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Preparation of the Development Plan for Meherpur Zilla

Assignment 04

Working Report on Rural accessibility and Development Potential Analysis



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Rural Area Plan (RAP) — Meherpur District

1. Introduction

1.1 Background

Meherpur District, located on the southwestern periphery of Bangladesh within the Khulna Division, represents a region defined by its rich agricultural heritage and strategic geographic positioning along the international border with West Bengal, India. While the district possesses two distinct urban centers—Meherpur and Gangni Paurashavas—the vast majority of its landmass and population resides within a sprawling rural hinterland. This Rural Area Transportation Plan (RATP) is a specialized strategic framework designed exclusively for these non-municipal zones, recognizing that the sustainable development of the district is inextricably linked to the mobility and connectivity of its agrarian communities.

Historically and functionally, the rural areas of Meherpur have served as the "production engine" of the district, generating approximately 110,022 metric tons of vegetables annually, valued at around Tk 500 crore. Despite this economic contribution, the transportation infrastructure within these unions has largely developed organically, resulting in a network dominated by low-capacity local roads that often lack the hierarchy and resilience required for modern logistics. This plan seeks to address these structural deficits by shifting the planning focus away from the urban cores and towards the 20 Unions that constitute the true rural fabric of the district.

1.2 Delineation of the Area

The geographical scope of this plan is strictly defined by the administrative boundaries of the rural Unions (Traffic Analysis Zones or TAZs).

The RAP covers a total of **20 Rural Traffic Analysis Zones (TAZs)** distributed across the district's three Upazilas:

1.2.1 Gangni Upazila (Rural Zone)

Gangni Upazila represents a significant portion of the district's northern rural landscape. The plan encompasses nine specific unions in this sub-region:

- **Kazipur (TAZ 1):** A high-population union (42,147 residents) serving as a major northern gateway.
- **Tentulbaria (TAZ 2):** A key agricultural zone bordering the northern frontier.

- **Bamandi (TAZ 3):** A critical rural growth center and logistics hub for the area.
- **Matmura (TAZ 4):** A densely populated union (47,546 residents) with high trip generation potential.
- **Sholotaka (TAZ 5), Raypur (TAZ 6), Shaharbat (TAZ 8), Kathuli (TAZ 9), and Dhankhola (TAZ 12):** These unions form the contiguous rural belt surrounding the Gangni municipal core, heavily reliant on feeder roads for market access.

1.2.2 Meherpur Sadar (Rural Zone)

The central belt of the district, surrounding the district headquarters, comprises seven key rural unions included in this plan:

- **Kutubpur (TAZ 10):** A massive demographic zone with 46,285 residents, acting as a primary labor catchment area.
- **Buripota (TAZ 16):** Located on the western border, this union functions as a major generator of education-related trips.
- **Amjhupi (TAZ 14):** Strategically located on the regional highway corridor, serving as a transit transition zone.
- **Shyampur (TAZ 11), Baradi (TAZ 13), Amdah (TAZ 17), and Pirojpur (TAZ 18):** These unions constitute the southern and eastern rural agrarian block of the Sadar Upazila.

1.2.3 Mujibnagar Upazila (Rural Zone)

The southern tip of the district, historically significant and geographically distinct, includes four rural unions:

- **Bagoan (TAZ 22):** The largest union in the south (41,960 residents), anchoring the sub-regional economy.
- **Mahajanpur (TAZ 19), Monakhali (TAZ 20), and Dariapur (TAZ 21):** These unions form the border-adjacent rural cluster, characterized by lower trip generation intensities but critical need for last-mile connectivity.

1.3 Geographic and Socio-Economic Significance

The total study area covers the vast majority of the district's 716.08 square kilometers. The topography is generally flat, typical of the Gangetic delta, but the transport network faces challenges related to seasonal accessibility and road surface quality.

Economically, these 20 zones are characterized by a high dependency on agriculture. The primary "Trip Purpose" data for the district reveals that **62.21% of all trips are Home-Based Work (HBW)**, largely generated by farmers and laborers living in these rural unions commuting to fields or local markets. Furthermore, the high volume of "Home-Based Other" trips (27.68%), which includes shopping and social visits, underscores the reliance of these communities on rural road networks to access essential goods and social capital.

1.4 Road Network Characteristics and Hierarchical Deficiencies

The backbone of the rural transport system is characterized by a high volume of low-order roads managed primarily by Local Government Engineering Department (LGED) and local bodies.

The existing road network of the study area is dominated by the local road network, with a total length exceeding 1,000 kilometers.

Road Class	Functional Description (Rural Context)	Approximate Length (km)	Assessment
Local Roads	Provide last-mile connectivity within settlements and villages.	>1,000 km	high length but low design standards and poor surface quality, leading to high maintenance costs and seasonal inaccessibility.
Union Roads	Secondary links between local and higher-order Upazila/Regional roads; connect major villages.	~200 km	Insufficient capacity/coverage; serves as the critical mid-level link but requires extensive upgrades to handle emerging inter-union traffic.
Upazila Roads	Connect major rural centers to Upazila headquarters; often serve as secondary arterials.	<150 km	Severely limited extent; the relative sparsity of this mid-level road infrastructure forces high volumes of traffic onto lower-order

			Union/Local roads, creating congestion and rapid deterioration.
Village Roads	Lowest level of access.	Minimal length	Underrepresented; suggests inadequate formalization or documentation of very localized, rudimentary paths.

2. Rural Socio-Economic Context & Travel Behavior

Understanding rural socio-economic structure is fundamental for designing a transport system that is responsive to the mobility needs of residents across Meherpur’s 20 rural unions. Transport behavior in rural areas is shaped not only by infrastructure availability but also by population composition, income distribution, occupational structure, educational status, and vehicle ownership patterns. The Household Interview Survey (HIS), combined with OD Survey insights, provides a robust empirical basis for interpreting these relationships.

Rural Meherpur is characterized by a predominantly agrarian society, scattered settlements, and strong socio-economic dependence on short-range mobility for livelihood activities. The data clearly shows that rural life is mobility-intensive but transport-poor—meaning people must travel frequently but lack adequate formal transport systems and high-quality roads. This section provides a detailed, data-driven, and critically analytical interpretation of demographic, socio-economic, and behavioral patterns influencing rural transport demand.

2.1 Demographic Structure of Rural Meherpur

2.1.1 Population Significance and Distribution

More than **85% of Meherpur District’s population resides in rural areas**, reflecting a predominantly non-urban demographic landscape. This high rural share places considerable transportation pressure on local and regional road networks, particularly in areas where settlements are dispersed and public transport is minimal.

Population densities in rural unions range between **700–1,200 persons per square kilometer**, depending on settlement compactness and agricultural land distribution. Higher-density rural unions (e.g., Kazipur, Kutubpur, Shaharbati) exhibit greater travel intensity and higher dependency on rural collector roads.

Socioeconomic Metric	Key Finding
Education Level	Predominance of low levels of formal education among household heads; the largest share (814 heads) falls into the below primary category.
Income Group	(Implied) Lower educational attainment typically correlates with lower and more variable income, leading to high sensitivity to transport costs and preference for cheapest available modes (NMT, para-transit).
Trip Ratio	(Total Number of Trip /Total Number of Household). This metric helps estimate per-household mobility demand, which is crucial for forecasting in rural zones where data is sparse.

2.1.2 Age Composition and Labor Force Dynamics

HIS data shows a **strong concentration of household heads between ages 30 and 49**, representing the most economically active segment of the population.

Age Group	Relative Representation	Implications
Under 25	Low share	Indicates delayed household formation; few very young heads
30–39	Secondary peak	Active workforce; commuting high
40–49	Primary peak	Mature labor force; strong link to agricultural & trade trips

A mature rural labor force leads to:

- High reliance on **daily commuting** to agricultural fields, workshops, markets, and small trading centers.
- Strong dominance of **Home-Based Work (HBW)** trips in rural trip patterns.
- Increased sensitivity to travel time and road conditions, since delays directly reduce productive work hours.

2.1.3 Household Size and Rural Mobility

Rural households tend to have **larger family sizes**, often exceeding 4–5 members. Larger households naturally generate more trips—children attending schools, women visiting markets or health centers, and male members traveling for work. The HIS regression confirms household size as the *strongest* predictor of trip generation.

This has three important implications:

1. **Larger households** → **higher daily trip volume**, especially in villages with more school-age children.
2. **Overcrowded para-transit vehicles** during school hours.
3. **Increased NMT activity**, particularly walking and bicycling.

2.1.4 Income Structure and Mobility Constraints

Rural income structure is predominantly low-income:

Monthly Income Bracket	No. of Rural Households	Transport Implication
< 20,000 BDT	1,249 households	High reliance on walking, bicycles, low-cost vans
20,000–40,000 BDT	763 households	Greater use of motorcycles and shared autos
> 60,000 BDT	Very few	Limited to moderate car ownership; more flexible mobility

Low-income dominance has the following transport consequences:

- **NMT dependence** becomes unavoidable, not optional.
- Affordability limits use of motorcycles despite their convenience.
- Households often choose **longer walking routes** to avoid para-transit fares.
- Transport deprivation affects access to healthcare, education, and markets.

2.1.5 Educational Attainment and Occupational Patterns

Educational levels of rural household heads are generally low:

Education Level	Number of Household Heads
Below Primary	814
Class 6–10	496
SSC/HSC	Limited
Tertiary	Very rare

Low educational attainment reinforces dependence on:

- Agricultural labor
- Informal employment
- Rural trades and services

These occupational realities produce:

- **High HBW travel** (fields, workshops, brick kilns, etc.)
- Regular trips to **local markets** for both work and buying necessities
- Movement patterns that are **short-range but high-frequency**, placing intense demand on rural local roads

The rural demographic fabric—low income, large household size, manual labor reliance, and low education—creates predictable but intense mobility needs, largely unmet by the current transport supply. This mismatch between transport need and transport availability is the core development challenge in rural Meherpur.

2.2 Trip Generating Behavior of Rural Households

Trip generation patterns show how rural households produce travel demand. The HIS regression model identifies **four significant predictors**:

Predictors of Trip Generation

Predictor	Interpretation
Household Size	Larger families = more school, market, and work trips
Income	Higher ability to afford motorcycles, para-transit
Motorcycle Ownership	Substantial increase in trip frequency
Bicycle Ownership	Supports short- and mid-range travel

Average Trip Rates

Category	Union	Trip Rate	Key Characteristics / Reasons
High Trip-Rate Unions	Kazipur	0.99	<ul style="list-style-type: none"> • Dense rural markets • High agricultural activity • Greater motorcycle/bicycle ownership • Strong inter-union travel demand
	Shaharbati	0.98	<ul style="list-style-type: none"> • Dense rural markets • High agricultural activity • Higher NMT and motorcycle use • Functions as a rural service hub
	Bamandi	0.87	<ul style="list-style-type: none"> • Active rural trading • High mobility for work trips • Strong access links with neighboring unions
	Monakhali	0.86	<ul style="list-style-type: none"> • Strong agricultural freight movement • Medium-dense settlement pattern • Higher bicycle and motorcycle usage
Low Trip-Rate Unions	Dhankhola	0.60	<ul style="list-style-type: none"> • Peripheral rural location • Limited local economic activity • Long distance from service centers • Poor Road connectivity discourages travel
	Pirojpur	0.63	<ul style="list-style-type: none"> • Peripheral location • Sparse economic nodes • Weak transport access to rural hubs • Higher travel cost/time reduces trips

Trip generation is **not uniform** across rural Meherpur. High-rate unions should be prioritized for enhanced collector roads, expanded para-transit management, and road widening. Low-rate unions require targeted access improvements rather than large-capacity investments.

TA Z No.	Name of Area	Tot al HH	Total HH Memb er	Trip Mak er	Trip Numb er	Trip Rate (Trip/Person/ Day)	Populati on in 2025	Total Trip Producti on
1	Kazipur	134	362	179	358	0.988950276	43,630	43,148
2	Tentulbar ia	101	331	112	252	0.761329305	33,794	25,728
3	Bamandi	77	177	77	154	0.870056497	30,476	26,516
4	Matmura	144	441	164	336	0.761904762	49,099	37,409
5	Sholatak a	73	217	84	169	0.778801843	25,877	20,153
6	Raypur	57	145	57	114	0.786206897	21,967	17,270
8	Shaharba ti	77	175	85	172	0.982857143	26,468	26,014
9	Kathuli	95	266	95	190	0.714285714	25,322	18,087
10	Kutubpur	134	348	134	268	0.770114943	47,847	36,847
11	Shyampu r	61	179	61	122	0.681564246	24,061	16,399
12	Dhankho la	124	434	128	260	0.599078341	45,980	27,546
13	Baradi	45	140	45	91	0.65	26,718	17,367
14	Amjhupi	92	265	99	205	0.773584906	37,546	29,045
16	Buripota	108	327	132	265	0.810397554	41,179	33,371
17	Amdah	98	277	99	200	0.722021661	34,159	24,663
18	Pirojpur	71	224	71	142	0.633928571	26,250	16,640

19	Mahajan pur	59	161	59	118	0.732919255	21,617	15,843
20	Monakha li	62	144	62	124	0.861111111	22,447	19,329
21	Dariapur	54	152	55	110	0.723684211	21,869	15,826
22	Bagoan	87	276	90	181	0.655797101	43,457	28,499

2.3 Rural Trip Purpose Distribution

Rural trip purpose distribution reflects the socio-economic structure and daily life patterns.

Trip Purpose	Share (%)	Interpretation
Home-Based Work (HBW)	62%	Agriculture, workshops, trades, services
Home-Based Other (HBO)	28%	Markets, social visits, household errands
Home-Based Education (HBE)	8.6%	School trips, often walking
Non-Home Based (NHB)	1.5%	Low due to limited multi-trip chaining

Implications for Rural Transport

1. HBW Dominance

- Reflects strong labor participation in farm and informal sectors.
- Requires reliable access to fields, markets, kilns, and workshops.

2. HBO Importance

- Rural hats and bazaars generate significant daily traffic.
- Transport planning must integrate **market-centric mobility solutions**.

3. Low Education Trip Share Masking High Sensitivity

Although only 8.6% of trips are HBE:

- Students are **highly vulnerable** road users.
- Poor road shoulders endanger school children walking long distances.

- Lack of formalized transport options forces children into mixed traffic.

Critical Interpretation

The rural trip-purpose structure demands a **dual-priority transport approach**:

- Enhance **HBW mobility** for economic productivity
- Enhance **HBE safety** for long-term human development

2.4 Rural Modal Choice Characteristics

Modal choice in rural Meherpur is not merely a preference—it is a reflection of affordability, road supply, and cultural patterns.

Dominant Modes

A. Non-Motorized Transport (NMT)

- **Walking**: most common for $\leq 1-1.5$ km
- **Bicycles**: heavily used for 1–3 km
- **Pedal Vans / Rickshaws**: intra-village transport

NMT dependence reflects:

- low income
- close proximity of daily destinations
- absence of affordable motorized alternatives

B. Para-Transit (Informal Transport)

- Easy-bikes
- Shared autos (CNG-type)
- Tempos

These serve as the **functional backbone** of rural mobility:

- flexible
- frequent
- relatively affordable
- but unregulated and often unsafe

C. Motorcycles

- High representation in OD surveys
- But limited ownership among poor households
- Allows high-frequency, long-distance rural-to-rural travel

D. Buses

- Rarely used for intra-rural travel
- Mostly connect rural nodes to district centers

Rural modal choice reveals an ecosystem where NMT and informal para-transit must be integrated—not replaced—in transport planning. Formal transport investment must coexist with these modes rather than attempt to displace them.

2.5 Regional Freight Movement and Seasonal Traffic Flows

The regional economy of Meherpur is deeply tied to agriculture, particularly vegetable production. Annual outputs exceed **110,000 metric tons**, requiring efficient transport channels for both local and inter-district distribution. The following seasonal dynamics define traffic intensity and freight movement:

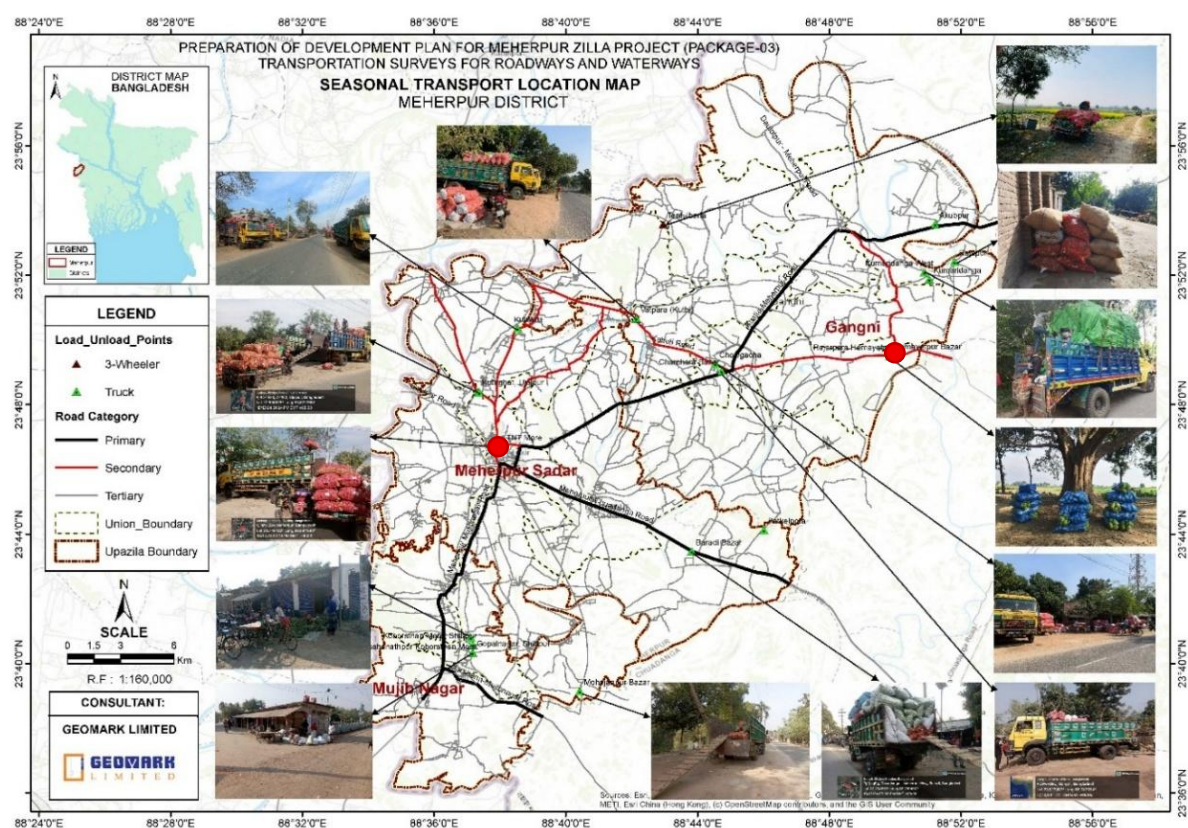
- **Summer–Monsoon (June–October):** Bulk movement of perishable crops like brinjal, bottle gourd, and pumpkin occurs toward **Dhaka, Khulna, and Jashore**. Truck flows on R745 reach their seasonal peak during this period, increasing road occupancy rates and travel delays.
- **Winter (November–February):** High-volume vegetable transport—cabbage, tomato, and leafy vegetables—leads to nocturnal trucking from Meherpur Sadar and Gangni to Karwan Bazar, Barishal, and Sylhet. This results in temporary surges in Vehicle-to-Capacity Ratios (VCR) during nighttime operations.
- **Export Season (December–April):** Specialized produce, such as Chinese cabbage and chili from Gangni, is transported to Chattogram Port, marking a rare example of rural–port logistics integration in a non-coastal district.

These seasonal logistics generate cyclical congestion around loading hubs such as **Baradi, Mohajanpur, Bamondi, and Kedarganj**, where temporary truck queuing, roadside loading, and haphazard parking reduce road efficiency and cause local safety concerns.

Key Loading Points and Spatial Distribution of Market Connectivity

Upazila	Major Loading/Collection Points	Main Transport Corridors	Primary and Secondary Destinations
Meherpur Sadar	Baradi, Mohajanpur, Hemayetpur, Ujalpur, Kathuli Road	Meherpur–Chuadanga Road, Meherpur–Kushtia Road, Meherpur–Mujibnagar Road	Dhaka (Karwan Bazar, Gabtoli), Jashore, Khulna
Gangni	Gangni Bazar, Bamandi Bazar, Charchuria, Patkelpota, Chowgacha	Gangni–Kushtia Road, Gangni–Meherpur Road	Dhaka, Jashore (Export hub), Chattogram Port
Mujibnagar	Kedarganj Bazar, Gopalnagar, Kutirghat, Bishwanathpur	Darshana–Mujibnagar Road, Daulatpur–Meherpur Road	Dhaka, Khulna, Barishal

Spatially, the concentration of truck movements aligns with zones of **high trip attraction** identified in the trip distribution analysis. Bamandi emerge as **dominant freight generators**, while **Gangni** functions as both a **trip attractor** and **export gateway**. The alignment of high trip generation with key corridors indicates a **direct spatial correlation between economic activity and road demand**, which is expected to amplify over time as production and trade volumes expand.



3. Proposed Transport Infrastructure Development Plan

High-trip-rate unions and high-volume OD corridors require wider, structurally stronger roads. Rural corridors connecting Kazipur–Bamandi, Kutubpur–Buripota, and Shaharbatī–Matmura must be prioritized.

Low-trip-rate unions such as Dhankhola and Pirojpur show suppressed mobility due to poor accessibility. Development focus is required to:

- reduce travel time,
- unlock economic potential, and
- integrate them with regional service centers.

A well-defined hierarchy—Primary, Secondary, and Tertiary roads—will:

- regulate traffic distribution,
- support freight movement, and
- guide future investment decisions.

The proposed road hierarchy ensures that primary roads function as district-level mobility spines, while secondary roads connect rural unions, markets, and agricultural zones.

The following table provides a summary of Right-of-Way standards, road widening lengths, and new road construction lengths across the district’s three upazilas.

Proposed Road Development Plan for Meherpur District

Road Hierarchy	Proposed RoW (ft)	Road Widening Length (KM)	New Road (KM)
Gangni			
Primary Road	60	82	
Secondary Road	40	31	
Meherpur Sadar			
Primary Road	60	36	
Secondary Road	40	30	13.98
Mujibnagar			
Primary Road	60	21.3	
Secondary Road	40	8.19	8.71

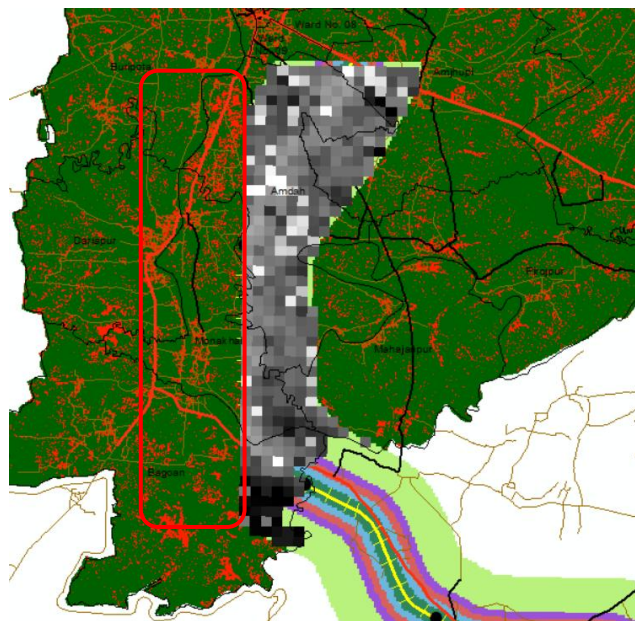
4. Railway Introduction and Impact on Rural Mobility

The proposed introduction of a new railway line is the single most transformative infrastructure project for the rural landscape of Meherpur District. While its primary function is regional connectivity, its alignment through the heart of several rural unions—notably **Amdah, Monakhali, Mahajanpur, and Bagoan**—will fundamentally alter the existing travel behavior and land-use dynamics of these 20 rural TAZs.

4.1 The Crucial Need for Feeder Road Development

A key concern is the inherent disconnection between the high-capacity, fixed-route rail infrastructure and the existing low-order road network. The map indicates that the rail corridor often passes through or near areas of low settlement density and minimal road connectivity.

- **Monakhali Station:** The area surrounding the proposed Monakhali rail station (TAZ 20) is currently dominated by agricultural land with poor spatial integration. The rail line's success depends entirely on the immediate, coordinated development of new access roads, feeder links, and local distribution routes. These links must connect Monakhali to surrounding rural TAZs like Bagoan (TAZ 22) and Dariapur (TAZ 21).



4.2 Land-Use Transformation

The introduction of improved multimodal connectivity along the rail alignment is highly likely to **trigger spontaneous urban expansion**, attract commercial and residential functions, and convert the existing agrarian landscape into a more urbanized corridor. This is a direct risk to the agricultural identity of the surrounding unions.

- **Impacted TAZs:** Unions like **Amdah (TAZ 17)**, **Monakhali (TAZ 20)**, and **Mahajanpur (TAZ 19)**, which currently retain a rural character, will experience rapid land conversion pressure, as evidenced by suitability mapping.

The proposed northern terminus area (near Meherpur Paurashava/Rural TAZ interface) presents a severe environmental planning challenge due to its proximity to **Chand Beel**, a critical sensitive wetland ecosystem.

- To safeguard the wetland's crucial role in local hydrology, biodiversity, and flood retention, a **500-meter protection buffer** must be legally established around Chand Beel.
- Within this buffer, construction, land conversion, and intensive activities must be strictly restricted. This policy decision is paramount; it ensures future growth in adjacent rural TAZs (e.g., Buripota, Kutubpur, Amdah) remains environmentally compatible and climate-resilient. This buffer effectively creates a no-development zone, limiting the spatial extent of rail-induced growth in a critical ecological area.

