning decisions.

These growth centers and hats not only support local commerce but also shape settlement patterns, transport demand, and public space usage. Recognizing their spatial influence is critical for infrastructure planning, land use zoning, and economic integration. Incorporating these nodes into the urban planning framework, supported by data from the Physical Feature Survey, can ensure that future development strategies reinforce the organic economic structure while addressing service gaps and spatial connectivity.

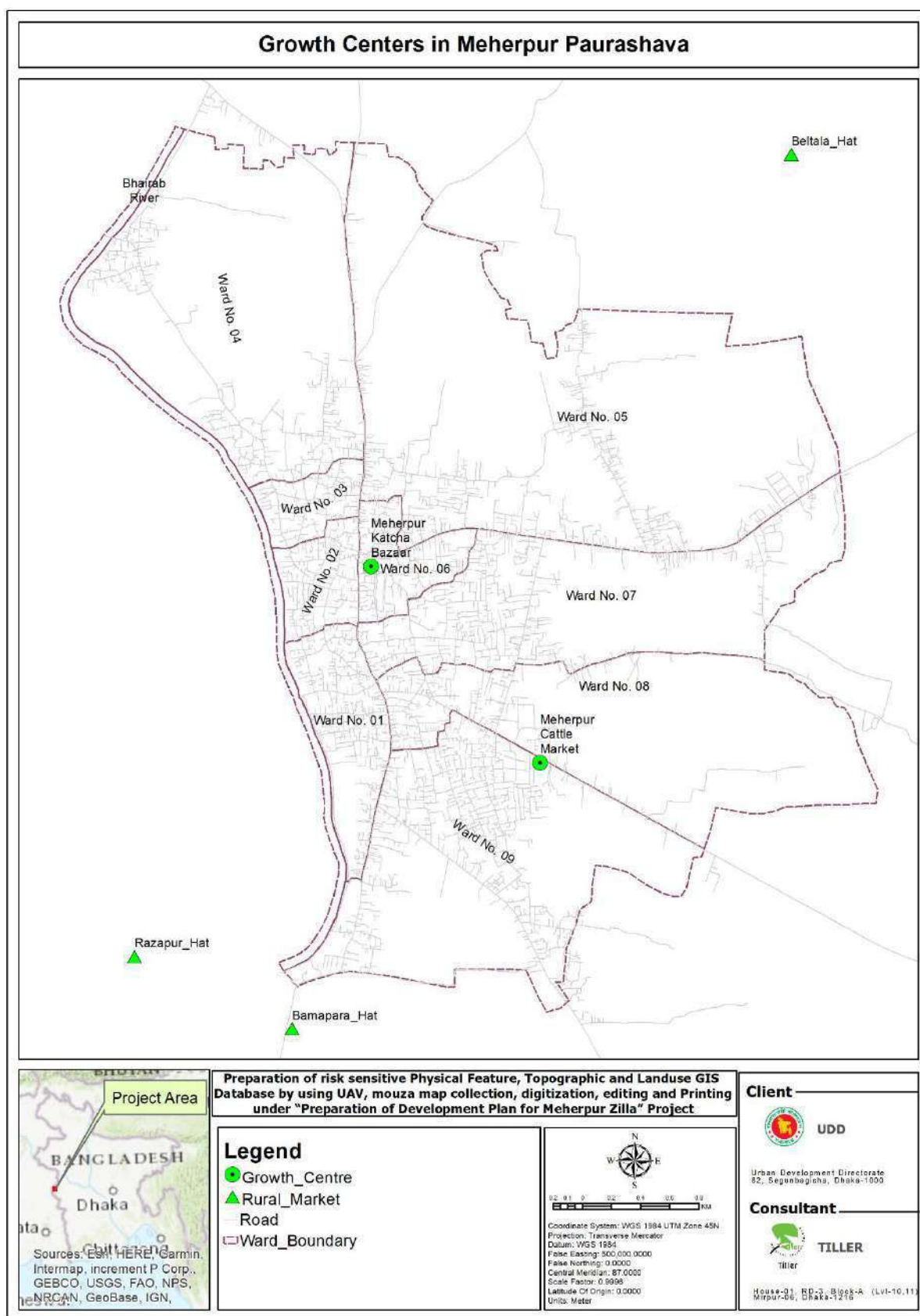
Table 16-2: List of Growth Center Locations in Meherpur Paurashava

Growth Center Name	Type	Location
Meherpur Cattle Market	Growth Centre	Ward No. 09
Meherpur Katcha Bazaar	Growth Centre	Ward No. 06
Bamanpara Hat	Rural Market	In Buripota Union but in a close proximity to Meherpur Paurashava
Rajapur Hat	Rural Market	In Amada Union but in a close proximity to Meherpur Paurashava
Uzalelpur_Hat	Rural Market	In Kutubpur Union but in a close proximity to Meherpur Paurashava
Shubidpur_Hat	Rural Market	In Kutubpur Union but in a close proximity to Meherpur Paurashava
Beltala_Hat	Rural Market	In Amjhupi Union but in a close proximity to Meherpur Paurashava
Modundanga_Hat	Rural Market	In Amjhupi Union but in a close proximity to Meherpur Paurashava

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Khoksha_Hat	Rural Market	In Amjhupi Union but in a close proximity to Meherpur Paurashava
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Map 16-2: Growth Center Locations in Meherpur Paurashava



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### **16.2.1.3 Government Establishments:**

The spatial distribution of government establishments in Meherpur Paurashava demonstrates a strong institutional presence across multiple wards, with a total of 66 identified entities comprising 60 government offices, 2 government residences, and 4 government rest houses. These facilities are critical in shaping the town’s administrative structure, public service delivery, and urban character.

Ward No. 01 and Ward No. 08 emerge as the most institutionally dense areas, each hosting 18 and 16 government establishments respectively. These include major administrative hubs such as the Deputy Commissioner’s Office, District & Session Judges Court, District Election Office, District Relief Warehouse, and the District Server Station in Ward No. 01, and a cluster of sectoral offices—Fisheries, Women Affairs, Food Controller, Passport, and Seed Certification—in Ward No. 08. Other wards with notable concentrations include Ward No. 09 with 16 establishments and Ward No. 06 with 4 offices and a rest house, including the Municipal Complex and the District Education Office.

This spread of institutions underpins the centralized nature of public administration and service provision in Meherpur, with key facilities concentrated in a few wards. The presence of rest houses and residences, though limited, further indicates planning for government staff support and logistics.

From a spatial planning perspective, the concentration of such a wide array of services in select wards underscores the importance of supporting transport accessibility, civic infrastructure, and public amenities in these zones. Equally, wards with limited institutional presence could be assessed for strategic facility placement to promote administrative equity. Mapping these establishments alongside land use and road networks from the Physical Feature Survey is essential for identifying service gaps, improving public access, and planning future expansion of civic facilities in an orderly, demand-responsive manner.

Table 16-3: List of Government Establishments in Meherpur Paurashava

Location	Government Office	Government Residence	Government Rest House	Grand Total
Ward No. 01	15	1	2	18
Ward No. 02	2			2
Ward No. 03	1			1
Ward No. 05	4			4
Ward No. 06	4			4
Ward No. 07	5			5
Ward No. 08	15	1		16
Ward No. 09	14		2	16
Grand Total	60	2	4	66

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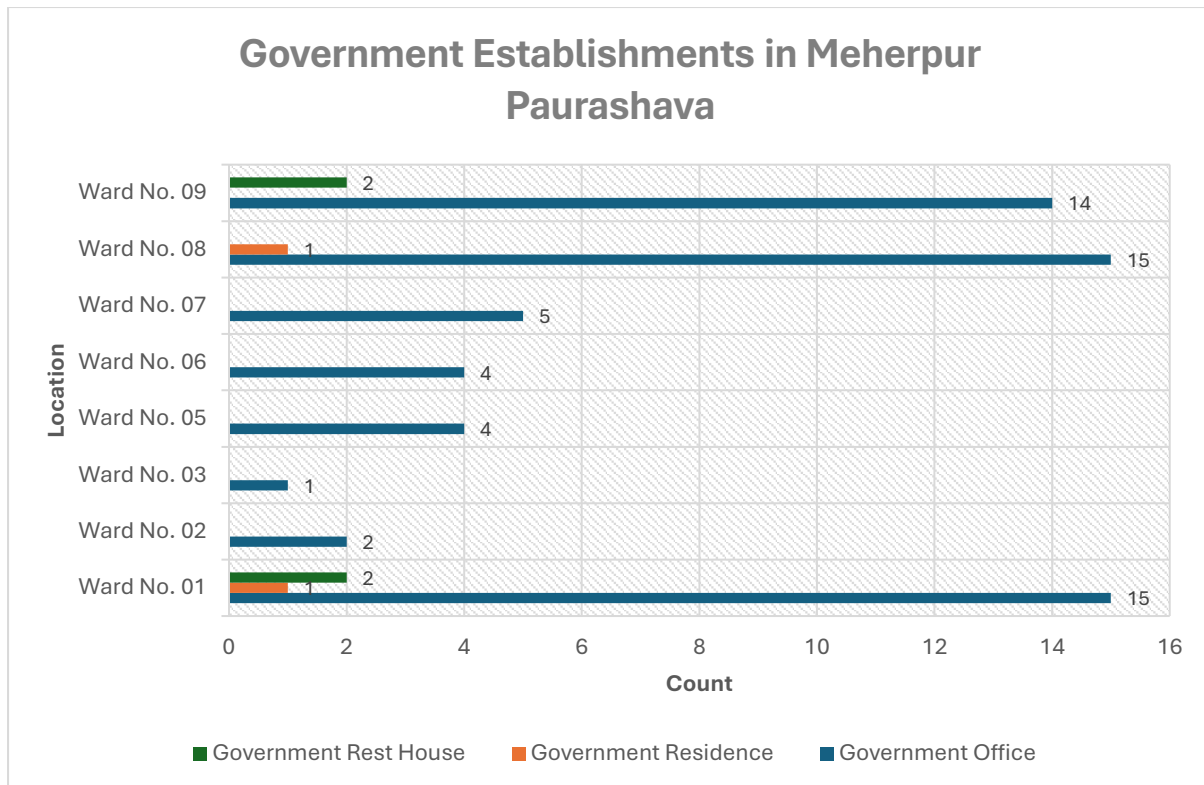
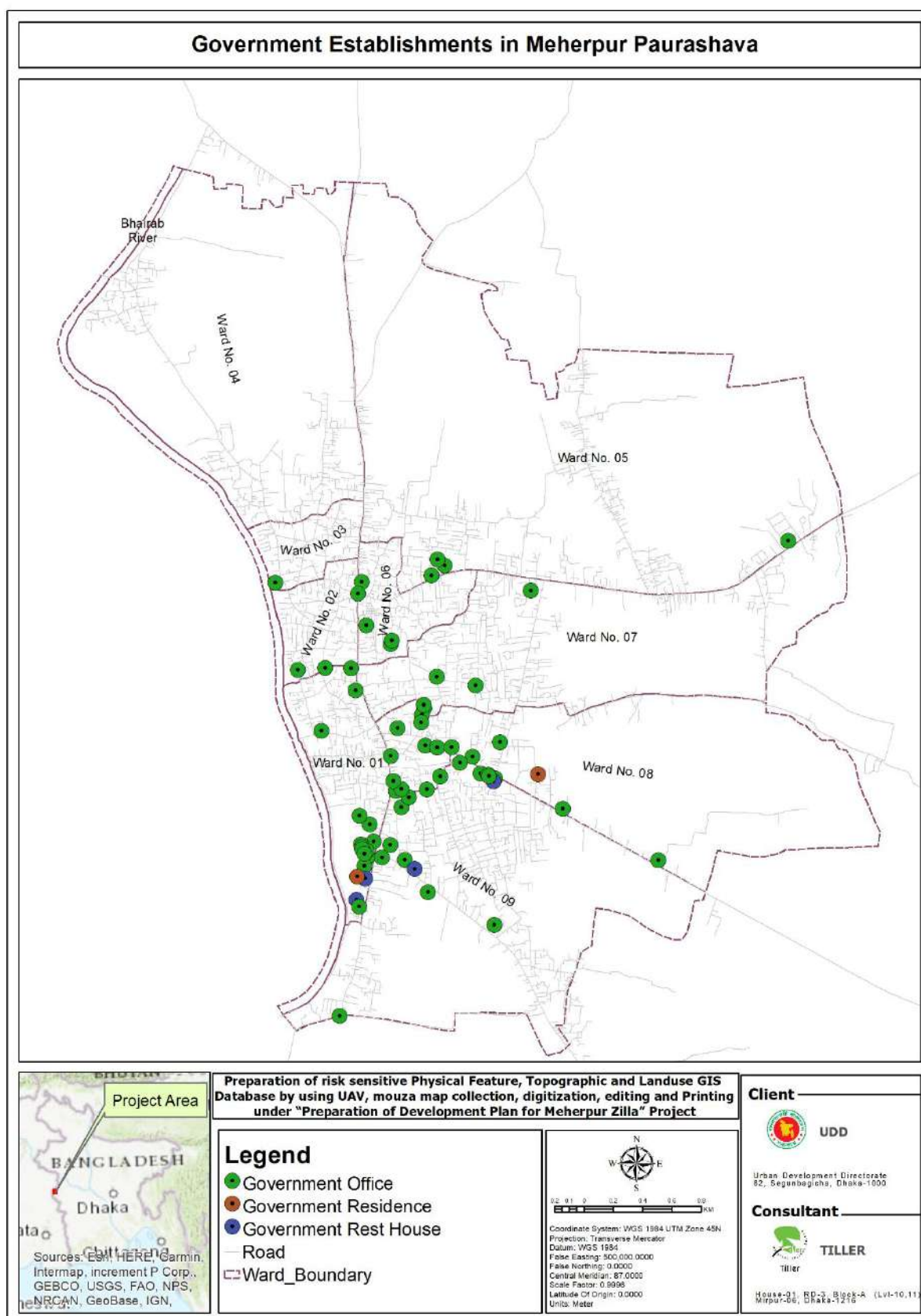


Figure 16-1: List of Government Establishments in Meherpur Paurashava

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Map 16-3: Government Establishments in Meherpur Paurashava

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#### **16.2.1.4 Educational Institutions:**

The educational infrastructure of Meherpur Paurashava reflects a relatively balanced distribution of institutions across the municipality, with a total of 33 institutions covering various levels and types of education. These include 10 colleges, 8 government primary schools, 4 high schools, 2 kindergartens, 6 madrashas, 2 private primary schools, and 1 university, showcasing a diverse academic ecosystem.

Wards 05, 07, and 08 exhibit the highest concentration of educational facilities, with 6, 5, and 6 institutions respectively. Notably, Ward No. 07 stands out as a higher education hub, hosting several colleges and specialized training institutes including the Genius Laboratory School and College, Meherpur Nursing Training Institute, and Institute of Medical Technology. Ward No. 08 is similarly prominent with both general and technical education institutions, such as Meherpur Government College, Meherpur Government Technical School and College, and a number of madrashas and high schools.

Primary education is fairly well spread, with government primary schools located in seven of the nine wards, ensuring basic educational access. The presence of Bangladesh Open University in Ward No. 09 adds a significant dimension of flexible, distance-based tertiary education to the town’s academic offering, further diversifying learning pathways for the population.

Madrashas, kindergartens, and private institutions supplement the mainstream education system, particularly in Wards 01, 02, 04, 05, and 08, indicating both cultural diversity and community-level educational initiatives. The range of institutions from early childhood to tertiary and technical education demonstrates a vertically integrated system, although the spatial clustering in a few wards suggests potential service gaps in others.

Incorporating these institutional locations into spatial planning is essential for assessing catchment areas, accessibility, and service delivery equity. Linking this data with the Physical Feature Survey will help identify underserved areas, inform road and transport planning around school zones, and support land use zoning for future educational expansion. Ensuring educational infrastructure aligns with population density and growth trends will be critical for inclusive urban development in Meherpur Paurashava.

Table 16-4: List of Educational Instructions in Meherpur Paurashava

Location	College	Government Primary School	High School	Kindergarten	Madrasha	Primary School	University	Grand Total
Ward No. 01				1	1	1		3
Ward No. 02		1	1	1				3
Ward No. 03					1			1
Ward No. 04	1	1			1			3
Ward No. 05	2	1	1		1	1		6
Ward No. 06	1	2						3
Ward No. 07	4		1					5
Ward No. 08	2	1	1		2			6

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Ward No. 09		2					1	3
Grand Total	10	8	4	2	6	2	1	33

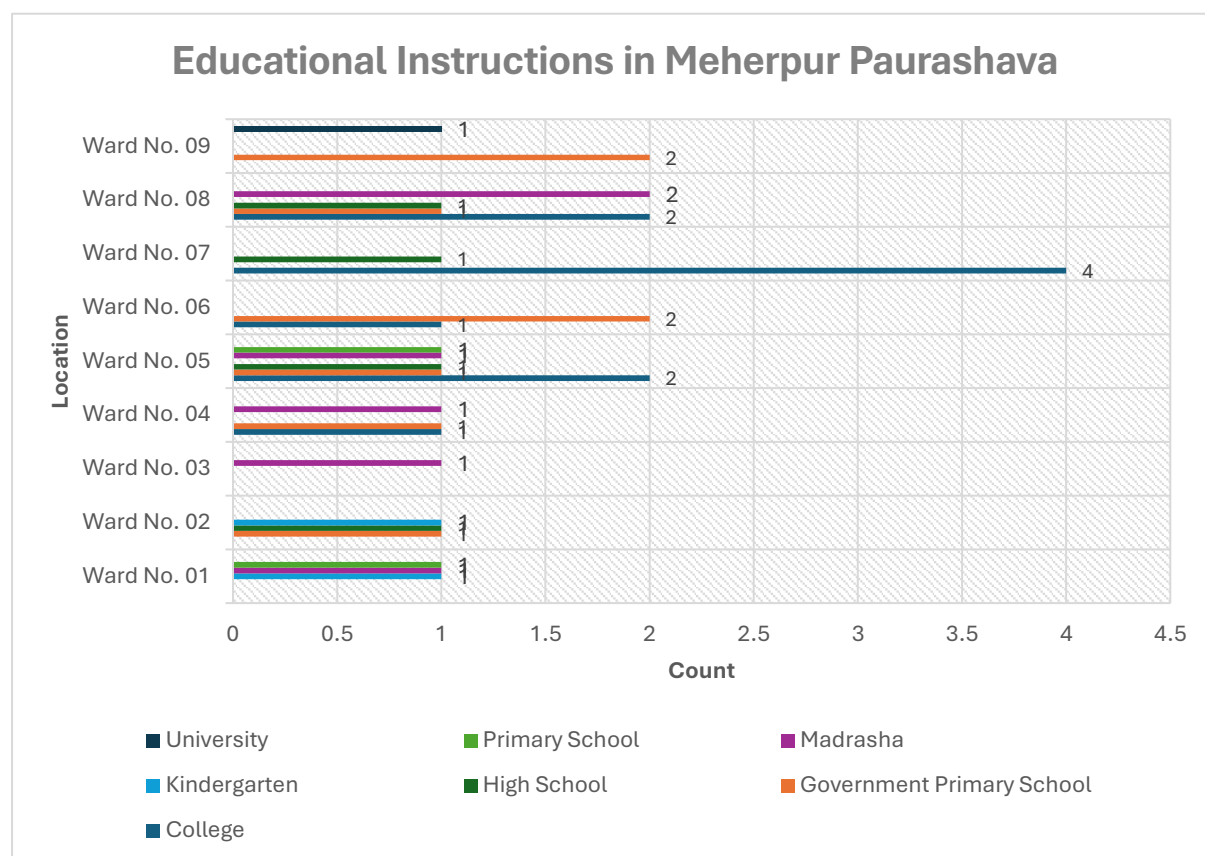
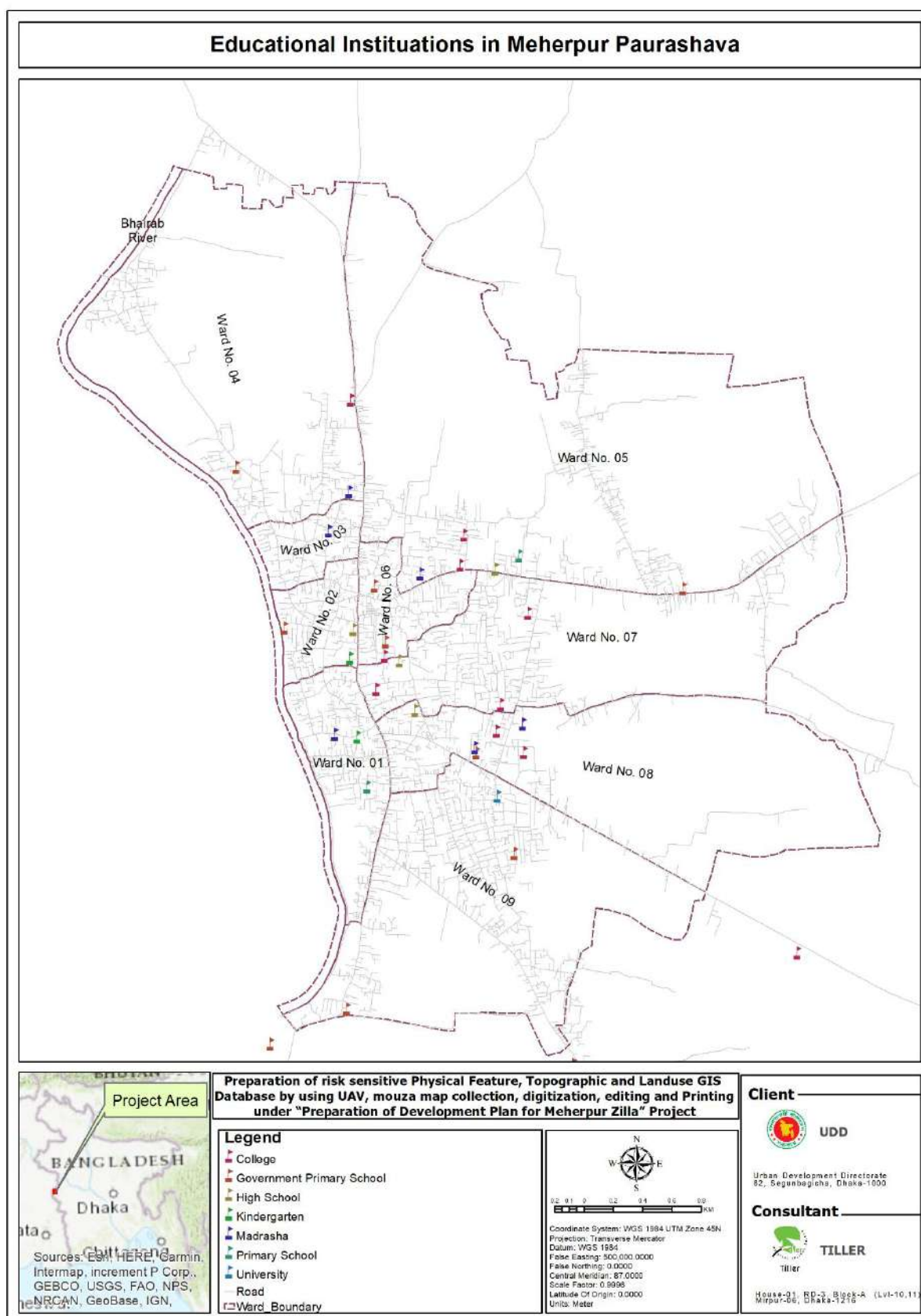


Figure 16-2: List of Educational Instructions in Meherpur Paurashava



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Map 16-4: Educational Institutions in Meherpur Paurashava

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#### 16.2.1.5 Health Facilities:

The health facilities data for Meherpur Paurashava highlights the spatial distribution and types of healthcare services available across various wards within the urban area. A total of six health facilities are identified, comprising two Family Welfare Centres and four hospitals, spread over five wards. Notably, Ward No. 07 hosts the highest concentration of health services, including two hospitals, one of which is the Meherpur 250 Bed District Hospital, marking it as a key healthcare hub. Family Welfare Centres are located in Wards No. 01 and 05, providing primary healthcare at the community level. Other hospitals are situated in Wards No. 02 and 03. This uneven distribution indicates a concentration of health resources in certain wards, particularly Ward No. 07, which likely influences residents’ access to healthcare and travel patterns within the urban area. The spatial arrangement of these facilities is critical for planning equitable healthcare provision and highlights the need to address potential gaps in underserved wards. This dataset therefore serves as a valuable attribute layer for spatial planning efforts aimed at improving healthcare accessibility and aligning infrastructure development with community needs.

Table 16-5: List of Health Facilities in Meherpur Paurashava

Location	Family Welfare Centre	Hospital	Grand Total
Ward No. 01	1		1
Ward No. 02		1	1
Ward No. 03		1	1
Ward No. 05	1		1
Ward No. 07		2	2
Grand Total	2	4	6

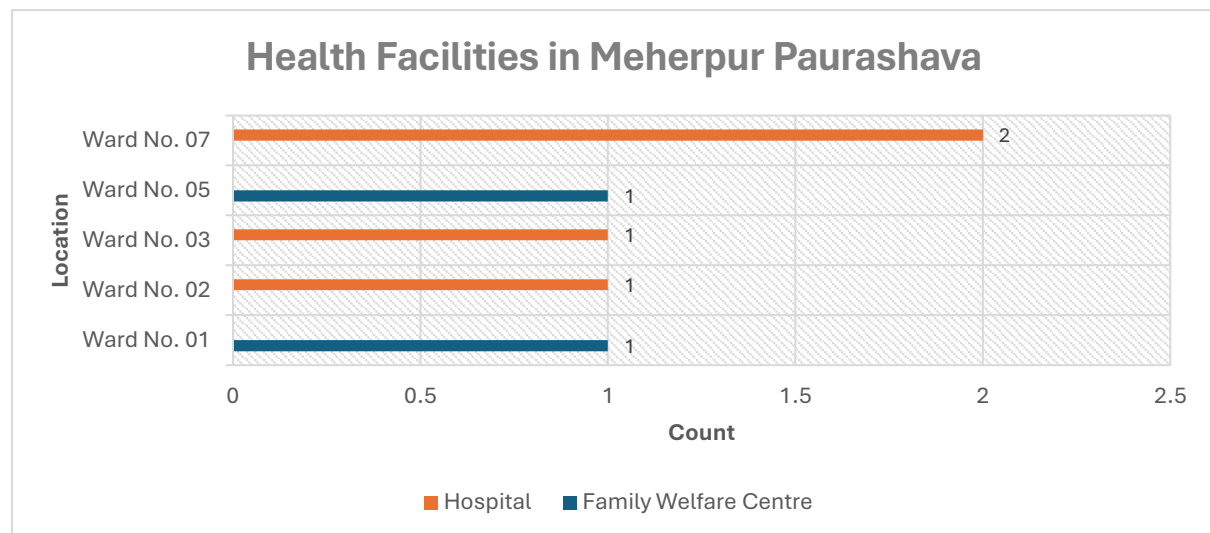
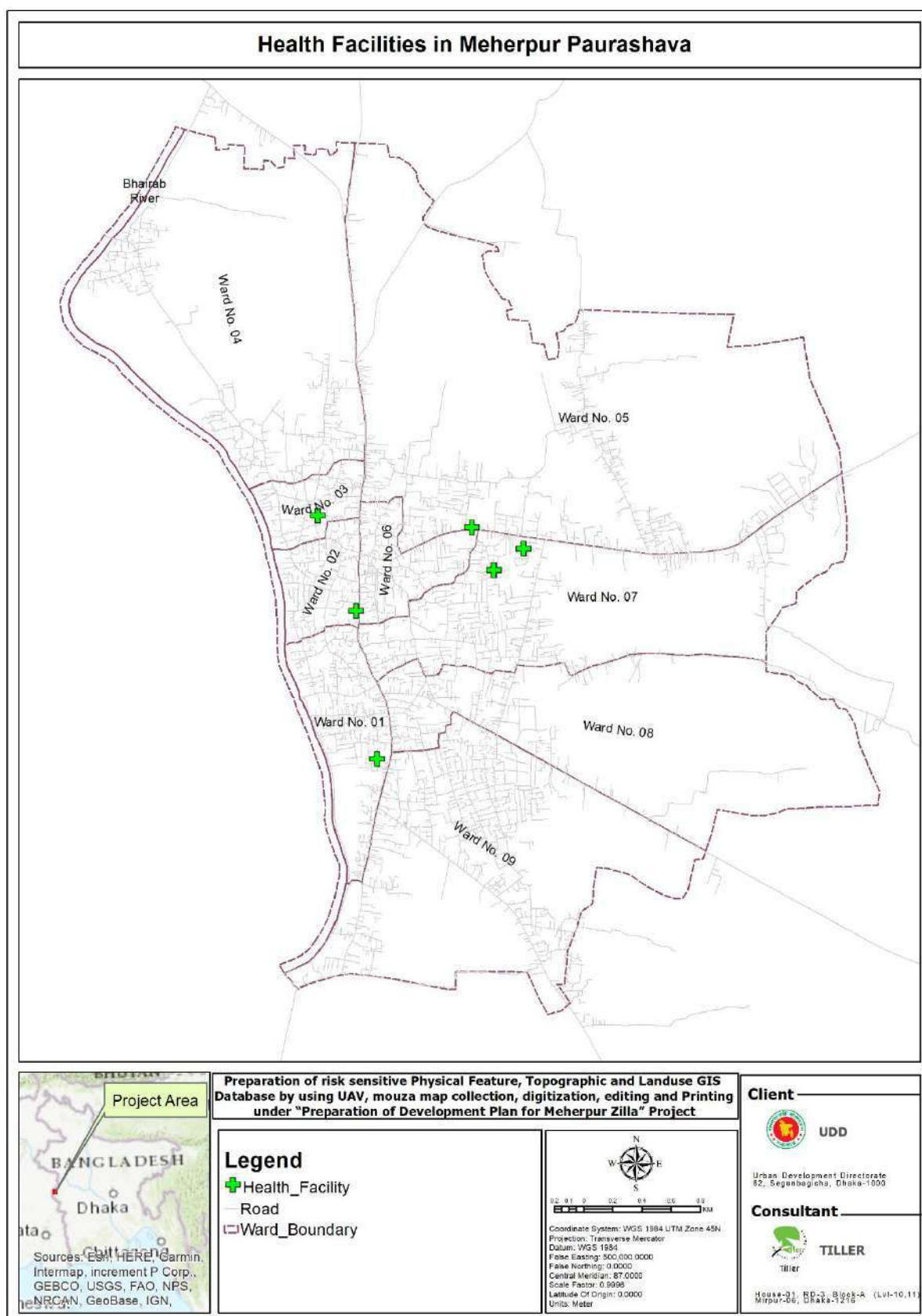


Figure 16-3: List of Health Facilities in Meherpur Paurashava

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Map 16-5: Health Facilities in Meherpur Paurashava

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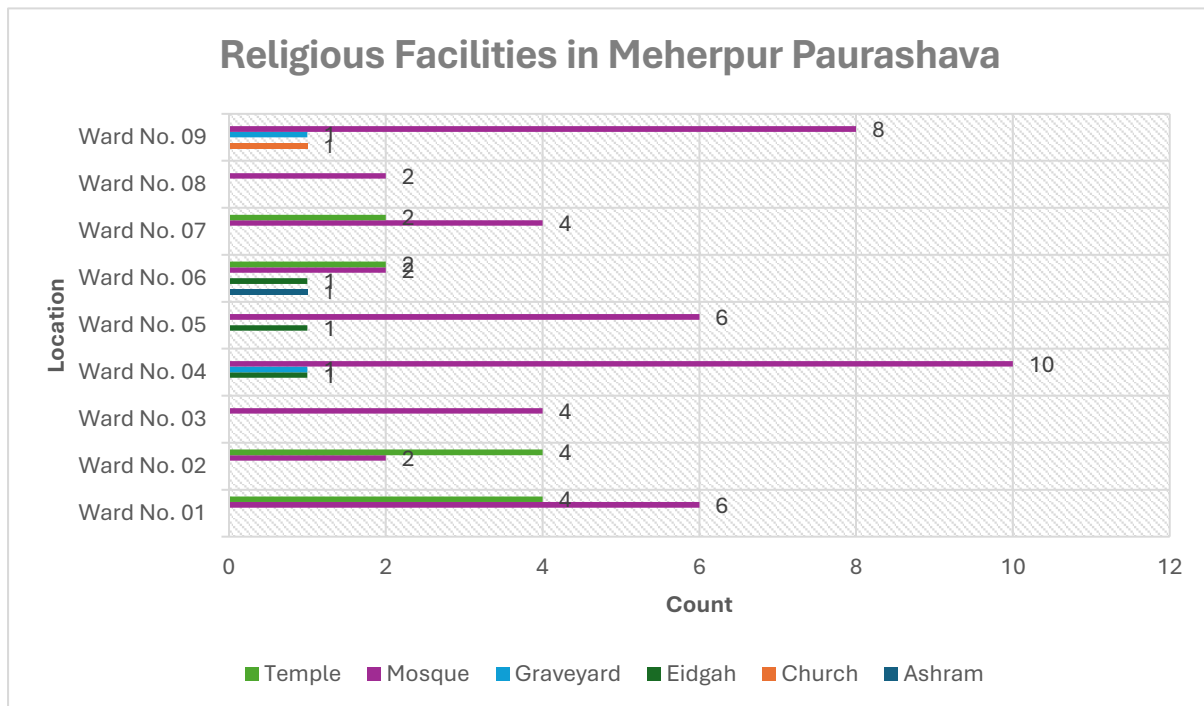
#### **16.2.1.6 Religious Centers:**

The spatial distribution of religious facilities in Meherpur Paurashava demonstrates a diverse and well-established network of places of worship across the urban wards. A total of 63 religious facilities are recorded, comprising mosques, temples, eidgahs, churches, ashrams, and graveyards. Mosques form the majority with 44 facilities, followed by temples with 12. Other religious sites include three eidgahs, two graveyards, one church, and one ashram. The distribution varies across wards, with Ward No. 01 having the highest number of religious facilities (10 mosques and 4 temples), followed by Ward No. 04, which hosts a mix of religious sites including one eidgah, one graveyard, and 10 mosques. Wards 02, 03, 05, and 07 also contain significant numbers of mosques and temples, while smaller numbers of churches, eidgahs, and other facilities are scattered in select wards such as Wards 04, 05, 06, and 09. This spatial pattern reflects the religious diversity and community infrastructure of the area. The presence and distribution of these facilities are crucial for urban planners to consider, as they influence social cohesion, cultural identity, and the accessibility of religious services across the urban landscape. This attribute dataset adds an important cultural dimension to spatial planning and land-use considerations within Meherpur Paurashava.

*Table 16-6: List of Religious Facilities in Meherpur Paurashava*

Location	Ashram	Church	Eidgah	Graveyard	Mosque	Temple	Grand Total
Ward No. 01					6	4	10
Ward No. 02					2	4	6
Ward No. 03					4		4
Ward No. 04			1	1	10		12
Ward No. 05			1		6		7
Ward No. 06	1		1		2	2	6
Ward No. 07					4	2	6
Ward No. 08					2		2
Ward No. 09		1		1	8		10
Grand Total	1	1	3	2	44	12	63

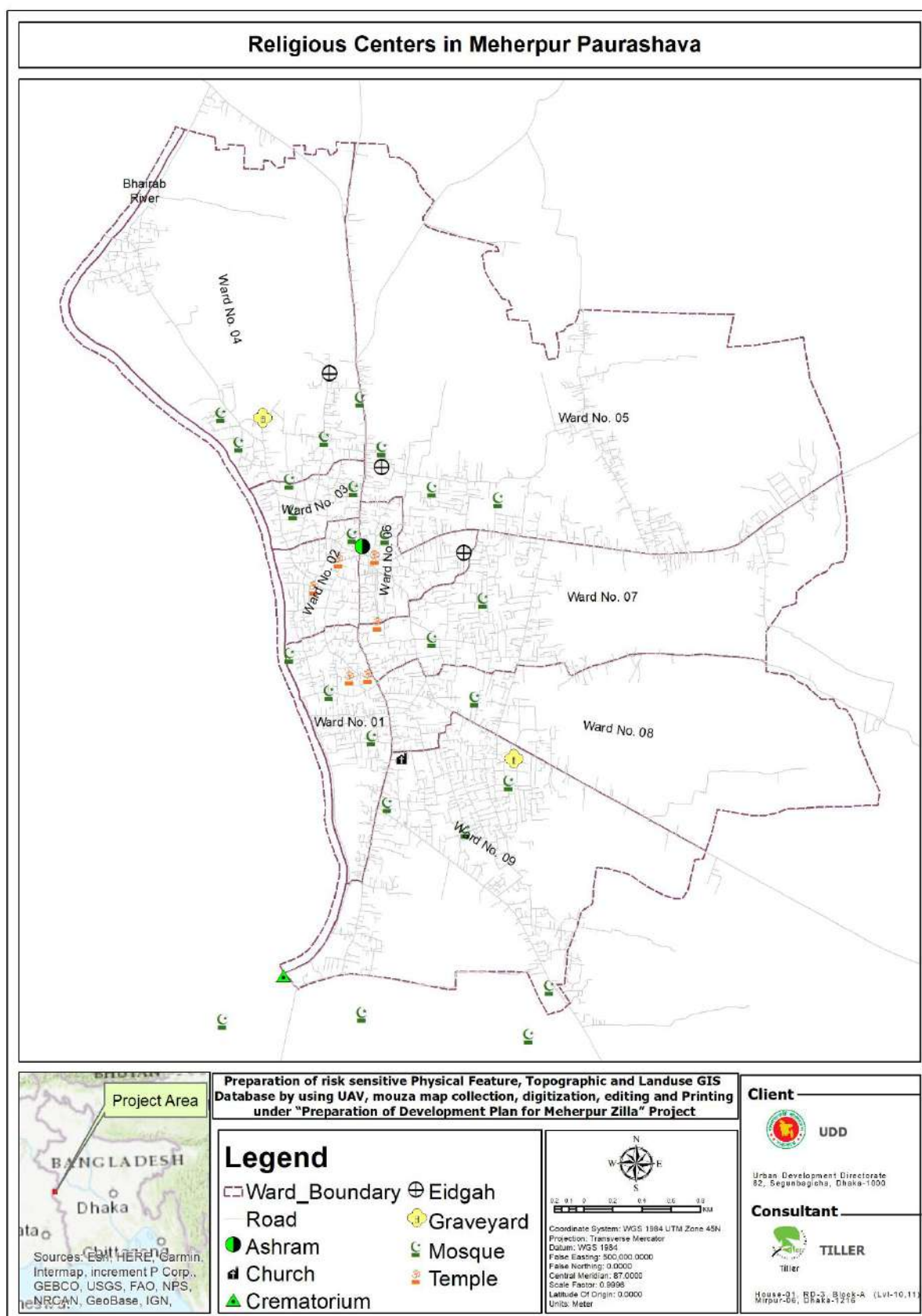
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*Figure 16-4: List of Religious Facilities in Meherpur Paurashava*



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Map 16-6: Religious Facilities in Meherpur Paurashava

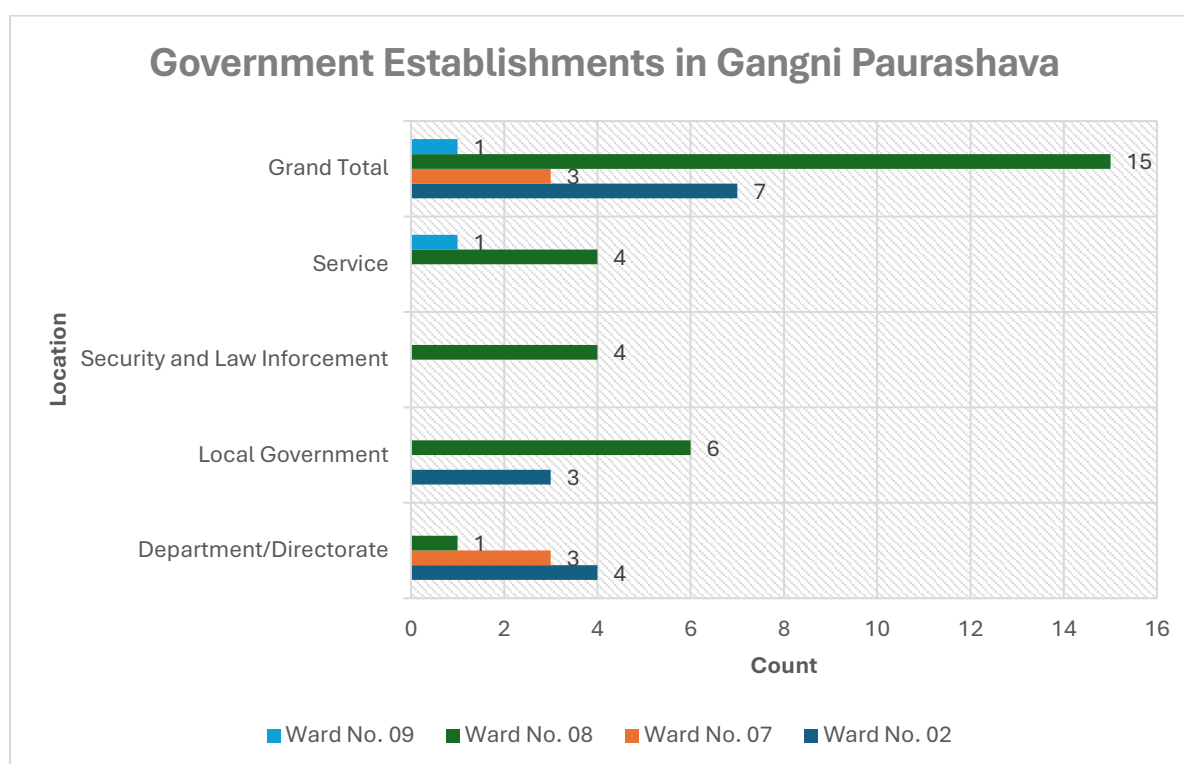
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## 16.2.2 Gangni Paurashava

### 16.2.2.1 Government Establishments

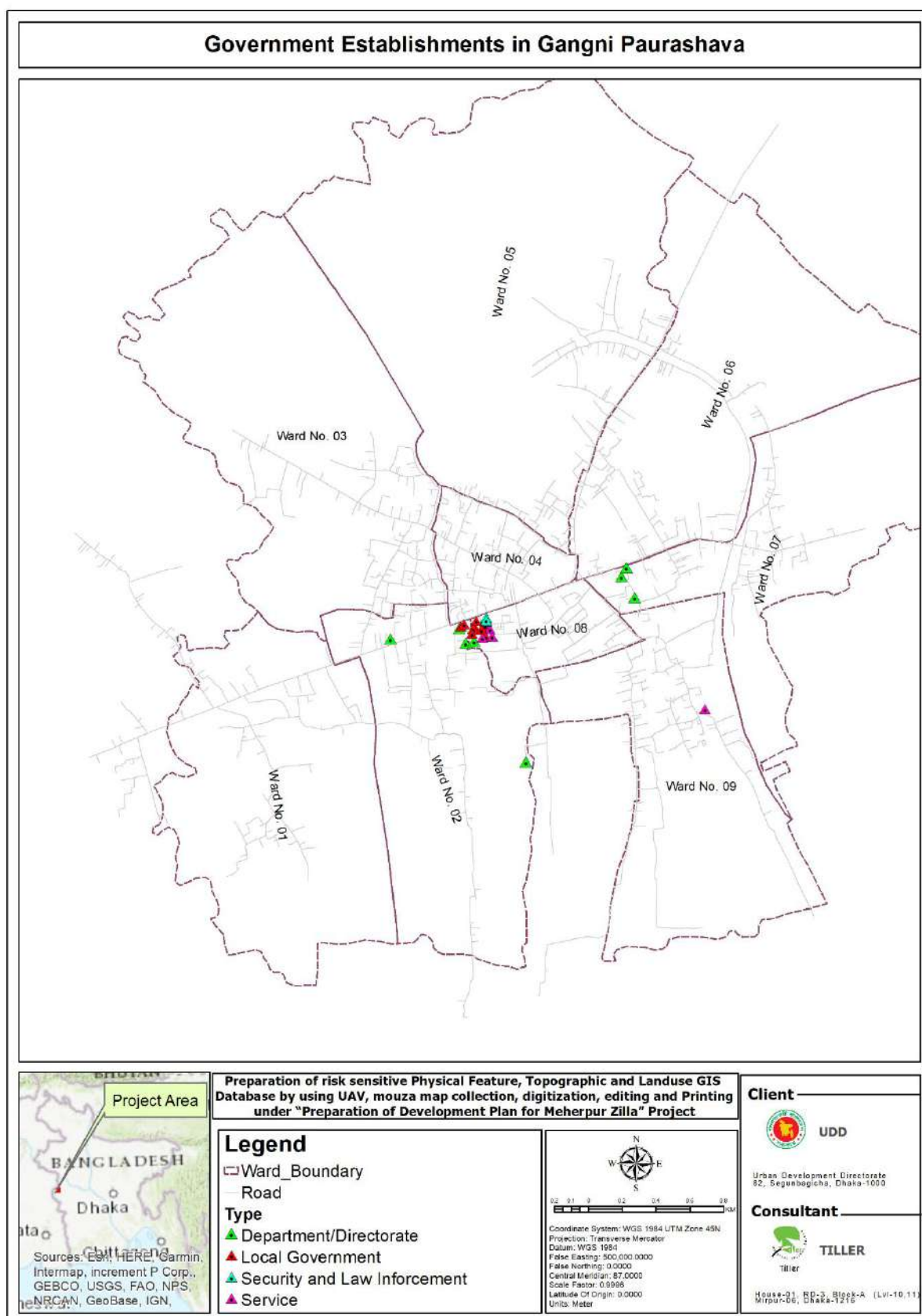
*Table 16-7: List of Government Establishments in Gangni Paurashava*

Location	Department/ Directorate	Local Government	Security and Law Enforcement	Service	Grand Total
Ward No. 02	4	3			7
Ward No. 07	3				3
Ward No. 08	1	6	4	4	15
Ward No. 09				1	1
Total	8	9	4	5	26



*Figure 16-5: List of Government Establishments in Gangni Paurashava*

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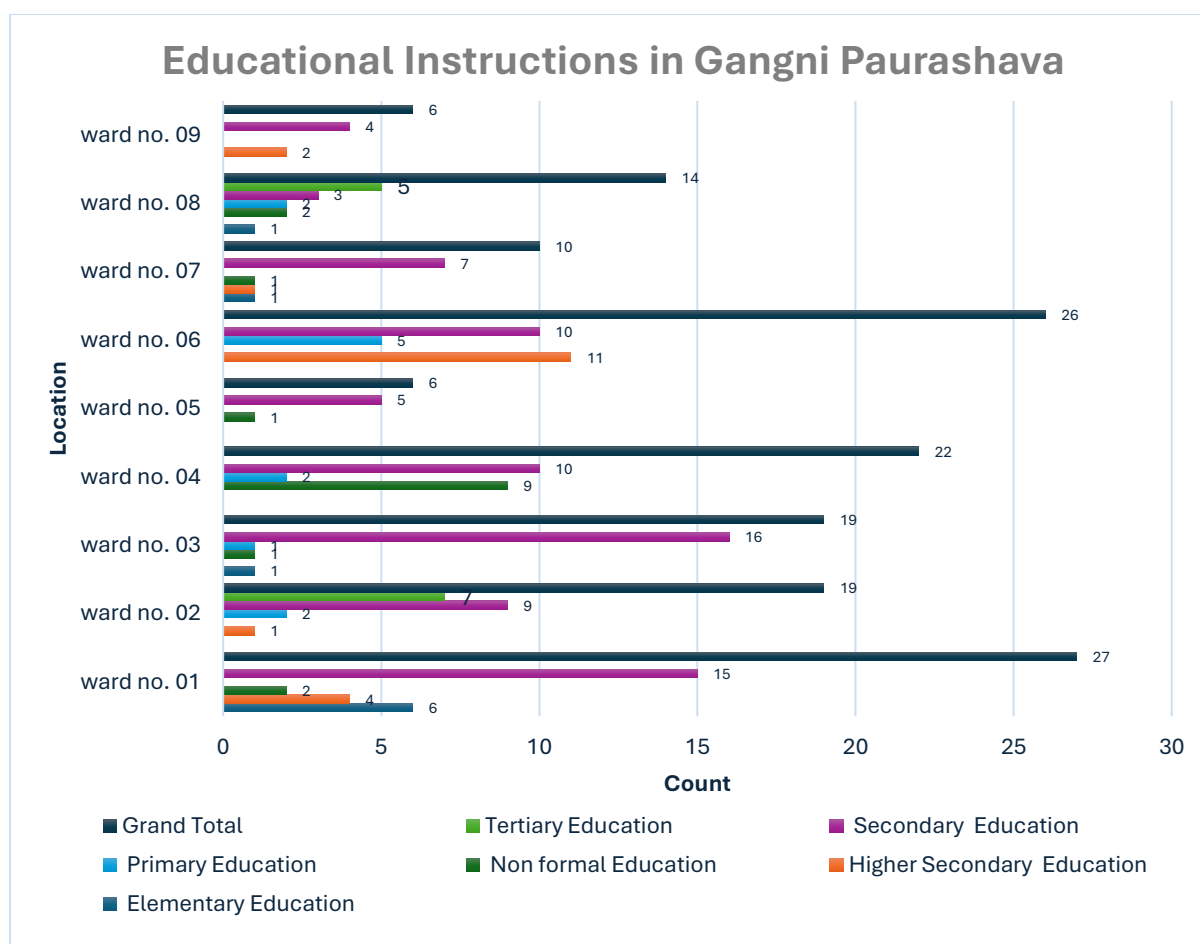


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### 16.2.2.2 Educational Institutions

*Table 16-8: List of Educational Instructions in Gangni Paurashava*

Location	Elementary Education	Higher Secondary Education	Non formal Education	Primary Education	Secondary Education	Tertiary Education	Grand Total
ward no. 01	6	4	2		15		27
ward no. 02		1		2	9	7	19
ward no. 03	1		1	1	16		19
ward no. 04			9	2	10		22
ward no. 05			1		5		6
ward no. 06		11		5	10		26
ward no. 07	1	1	1		7		10
ward no. 08	1		2	2	3	5	14
ward no. 09		2			4		6
Total	9	19	16	12	79	12	149

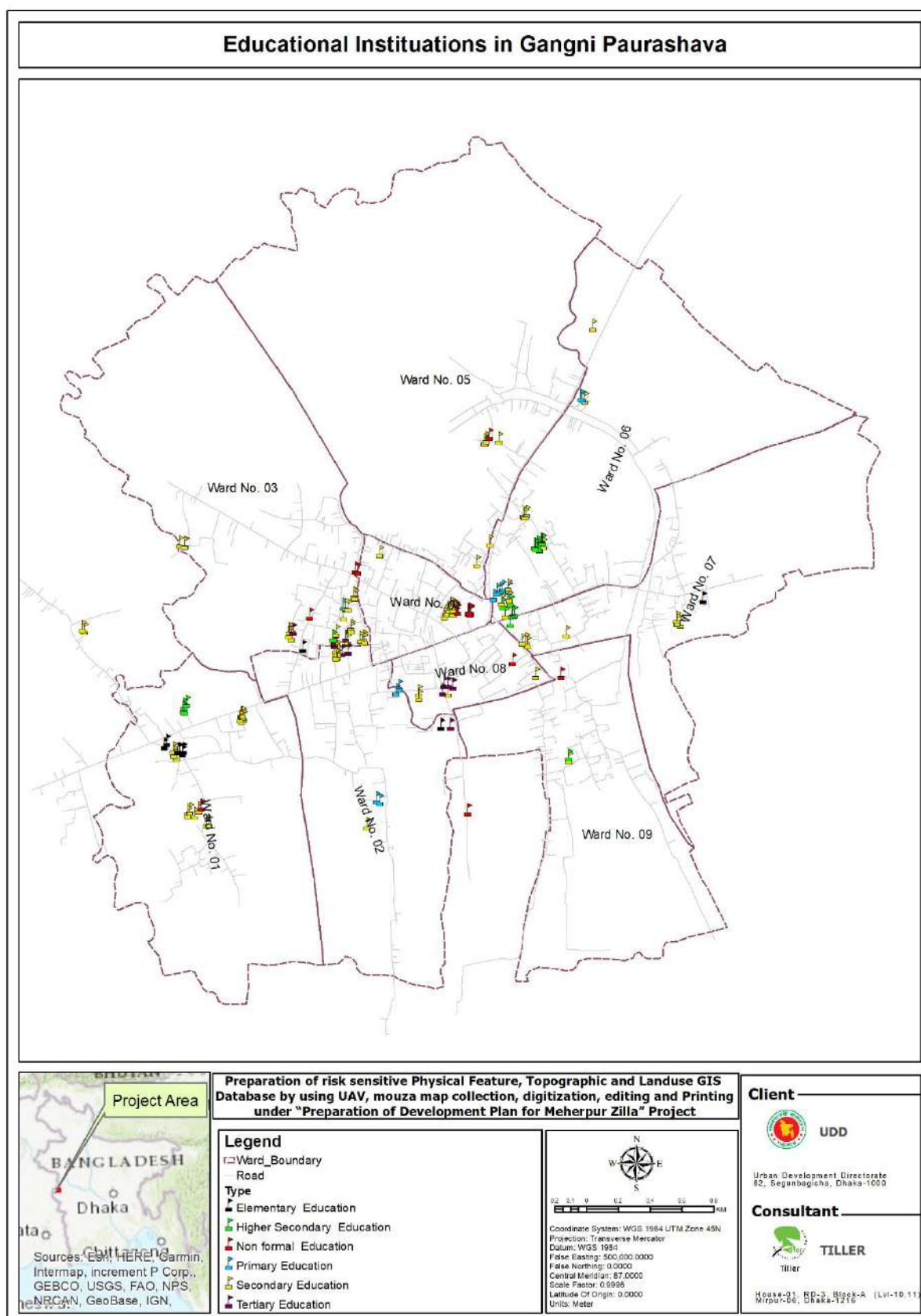


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*Figure 16-6: List of Educational Instructions in Gangni Paurashava*



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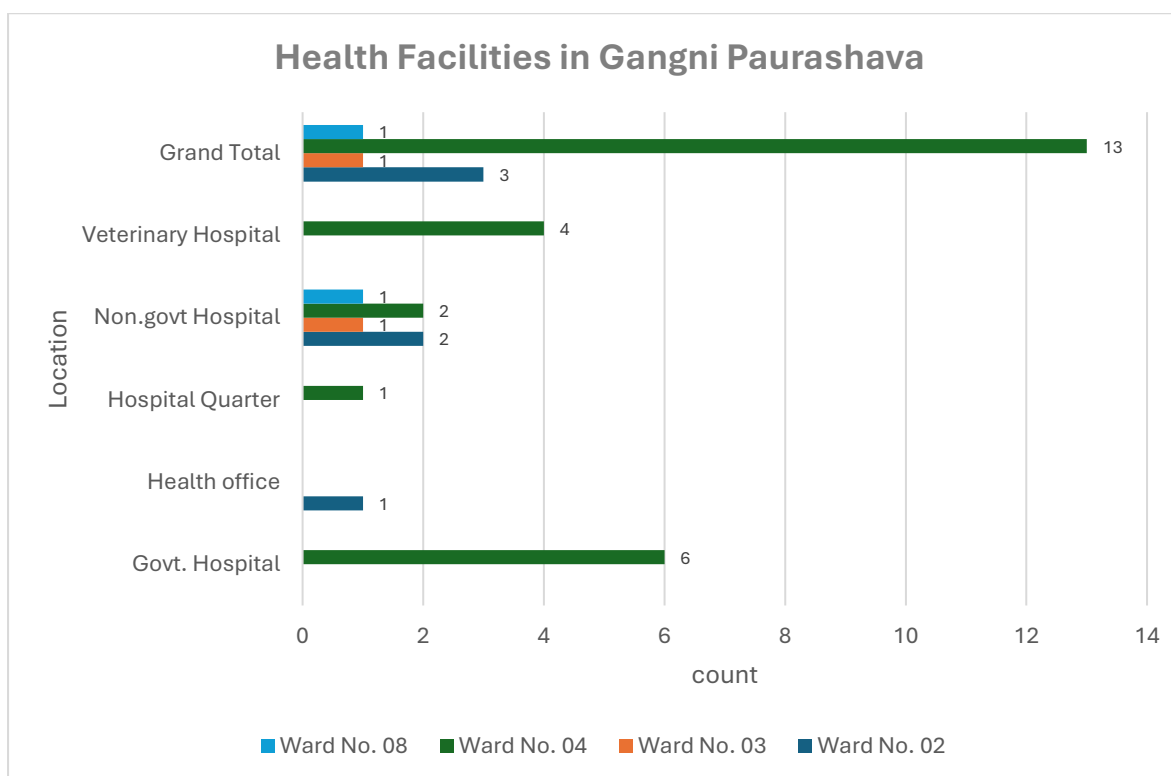
Map 16-8: List of Educational Institutions in Gangni Paurashava

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### 16.2.2.3 Health Facilities

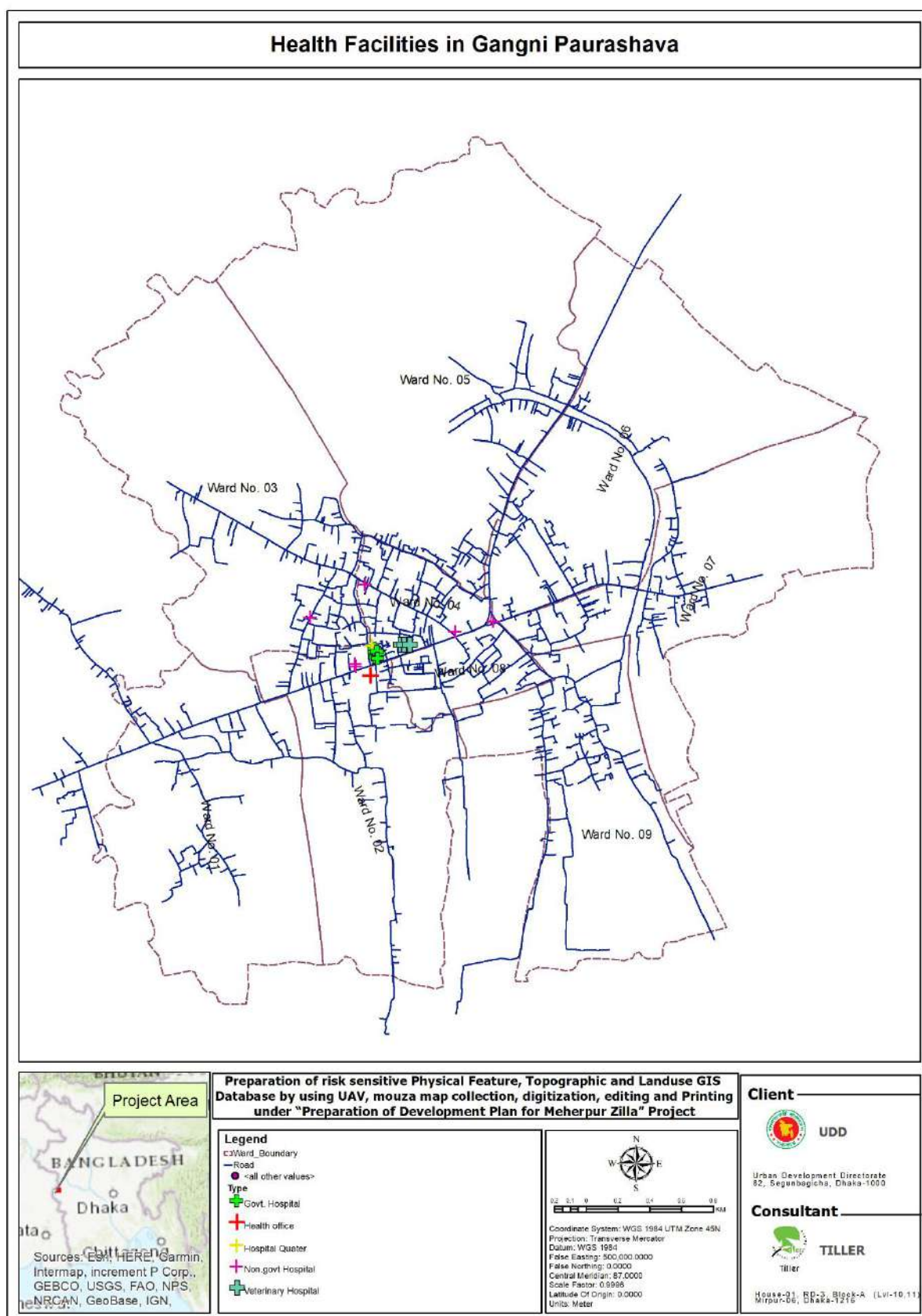
*Table 16-9: List of Health Facilities in Gangni Paurashava*

Location	Govt. Hospital	Health office	Hospital Quarter	Non. govt Hospital	Veterinary Hospital	Grand Total
Ward No. 02		1		2		3
Ward No. 03				1		1
Ward No. 04	6		1	2	4	13
Ward No. 08				1		1
Total						18



*Figure 16-7: List of Health Facilities in Gangni Paurashava*

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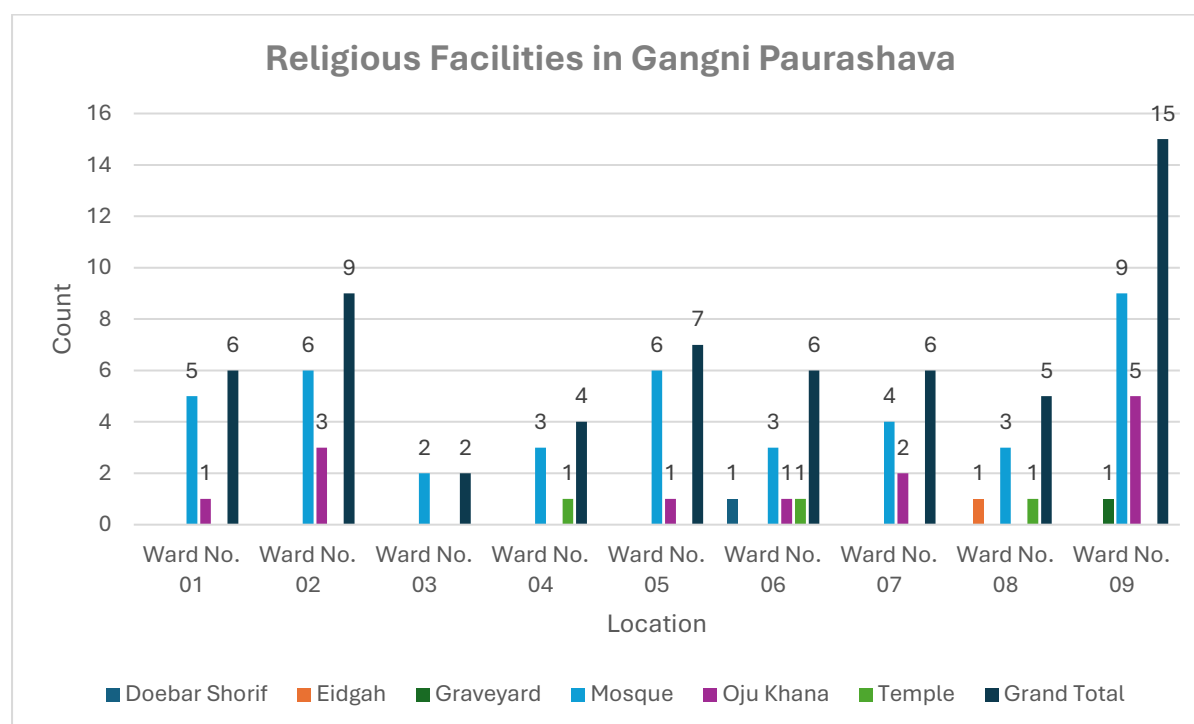
Map 16-9: List of Health Facilities in Gangni Paurashava

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#### 16.2.2.4 Religious Centers

*Table 16-10: List of Religious Facilities in Gangni Paurashava*

Loaction	Doobar Shorif	Eidgah	Graveyard	Mosque	Oju Khana	Temple	Grand Total
Ward No.01				5	1		6
Ward No.02				6	3		9
Ward No.03				2			2
Ward No.04				3		1	4
Ward No.05				6	1		7
Ward No.06	1			3	1	1	6
Ward No.07				4	2		6
Ward No.08		1		3		1	5
Ward No.09			1	9	5		15
Total	1	1	1	41	13	3	60

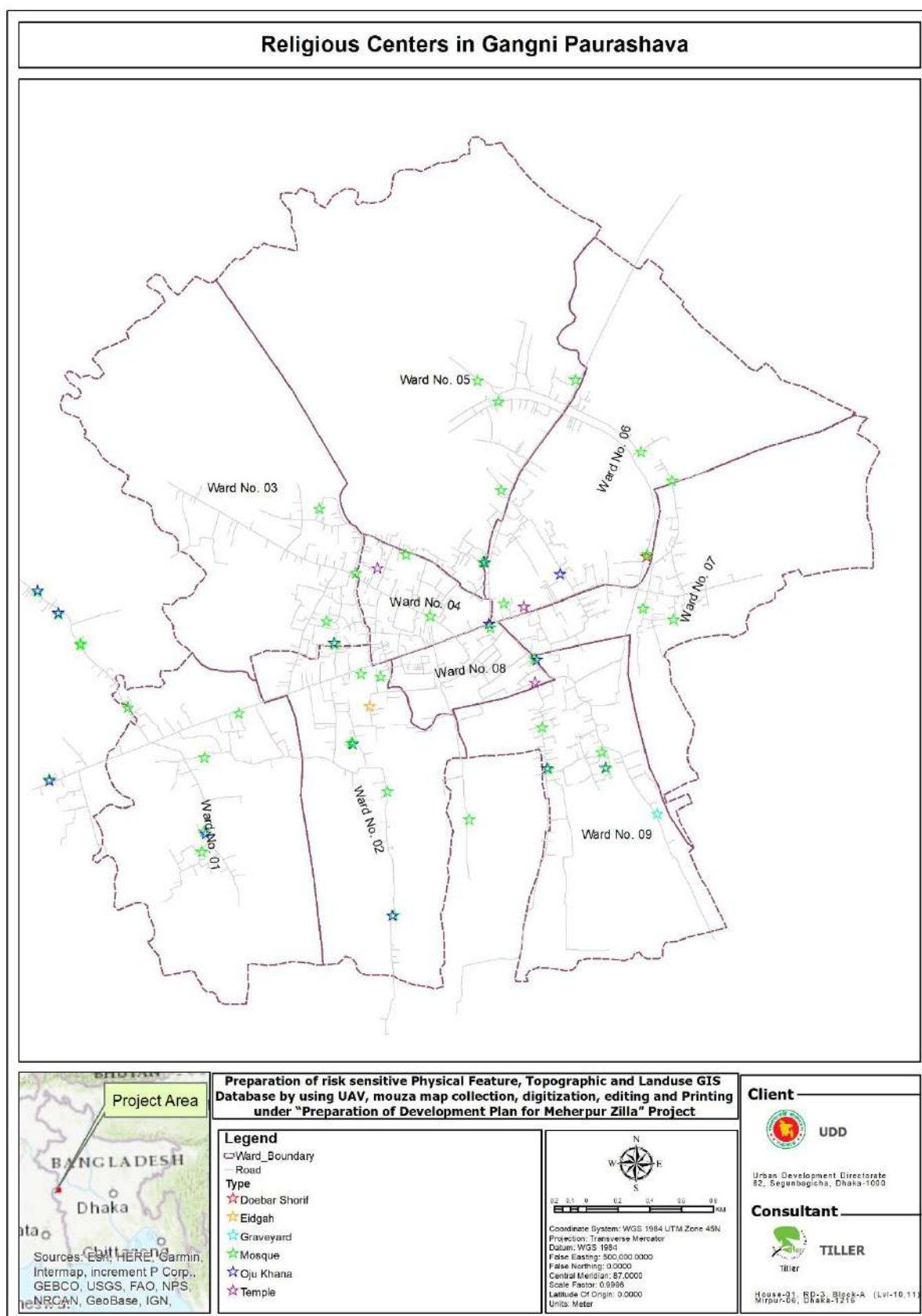


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*Figure 16-8: List of Religious Facilities in Gangni Paurashava*



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*Map 16-10: List of Religious Facilities in Gangni Paurashava*

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### 16.3 Concluding Remarks

The integration of other relevant attribute and spatial data plays a vital role in strengthening the analytical foundation of the Development Plan for Meherpur Zilla. While often categorized as supplementary, these datasets provide critical insights into the finer spatial and functional dynamics of the planning area. Their inclusion ensures that the planning framework not only addresses the core structural elements of urban and rural form but also captures the subtleties that influence everyday life, access, equity, and opportunity.

This working paper has consolidated these diverse data components to support more informed decision-making, identify gaps in spatial coverage, and enhance the coherence of the overall planning approach. As planning progresses, these datasets will further contribute to thematic overlays, land suitability analysis, zoning strategies, and infrastructure prioritization—ultimately ensuring that the development plan is both inclusive and grounded in spatial realities.

In conclusion, the value of this working paper lies in its ability to bridge sectors, reveal hidden patterns, and promote a more nuanced, data-driven planning process. Continued updating and integration of these spatial attributes, in coordination with the evolving survey outputs and stakeholder inputs, will be essential to achieving a robust and responsive planning outcome for Meherpur Zilla.

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## CHAPTER 17: CONCLUSION

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This Interim Report marks a critical milestone in the comprehensive planning process for Meherpur Zilla, laying the foundation for evidence-based and spatially guided development. Through extensive physical feature, land use, topographic, and mouza-level surveys—alongside the integration of multi-sectoral datasets provided by other specialist firms—a consolidated understanding of the district’s existing conditions has been established.

The analysis reveals a district in transition: while agricultural land remains dominant and stable, there are visible trends of urban expansion, declining natural resources, and shifting land utilization patterns. These insights, derived from the integrated spatial database, highlight emerging opportunities for planned urban growth, efficient land management, and ecological preservation.

This report not only documents the current spatial and thematic landscape of Meherpur but also serves as a strategic baseline for the formulation of the Structure Plan, Urban Area Plan, and Rural Area Plan. The spatial database developed through this phase will enable informed decision-making, zoning, infrastructure investment, and environmental conservation in the upcoming stages.

Moving forward, it will be essential to maintain stakeholder engagement, institutional coordination, and technical rigor to ensure that the final development plan is both visionary and implementable—delivering sustainable and inclusive growth for Meherpur Zilla over the long term.



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