Payra-Kuakata Comprehensive Plan Focusing on Eco-Tourism
Structure Plan: 2021-2041

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The Structure Plan is basically a policy document that sets the ground and serves as the guideline for subsequent local level plans. This report provides detailed findings from the regional plan level and guideline at structure plan level. As Taltali Upazila has no Pourashava, the plan also includes a suitable location for the potential Urban Area. The strategic zones will provide a direction for the Rural Area Plan and Zones. The basic database also different sectors expert's inputs are incorporated in the preparation process has been described in this report. Besides this, with the help of secondary databases, relevant analyses for decision making have been conducted at interim phase and survey report phase. In-depth analysis and findings have been presented in several working paper report. To prepare the base map and very primary reference point of the plan, all the mouzas of the project area has been digitalized, the entire procedure has been described in planning approaches section of this report, and databases were prepared in Geographic Information System compatible format.

It describes the study area, objective, component and approach of planning. The overall goal of this structure plan is to lead the development of Taltali Upazila in order to enhance the residents' socioeconomic position by following the guidelines laid out in the regional plan and focusing on eco-tourism.

The critical planning issues are very vital for proposing the strategic zones. Demography, Natural Resources, Transportation, Topography, Ecologically Critical Areas, Cropping Pattern, Disaster etc. are the critical issues for Taltali Upazila. These issues are discussed in chapter 2.

Socio-spatial Forecasting and development prospects are discussed in Chapter 3. Population projection, Hosing, water, electricity demand etc. are discussed here. Moreover, Traffic and Transportation, Drainage and Flooding, Basic services area discussed as development prospects.

Policies help to determine our conduct in a particular setting so that social harmony and peace are maintained and our welfare is secured. Several Policies have accumulated for the structure plan proposed zones depending on the critical issues and development prospects. The policies are discussed on Chapter 4.

Chapter 5 is the most important chapter which included the composite structure plan. In this chapter existing land use, Geological, Hydro-geological, Strategic Service Centre suitability are discussed. Moreover, multi criteria analyses on infrastructure, Human Settlement and Economic Region also included in this chapter. The proposals of structure plan and recommendations are also described here.

In Chapter 6, development conditions/restrictions/permission to be applied for the development of a particular area where it is required is discussed. The Permitted and Conditional Uses of the Structure Plan Zones also given in this chapter. Finally, Chapter 7 discussed about Plan Implementation Phase and authorities. For Taltali Upazila as well as Amtali and Kalapara Upazila the custodian of the plans will be Payra Development Authority.

CHAPTER ONE: INTRODUCTION

The Structure Plan provides a long-term strategy for the 20 years from 2021-2041 for the development of Taltali Upazila. It is basically a policy document that establishes an indicative and flexible long-term strategy that will demonstrate the future direction for corresponding development and provide a framework as well as guidelines for subsequent local-level plans. The structure plan report comprises various supporting maps and an appropriate-scale composite map illustrating key elements of key strategic decisions. The overarching purpose of the Plan is to promote the long-term, comprehensive development of the Upazila through integrated planning and implementation involving several organizations and community participation for optimal resource utilization and poverty reduction. It also includes the future general functions of the various policy areas. The report categorizes the scale and direction of planned rural and urban growth. In addition, it sets out a wide range of necessary sectoral policies to achieve the overall vision and objectives of the plan.

Strategic Planning is a systematic process of envisioning a desired future, and translating this vision into broadly defined goals or objectives and a sequence of steps to achieve them. In contrast to long-term planning (which begins with the current status and lays down a path to meet estimated future needs), strategic planning begins with the desired end and works backward to the current status. Also, in contrast to tactical planning (which focuses on achieving narrowly defined interim objectives with predetermined means), strategic planning looks at the wider picture and is flexible in its choice of means[1].

The success of developing Payra-Kuakata region as a tourist centre depends much on good communication facilities and the availability of modern amenities. Moreover, it is predicted that the Payra seaport would generate many port-related new activities including huge vehicular traffic such as air, rail, road and water. This phenomenon would positively and negatively impact the region's socio-economic condition and existing land use patterns. The proposed plan would guide such probable changes in the Upazila's socio-economic condition and land use pattern will also address the adverse impact of such changes. Each Upazila within the coastal region has its own topographic and demographic characteristics. Therefore, separate Upazila level structure plans are essential to address variances. In this line, this report is describing the structure plan for Taltali Upazila.

1.1 Background of the Study Area

Past and Present Administration of Taltali Uapazila: Taltali Upazila is located on Bangladesh's outer coastal belt. It is under Barguna District of Barisal Division with an area of 258.94 sq. km. Barguna became a new district in 1984. In 1859 Gulishakhali thana was established with Amtali, Barguna and Pasarara. In 1871, when Patuakhali was transformed into subdivision, Gulishakhali was included in it. In 1901, due to river erosion, the thana of the Sadar Sadar was transferred to the south of Amtali, AK, near the school. In 1944 Gulishakhali was transformed into Amtali Police Station. In 1982, Amtali thana was turned into an Upazila. In ECNEC meeting dated January 2012, Taltali Upazila was formed from Amtali Upazila, consisting 7 Unions in the South of Amtali. Burishwar river and Barguna Sadar Upazilas on the west, Kandapara Upazila on the Andharmanik river and Patuakhali on the east, Tangagiri forest on the south and Bay of Bengal and Kachuputra, Pachankoria river and Amtali Upazilas on the north are surrounding the Upazila. Taltoli Upazila consisted with the population of 88,004 people. Its literacy rate is 89%. Most of the area is Rural Based.

[1] (http://www.businessdictionary.com/definition/strategic-planning.html).

Farmers and Fishermen are the Leading professions. It has a Natural Reserve Forest Named Tengra Giri Eco Park and a Clean and Calm Beach Named Shuvo-Shondha, Many Tourists come here to enjoy the Natural Beauty of Payra-Bishkhali-Bay of Bengal Mohona. Some Rakhine and Mog Ethnic groups are still living here. (Bangladesh National Portal, 2022). Upazila comprises 7 unions (Barabagi, Chhota Bagi, Karaibaria, Pancha Koralia, Nishanbaria, Sarikkhali and Sonakata), 20 populated Mouzas and 82 villages (BBS, 2011).

Figure 1: Administrative Boundary of Taltali Upazila

Source: PKCP Project, UDD, 2019

The Upazila is renowned for its iconic and diverse coastline. With over 10 kilometers of coastline, the local community values the recreational and lifestyle opportunities that the coast provides. It offers a range of economic benefits and attracts industries and businesses reliant on coastal resources. Shuvo-Shondha Beach and Fatrar Char mangrove forest attract domestic and international visitors keen to experience a slice of paradise. The coastline along the Upazila is dynamic and distinctive. These distinct environments bring their own unique challenges and this requires strategies to understand the characteristics, opportunities, and solutions that are best matched to each area. The impacts of climate change and inevitable pressures caused by land use and development need to be carefully considered along with ways in which the community as well as the authority can ensure sustainable management of natural and physical coastal resources, now and for future generations.

The background of this strategic plan is to propose strategic and integrated land use zones considering its hydrological, geological, disaster risk sensitiveness, socioeconomic, and other relevant facility settings, for managing the protection, use and development of the Upazila environment.

1.2 Objective of the structure plan

The overall goal of this structure plan is to lead the development of Taltali Upazila in order to enhance the residents' socioeconomic position by following the guidelines laid out in the regional plan and focusing on eco-tourism.

Specifically, the objective of this structure plan is to formulate strategic development plan for regional plan considering functional and landuse requirement with hazard vulnerability.

To reach the objective the plan has been prepared considering existing Physical features, Socio-economic scenario, Transportation, Disaster, Hydro-geology, Geology, Hydrology and Natural resources like Forest, River, Char etc.

1.3 Component of the structure plan

To inspect the comprehensive circumstances, multiple components have been taken into account. The plan has been prepared taking into account Physical development of the Upazila, Socio-economic status, Condition of Transportation Network, Disaster and Vulnerability, Hydro-geological attributes, Geological scenario, Hydrology, Forest as well as Natural Resources.

1.4 Approaches To Planning

Structure Area Plan is the Second-tier plan for this “Payra-Kuakata Comprehensive Plan”. This is the lower-tier plan after the Regional Plan. The Structure Area Plan is done for the specific Seven Upazilas of the project. It is a reflection of the Upper-Tier Plan and give direction to the lower-tier plans. Here are the approach and methodology that have follow to prepare the structured plan for Taltali Upazila of Bangladesh-

- Establish goals and objectives: Based on the needs assessment, establish clear goals and objectives for the plan. These should be specific, measurable, achievable, relevant, and time-bound (SMART), and should reflect the priorities and aspirations of the people and communities of Bangladesh.
- For assessing the overall scenario of Taltali Upazila several primary surveys are conducted- Several transport related surveys- Hydrological survey, Geological and

Geo-Physical investigation, Cropping Pattern Survey, PRA, Physical Feature Survey, Formal Informal Survey and Socio-economic Survey.

- Available data collection from secondary sources i.e., hydrographic chart, water level, water flow, meteorological and disaster data;
- Preparation of map to identify the important features such as existing embankments, khals, hills, wetlands, regulators, bridges of the proposed area, satellite images and preparation of the map showing all the features;
- Agriculture PRA provides data on cropping patterns such as single-cropped, double-cropped or triple-cropped lands;
- Collection of the tentative plan for the economic zone and other government proposals in the project area.
- Statistical analysis of time series simulated storm surge level and significant wave height and assessment of storm surge level for different return periods around the proposed area;
- Assessment of significant wave height of cyclonic as well as flood wave for different return periods around the proposed area and assessment of embankment crest level for fifty/hundred-year return period considering tide, storm surge level and cyclonic wave; Fixation of crest level considering simulated results with climate change scenario.
- Morphological analysis i.e., bank-line shifting characteristics by time series satellite images, erosion-deposition pattern by model result and data analysis.
- Identify the source of sweet water for industrial, Agricultural, Residential and other uses;
- Planning of the proposed development work considering the natural beauty of this area for tourism;
- Rakhine Ethnic community culture conservation and development.
- Recommendation for improvement of existing communication facilities in the study area;
- Develop a detailed implementation plan that outlines specific actions, timelines, resource needs, and responsibilities for achieving the goals and objectives of the plan.

Overall, the structure plan approach to planning can help Taltali Upazila problems, address the complex challenges it faces and achieve sustainable, inclusive development that benefits all of its people.

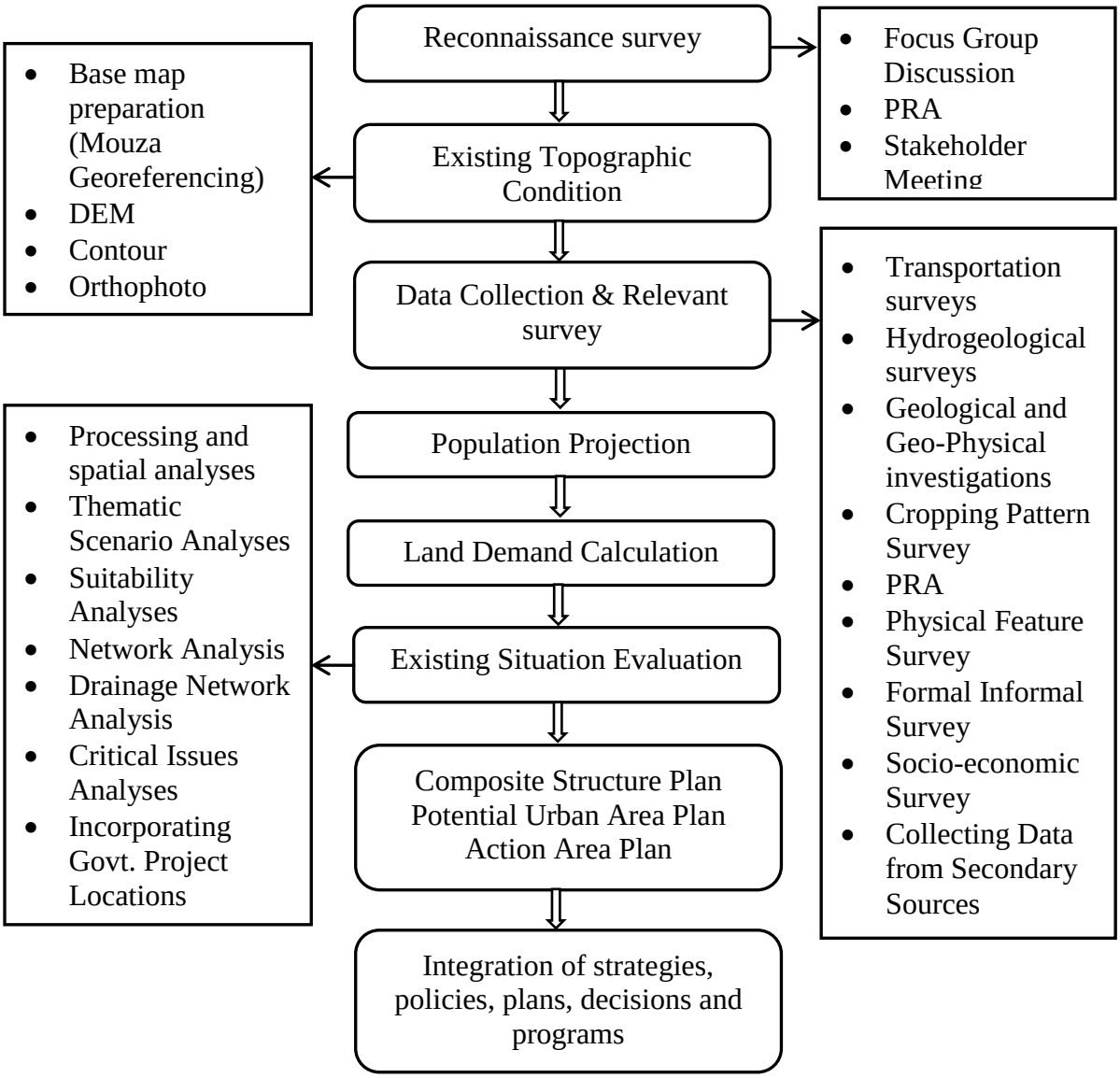


Figure 2: Technical Methodology of Structure Plan Preparation
Source: PKCP Project, UDD, 2019

CHAPTER TWO: CRITICAL PLANNING ISSUES

It is necessary to investigate the past scenario in order to plan for the future. In this chapter, demographic, topographic and socio-economic aspects have been investigated to learn about natural and anthropogenic expansion.

2.1 Demographic setting of the Upazila

In 2011 the total population of the Taltali Upazila was 88004, of which 43707 were males, and 44297 were females. The sex ratio of Upazila was 97, which has remarkably decreased in 2011 compared to 104 in 2001. Figure 3 clearly describing age-sex wise population distribution, that in 2011 percentage of younger dependent population was high in 2011. Therefore, insight could be drawn that in the coming year Taltali needs more employment opportunity to sustain residence's livelihood and to support elderly dependent population.

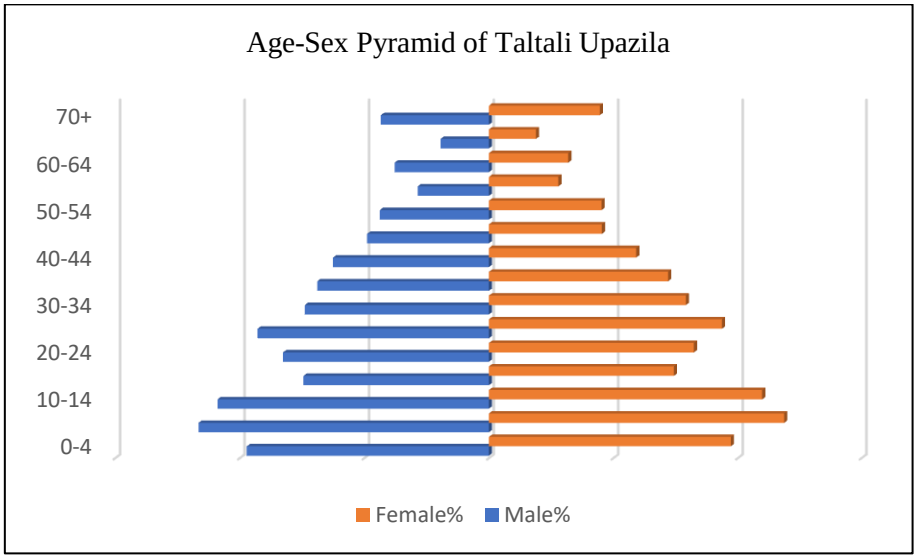


Figure 3: Age-sex pyramid of Taltali Upazila
Source: PKCP project, UDD, 2020

2.2 Natural Resource

Forest Resources: Taltali Upazila is very close to the Sundarbans pargana. The main Forest of the Upazila is Fatrar Char, Nolbunia and Nidra of about 7000 acres' area. People started clearing forests for various development activities. Forests have to reproduced for human needs. The forest department declared Fatrar Char as a reserve forest and eco-tourism sites. The forest department realised deer and crocodile in the reserved forest. At present deer, crocodile, monkey, forest rooster, fox, beige, guitar, and guest birds of different species live in the forest. It is obvious that unplanned development activity will lower the amount of tree cover in the area, which will result in an increase in greenhouse gas emissions. Furthermore, it will have an impact on the existing environment and will contribute to the reduction of local flora and fauna. However, it is possible to address the climate change challenges while also enhancing the socio-economic development of the local community by providing suitable greening and ecotourism facilities in a coordinated manner.

Wet Lands: Taltali Upazila is encircled by wet lands on almost all the sides. It is situated on the bank of the Bay of Bengal which is in the south of the Upazila. The surrounding Rivers are Burishwar, Andharmanik and Kochupatra River. Because of close proximity to the Bay of Bengal and three rivers, there is a huge number of wetlands encompassed the area which is about 15869.08 acres. A lot of natural khals and canals are connecting the main land to the

rivers and sea. Also, there are a great number of ponds and ditches. Most of the Khals and Canals are filling up Rapidly with mud, silt and sand.

Sea Beach: The Bay of Bengal is in the south of Taltali Upazila. Thus, there are beaches exists here. Shuvo-Shonda beach is the main attraction to the local people and tourists from other districts of the nation. Moreover, at the end of the Ftrar Char Forest there is also a beach but is difficult to access. Due to bank erosion the Beaches are moving inwards very rapidly. From the social survey it is obtained that in recent years it has moved almost 1.5 km towards the main land.

2.3 Transportation

The connectivity of Taltali Upazila with other areas is very poor. There is no RHD road and only one Primary Road as well as Upazila Road of LGED but the condition is very miserable. Maximum Roads of the Upazila are in a very bad condition with HBB and Earthen surface. Moreover, there are no Bus terminal, Truck Terminal and CNG Stations. The vehicles are stopping here and there which creates problems to the local life. To get the present condition and predict for the future, several traffic surveys have been conducted. Firstly, it provides an idea about the existing traffic demand and available supply in the form of infrastructure and services. Secondly, it acts as the input for the travel demand forecasting model that is to be constructed as the output of the project, which will enable to analyse various traffic scenarios with respect to changed networks (road, rail and water) as well as land-use scenarios.

2.4 Housing and house building material

As a natural disaster-prone area, the house building materials has a great impact. It has been observed that people do not want to leave their houses for group shelters due to concern for their belongings and livestock. This causes higher casualties during cyclones. People in these disaster-prone areas make their own ways of surviving through housebuilding techniques and settlement patterns. Since traditional houses are made of indigenous materials with crude methods, the loss of life and property is enormous.

Each jurisdiction should be aware of the risks that could cause individuals and households to be displaced for an extended period of time, as well as their communities' potential disaster housing needs and their ability and capacity to help meet those needs through sheltering, temporary housing, or permanent housing solutions. To supplement total housing availability in the area, jurisdictions should adopt integrated sheltering and housing solutions and policies for their population. Through comprehensive disaster risk assessment, this structure plan will propose possible solutions.

2.5 Disaster and Vulnerability

Bangladesh has been identified as one of the world's most vulnerable nations when it comes to climate change challenges. The low adaptive capacity, flat topography and exposure to assorted natural disasters render the coastal region of the nation significantly vulnerable. The communities of Taltali Upazila under Barguna coastal districts are vulnerable to different natural disasters because of their proximity to the Bay of Bengal and surrounded several Rivers. The major hazards are flood, storm surge, cyclone, salinity intrusion, sea level rise, tidal floods, bank erosion, and waterlogging. In addition to present vulnerability, the socio-economic performance, health and way of life of the coastal people would all suffer as a result of climate change. The coastal areas of Bangladesh are different from rest of the country not only because of its unique geo-physical characteristics but also for different

socio-political consequences that often limits people's access to endowed resources and perpetuate risk and vulnerabilities.

Salinity Intrusion

The salinity levels in Taltali Upazila vary depending on the time of year and the location within the upazila. During the dry season (November to April), when there is less rainfall and freshwater flowing into the area, salinity levels tend to be higher. Conversely, during the Monsoon season (June to September), when there is more rainfall and freshwater, salinity levels tend to be lower.

According to a study conducted by the Bangladesh Water Development Board, the salinity levels in Taltali Upazila range from 5 to 20 parts per thousand (ppt) during the dry season and from 0.5 to 5 ppt during the monsoon season. These levels can vary depending on factors such as distance from the coast, elevation, and proximity to freshwater sources such as rivers and canals.

Table 1: Salinity coverage of Taltali Upazila for different scenario of 0.5m SLR.

Upazila	1 ppt				5 ppt				15 ppt			
	baseline		0.5 SLR		baseline		0.5 SLR		baseline		0.5 SLR	
	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
Taltali	267.24	100	267.24	100	267.24	100	267.24	100	65.41	24.47	108.42	40.57

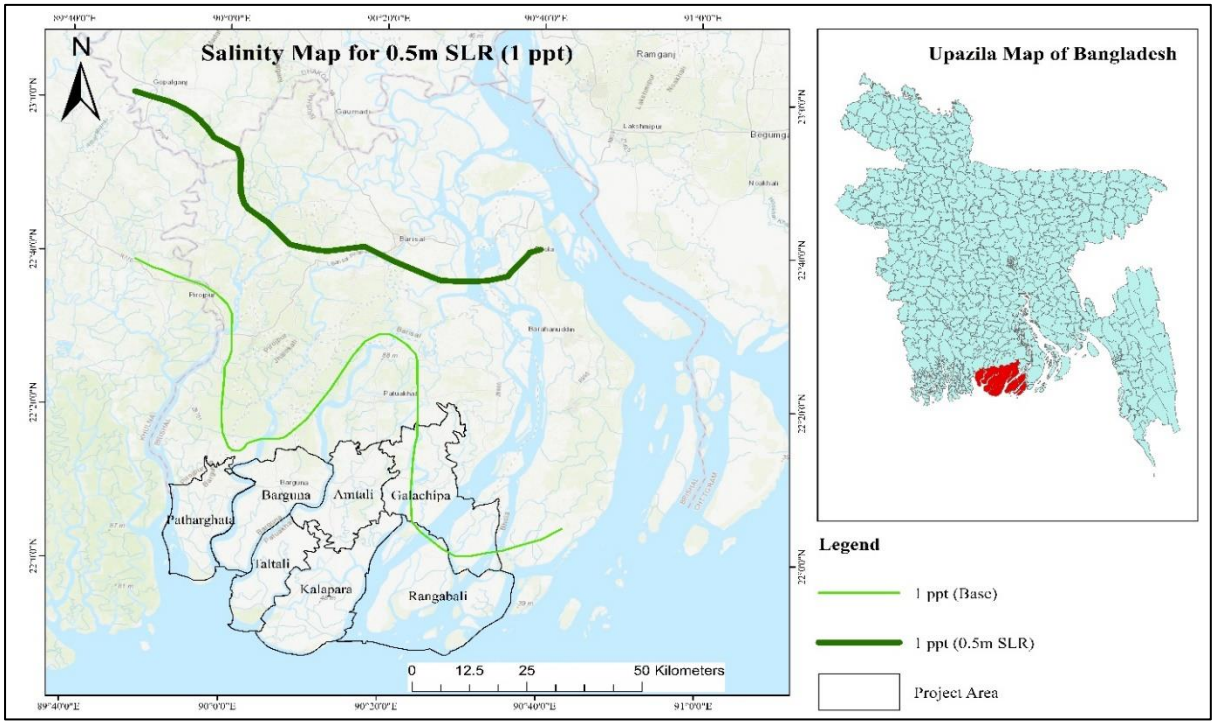


Figure 4: Salinity Map of 1 ppt for 0.50 m SLR

Source: PKCP Project, UDD, 2022

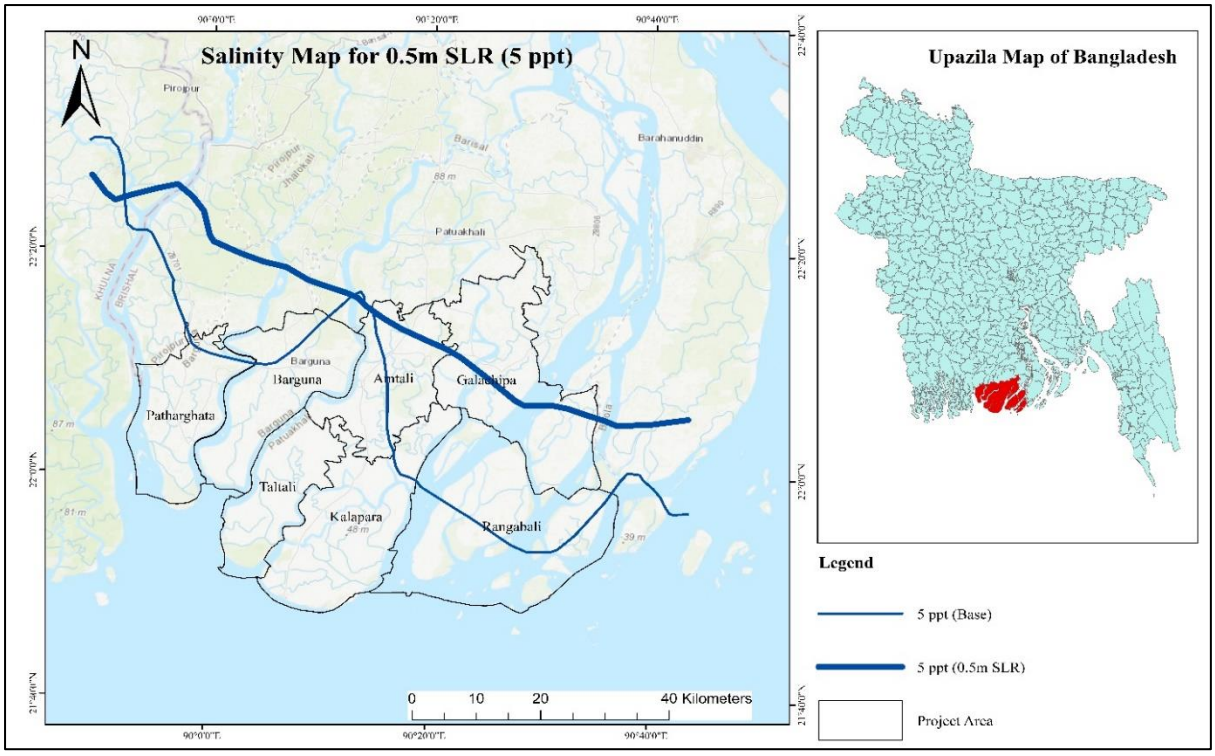


Figure 5: Salinity Map of 5 ppt for 0.50 m SLR
Source: PKCP Project, UDD, 2022

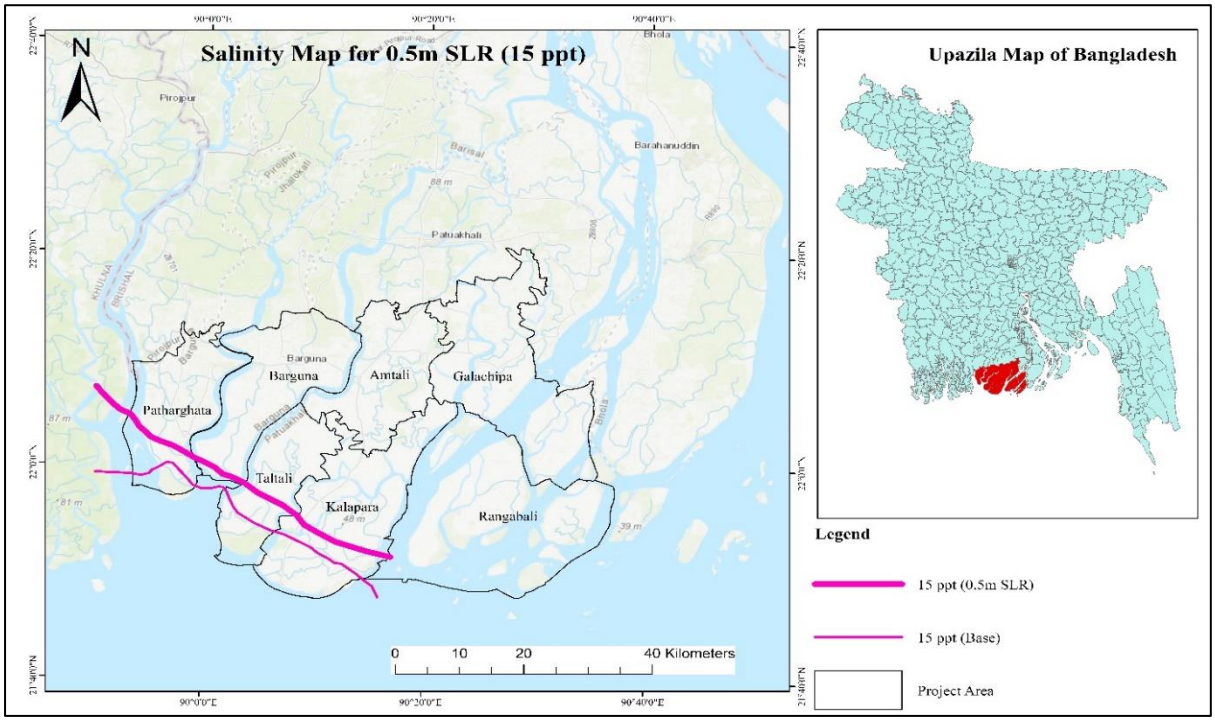


Figure 6: Salinity Map of 15 ppt for 0.50 m SLR.
Source: PKCP Project, UDD, 2022

Sea Level rise

According to various studies and reports, the sea level in Bangladesh has been rising at a rate of around 7 millimetres per year, which is higher than the global average. This rise in sea level has significant impacts on the coastal communities of Taltali Upazila and the surrounding areas, including increased coastal erosion, inundation of low-lying areas, and saltwater intrusion into freshwater sources.

The impacts of sea level rise are particularly severe during cyclones and storm surges, which are becoming more frequent and intense due to climate change. These events can cause widespread damage to infrastructure, homes, and crops, as well as loss of life.

Land Cover Change

The study area has observed rapid changes in land use and land cover in the last 4 decades. Landsat satellite images of historical data over the study area are assessed from 1989 to 2021. Changes of different types of land use classes are assessed using satellite data. Below figures show land use map in 1989, 1999, 2009 and 2021. A summary the upazila-wise changes in water bodies, forests, bare land, cultivable land, and build up areas in the study area are presented in table 2 respectively.

Table 2: Land use/ Land cover (LULC) changes (in km$^{2)}$ for Taltali Upazilas from 1989 to 2021.

LULC type	1989	1999	2009	2021	Change	(%)
Waterbody	46.5408	48.1419	51.8643	54.8055	8.2647	17.76
Forest	32.7105	33.4098	40.7934	51.4332	18.7227	57.24
Bareland	162.2034	143.9496	102.5631	78.5043	-83.6991	-51.60
Cultivate land	32.8239	48.2607	76.3623	87.6438	54.8199	167.01
Buildup land	0.1521	0.6687	2.8476	2.0439	1.8918	1243.79

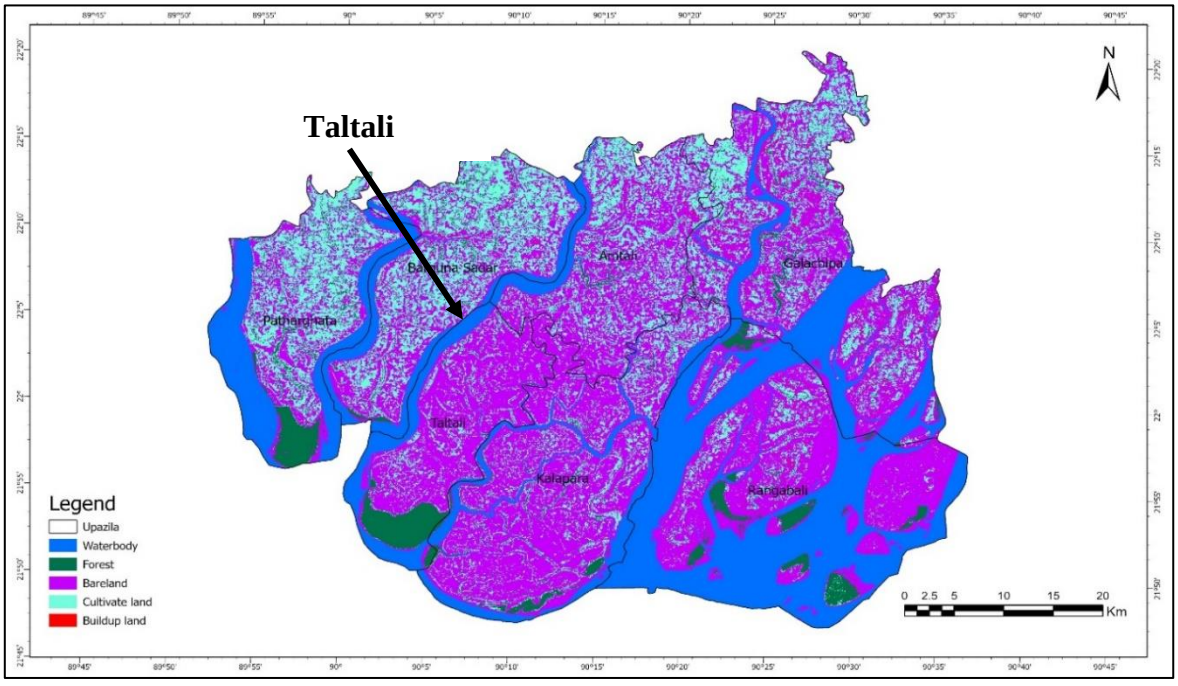


Figure 7: LULC map of Project area for the year of 1989

Source: PKCP Project, UDD, 2022

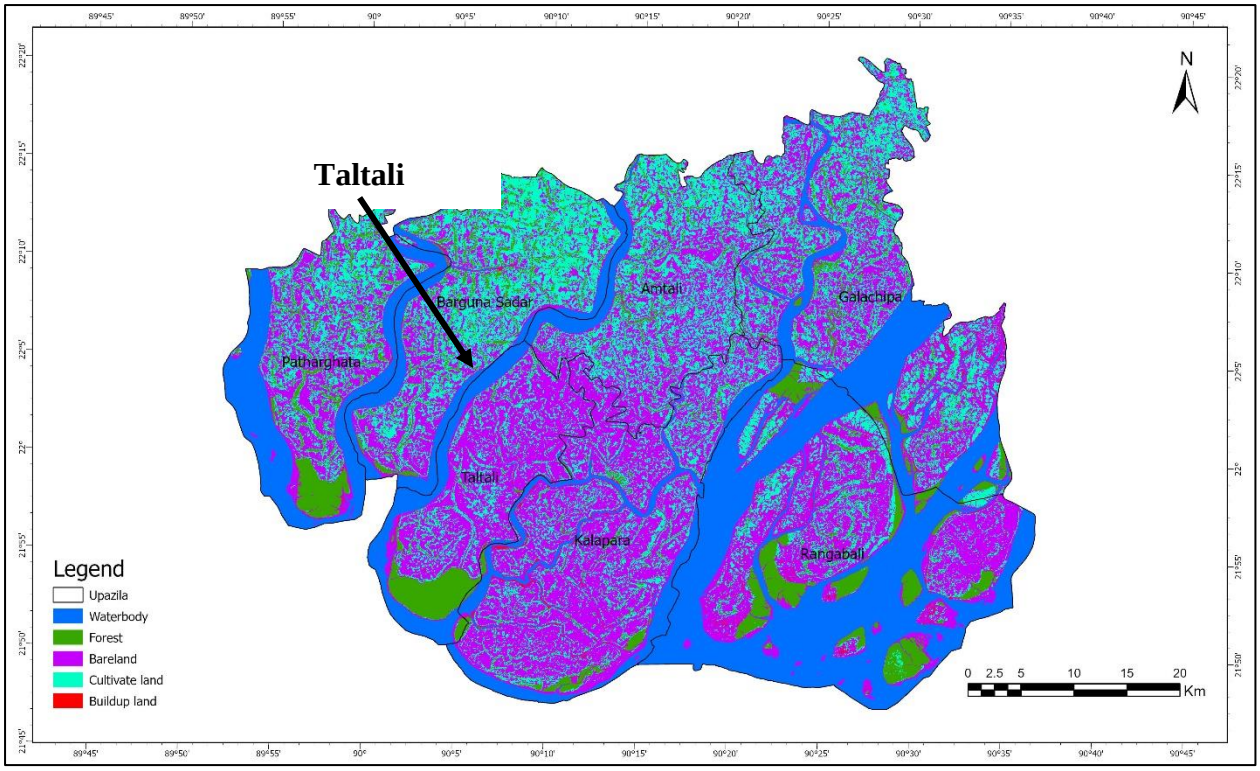


Figure 8: LULC map of Project area for the year of 1999
Source: PKCP Project, UDD, 2022

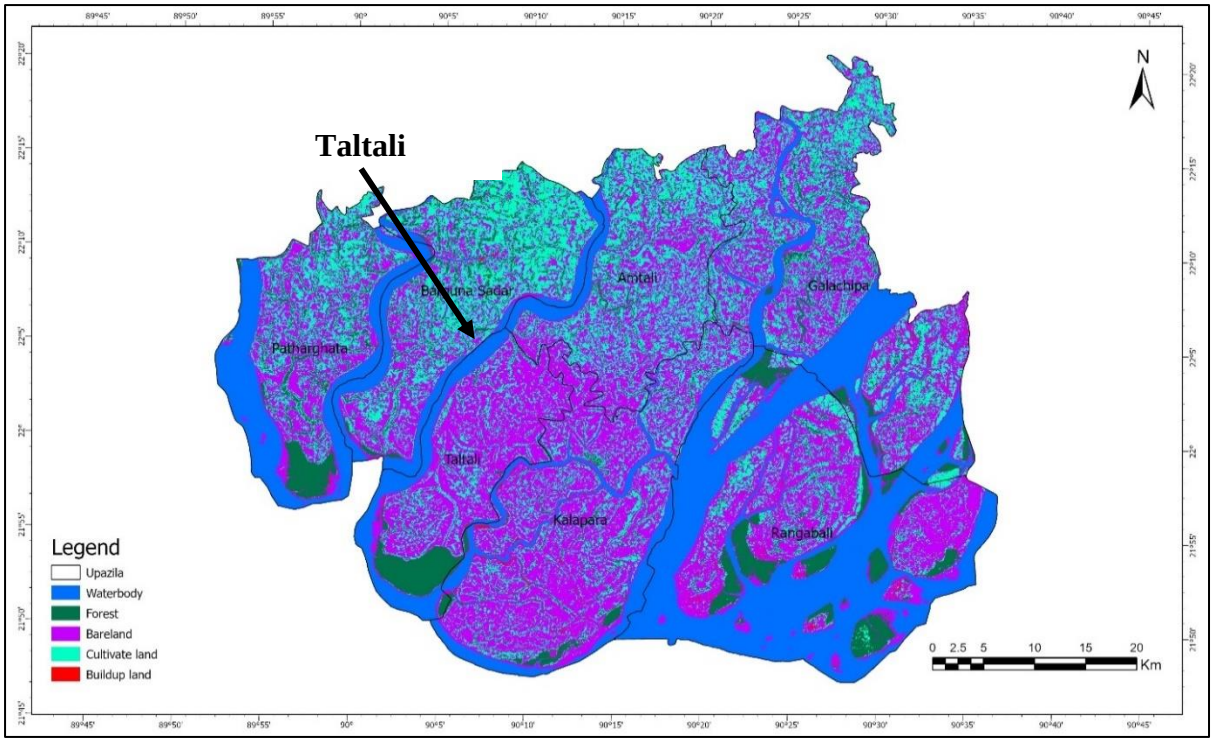


Figure 9: LULC map of Project area for the year of 2009
Source: PKCP Project, UDD, 2022

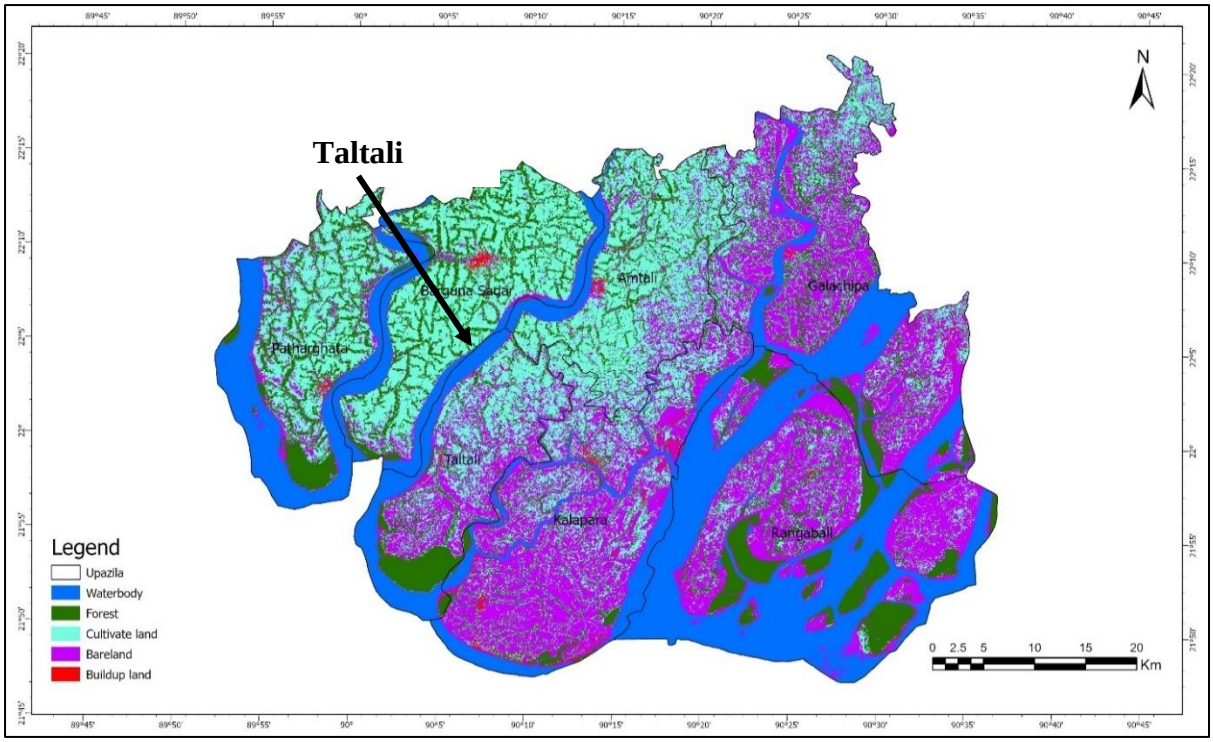


Figure 10: LULC map of Project area for the year of 2021

Source: PKCP Project, UDD, 2022

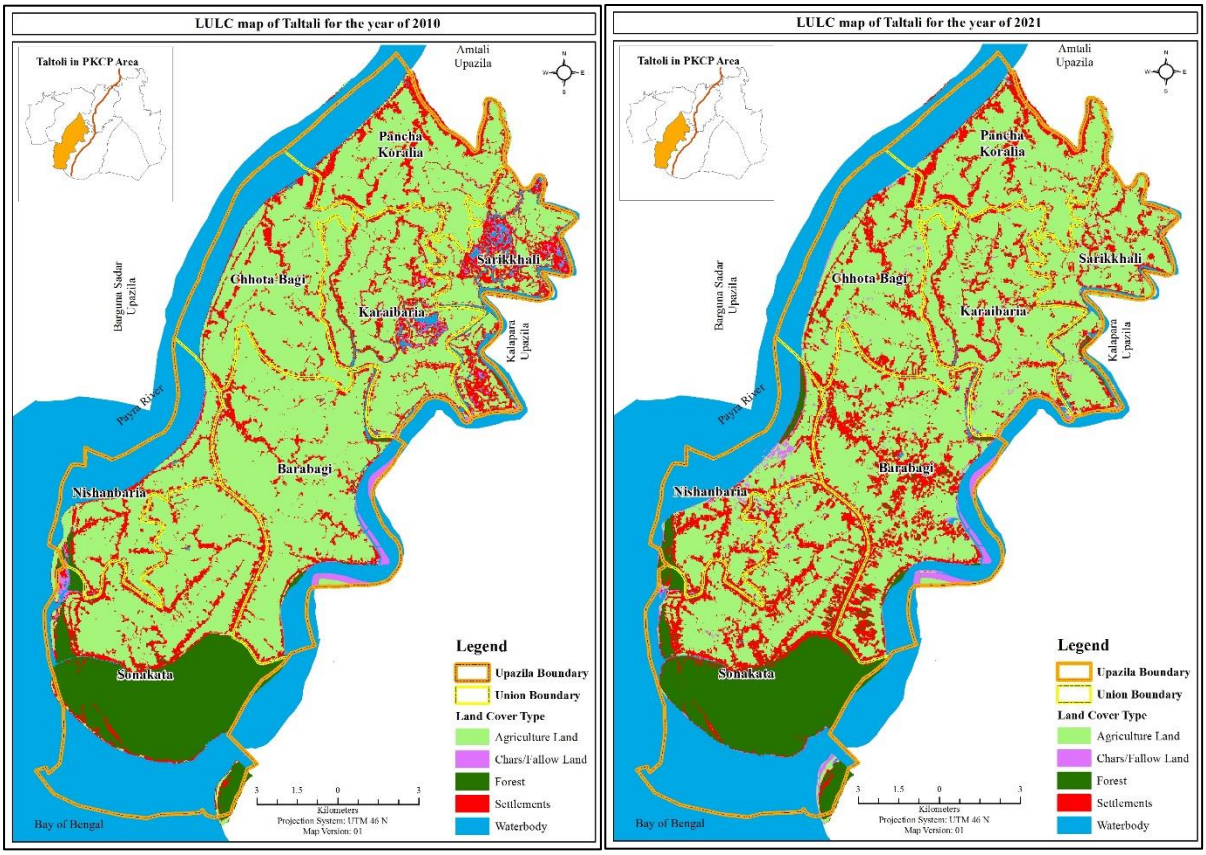


Figure 11: Model simulated LULC map of Taltali for the year of 2010 and 2021

Source: PKCP Project, UDD, 2022

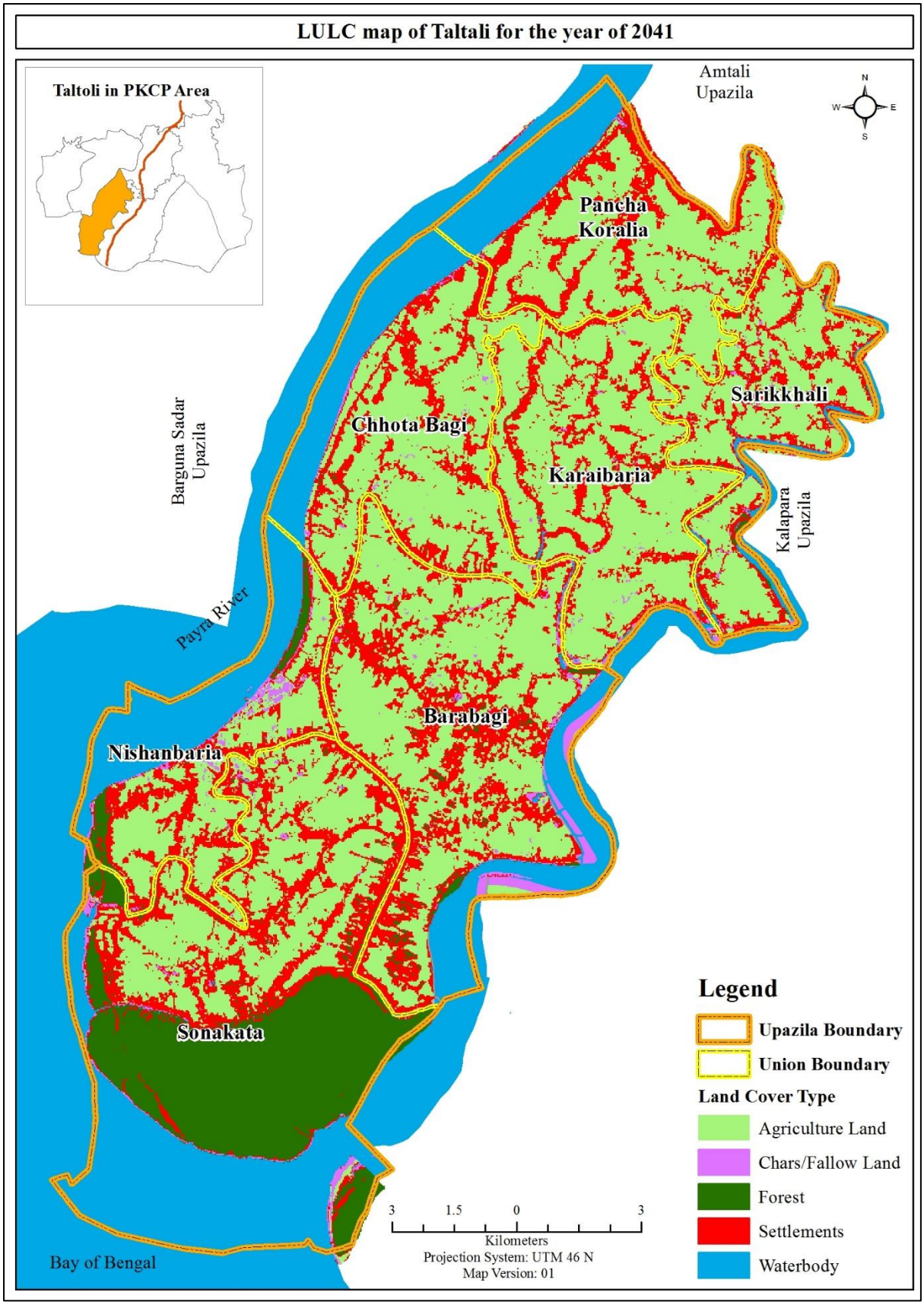


Figure 12: Model simulated LULC map of Taltali for the year of 2041

Source: PKCP Project, UDD, 2022

Future changes of LULC are predicted for 2041 using the Cellular Automata (CA) with Markov model. The Cellular Automata(CA) model is a discrete model with a spatially extended dynamic system based on a defined transition rule that relates the new state to the previous state of the LULC type (Guan et al., 2011). CA-Markov model develops with a combination of Cellular Automata and the Markov Chain to predict spatiotemporal changes of LULC.

A summary of the predicted of LULC changes in the future over the study area is presented in Table 3. It has been found that agricultural area will be reduced in the future while natural forests and Settlement will be increase. On the hand, natural water bodies will be reduced by being filled up or transferred to other land use types.

Table 3: Predicted of LULC changes in the future from 2010 to 2021 using CA-Markov model

Area LULC Type	Area (km2)		
	Year 2010	Year 2021	Year 2041
Agriculture Land	148.007	139.283	126.277
Settlements	39.5235	48.474	61.1118
Forest	26.6229	26.7876	26.8686
Chars/Fallow Land	2.1186	2.8341	3.8574
Water	58.1175	57.0105	56.2743

Erosion and Accretion

As Taltali is situated on the bank of the Bay of Bengal and several rivers. It is an erosion and deposition-prone area. The beach areas are coming towards the mainland about 1.5 km during the past decade as a result of bank erosion. On the other hand, some areas are depositing over time on the west and east side of the Upazila.

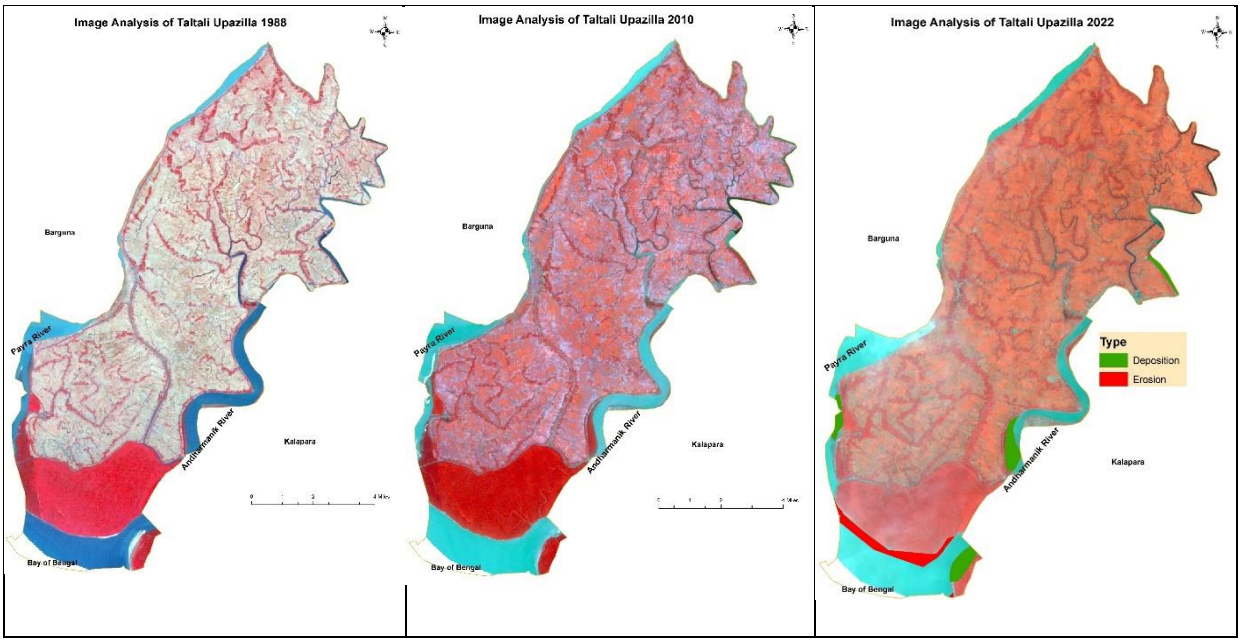


Figure 13: Erosion and accretion Scenario of Taltali Upazila

Source: PKCP Project, UDD, 2022

Table 4: Accretion and erosion areas between 1989 and 2021 (in acre)

1989-1999		1999-2009		2009-2021		1989-2021	
Accretion	**Erosion**	**Accretion**	**Erosion**	**Accretion**	**Erosion**	**Accretion**	**Erosion**
13.48	12.64	15.52	10.11	1.94	3.88	3.48	8.36

Cyclonic Storm surge

Records of the last 200 years show that at least 70 major cyclones have hit the coastal belt of Bangladesh. The Khulna/Sundarbans and Barisal-Noakhali coasts received about 30 percent of the cyclones. Payra-Kuakata region falls in the high-risk area.

Cyclones are increasing in Bangladesh. From the historical trend analysis, it is observed that a severe cyclone strikes the country on average every three years. Twenty-one tropical cyclones (wind speed >117 km/hr) and severe cyclones (wind speed between 87 to 117 km/hr) struck the Bangladesh coast between 1960 and 2010 (MoEFCC, 2018). Of these, 33% happened in the pre-monsoon season, while the remaining 67% occurred in the post-monsoon season.

Cyclone with storm surge causes colossal damages to the coastal people in terms of physical infrastructures, settlements, deaths, shocks to the natural system etc., as a whole. These facts should be taken into account in each tire of physical planning.

Table 5: Maximum water level (m) for major historical cyclones occurred in Taltali Upazila

Upazila	Maximum Strom inundation level (m)	Maximum Strom inundation level (m) under 0.5m SLR scenarios
Taltali	1.50	2.00

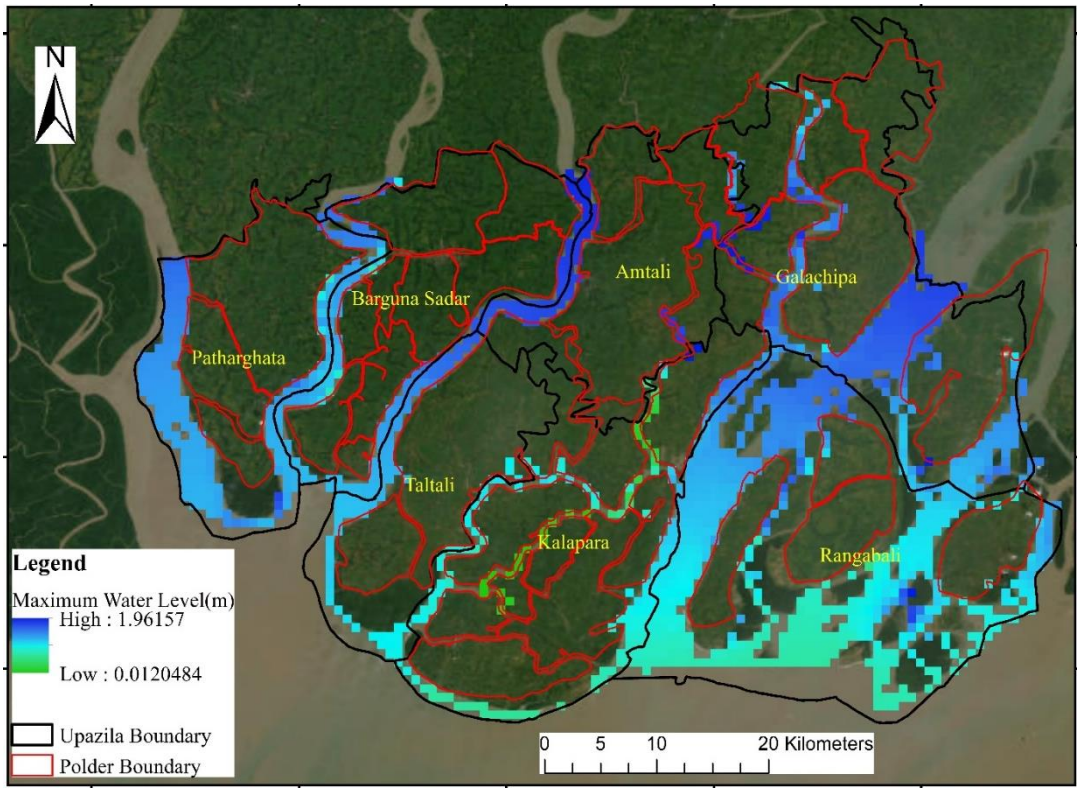


Figure 14: Maximum Water Level (m) for historical major cyclones

Flood Inundation

The flood inundation mapping approach adopted in this study is based on the spatial association between the digital elevation model (DEM) of the project area and flood levels as obtained from flood frequency analysis using measured daily water level data of the nearby gage stations maintained by Bangladesh Water Development Board (BWDB). The estimated flood levels with respect to mean sea level (MSL) in all five water level gage stations for 50, and 100-year return periods are shown in below table-

Table 6: Flood levels (m MSL) of the surrounding rivers of the project area corresponding to 50- and 100-year return period

River	Stations	Returen period	
		50	100
Baleswar	Rayenda (SW107.2)	3.47	3.54
Bishkhali	Barguna (SW38.1)	3.38	3.48
Bishkhali	Patharghata (SW39)	3.67	3.80
Buriswar	Amtali (SW20)	3.10	3.20
Andharmanik	Khepupara (SW220)	2.68	2.83

The area is mostly protected from the tidal flood by polders (Figure 35). Out of 139 polders in coastal Bangladesh, 35 are located in the project area. The elevation of all the polders in the project area varies from 4.04 m MSL to 5.54 m MSL. As the maximum flood level corresponding to the 100-year return period (3.80 m MSL) is less than the minimum elevation of the polder (4.04 m MSL), the poldered area inside the project area would never be overtopped.

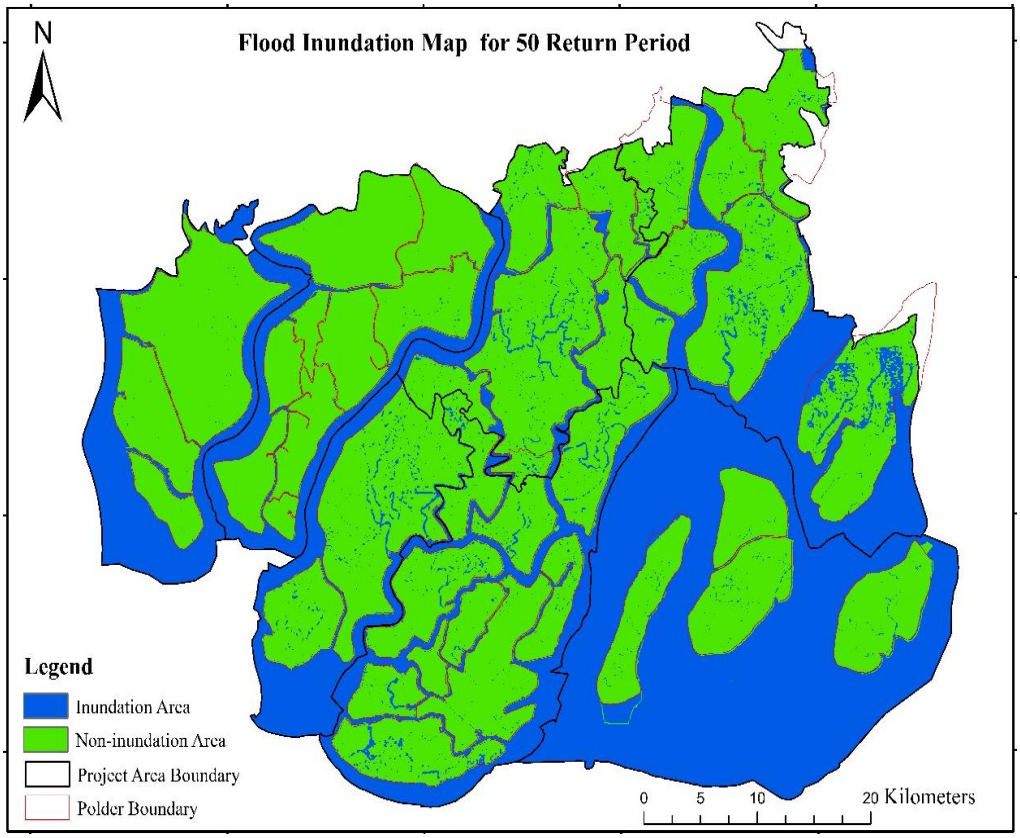


Figure 15: Flood inundation map for the 50-year return period

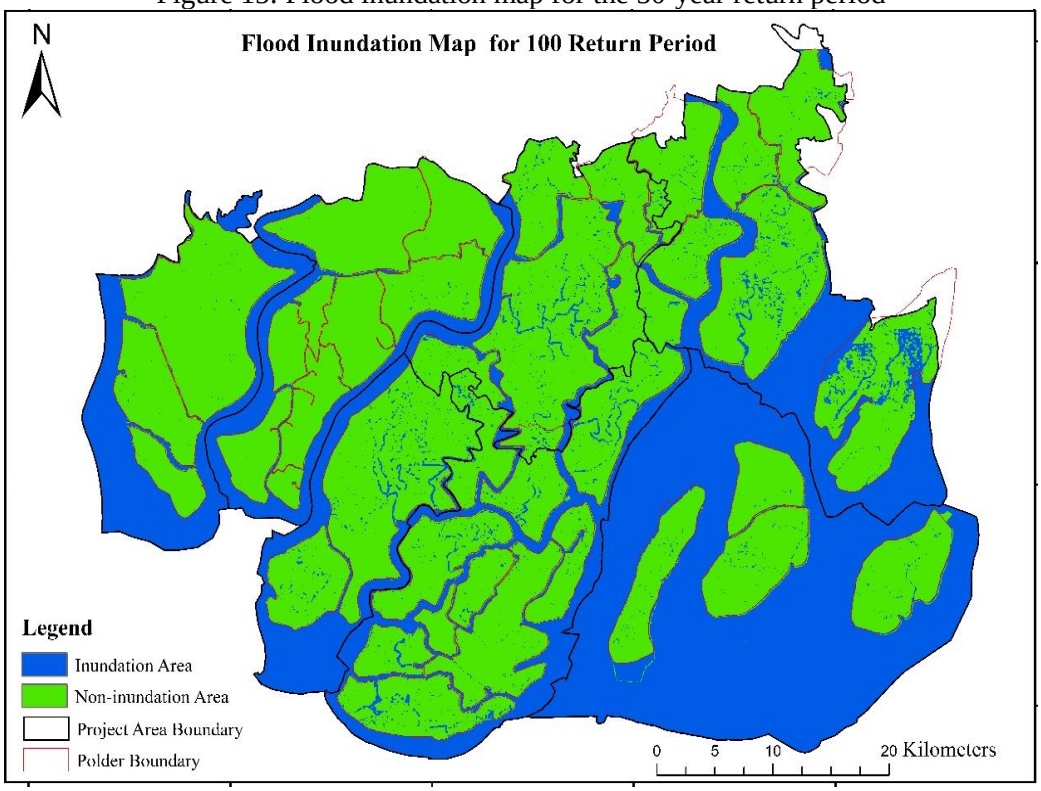


Figure 16: Flood inundation map for the 100-year return period

Thus, according to the flood inundation mapping, the project area which is poldered is free from river flooding. However, it can be vulnerable due to inundation caused by cyclonic storm surges.

2.6 Composite Hazard Scenario

As the project area is one of the hazard prone areas of Bangladesh, a composite hazard map is prepared considering the above scenarios. The composite hazard map is prepared using four main hazard components that are prominent in the study area. These are – 1) Salinity level of 1ppt, 5ppt, 25ppt for 0.5m SLR, 2) Maximum inundation of Strom surge water level (m), 3) Erosion- Accretion from 1989 to 2021 and 4) Flood inundation for 20-year return period.

A normalization statistics equation is used to convert all the layer values from 0 to 1. After normalizing all values, all the layers of hazard component are reclassified into three classes i.e., 0.0 to 0.329, 0.33 to 0.67, 0.67 to 1. The reclassify score of all hazard layers are given in table below.

Table 7: Scores of different major hazards after normalizations

Salinity		**Erosion-Accretion**		**Strom surge inundation**		**Flood Inundation**	
Reclass	Score	Reclass	Score	Reclass	Score	Reclass	Score
0.0 -0.33	1	0.0 -0.33	3	0.0 -0.33	1	0.0 -0.33	3
0.33-0.67	2	0.33-0.67	2	0.33-0.67	2	0.33-0.67	2
0.67-1.00	3	0.67-1.00	1	0.67-1.00	3	0.67-1.00	1

The weighted overlay technique is used to prepare the final composite hazard map. As Salinity and Erosion- accretion processes are mainly dominated in the projected area, the influence factors i.e., 35% for Salinity, 35% for Erosion-Accretion process, 15% for Strom surge inundation and 15% for Flood Inundation are sequentially assigned.

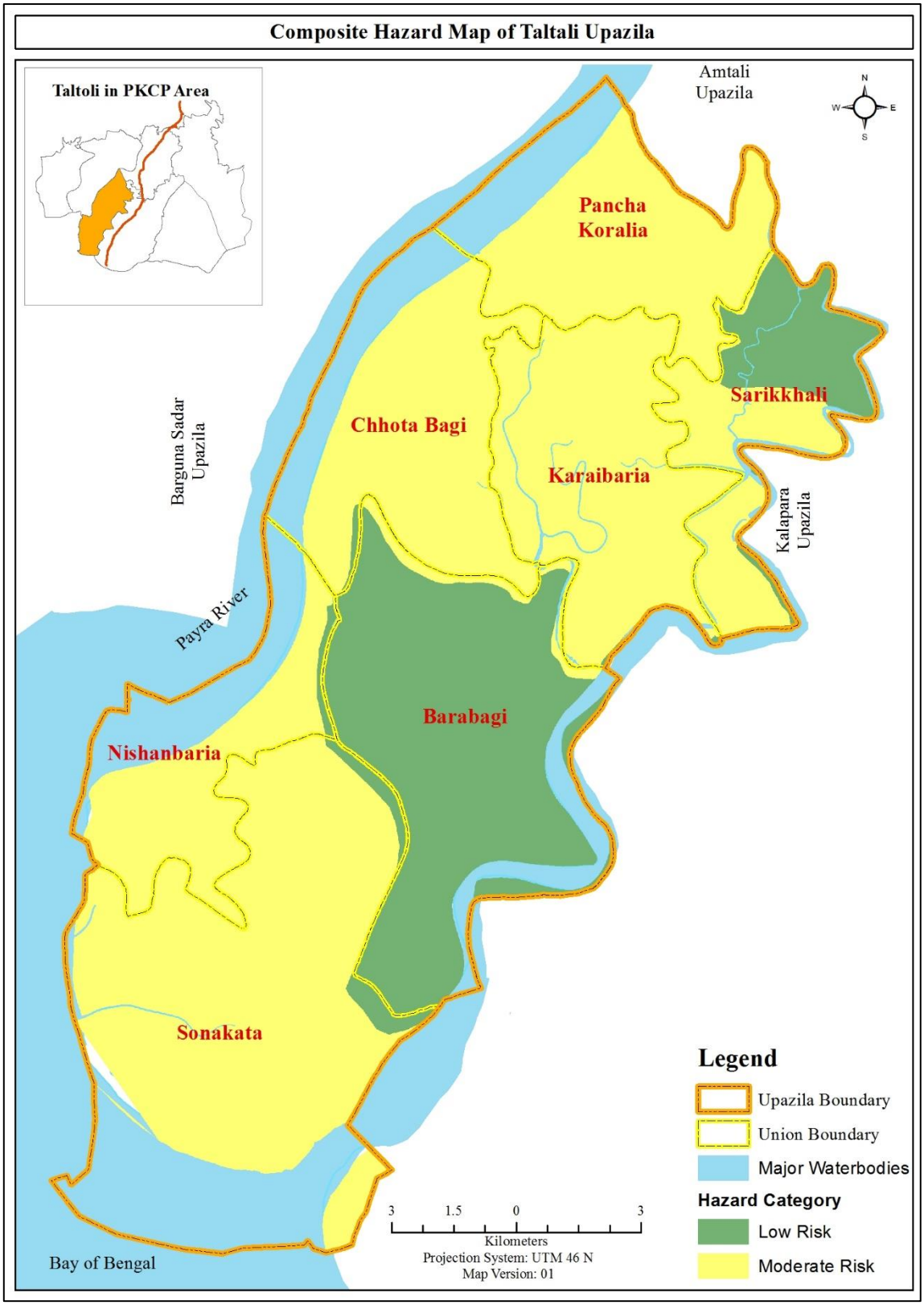


Figure 17: Composite Hazard map of Taltali Upazila

Source: PKCP project, UDD, 2022

It is observed that most of the areas of taltali Upazila is moderately hazard risk prone areas. Only Barabagi Union and a portion of Sarikkhali Union is under low risk area.

2.7 Coal Power Plant and Ship Yard

The Barisal Coal Power Plant is being constructing in Taltali Upazila which will contribute electricity to the national grid. Thus, the electricity problem of the local people will be reduced. This plant has a great impact to boost up the economy of this area. But it may have some detrimental effects too. The environment of the surrounding areas has an immense possibility of degradation due to emission and pollution from coal. Moreover, there is a Govt. proposal of Ship Yard in Nishanbaria Union.

There will be two locations of Ship Breaking and Ship Production Yard in the same Union. But the proposed locations are closed proximity to the Nidra and Nalbunia Forest. Therefore, the forests will be in a vulnerable condition. An action must be taken to conserve the forests as well as natural resources.

2.8 Topographic Condition

Topography describes the physical features of an area. These features typically include natural formations such as sea, rivers, lakes etc. Manmade features such as roads, dams, and structures may also be included. Human Settlement, Means of Transport and Communication, Land Use, Relief and Drainage etc. mainly interpreted the topographic map. Taltali Upazila is situated in the costal belt of Bangladesh.

The Upazila is comparatively in the low land than the other areas of Bangladesh. Coastal regions are very complex environments with various hydrodynamic and bio-geomorphological circumstances and with important socio-economic and ecological difficulties. They are directly affected by the impact of climate change on sea level, storm surges frequency and strength, as well as recurrence of coastal river floods.

2.9 Ethnic Groups

Cultural value orientation patterns vary not only across the world cultures but also vary among sub-cultures within a given society. Ethnic community people living in Bangladesh have certain perceptual and cognitive view to the social and physical universe. According to their cultural point of view, they direct their personal, familial and community behaviour to solve human problems faced in those universes.

In Taltali Upazila there are two ethnic groups- Mog and Rakhain. Rakhains are comparatively dominated than the Mogs. The people of Mog ethnic group are in a very threatened condition. Moreover, the culture and language of these ethnic groups should be taken into action from evanesce.

2.10 Eco-tourism Potentiality

A timely and tourism industry-friendly tourism master plan is required for the purpose of clarifying and implementing specific development measures in the tourism sector over a certain time period, of course, with government funding for development. The experts' panel emphasized the necessity of a regional tourism policy due to its unique characteristics (e.g., social, cultural, and political) of each region within the country.

Additionally, the experts advocate for a bottom-up approach, implying that additional layers can be added at the divisional or local levels to facilitate site-specific administration. The Shuvo-Shondha Beach and Fatrar Char Forest are very Potential for Eco-Tourism in Taltali Upazila.

2.11 Economic Condition of the Upazila

Taltali Upazila is in a backward economic condition comparing the national context. The fishery is one of the main economic bases here. The livelihood of most of the local people of this Upazila is dependent on fisheries resources. Due to the coastal Upazilas, sea fish are more available here.

In the Taltali Upazila, the amount of fish resources extracted from the sea is higher than that of freshwater fish. The trade and commerce of this Upazila are mainly fishery based. There are many fishing grounds and Sutki Palli.

The second dominated economic base is agriculture. Thus, the rice business is carried out here. Alternative livelihoods for the local people are a persuasive demand. Different afforestation programs have so far been taken along the river banks to provide the needs of forest resources of the local people.

2.12 Language and Culture

The geography and geographical location of the Upazila have played a role in the formation of the language and culture of the people of this Upazila. Cultural events are spread in Taltali Upazila on the basis of seasonal events such as Nowkabaich (boat recessing), Baishakhi Mela, Pausch Sanchini, Muharram Mela etc.

There are also two ethnic groups named Rakhain and Mog. They have their own language and Culture.

2.13 Flooding and Drainage

As the area lies at the southernmost tip of the Bay of Bengal as a result Taltali Upazila is highly vulnerable due to hydrological hazards, especially monsoon floods and coastal floods. Coastal floods can arise from tidal floods as well as storm surge-induced floods.

The area is also vulnerable due to extreme precipitation, especially during cyclones that occur during the pre-monsoon and post-monsoon periods. The extreme precipitation and storm surges can cause drainage problems in the area as well.

Moreover, the Khals and Canals which act as the main natural drainage system are filing up continuously. It causes salinity to the agricultural lands due to the stuck water. It is also causing water logging in the communities.

Furthermore, the irrigation system is hampered for this reason. The drainage outlets mainly depend on the main river system and adjusted canals near the main drainage site. There are a few storage basins, also notable in the main drainage sites of the Upazila.

2.14 Cropping pattern

The economy of the Taltali Upazila is dominated by agricultural activities. Households are engaged in farming activities that produce varieties of crops, namely Aaman rice, watermelon, sunflower, wheat, vegetables, spices, cash crops, pulses and others. Various fruits like mango, jackfruit, coconut, betel nut, banana, etc. are grown. Coconut and betel nuts are grown abundantly in Upazila.

Conducting a workshop with union level agricultural officer it is explored that about 58% of the agricultural lands are single-cropped, others are double-cropped and a very few lands about 4% are triple-cropped. It is decided that the double and triple-cropped lands will be reserved while proposing for development or destroyed as little as possible.

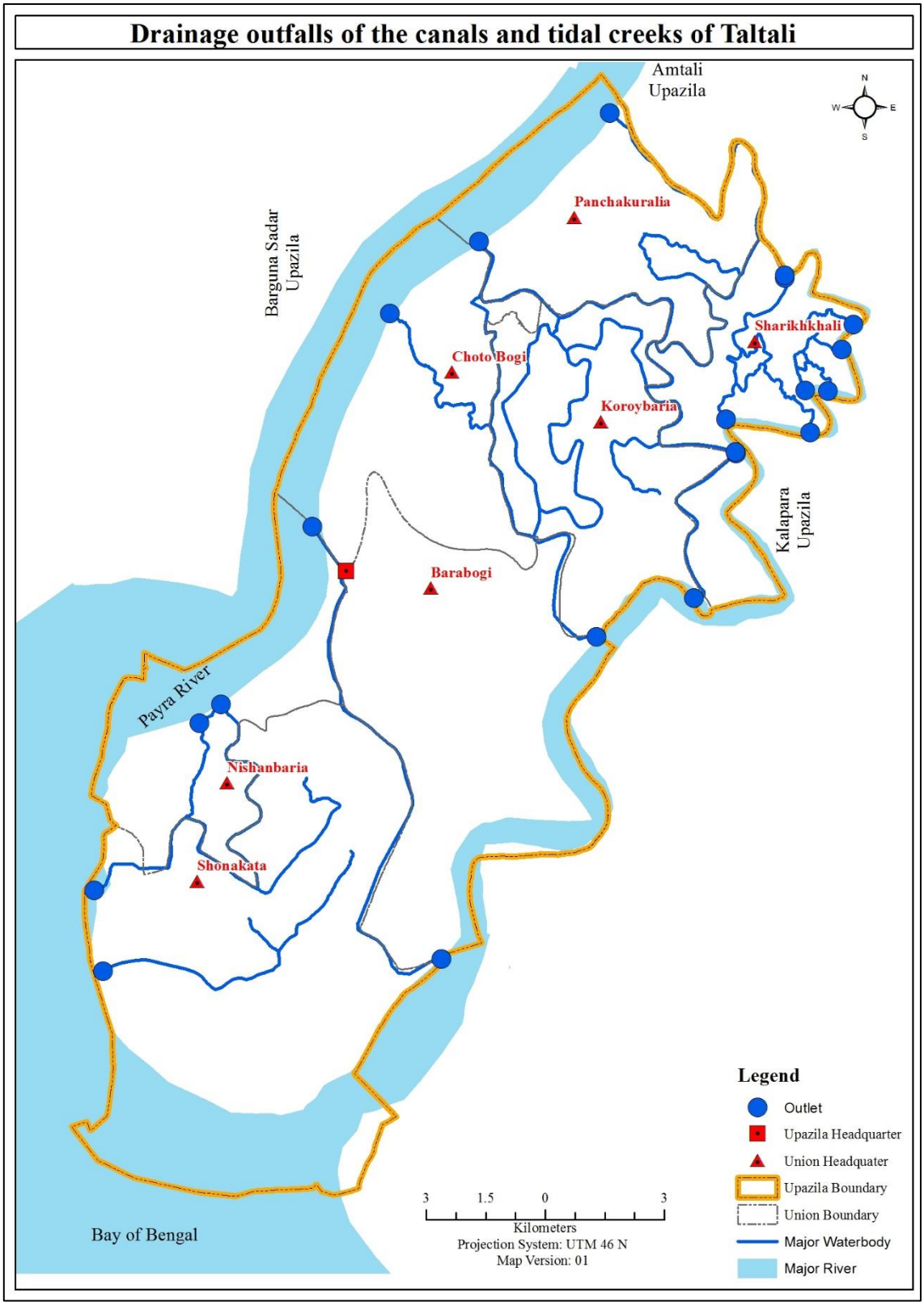


Figure 18: Drainage outfalls of the canals and tidal creeks

Source: PKCP project, UDD, 2022

Table 8: Cropping Pattern of Taltali Upazila

Cropping Pattern	Area (Acre)	%
Single Crop	20399.83	58
Double Crop	12948.28	37
Triple Crop	1744.11	5

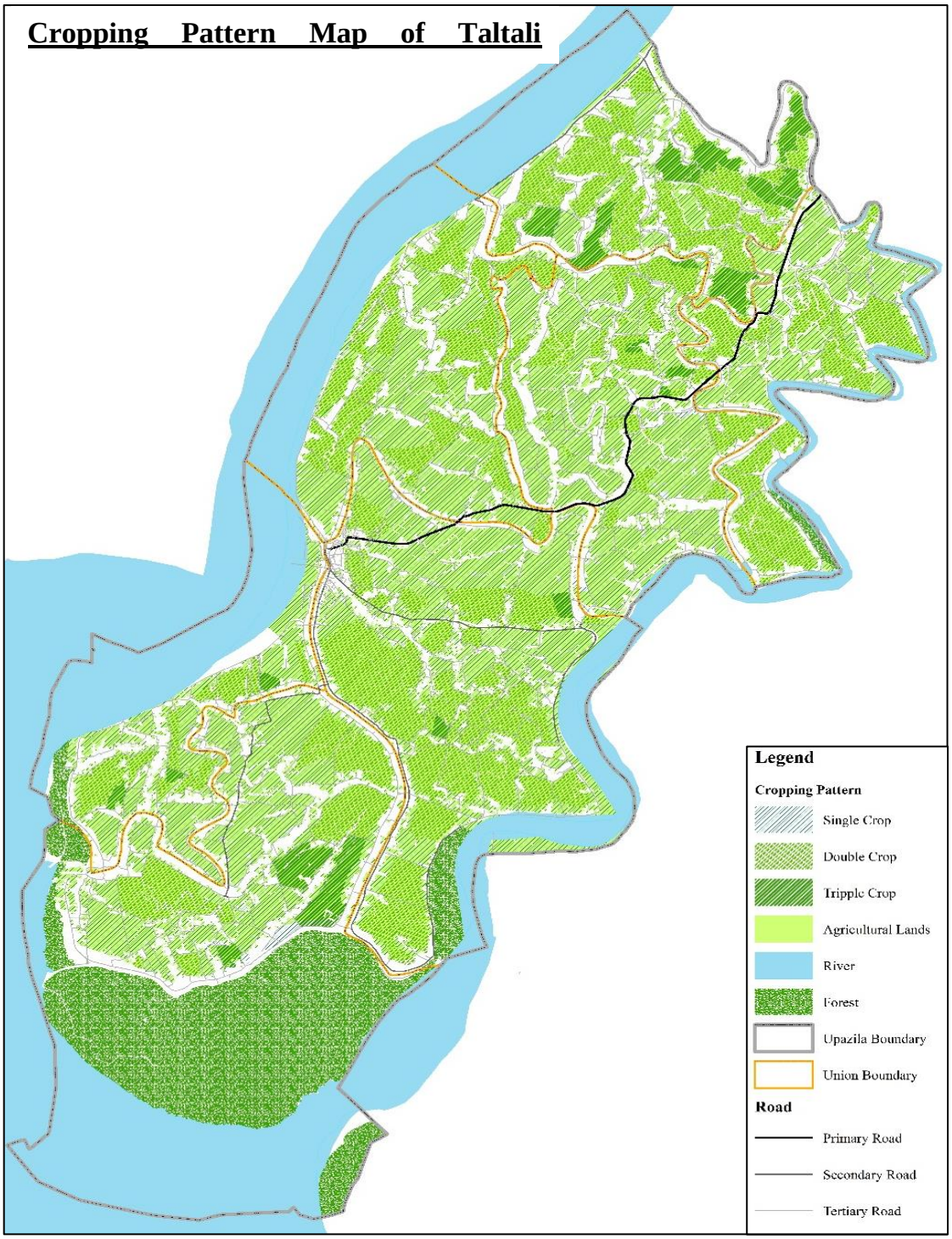


Figure 19: Cropping Pattern Map of Taltali *Source: PKCP Project, UDD, 2022*

2.15 Water, Sanitation and Hygiene

From the social survey, it is found that 60% of septic tanks are in healthy condition and yet 40% are in unhealthy condition. This scenario clearly illustrates that the sanitation facility has to develop a lot. Based on water quality survey about 98% water sources provide drinkable water. Only 2% are undrinkable, Contaminated with Arsenic and Odour. The following categories are driven following The JMP service ladder for drinking water

Easy accessibility to a water source **Drinking water from an improved water source that is accessible on premises, available when needed**
Somewhat accessibility to a water source Drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing
Limited accessibility to a water source Drinking water from an improved source for which collection time exceeds 30 minutes for a roundtrip including queuing
Surface Water Drinking water directly from a river, dam, lake, pond, stream, canal or irrigation canal

It is spatially calculated based on the household location that only 6 percent of households have easy accessibility to a drinking water source while 86 percent has Somewhat accessibility to a water source and 8 percent has Limited accessibility to a water source.

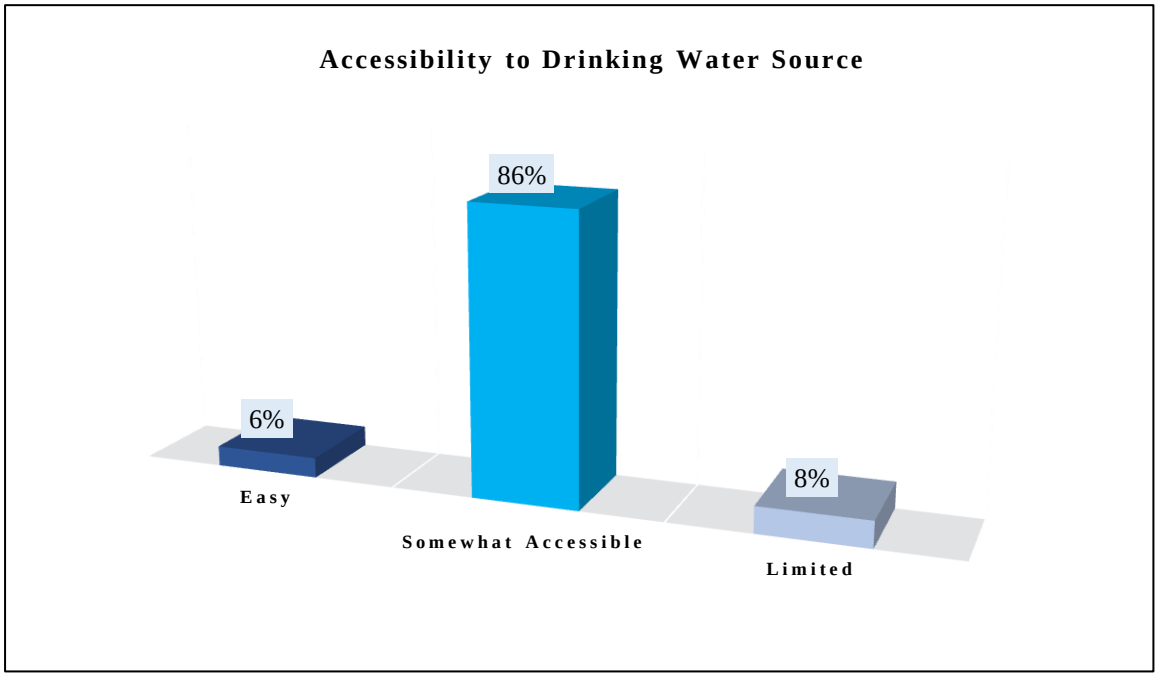


Figure 20: Accessibility to Drinking Water Source

Source: PKCP Project, UDD, 2019

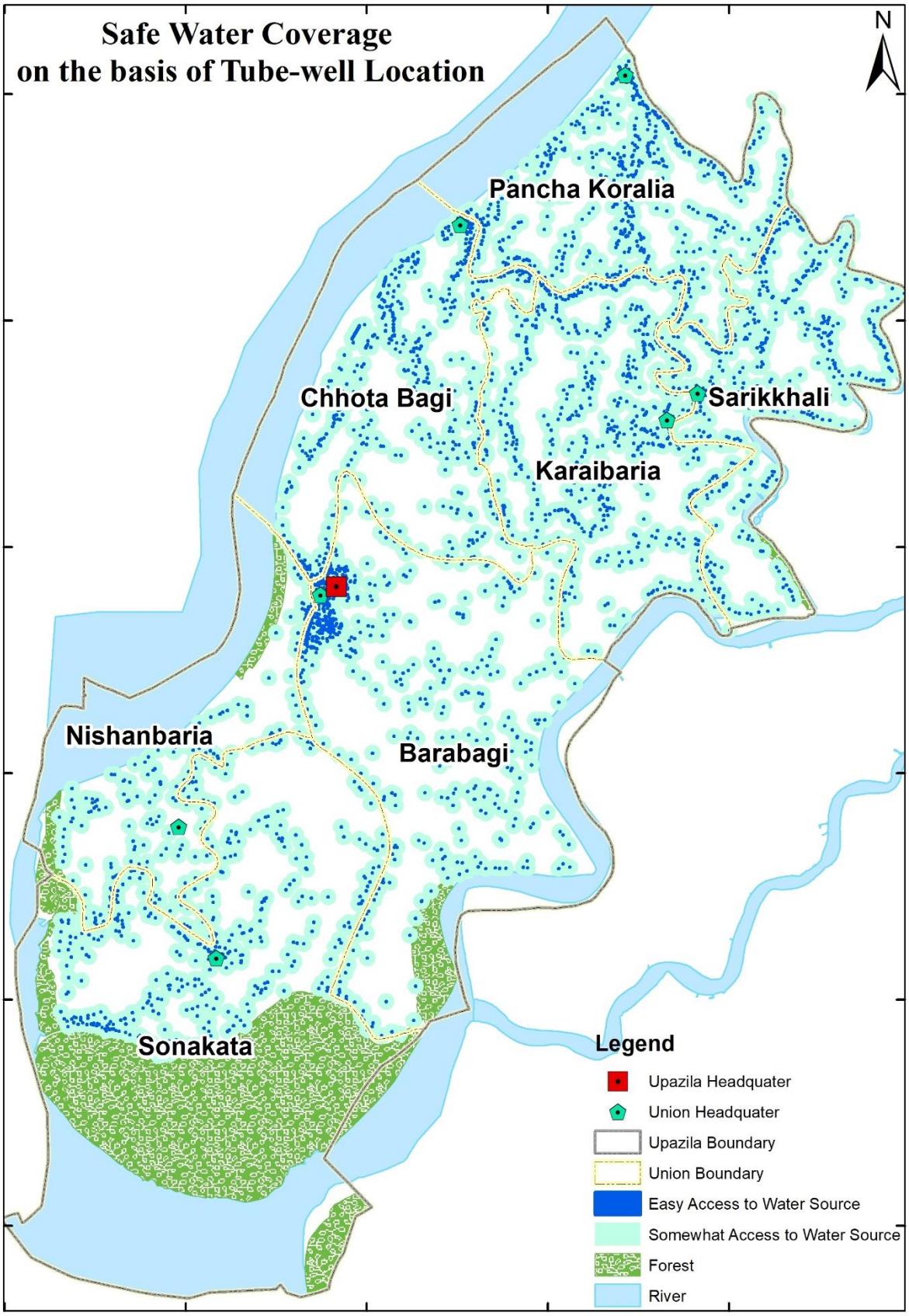


Figure 21: Safe water coverage of Taltali
Source: PKCP Project, UDD, 2019

2.16 Hydro-geological Attributes

Any development work requires water. Assessment of the availability of water and its quality is necessary for existence of the area. This is even more important in the coastal area because of the limited availability of fresh water and their high contamination risk. There is a scarcity of safe drinking water in the coastal areas of Bangladesh as well as Taltali Upazila because shallow aquifers here are mostly contaminated by various poisonous elements like Arsenic, Iron, Chloride, Magnesium, Sulphates, etc.

First clay layer beneath the top soil is continuous in central part along the cross section. Cross shows abrupt change in the underlying lithology both laterally and vertically. Distribution of underlying sediments especially clay layers change throughout the section. Thus, any uniform trend of thickness is difficult to establish. Subsurface lithology is dominated by sand grains particularly fine-grained sand. A thick deposition of clayey silt spotted at 130 m depth which is coexisted with clay layer of the Taltali Upazila.

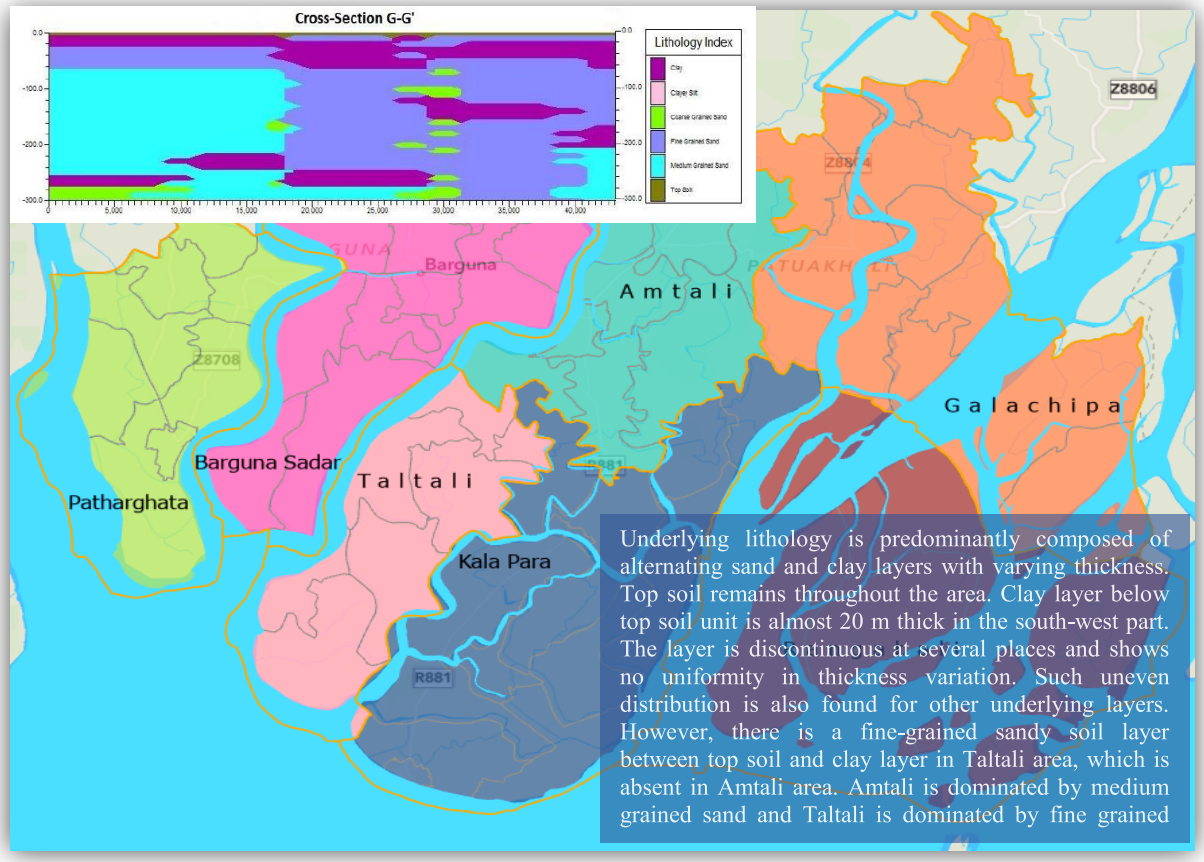


Figure 22: Subsurface lithology of Taltali Upazila
Source: PKCP Project, UDD, 2019

2.17 Geological Attributes

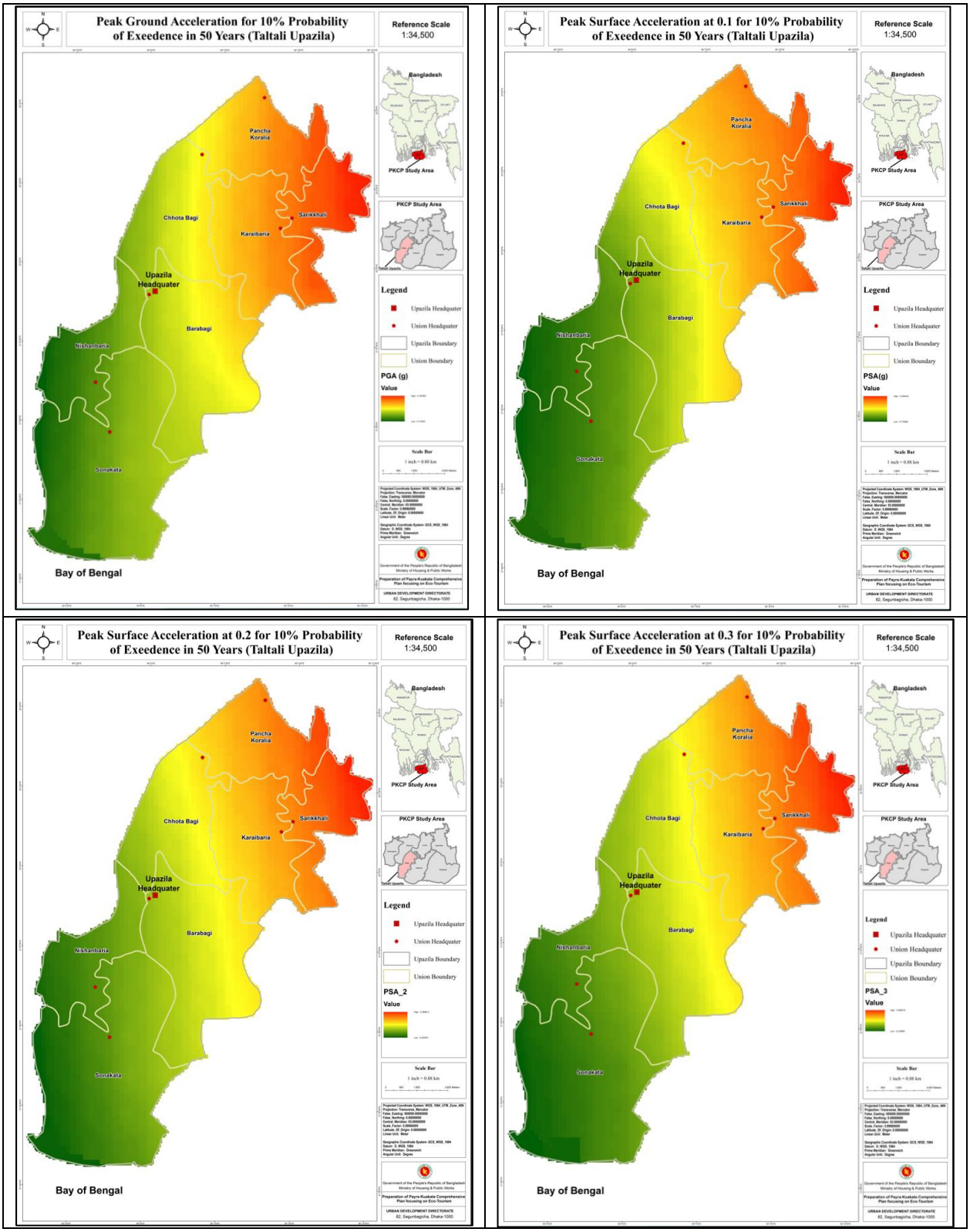


Figure 23: Geological Attribute of Taltali Upazila

Source: PKCP project, UDD, 2020

The study area shows three prominent geomorphological units such as 1) Fluvio-Tidal Deltaic Plain, 2) Natural Levee, and 3) Intertidal/Supratidal units. The surface of the study area is fully covered by the recent sediments, which are divided into two major surface geological units, i.e., 1) Tidal Deltaic Deposit and 2) Mangrove Swamp Deposit.

Based on the SPT-N value of boreholes, Layer 4 (average SPT-N value 22) and Layer 6 (average SPT-N value 42) are considered deep foundation layers for the study area. The seismic hazard maps for the study area are presented in the figures below, displaying spatial distribution of PGA and PSA at 0.2s, 0.3s, and 1s computed for 10% and 2% probability of exceedance in 50 years, which correspond to 475 and 2475-year return period, respectively. The results (Figure-5) show that the PGA of the study area ranges from 0.167g to 0.239g for a 0% probability of exceedance in 50 years and range from 0.339g to 0.509g for a 2% probability for accessidence of 50 % probability.

Peak spectral acceleration (PSA) is an important tool for determining the building height of an area. Here PSA for 1.0 and 0.3 seconds is used for identifying the appropriate location for high rise and low-rise buildings, respectively. A building height map is produced for the study area using PSA, which represents low-rise and high-rise buildings. Low-rise indicates 3 stories building, and high rise represents 10 stories building (Ishiyama, 2011). Detail has been described in annexure II.

Table 9: Geological classification for infrastructure development

Sl No.	Geological Suitability	Infrastructure foundation suitability	Suggested Geologically Suitable landuse
1	Good	4-6 story light infrastructure is suitable with a foundation depth of around 12 - 20m. Large and tall infrastructure requires pile foundation placed on layer no 4 or 6.	Commercial area Residential area, Industrial zone
2	Moderate	4-6 story light infrastructure requires on-site subsoil investigation and proper foundation design. Deep pile foundation is needed for large infrastructure.	Industrial zone, Residential area, Commercial area, Agricultural Zone, Park and Recreation
3	Poor	Detail subsoil investigation and proper foundation design is required for all types of infrastructure, due to low suitability with hazard potential.	Agricultural zone, Wetland Rural settlement Park and Recreation
4	Very Poor	Detail subsoil investigation for deep pile foundation is essential, due to very low soil resistance and high hazard potential. Shallow foundation is not preferred.	Agricultural zone, Wetland Rural settlement Park and Recreation

2.18 Socio-economic status

The socio-economic survey has been conducted with the aim of analysing the reality and perspectives of a variety of societal concerns, which has been accomplished by the use of statistically proven data and information, allowing to be more open about the need and demands of the local people, the dangers and opportunities faced by them.

Family type of the respondent: In total, 80 percent of the respondent live in nuclear families in Taltali Upazila.

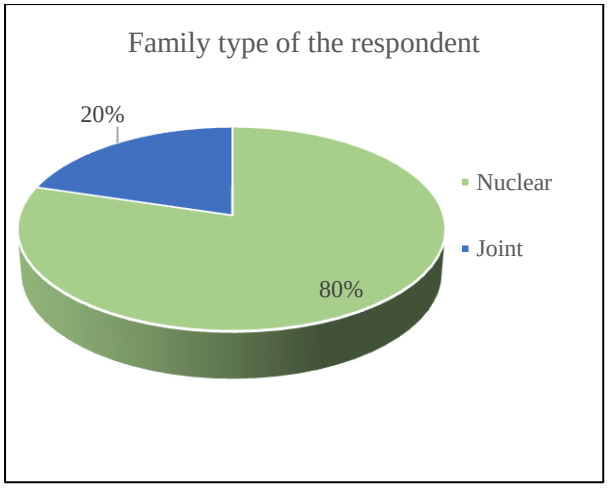


Figure 24: Family Type of the Respondents

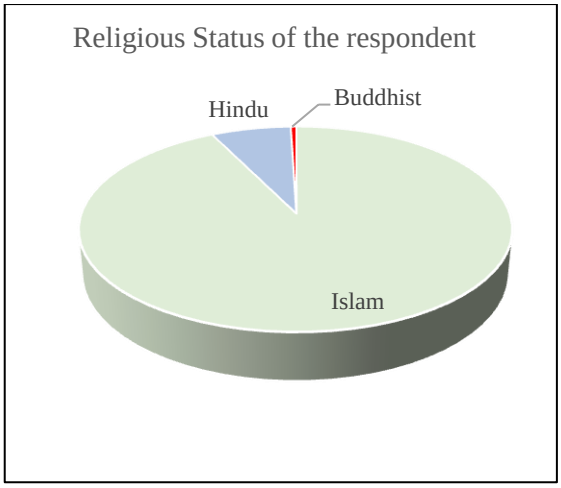


Figure 25: Religious Status of the Respondents

Source: PKCP project, UDD, 2020

Religion: More than 93 percent of the respondent was Muslim, the rest of the respondent was Hindu and a very few number of ethnic group people was Buddhist.

Status of living abroad: Only 2% people of Taltali Upazila is living outside the country.

Plinth Height of the structure: Considering the plinth height and structure type, primary data shows that the majority of the structure's plinth height is 2 feet and a huge number of structures has 1 feet plinth height.

Land and housing status: Maximum respondents live on their own land/house. Among them, 99 percent of respondent lives in their own house, among them about 68% live in Tin-shed House and only one percent live in Pucca House. Majority of the pucca structures are one-story buildings.

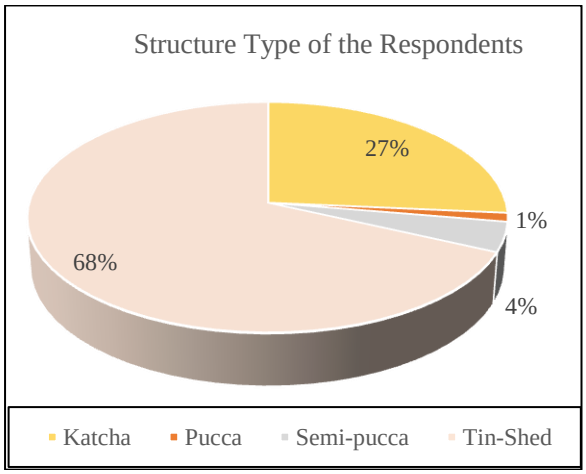


Figure 26: Structure Type of the Respondents

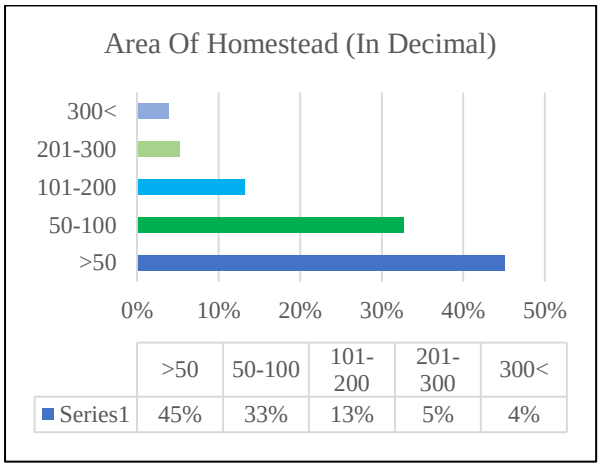


Figure 27: Area of Homestead (In Decimal) of the Respondents

Source: PKCP project, UDD, 2020

Area Of Homestead: According to the social survey, most of the people of the Upazila have their own house. About 45% people has a homestead of less than 50 decemel, 33% people has 50-100 decemal, 13% people has 101-200 decemal, 5% people has 201-300 decemal and only 4% people has more than 300 decimal land.

Income Range Distribution: About 64% of the peoples' monthly income range is between 10000-20000. 19% of people have an income of less than 10000, which shows that a good number of people live close to the poverty line. About 15% of people's monthly income range is between 20000-30000. A very few people have a higher income range.

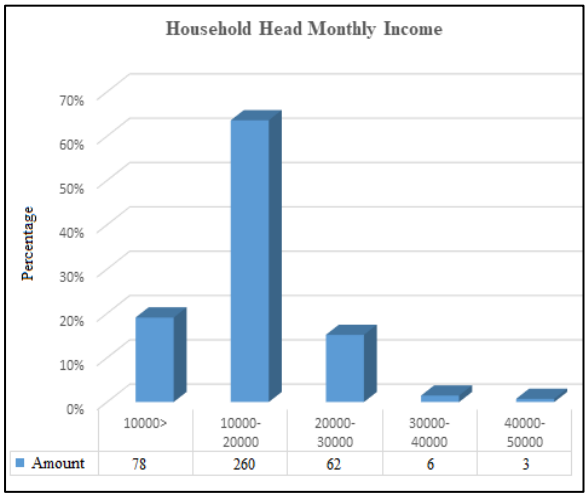


Figure 28: Monthly Income Range of the Household Heads

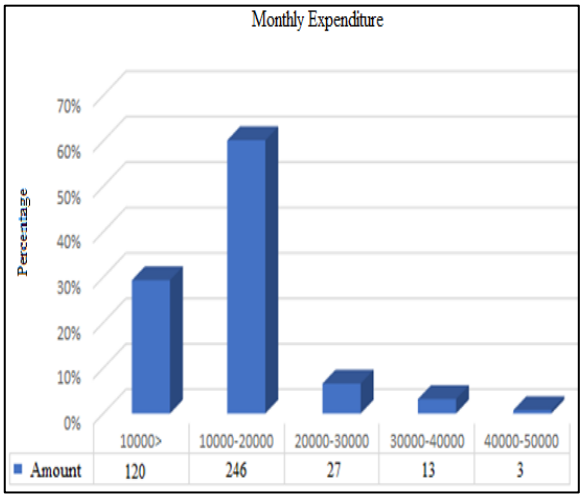


Figure 29: Monthly Expenditure Range of the Households

Source: PKCP project, UDD, 2020

Expenditure Range Distribution: Like the income range, expenditure range is also similar. Most of the peoples' monthly expenditure range is between 10000-20000, about 60%. 29% of people have an expenditure of less than 10000. About 7% of peoples monthly income range is between 20000-30000.

Family member Distribution: About 49% of family member number is 4-5, 24% have 6-7%, 16% have small families with only 1-3 members and about 7% families have more than 7 members.

Modification of the embankment height-required or not: The majority percent of the respondent has said that embankment height is enough to protect the area, point to be noted that only 20 percent of the total respondent has somewhat knowledge regarding the height of the embankment. So, the planning team might need relevant authority or expert opinion.

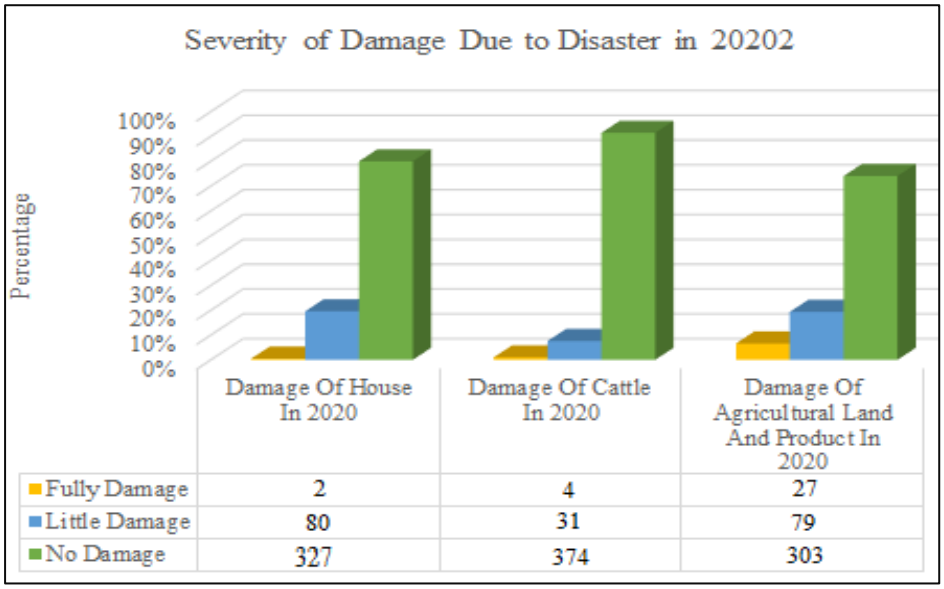
Drinking water source, availability and water quality: Tube-well is the main water source of the local people of Taltali. From the socio-economic sample survey, it is explored that Tube well (98%) is the main water source for the people of Taltali Upazila. Other peoples are dependent on surface water mainly pond water and Rain Water. Among the 98%, 78% people use common Tube-well and only 20% people has their own Tube-well in the premises.

Drainage facility: This Upazila has almost no man-made drainage facility. Most of the natural drainage such as Khals and Canals are filled with mud, clay, sand, silt etc. For the solution of the water logging problem and irrigation, these Khals and Canals must be excavated in an emergency basis.

Distance of Local Hat-Bazars and Mode of transport: Most of the people of Taltali Upazila live within 1-2 km from the local Hat-Bazar, which is about 32% of the total respondents. 28% people live in more than 3 km distance, 22% people live within 2-3 km distance and only 18% people live within 1 km distance from the local Hat-Bazar. Most of the respondents are comfortable to go by walking to visit any place. Maximum respondent has to walk 20-30

minutes to the local Hat-bazar. A good number of people has their own Bicycle and Motor-bike. Now-a-days local people are very much dependent on Easy Bike and auto-rickshaw.

Occupation Status of Taltali Upazila: In Taltali Upazila majority percent of the respondent



claimed that agriculture-related activity and fishing is the main source of income.

Figure 30: Severity of Damage due to Natural Disaster in 2020
Source: PKCP project, UDD, 2020

Disaster Damage: As situated in the costal belt, Taltali Upazila affect from mainly Tidal Surge, Flood, Cyclone. From the social survey, it is derivative that, 20% House, Agricultural Land and Product had a little damage due to natural disaster. Only 7% Agricultural Land and Product was fully damaged. But after the natural disaster a huge number of agricultural lands affect by the salinity problem.

Health Centers Distance from the house and Service Quality: Taltali Upazila is in a very bad condition in the context of the health facilities. There is only one Upazila Health Complex and some community clinics. Most of the people live far from the health Centres and when in need they are deprived of good health facilities.

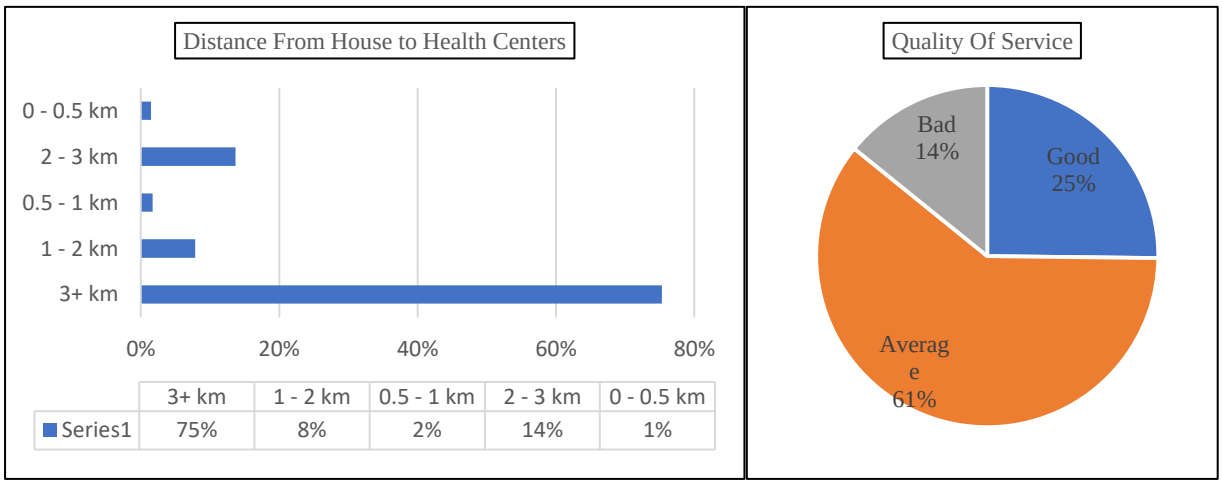


Figure 31: Health Centers Distance from the house and Service

Source: PKCP project, UDD, 2020

2.19 Physical feature

Structure Type and Use: According to the physical feature survey, most of the structures, about 84% is Tinshed with wall made of mud and a huge number of structures are 2 storied. Remaining 9% is semi- pucca, 4% is pucca and only 2% is katcha. On the basis of the use of structure, naturally the dominated one is residential, about 83%. Another dominated one is Commercial.

Road: From the Physical feature survey, it is found that the road condition of Taltali Upazila is very poor. Maximum roads are katcha, about 66%. Only about 24% roads are pucca, constructed of mainly Reinforced Concrete and Bituminus Carpeting though the condition is not good enough. Remaining roads are semi-pucca (Table 10).

Table 10: Total Road Network according to Road Type

Road Type	Length in M	Length in Km	%
Katcha	421457.81	421.46	65.71
Semi Pucca	66304.90	66.30	10.34
Pucca	153613.23	153.61	23.95
Total	**641375.94**	**641.38**	**100.00**

Source: PKCP project, UDD, 2020

Construction Material: From the Physical feature survey, it is found that the road of Taltali Upazila is mainly earthen about 80%. Only 12% roads are constructed of Bituminous carpeting and about 7% roads are Herringbone Bonded. Other roads are constructed of Reinforce Concrete and Tile.

Table 11: Construction Material of the Upazila Roads

Construction Material	Length (m)	Length (km)	%
Bituminous Carpeting	140760.51	140.76	12.08
Earthen	926038.61	926.04	79.44
Herringbone Bond	80305.29	80.31	6.89
Reinforced Concrete	17476.60	17.48	1.50
Tile	1088.39	1.09	0.09
Total	**641375.94**	**641.38**	**100.00**

Source: PKCP project, UDD, 2020

In Taltali Upazila, considering the functional categories of road, it is found that the majority percentage of the roads are in tertiary category which are mainly Katcha roads. On the other hand, Primary roads directly connect this Upazila with the Regional Road in Amtali Upazila (Table 12).

Table 12: Total Road Network according to Road Class

Road Class	Length in M	Length in Km	%
Primary	16218.139	16.22	2.53
Secondary	38984.238	38.98	6.08
Tertiary	586173.564	586.17	91.39
Path	524930.96	524.93	
Grand Total	**641375.941**	**641.38**	**100.00**

Source: PKCP project, UDD, 2020

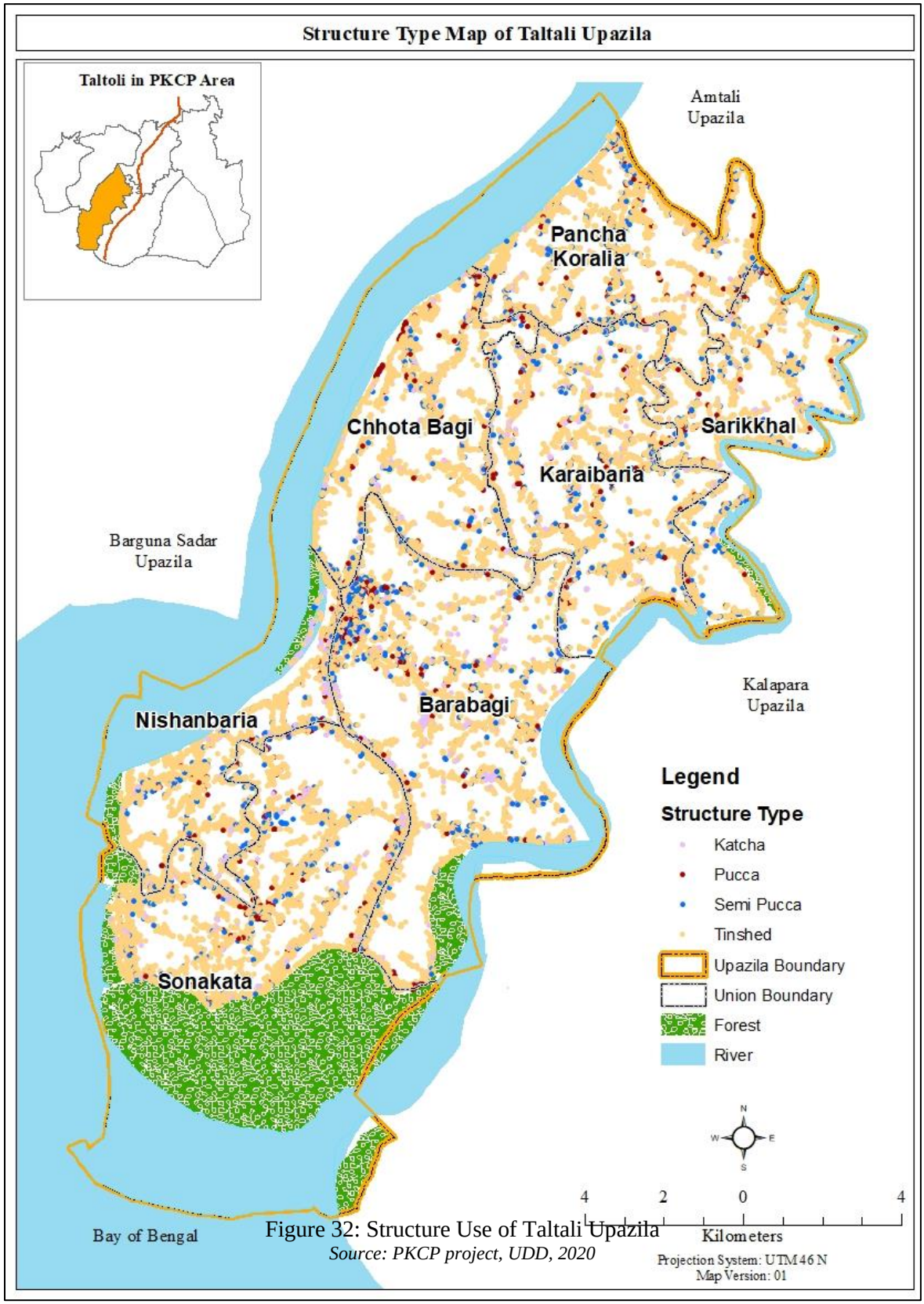


Figure 32: Structure Use of Taltali Upazila

Source: PKCP project, UDD, 2020

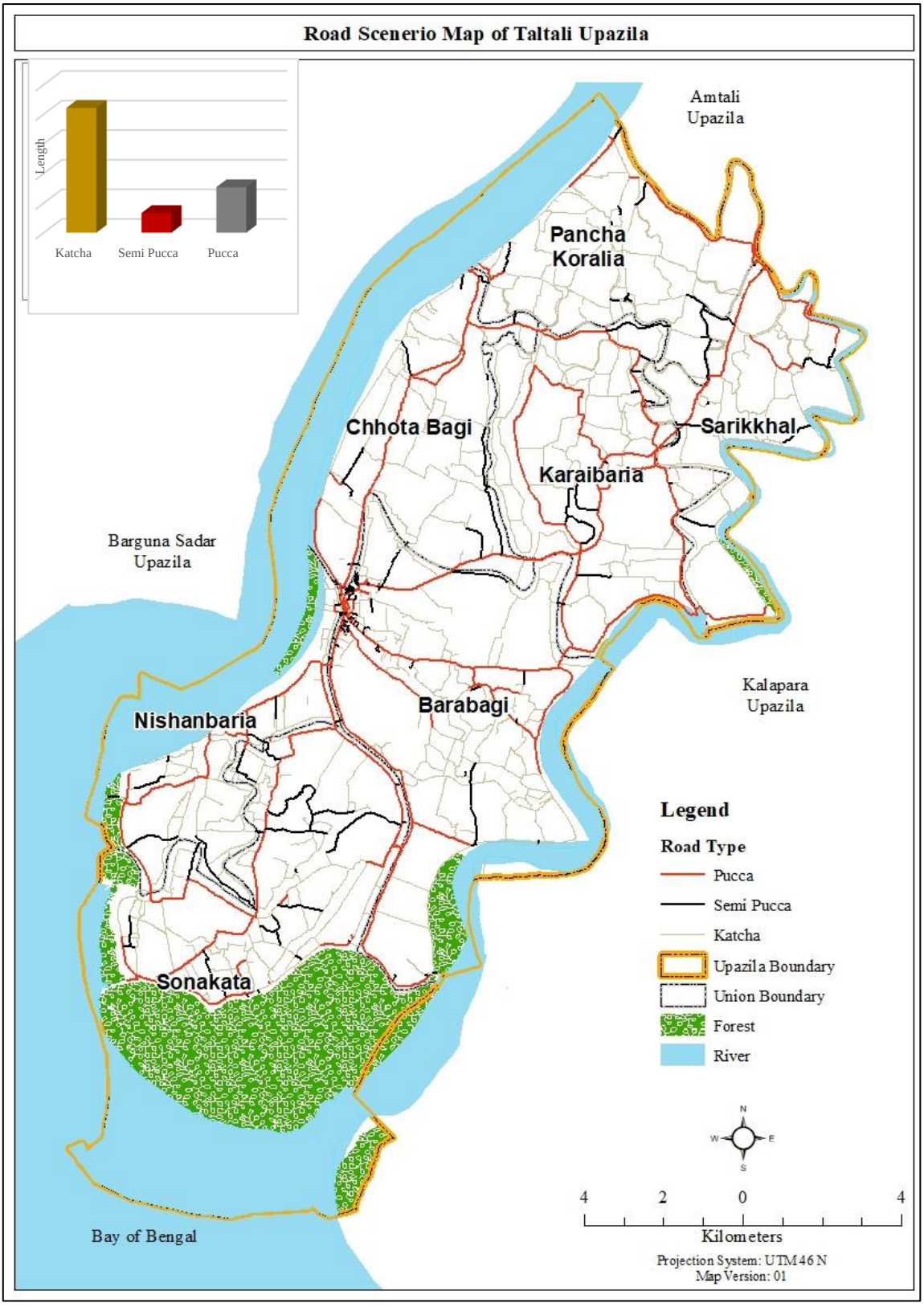


Figure 33: Condition of Roads in Taltali Upazila
Source: PKCP project, UDD, 2020

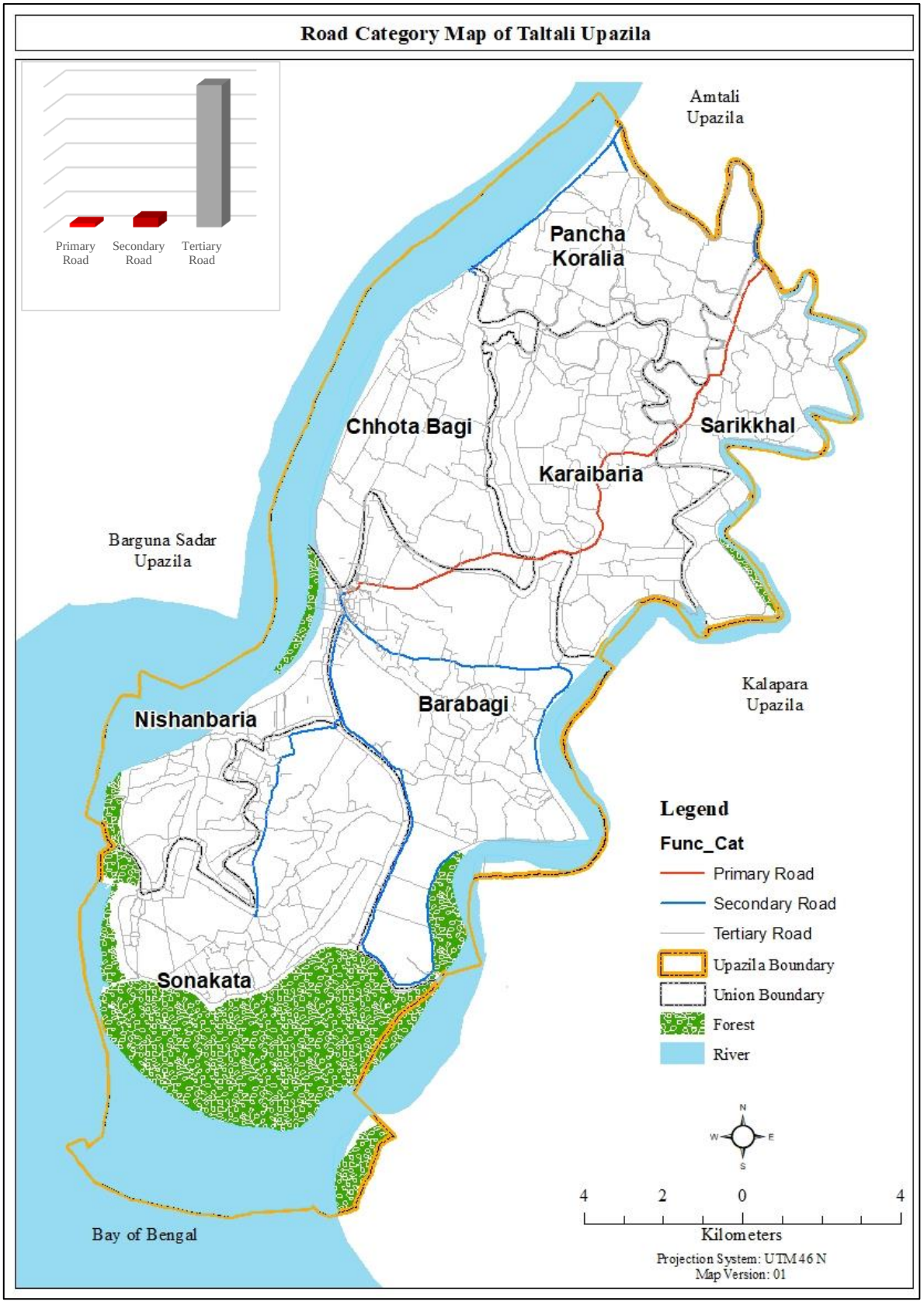


Figure 34: Functional Hierarchy of the Road Network of Taltali
Source: PKCP project, UDD, 2020

Administrative Area: One of the most important areas of a place are administrative areas. Total 22 administrative areas are found in Taltali Upazila according to the physical feature survey, which is covering almost 436 acres of land.

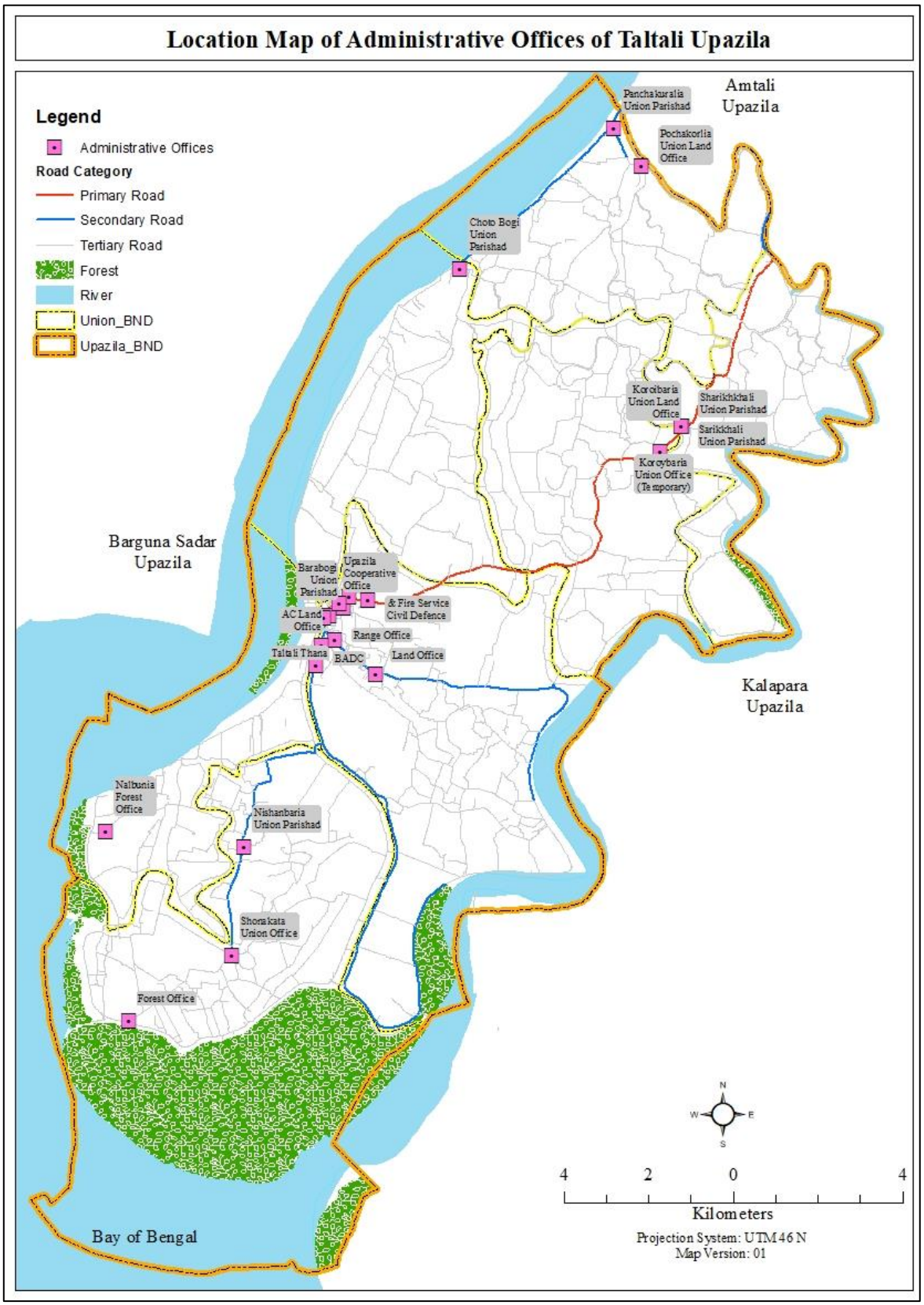


Figure 35: Location of Administrative Areas

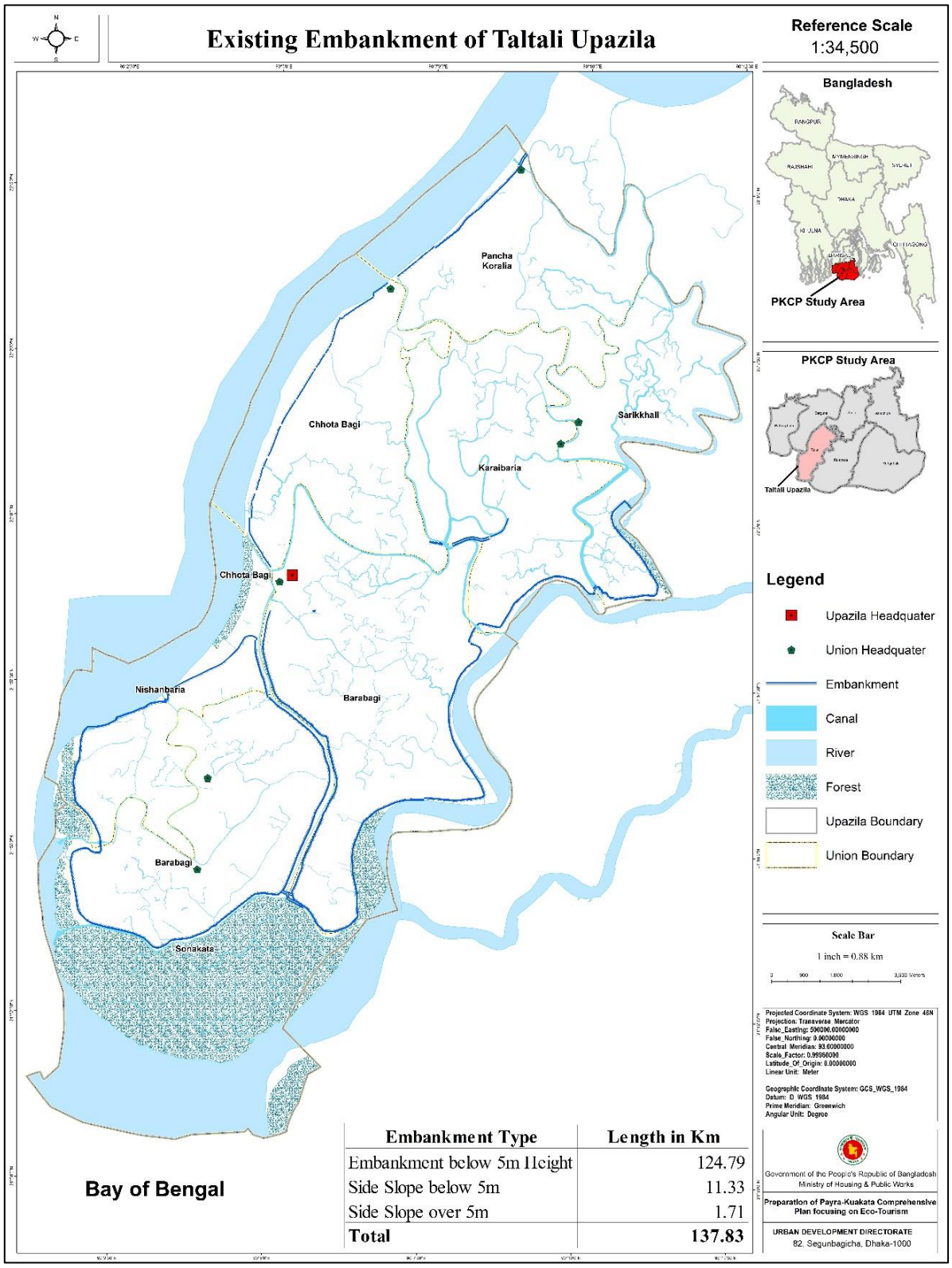
Source: PKCP project, UDD, 2020

Educational and Resaerch: According to the pfysical feature survey, there are total 95 educational institutions in Taltali Upazila. There is only one Degree College, 2 Higher Secondary Schools, 13 High Schools and 68 Primary Schools. There are also some kindergartens, Madrasas and NGO schools. Moreover, there is a Special School for the disables.

Figure 36:Educational Institutions of Taltali Upazila

Source: PKCP project, UDD, 2020

Embankment: As Taltali Upazila is situated in the costal belt and several rivers are surrounding the area, government has already constructed a lot of embankments along with the major waterbodies. But according to the PRA proposals, the embankment is need to reconstruct in many points and have to increase the hight in some areas.



Embankment Type	Length in Km
Embankment below 5m Height	124.79
Side Slope below 5m	11.33
Side Slope over 5m	1.71
Total	**137.83**

Figure 37: Embankments in Taltali Upazila

Source: LGED, 2013

Hut-Bazar: Hat-Bazars are the key to economic activities of an area. According to the physical feature survey, there are 20 local huts and bazars. According to the Growth Center list of LGED there are 3 Growth Centers in Taltali Upazila named Taltali Hat, Kochupatra Bazar and Bogir Hat.

Figure 38: Hat- Bazar locations in Taltali Upazila

Source: PKCP project, UDD, 2020

Health Center: There are very poor condition of health facilities in Taltali Upazila. There is only one Upazila Health Complex with a very limited facility. Maximum people dependent on the community clinic. Due to the bad road condition and inadequate health facility local people are deprived from this very important basic need.

Figure 39: Location of Health Facilities in Taltali Upazila

Source: PKCP project, UDD, 2020

Waterbodies: Table 12 represents the present scenario of existing waterbody of Taltali Upazila. There is existence of canal, ditch, fish pond, pond and river. Majority of water body of this upazila is River which is almost 46% and Payra is the major river flowing through this Upazila.

Figure 40: Waterbodis of Taltali upazila

Source: PKCP project, UDD, 2020

Table 13: Existing Waterbody of Taltali Upazila

Type	Area Acre	Area Sq Km
Borrow pit	36.70	0.15
Canal	1568.87	6.35
Ditch	553.55	2.24
Fish pond	1923.75	7.79
Lake	10.65	0.04
Pond	432.21	1.75
River	11347.06	45.92
Tank (dighi)	35.08	0.14
	15907.87	**64.38**

Source: PKCP project, UDD, 2020

2.20 Critical Habitat

Taltali Upazila is Situated on the bank of Bay of Bengal and has forest areas about 7000 acres which includes a wildlife sanctuary named Fatrar Char Forest. Thus, there are several wildlife habitats. Most of the Habitats are marked in Sonakata Union. Barabagi and Nishanbaria Unions also contains some critical habitates like Resident Birds and Wild Cat. Red Crabs which are a very rare habitat is seen in the beach areas.

Table 14: List of Critical Habitats

Critical Habitats	Nos of Sites	Union Name
Crabs	2	Sonakata
Crocodile	2	
Deer	2	
Dolphins	2	Barabagi, Nishanbaria
Fox	1	Sonakata
Resident Birds	7	Barabagi, Nishanbaria, Sonakata
Resident Waterbirds	1	Sarikkhali
Sea Turtles	1	Sonakata
Wader Birds	1	
Wild Boar	1	
Wild Cat	4	Barabagi, Nishanbaria, Sonakata

Source: PKCP project, UDD, 2020

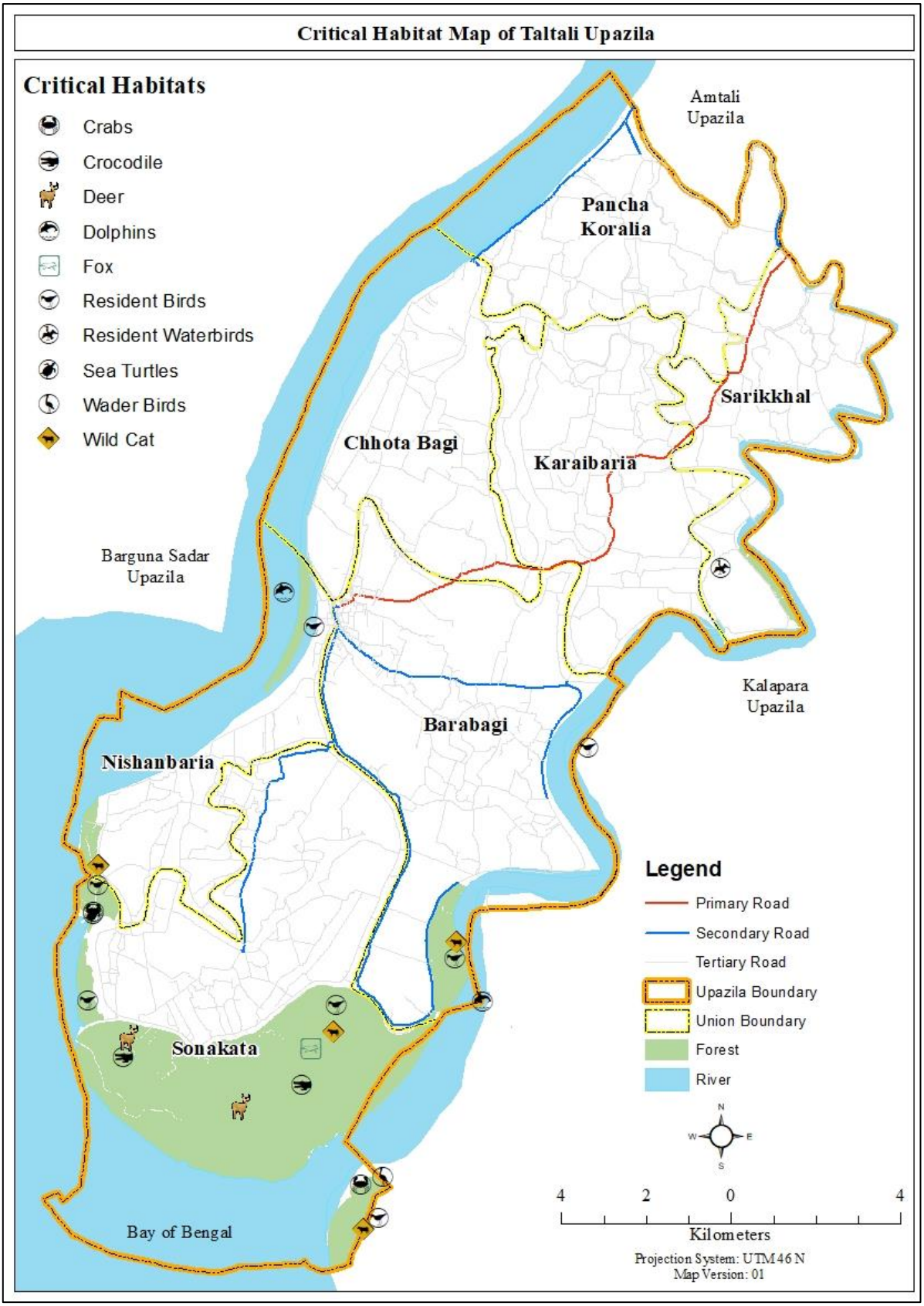


Figure 41: Critical Habitat Map of Taltali Upazila

Source: PKCP project, UDD, 2020

CHAPTER THREE: SOCIO-SPATIAL FORECASTING AND DEVELOPMENT PROSPECTS

3.1 Population Projection

Population has been forecasted applying cohort method. The cohort-component method segments the population into age-sex groups or birth cohorts and accounts for the fertility, mortality, and migration behaviour of each cohort.

Projected population: According to BBS, the population of Taltali Upazila in 2011 was 88004.

shows that the population in 2021, 2031 and 2041 will be 98518, 111316 and 122448 respectively.

Table 15: Union wise Projected Population

Union	Year					
	2016	**2021**	**2026**	**2031**	**2036**	**2041**
Barabagi	19428	20590	21929	23285	24517	25588
Chhota Bagi	13959	14806	15747	16674	17524	18283
Karaibaria	13645	14465	15395	16337	17207	17978
Nishanbaria	13645	14446	15370	16320	17199	17963
Pancha Koralia	12146	12868	13693	14523	15282	15955
Sarikkhali	8245	8737	9313	9904	10447	10927
Sonakata	11903	12607	13423	14273	15064	15754
Total	**92970**	**98518**	**104869**	**111316**	**117240**	**122448**
Growth Rate	**1**.13	**1**.19	**1**.29	**1**.23	**1**.06	**0**.89

Source: PKCP project team, UDD, 2022

3.2 Housing demand projections

It gives an estimate of the number of dwelling units that people are likely to desire in the future over a specified time period. Based on the existing population and the number of structures, the threshold population has been calculated. Based on the projected population of 2041, the land requirement for residential purpose is about 476 acres.

3.3 Economy & Employment/Economic forecasting

Findings from Basic and Non-Basic Employment

From the perspective of the percentage increase from 2003 to 2013, in Taltali Upazila, basic employment has increased by 160 percent, and total employment has increased by 116 percent. Basic employment contributes to total employment. Basic employment constitutes 34% in Taltali. So, most of the employment is not export-related, although basic employment contributes to non-basic employment, which can be identified by the economic base multiplier

Table 16: Employment of 2003 and 2013 Comparison among the Upazilas

Upazila	Basic Employment 2003	Total Employment 2003	Basic Employment 2013	Total Employment 2013	Increase in Basic Employment	Increase in Total Employment

Taltali	840	3006	2183	6482	160%	116%

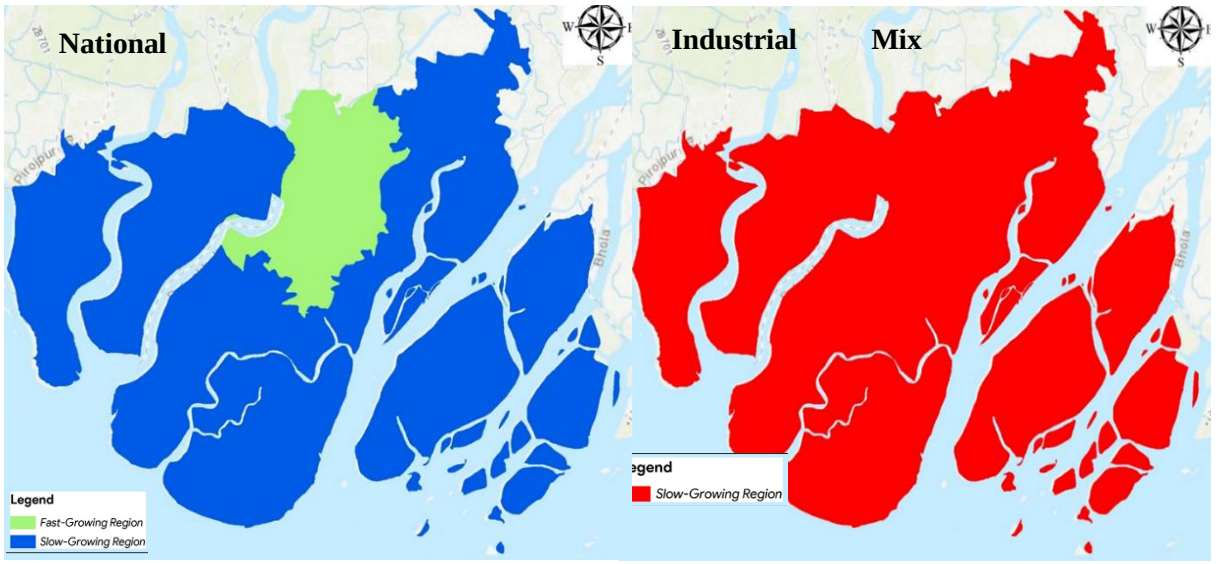
(Source: PKCP project, UDD, 2019)

Findings from Shift-Share Analysis: Shift-Share analysis splits the employment growth between the three shift-share components, namely: National Share, Proportionality Shift, and Differential Shift. The industrial structure analysis provides an insight into the growth of the Upazila. It has been seen that Taltali Upazila lags behind the national growth rate as the Growth is lower than National Share. This is a result of an unfavourable industry mix and regional disadvantage.

Table 17: Industrial Structure Analysis

Upazila	Growth (G_j)	National Share (NS)	Industrial Mix (IM)	Regional Shift (RM)	Net Shift Component
Taltali	3476	3527	-565	514	-51

(Source: PKCP project, UDD, 2019)



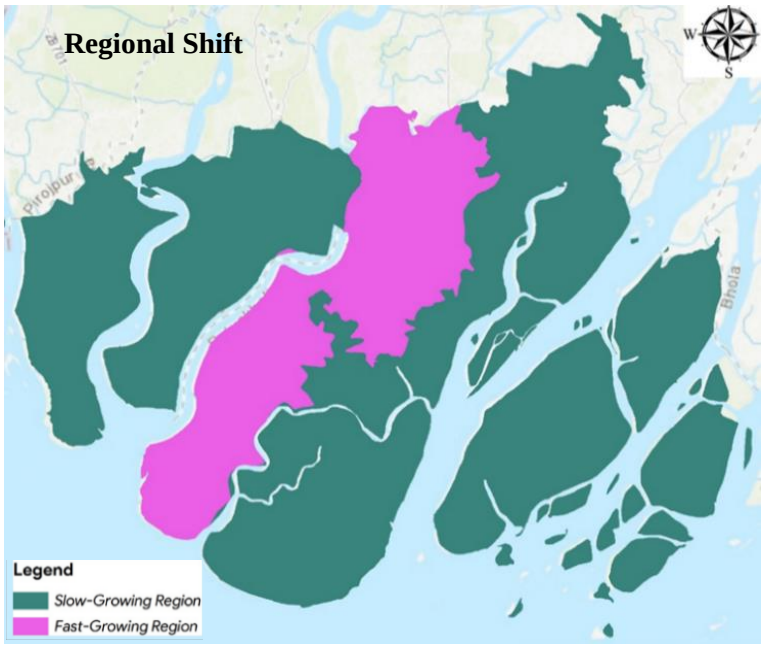


Figure 42: Delineation of Fast Growing and Slow Growing Regions on the Basis of National Shift, Industrial Mix Shift and Net Regional Shift

Source: PKCP project, UDD, 2019

General Findings: General findings have been drowned by comparing Taltali Upazila with other six Upazilas within the project region depicts the Upazilas as Fast-Growing or Slow-Growing regions based on the Total Growth of Employment (G_j) in each region with respect to their National Share (NS) delineates the Upazilas in Fast-Growing or Slow-Growing regions based on their Industry Mix (IM).

The following maps are prepared on the basis of the Regional Shift (RS) component and divides the Upazilas into Fast-Growing or Slow-Growing regions based on local advantages. Taltali Upazila has fallen under slow-growing in terms of regional/local advantages. This means that the growth rates of employment in a number of sectors in these Upazilas are lower than the growth rates in these sectors at the national level.

3.4 Traffic & Transportation

Household Survey and Trip Purpose: From the survey, it is observed that, on average, 4.37 trips per household are generated within the Taltali area per day. For ease of analysis, the consultant team categorized all purposes into five categories: Educational, Shopping (trips to Bazar are also included), Work, Recreational and others (personal, treatment etc.). Other than these categories, there is another category called Home Based Trip, which includes all trips destined for a household.

Table 18: Average trips per household and trip purpose of Taltali Upazila

Union	Total Households	No. of Trips per day	Avg. trips/ HH	Educational	Work	Shopping	Recreation	Home Based	Others
Barabagi	4321	20417	4.73	13%	16%	13%	4%	49%	5%
Chhota Bagi	2932	13341	4.55	22%	21%	2%	5%	50%	0%
Karaibaria	3095	11452	3.7	18%	21%	10%	0%	50%	1%
Nishanbaria	3226	16130	5	23%	20%	7%	2%	50%	0%
Pancha Koralia	2704	10343	3.83	21%	14%	12%	2%	51%	1%
Sarikkhali	1812	8018	4.43	24%	23%	4%	1%	49%	0%
Sonakata	2921	12779	4.38	21%	22%	5%	3%	49%	0%

(Source: PKCP project, UDD, 2019)

Mode Choice – In the overall scenario for the whole Study area, people make most of the trips by walking, which is 78.7% of total trips. These trips are generally short-distance trips. Again, 7.4% are made by Auto-Rickshaw, 9% by Motorbike and 2.1% by boat.

Travel Cost and Time – The travel cost is lower in the zones where major modes of trip are walking and cycling, though their travel time may be higher. Also, people in the study area use multiple modes, including water transport. The average trip length is about 33 minutes and average travel cost is about 7 tk. Per km.

Type of Trip – The higher number of intra-zonal trips in most cases may be due to the fact that most of the facilities such as rural markets, educational institutions, health facilities, administrative and other offices etc. are available within most zones, and the local inhabitants do not usually have to move to other zones or distant places for their day-to-day activities. Another reason is that most of the areas are separated by river networks, and it results in local people's movement within the zones. However, the zones with a higher amount of inter-zonal traffic are more dependent on other zones for their day-to-day activities.

Travel behaviour in Dry and Rainy Season (Travel Time and Cost) – As the study area is surrounded by a river network and the most disaster-prone area, so the travel pattern is not as same as the dry season in the rainy season. The consultant team tried to find out the change in travel patterns in both dry and rainy seasons. Three criteria: Mode, Travel time and Cost, have been taken into account to determine the change. The major observation is that mainly travel pattern changes in case of travel time and cost. In the study area, travel time increases by an average of 8.78 minutes and cost decreases by 2.27 takas on an average.

Table 19: trip length covered and cost spent by local people

Union/ Zone	Dry Season		Rainy Season	
	Avg. Trip Length (minutes)	Avg. Travel Cost (tk.)	Avg. Trip Length (minutes)	Avg. Travel Cost (tk.)
Barabagi	26.88	5.63	35.27	1.98
Chhota Bagi	29.84	19.51	34.59	20.8
Karaibaria	33.33	1.45	40.32	1.45
Nishanbaria	31.96	12.4	38.75	1.78
Pancha Koralia	34.16	4.93	43.39	3.59
Sarikkhali	42.76	1.64	53.18	1.33
Sonakata	30.29	1.86	45.19	0.57

Survey on Growth Centre: Traffic congestion is at a minimum level in the growth centre, except hat days- which means as roads capacity is less to support vehicles and businessmen from the surrounding area. The survey also unveils that toiler and drinking facilities were not at a satisfactory level. In some Bazar, these facilities were unavailable. The parking facility and road condition surrounding the Upazila required up-gradation.

Table 20: Detail information on the Growth centre

Growth Centre	Road Network	Traffic Congestion	Road Condition	Toilet and Tube well Facility
Taltali Bazar: Area of 1 acre	• Taltali Sadar road • Connective road: Taltali- Amtali road	Always remains crowded In hat days around 10 thousand people gather here	The road condition of this area is satisfactory	No

Source: PKCP project, UDD, 2019

Traffic Volume Count Survey – The major travel mode of Taltali is mainly Motorbike. People use Motor Bike for their daily movement as there is no public transport such as bus service. For Short distance travel and travelling for surrounding areas motorbike is used. Other important modes are baby taxi, rickshaw, van and tempo.

Table 21: Traffic volume of Taltali

Upazila	Major Three Modes					
	Mode- 1		Mode- 2		Mode- 3	
	Up	Down	Up	Down	Up	Down
Taltali	Motor Bike (33.0%)	Motor Bike (33.1%)	Rickshaw (27.2%)	Rickshaw (27.4%)	Baby Taxi (24.1%)	Baby Taxi (23.5%)

Source: PKCP project, UDD, 2019

Origin Destination Survey: Vehicular trips are distributed within the Upazila. Major vehicular trips are seen within the unions or near the surrounding unions of the same Upazila or other Upazilas.

Stakeholder Interview Survey Outcome: the participants mentioned that congestion creates due to on-street parking, narrow road network, and lack of parking facilities.

Travel Speed Survey: The average travel speed was 25 kmph. The roads were observed to have narrow carriage width considering the requirements for two vehicles to pass side by side. The roads had several sharp turns as well. Road condition is very bad; roads are not paved, there is a crack in roads, brick soling, wholes exist in here and there, ongoing construction works etc.

3.5 Drainage and Flood Control

As the area lies at the southernmost tip of Taltali facing the Bay of Bengal, the area is highly vulnerable due to hydrological hazards, especially monsoon floods and coastal floods. Coastal floods can arise from tidal floods as well as storm surge-induced floods. The hydrological assessment would be based on flood level analysis as well drainage analysis. The flood analysis would focus on the estimation of the design flood level. For flood inundation analysis, the topographic data in the form of a digital elevation model (DEM) would be required.

The area is also vulnerable due to extreme precipitation, especially during cyclones that occur during the pre-monsoon and post-monsoon periods. The extreme precipitation and storm surges can cause drainage problems in the area as well.

3.6 Basic services and facilities forecasting

Existing Facilities: The distribution of existing socio-economic facilities by Upazilas is presented in Table 21 while Table 22 presents the distribution of facilities per 10,000 people, which gives a relative picture of the Upazila in terms of availability of facilities. For example, in Taltali Upazila, there is only 0.67 or less than one high School per 10,000.

Table 22: Distribution of Existing Facilities in Taltali

Total Number of Existing Facilities									
HS1	**PS2**	**MDSA3**	**UHC/H4**	**FWC5**	**CC6**	**GC7**	**RM8**	**CS9**	**COL10**
11	94	15	0	5	10	5	11	33	2
1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College									

Source: PKCP project, UDD, 2019

Requirements of Social Facilities in Future: Requirements of socio-economic facilities for the whole project area have been determined on the basis of the threshold population for each facility, as discussed above. The threshold population of each facility in the study area as calculated on the basis of the Reed-Muench method is shown below:

Table 23: Estimated threshold population for a particular facility

Facility	Threshold Population
Primary school	450
Madrasa	8315
High school	7217
College	31783
Upazila health complex/ hospital	208403

Family welfare centre	22001
Community clinic	24975
Growth centre	38202
Rural market	2850
Cyclone shelter	2569

Source: PKCP project, UDD, 2019

Table 23 presents the projected requirements of socio-economic facilities in Taltali Upazila in 2021, while **Table 24-27** show the projected requirements of facilities in different Upazilas in 2031 and 2041, respectively. **Table 28** indicates that if facilities are provided on the basis of threshold population, then there would be very little disparity among the Upazilas of the project region in terms of the availability of facilities under study.

Table 24: Distribution of Existing Facilities

Facility	Total Number of Existing Facilities									
	HS[1]	PS[2]	MDSA[3]	UHC/H[4]	FWC[5]	CC[6]	GC[7]	RM[8]	CS[9]	COL[10]
Taltali	11	94	15	0	5	10	5	11	33	2

1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College

Table 25: Existing Facilities per 10,000 People in Taltali

Facility	Number of Existing Facilities per 10,000 People									
	HS[1]	PS[2]	MDSA[3]	UHC/H[4]	FWC[5]	CC[6]	GC[7]	RM[8]	CS[9]	COL[10]
Taltali	1.25	10.68	1.70	0.00	0.56	1.13	0.56	1.25	3.75	0.23

1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College

Table 26: Projected Requirement of Facilities in 2021

Facility	Total Number of Facilities Required by 2021									
	HS[1]	PS[2]	MDSA[3]	UHC/H[4]	FWC[5]	CC[6]	GC[7]	RM[8]	CS[9]	COL[10]
Taltali	14	224	12	0	12	0	5 4	35	39	3

1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College

Table 27: Projected Requirement of Facilities in 2031

Facility	Total Number of Facilities Required by 2031									
	HS[1]	PS[2]	MDSA[3]	UHC/H[4]	FWC[5]	CC[6]	GC[7]	RM[8]	CS[9]	COL[10]
Taltali	15	245	13	1	5	4	3	39	43	3

1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College

Table 28: Projected Requirement of Facilities in 2041

Facility	Total Number of Facilities Required by 2041									
	HS[1]	PS[2]	MDSA[3]	UHC/H[4]	FWC[5]	CC[6]	GC[7]	RM[8]	CS[9]	COL[10]

Taltali	17	266	14	1	5	5	3	42	47	4
1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College										

Table 29: Facilities per 10,000 People if Required Facilities are provided

Facility	**Number of Facilities per 10,000 People in 2041 if Required Facilities are Provided**									
	HS[1]	**PS[2]**	**MDSA[3]**	**UHC/H[4]**	**FWC[5]**	**CC[6]**	**GC[7]**	**RM[8]**	**CS[9]**	**COL[10]**
Taltali	1.42	22.20	1.17	0.08	0.42	0.42	0.25	3.51	1.42	0.34
1=High School 2= Primary School 3=Madrasa 4=Upazila Health Complex/Hospital 5=Family Welfare Centre 6=Community Clinic 7= Growth Centre 8=Rural Market 9= Cyclone Shelter 10=College										

3.7 Water scarcity and Demand projections

According to the model simulated recharge assessment, the water balance calculation was done for shallow and intermediate aquifers, which are recharged by rainwater shows the water demand and water resources calculation summary. Also it calculated the availability of water at deep aquifer.

Table 30: Water Balance Calculation

Water Balance Calculation for Shallow and Intermediate aquifers in the Payra-Kuakata Project area					
Aquifer	***Set Up***	***Population status***	***Water Demand (million m3/year)***	***Water Availability (million m3/year)***	***Comments***
Shallow and Intermediate	Rural	1,144,505.00	25.06	199.37	Current water abstraction rate is OK
Shallow and Intermediate	Urban	1,144,505.00	83.55	199.37	Current water abstraction rate is OK
Shallow and Intermediate	Rural	2,289,010.00	50.13	199.3662	Double water abstraction also Ok
Shallow and Intermediate	Urban	2,289,010.00	167.10	199.3662	Double water abstraction also Ok
Deep aquifer	Rural/ Urban	1200000	23	13	The difference of 13 million m3/y, which must be added to the aquifer via vertical flow that will affect deep aquifer quality by salt water intrusion and consequent subsidence of the area

The most important concern in this area is the potential rise in water demand in the near future. Therefore, one future scenario of higher pumping has been considered. We all are concerned and excited about the Payra port at Kalapara, Patuakhali, another large seaport in Bangladesh. When various activities through this port start, this area is expected to become a large commercial area, a large number of people will go there daily for business purposes. Various industries will develop in this area in general. So, it's conspicuous that the demand for water will increase greatly. As groundwater is the only source of fresh water in this area, people will start to pump groundwater at a higher rate than present day. A ten times higher abstraction than the present abstraction rate was considered in the entire model area. The projected water demand is 334604 gallons per day for the year 2041.Since, sample from shallow and intermediate mostly brackish, water conservation practices should be encouraged, such as implementing rainwater harvesting systems to reduce the demand for water resources. Moreover, water treatment technologies such as desalination technologies that remove salt from water can be incorporated.

3.8 Solid Waste Generation

Solid waste management is a major concern to local governments to protect human health, the environment and to preserve natural resources. The design and operation of an effective solid waste management system requires accurate estimation of future waste generation quantities. The main objective of this study was to develop a model for accurate forecasting of solid waste generation that helps waste related organizations to better design and operate effective solid waste management systems. The waste generation unit is 0.10 kg per person per day. According to survey, Rangabali Upazila produced 10.24 tons of solid waste in 2021 as opposed to 13.52 tons in 2041.

Table 31: Solid Waste Generation Projection

Union	***Year***											
	2016	**Waste Generation (kg)**	**2021**	**Waste Generation (kg)**	**2026**	**Waste Generation (kg)**	**2031**	**Waste Generation (kg)**	**2036**	**Waste Generation (kg)**	**2041**	**Waste Generation (kg)**
Barabagi	19428	1942.8	20590	2059	21929	2192.9	23285	2328.5	24517	2451.7	25588	2558.8
Chhota Bagi	13959	1395.9	14806	1480.6	15747	1574.7	16674	1667.4	17524	1752.4	18283	1828.3
Karaibaria	13645	1364.5	14465	1446.5	15395	1539.5	16337	1633.7	17207	1720.7	17978	1797.8
Nishanbaria	13645	1364.5	14446	1444.6	15370	1537	16320	1632	17199	1719.9	17963	1796.3
Pancha Koralia	12146	1214.6	12868	1286.8	13693	1369.3	14523	1452.3	15282	1528.2	15955	1595.5
Sarikkhali	8245	824.5	8737	873.7	9313	931.3	9904	990.4	10447	1044.7	10927	1092.7
Sonakata	1190	1190.3	1260	1260.7	13423	1342.3	14273	1427.3	15064	1506.4	15754	1575.4

	3		7									
Total	**92970**	**9297**	**98518**	**9851.8**	**104869**	**1048 6.9**	**111316**	**1113 1.6**	**117240**	1172 4	**122448**	12244 .8

Table 32: Water Demand Calculation for Taltali Upazila

Union Name	Population, 2016	Water demand (thousand litre)	Population, 2021	Water demand (thousand litre)	Population, 2026	Water demand (thousand litre)	Population, 2031	Water demand (thousand litre)	Population, 2036	Water demand (thousand litre)	Population, 2041	Water demand (thousand litre)
Barabagi	12240	786175.20	13088	840642.24	14001	899284.23	14869	955035.87	17779	1141945.17	12240	786175.20
Chhota Bagi	18294	1175023.62	19572	1257109.56	20971	1346967.33	22329	1434191.67	23510	1510047.30	18294	1175023.62
Karaibaria	22905	1471188.15	24126	1549612.98	25388	1630671.24	26507	1702544.61	27407	1760351.61	22905	1471188.15
Nishanbaria	17043	1094671.89	18170	1167059.10	20134	1293206.82	21203	1361868.69	22130	1421409.90	17043	1094671.89
Pancha Koralia	18354	1178877.42	19517	1253576.91	20738	1332001.74	21885	1405673.55	22857	1468105.11	18354	1178877.42
Sarikkhali	15470	993638.10	15818	1015990.14	16667	1070521.41	17670	1134944.10	18645	1197568.35	15470	993638.10
Sonakata	29067	1866973.41	30958	1988432.34	32948	2116250.04	34806	2235589.38	36280	2330264.40	29067	1866973.41
Total	19720	1266615.60	20136	1293335.28	21231	1363667.13	22611	1452304.53	24063	1545566.49	19720	1266615.60

Source: PKCP Project, UDD, 2022

Table 33: Electricity Demand Calculation for Taltali Upazila

Union Name	Population, 2016	Electricity Consumption (wh)	Population, 2021	Electricity Consumption (wh)	Population, 2026	Electricity Consumption (wh)	Population, 2031	Electricity Consumption (wh)	Population, 2036	Electricity Consumption (wh)	Population, 2041	Electricity Consumption (wh)
Barabagi	19,428	9,714	20,590	10,233,169	21,929	12,543,151	23,285	15,298,524	24,517	18,559,272	25,588	22,313,083
Chhota Bagi	13,959	6,979	14,806	7,358,355	15,747	9,007,026	16,674	10,954,782	17,524	13,265,909	18,283	15,942,623
Karaibaria	13,645	6,822	14,465	7,188,927	15,395	8,806,193	16,337	10,733,413	17,207	13,025,409	17,978	15,676,904
Nishanbaria	13,645	6,822	14,446	7,179,652	15,370	8,791,669	16,320	10,722,229	17,199	13,019,556	17,963	15,663,431
Pancha Koralia	12,146	6,073	12,868	6,395,590	13,693	7,832,491	14,523	9,541,756	15,282	11,568,172	15,955	13,912,837
Sarikkhali	8,245	4,122	8,737	4,342,343	9,313	5,326,811	9,904	6,506,719	10,447	7,908,726	10,927	9,527,946
Sonakata	11,903	5,951	12,607	6,265,466	13,423	7,677,729	14,273	9,377,242	15,064	11,403,471	15,754	13,737,414
Total	**267027**	**132712419**	**277829**	**158918188**	**294808**	**1.94E+08**	**312045**	**2.36E+08**	**330031**	**2.88E+08**	**267027**	**132712419**
Total in kWh		**46.48**		**48,963.50**		**59,985.07**		**73,134.66**		**88,750.52**		**106,774.24**

Source: PKCP Project, UDD, 2022

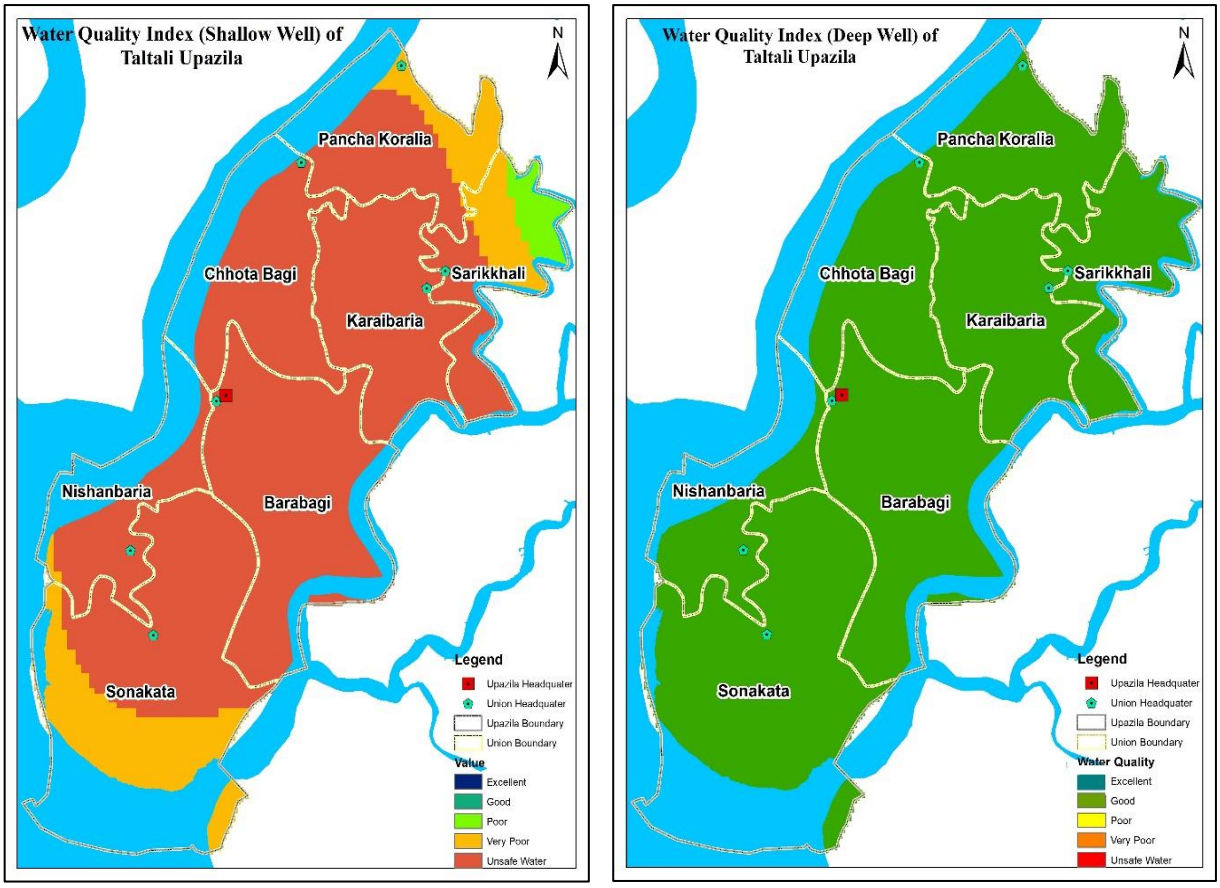


Figure 43: comparison between water quality Index of deep aquifer and Shallow aquifer
Source: PKCP project, UDD, 2019

3.9 Electricity demand projection

Provision of Electricity is most essential for supplying power and energy to the Upazila. In the urban area people are highly dependent on the electricity for both domestic and commercial consumption. For smooth functioning of the community services by public and private sectors, electricity supply has to be ensured round the year. With the growth of population and increase in the level of urbanization, electricity consumption will also increase in the future. An estimation of electricity consumption for the Upazila is made which is 12 Mega Watt. For 2041 (shown in Table 31).

CHAPTER FOUR: SECTORAL AND STRUCTURE PLAN POLICIES

4.1 Development Planning Strategy and Sectoral Policies proposed in the structure plan

Several national plan policies have been reviewed to determine the strategies for Taltali Structure Plan area. Some of the important plans and policies that have been reviewed that are the following: Perspective Plan (2021-2041), Perspective Plan (2010-2021), the 8th Five-Year Plan, 7th Five Year Plan, the Bangladesh Climate Change Strategy and Action Plan (2009), Bangladesh National Conservation Strategy (2016-2031), National Adaptation Programme of Action (NAPA) 2009, Coastal Development Strategy 2006, National Food Policy 2008, Coastal Zone Policy 2005, the Country Programming Framework (2010), Coastal Environment and Management Plan for Bangladesh 1988, Environment Policy and Implementation Plan 1992, National Environmental Policy 1992, Environmental Court Act 2000, National Water Policy 1999, Bangladesh Water Act 2013, National Agriculture Policy 1999, Land Use Policy 2001, Tourism Master Plan of Bangladesh, the Bangladesh Water Act 2013, Environmental Conservation Act 1995, National Environmental Management Plan 1995, the Bangladesh Delta Plan 2100, the National Adaptation Plan and the Sustainable Development Goals.

Urban Sector

In the urban sector the policy recommends strategies to promote sustainable urban development, including the creation of adequate and affordable housing, the provision of basic urban services such as water supply and sanitation, and the development of sustainable transportation systems. This also recommends the adoption of policies that encourage the use of renewable energy, the reduction of greenhouse gas emissions, and the promotion of green spaces and public parks. Additionally, effective land use planning is critical to ensure proper urban development and sustainable economic growth. The policy strategy highlights the importance of developing effective land use plans to ensure that land resources are utilized in the most efficient manner.

The government's lone effort in resources, capabilities and initiatives is inadequate to resolve the ever-increasing housing problem. As a result, the gap between housing demand and supply becomes wider. The genesis of the problem remains in the fact that the development of housing and related infrastructure can't cope with the growth of the population. Affordable, equitable and accessible urban services is the key to ensuring sustainable development of urban areas.

US-01: Prepare more detailed land use zoning for pourashavas/urban areas.

Justification

Land use development is more intensive and diverse in urban areas. So, more detailed zoning is necessary for urban part of the upazila.

Strategies

1. Apply urban area land use zoning for guiding building permission in the potential urban area.

2. Maintain maximum possible flexibility in the land use to enable development where pressure is high for development permission.

3. Urban green spaces should be enhanced to promote better lifestyles and healthier environments. Trees and green spaces should be preserved to improve air quality, lower urban temperatures, promote physical activity, and enhance general health.

US-02: Limiting urban expansion to the Proposed Urban Area
Justification

Limiting urban expansion to the proposed urban area is an important aspect of urban planning and development to ensure balanced urban growth and management of cities.

Strategies

1. For Upazila, infill construction is recommended. Every land proposal should be made in close proximity to an already developed area. Due consideration should be given to safeguard urban water bodies, playgrounds and high-value urban agriculture.
2. To preserve quality of life in urban places include integrated polycentric development, multiple functions, and high-quality public space. Polycentric development in terms of morphological aspects that focus on population size, employment rate, land use combinations, and functionality mainly emphasizes the activity exchange and metabolism of the fabric.
3. Economic competition should be encouraged based on the city's current natural resources, human resources, and revenue-generating assets. Current resources and abilities should be utilized to their fullest potential. Assets in the areas of culture, heritage, industry, and environment should be prioritized.
4. Urban areas should be connected with their rural surroundings. Cities heavily rely on nearby rural areas for food, labor, water supply, and the disposal of food waste.

Implementing Agency

The UDD is a government agency under the Ministry of Housing and Public Works that is responsible for urban planning, development, and management at the national level in Bangladesh. Local government authorities, such as city corporations, municipalities, and pourashavas are responsible for the planning and development of urban areas at the local level in Bangladesh.

US-03: Ensure properdrainage, modern sewerage, proper waste management and clean air in cities.

Justification

To promote sustainable urban development the creation of adequate and affordable housing, the provision of basic urban services such as water supply and sanitation, and the development of sustainable transportation systems are utmost important.

Strategy

Waste management should include prevention, minimization, recycling and reuse of wastes, biological treatment, incineration, and landfill disposal. Prioritize nature-based solutions to ensure proper drainage, simultaneously protecting and enhancing the environment and minimizing management cost. By adopting multifunctional sustainable drainage systems, it is

possible to create new habitats and mitigate climate change impacts in collaboration with stakeholders while minimizing management costs. Additionally, the installation of modern sewage systems should be based on need and feasibility assessments.

Implementing Agency

The UDD is a government agency under the Ministry of Housing and Public Works that is responsible for urban planning, development, and management at the national level in Bangladesh. Local government authorities, such as Development Authorities and municipalities are responsible for the planning and development of urban areas at the local level in Bangladesh.

US 04: Promote urban physical environment with proper balance between ecology

Justification

Urban ecology seeks to develop a balance between human culture and the natural environment in areas where paved surfaces, high-density homes and businesses, and other urban-related elements dominate the landscape. This equilibrium can be attained using a technique called ecological urban planning. Making choices about how to use land and other resources in a way that reduces harmful effects on the environment while maximizing positive effects for people.

Strategy

1. In order to encourage urban agriculture, which can lower CO2 emissions from food transportation and increase access to nutrient-dense foods, farmland within cities should be maintained. Farmers' markets might be encouraged in order to foster diverse local supply chain.Urban green spaces should be enhanced to promote better lifestyles and healthier environments. Trees and green spaces should be preserved to improve air quality, lower urban temperatures, promote physical activity, and enhance general health.

Implementing Agency

Municipalities, and pourashavas are responsible for local level planning and development of urban areas under the guideline of Regional Plan, Structure Plan and Urban Area Plan prepared by Urban Development Directorate (UDD).

Rural Sector

RS-1: Ensuring urban services into rural areas following the government agenda "My Village My Town"

Justification

Development of infrastructure such as road, power, irrigation, prevention of river erosion and flood protection will boost rural economy. Surplus rural capital will be invested in agricultural and non-agricultural activities creating new jobs.

Strategies

Better connectivity should be established to unlock the potential of the rural economy. Community people and local government should work together to promote a common vision of how to develop and improved an upazila where culture and tourism may play a significant role.
Gear up infrastructure development activities with domestic and foreign funding.

Implementing Agency

Greater role to be played by REB, BADC, Krishi Bank, LGED, BWDB by taking up more development projects.

RS-2: Improve the coverage of primary education, health, sanitation and safe drinking water facilities

Justification

This approach takes into consideration various factors such as social, economic, environmental, and cultural aspects of rural areas to ensure that development initiatives are sustainable, inclusive, and aligned with existing rural settlement patterns.
Strategies

- Only fundamental services in the areas of health, education, social safety, and communication infrastructure may be taken into account for inclusion in the plan.
- Facilities need to be located at a distance of 500 meters or less from union headquarters or current growth centers.

Implementing Agency
Ministry of Agriculture, Ministry of Housing and Public Works, Ministry of Education, Upazila and Zila Parishads.

RS 03: Flexible planning for rural land zones, infrastructure and facilities

Justification: Rural land may have a diverse mix of uses, and its zoning may not accurately reflect the variety of land uses actually being used there. Rural areas may also contain areas with important environmental qualities, habitat for certain species, and local and regional landscape values. So while making plans for rural area, it is crucial to take these issues into account.

Strategies:

1. Growth center hierarchy has been determined taking into account functional and geographical relevance, The hierarchy will be taken into account when establishing road connectivity. other facilities such as telecommunications, including internet connectivity, health centers, sanitation and waste management, market infrastructure, quality education, safe drinking water, information technology facilities and high-speed internet, as well as better sewage facilities, community space and recreation, banking, rural resources, power and energy supply, modernization and mechanization of agriculture would be provided on the basis of the hierarchy of growth centers.
2. Prioritize nature-based solutions to ensure proper drainage, simultaneously protecting and enhancing the environment and minimizing management cost.
3. Private conservation can be provided via environmental conservation or landscape protection, which enables the plan to more accurately represent current land usage.

Implementation Agency

Urban Development Directorate (UDD) and LGED.

RS 04- Encourage the best possible use of the land and its conservation in order to increase agricultural output and produce food.

Justification

Agricultural land is land that has comparative advantages in terms of soils, climate, water (rain or irrigation), and availability to services. It is significant for agriculture and/or food production on a state, regional, or municipal level. The State's food supply, especially its supply of fruits and vegetables, is primarily derived from agricultural land.
High-quality agricultural land data that has undergone consultation and refinement to remove land needed for current and future urban/development areas, public use areas, and land needed for environmental objectives is the foundation for the identification of priority agricultural land.

Strategies

1. Increase the variety of crops and livestock used in business operations.
2. Make use of mixed pastures and crop rotations based on legumes
3. Combine various crop kinds
4. When selecting varieties that tolerate a specific bug or disease, choose those that have multiple genes rather than just one or two
5. Give open-pollinated crops the edge over hybrids due to their greater genetic diversity and capacity to respond to local circumstances
6. Plant cover crops in crop fields, vineyards, and orchards
7. At the field's edge, leave strips of natural vegetation
8. Create passageways for wildlife and helpful insects
9. Engage in agroforestry, which combines trees or shrubs with livestock or crops to increase the continuity of the natural enemies' habitat
10. Plant native plants and trees that can alter the microclimate to create hedgerows or windbreaks
11. Provide a water supply for insects and birds

Implementation Agency

Urban Development Directorate (UDD).

Agriculture Sector

For the sake of food production, there is a need to conserve high-yielding agricultural lands from encroachment by severely competing non-farm land use demand. In disaster prone areas, strategies are recommended to protect agricultural land. Investing in agro-based industries and food processing are key steps to move forward to secure food supply and agricultural growth.

AS-1: Intensification of agriculture and crop diversification to increase food security; develop salt tolerant crop varieties.

Justification

Diversifying crops can help increase crop intensity by growing different crops in the same field or rotating crops between seasons. This practice can help reduce pest pressure, increase

soil fertility, and optimize water use, leading to higher crop yields without expanding agricultural land.

To save the agricultural land for food security in the country, it is necessary that further loss of agricultural land is prevented

Strategies

Cropping pattern information, ground water quality and quantity and interpolated surface geology information will assist relevant agenciec to take adaptive strategies to save and protect at least double and triple cropped agriculture lands.
The strategy has identified upazilas affected by salinity at various levels due to 0.50m, 0.62m, 0.95m, and 1m SLR, which will let pertinent agencies make decisions to increase Productivity, cropping pattern of the region has been surveyed which will help to conduct R&D to shift in agriculture paradigm and lay emphasis on the necessity of coastal polders for protecting agricultural fields from saltwater incursion.

Fish stocks must be managed responsibly by utilizing the bounty of the ocean, lakes, and rivers to produce food and nourishment, or else the resource will go extinct and negatively impact both people and the aquatic environment. Agro-fisheries equipment should be environment friendly and affordably priced and simple to use, which can increase yields.

AS -2: Prevent non-agricultural use of the fertile agricultural lands.

Justification

Bangladesh is an agricultural country. Its economy is mostly dependent on agriculture. But in order to provide housing, most of the agricultural lands are being converted to residential areas. As a result of expansion of residential areas, the total amount of agricultural lands is decreasing day by day which is harmful for future food production. So, it is the demand of the time to discourage residential expansion in the agricultural land and keep suitable agricultural lands free from any kind of encroachments.

Strategies

Keep suitable agricultural lands free from any kind of encroachments particularly from human settlements.
The plan should identify the cropping pattern of the study region in order to identify high productive fields and restrict non-agricultural use of land resources through defining them as Agriculture zone.

Transportation and Traffic Management

TT-01: Develop an integrated network of communication including highways, rural roads, railways and water ways.

Justification

The first step would be to establish a comprehensive transportation plan that considers the needs and demands of local, regional, and national transportation systems. This would require coordination among various government agencies. Development of local transportation

network will help build up improved internal road and waterway transport system within the Taltali Upazila.

Strategies

1. Proposals will be made for widening the existing narrow roads where possible and development of new roads where accessibility is poor.
2. Infrastructure like, terminals, parking spaces for motorized and non-motorized vehicles, traffic signals, automobile workshops and garages, pick up and drop off spaces for passengers and goods, etc. would be developed depending on the needs.
3. Plan would consider integration among road, rail and water ways.
4. Establishment of connectivity by inter-regional highways with economic zone areas, ports, airports, power stations, inland water transport facilities, rail stations and major tourist resorts.
5. Upgrading of all inter-district roads to at least 4 lane facilities and upgrading /extending existing bridges; Upgrading zilla and upazila roads to at least 2 lanes. Conversion of village roads to asphalt standard with at least one lane.
6. Creation of physical segregation of the primary road from the local activities and local traffic including manually operated vehicles.
7. Establishment of road hierarchy among primary, secondary and tertiary roads.

Implementation Agency

Ministry of Road Transport and Bridges, Road Transport and Highways Division, Bridge Division, Roads and Highways Department (RHD)

TT-02: Promote bike lanes and pedestrian walkways, recommend light transports, tourist-oriented sightseeing electric bus/ boats.

Justification

For achieving a better quality of life in the Paurashava and other urban areas, safe sidewalks and bicycle paths are required along the road system. An exclusive bicycle trails can also be created in suitable areas or along the roads with low traffic volume for supporting healthy lifestyle of local communities.

Strategies

1. Walking and bicycling facilities should link all the important services, community facilities and recreational spaces in the Paurashava and other urban areas. The width of the roads/right of ways for roads should be designed with required planning standards to accommodate the sidewalks and bicycle paths.
2. Proposal of water cruise route from Sonar Char to Sundarbans connecting Kuakata would be considered.
3. Tourist-oriented sightseeing electric bus/ boats etc. would be considered for Kuakata Tourism area and for other tourist areas.

Implementation Agency

Ministry of Road Transport and Bridges, Local Government Division, Pourasava.

TT-03: Prioritize inter-regional river connectivity to facilitate trade, commerce and tourism; improve the navigability and river port infrastructure.

Justification

Bangladesh being a country with many rivers, Inland Water Transport (IWT) is a major mode for the transport of goods and people. IWT is the cheapest mode of transport compared to road or rail. The study region is well connected with inland water transportation system.

Strategies

1. Conduct regular dredging activities to maintain river transportation; develop and maintain river ports, ferry ghats and terminal facilities in ports/ ghats.
2. Provide modern water vessel/ ship in these routes.

Implementation Agency

Ministry of Shipping, BIWTA, BIWTC

Water Resource and Drainage

Water resource planning and management is concerned with hydrology, water supply, sanitation, sewerage and drainage etc. Ensuring sustainable management of surface and ground water is the key to enhancing efficiency in water use in an equitable manner. Conservation and preservation strategies are highlighted for supply of safe water. Industrial development in recharge areas is to be restricted to prevent water pollution. Water treatment plants and regular monitoring is needed to maintain the quality of water. Application of 3R policy, preservation of recharge areas, and rainwater harvesting schemes are some of the proposed strategies.

WR-01: Promote rainwater harvesting in coastal areas, and preserve and maintain the existing natural water bodies for drainage to save crop and property, control flood and protect the environment

Justification

The only economically reasonable alternative of groundwater is rainwater. The most important advantage of rainwater harvesting is that it has no connection with sanitation problem and it requires no or minimal treatment for drinking. If people of the study area are interested about the rainwater harvesting and do it spontaneously then it will largely decrease the groundwater abstraction pressure from subsurface water bearing zones.

Rainwater harvesting boosts soil fertility, lessens the need for chemical fertilizers, increases well water use, replenishes groundwater, and makes better use of all the water that falls on the farm to increase crop yield. The most crucial factors in the optimization of Rain Water Harvesting Systems is the tank location and the distribution technique selected.

Strategy

Strategies such as wetland conservation, storm water management, watershed management, floodplain management, ecosystem restoration, monitoring and enforcement, and education

and outreach can help ensure the sustainability and condition of natural water bodies for current and future generations.
In order to promote sustainable water management practices, rainwater harvesting systems should be incentivized by lowering installation and equipment costs for collecting and storing rainwater for domestic use or to recharge aquifers.
The water problems can be solved and climate resilience can be increased through the use of green infrastructure, which relies on vegetation, soil and natural systems to manage rainfall runoff.
Conserve big ponds with clean water as a source of drinking water. Local agencies could take lease private owned such ponds. It is important to protect water pockets and bodies as a safeguard measure. Construction and rehabilitation of flood and drainage management measures should follow eco-engineering solutions.
The expansion and conservation of green and blue infrastructure can improve urban environments and drainage systems.
To increase fresh water supply restoration of water reservoirs the following critical elements should be considered: Catchment processes (interaction between geology, topography, evapotranspiration, rainfall, and land use and cover causing runoff and the production and transportation of pollutants, nutrients, carbon, and sediment), Flow regime (Hydrology (magnitude, frequency, duration, and timing of flows), surface and groundwater interactions), Habitat (Sediment mobilization and deposition; hydraulic habitat from interaction of hydrology and physical form), Water quality and sediment chemistry (Temperature, nutrients, salinity, DO, turbidity, metals, toxins, carbon), Aquatic and riparian biodiversity (Abundance and organization of flora, fauna and microorganisms; ecological processes (metabolism, nutrient cycling)).

Implementation Agency

Public health Engineering Department, pourashava, NGOs/CBOs

WR-2. Provision of safe and affordable drinking water supply with special attention to salinity prone coastal areas.

Justification

Safe in context of salinity, arsenic contamination etc. is a basic requirement of people. It is also a crucial need of the people of coastal area.

Strategy

Long-term water resource management strategies documented by the Government. following IWRM concept (such as examining large-scale O&M activities in embankments and polders to prevent salinity intrusion, identifying and implementing the best option and undertaking desalinization activities) should be incorporated. Coastal embankments also need to be rehabilitated. Arsenic mitigation measures should be taken. Industrial development in water recharge areas should be restricted to prevent water pollution.

the plan ranks sites based on availability of quality ground water which will help to make proper use of ground water; the plan identifies surface water network by analyzing DEM and field survey. In Urban area plan the location of water treatment plant should be located.
The option to treat drinking water at home using filters, solar disinfection or flocculants will be made available to ensure safe drinking water for all.

Encourage cost-effective methods to improve water quality, such as using chlorine tablets or exposing plastic bottles to sunlight.
It should be given priority to conserve, manage and re-excavate the wetlands.

Implementation Agency

Public health Engineering Department, pourashavas, NGOs/CBOs

WR-3. Reduce dependency on groundwater and ensure natural and artificial recharge of groundwater.
Justification

To reduce groundwater dependency, demand-side management interventions and supply-side engineering measures is important. Aquifer recharge improvement with excess surface runoff, urban wastewater reuse and complementary local supply-side steps like rainwater harvesting should always be promoted.

Strategy

The plan should identify highest recharge area to maintain the areas unpaved. Coastal Afforestation zone may be proposed in this area.
Industrial development in water recharge areas should be restricted to prevent water pollution.

Implementation Agency

Plan implementing agencies like Public Health Engineering Department, Pourashava, Development Authority, NGOs/CBOs

Renewable Energy

Power is a part of modern living. Progress in all respect cannot be moved forward without adequate power supply. This is an essential part of everyday life. Target has been set in Bangladesh Delta Plan 2100 for at least 30% energy production from renewable sources by 2041 in the context of being a prosperous country.

RE-1: Extension of power supply to unserved rural areas/char land
Justification

Government has to take steps to extend power supply to rural areas through REB. Necessary budget should be sanctioned in this regard. If it is delayed alternative measures may be promoted.

Strategies

1. Take up power supply as major national development policy.
2. Crush program by REB with necessary budget allocation.

RE -2: Emphasis on development of renewable energy, particularly solar homes and biogas plants; Include energy saving devices in all infrastructure; Reduce the use of fossil fuel; Investment to harness wind energy particularly in coastal areas.

Justification

Take necessary steps to promote solar energy, renewable energy and Wind Mill as alternative national power supply. Involve private sector to meet the supply gap through sustainable energy.

Strategies

1. Involve private commercial agencies and energy sector NGOS to supply domestic solar system.
2. Introduce soft credit facility for users to purchase solar system.
3. Renewable energy use such as solar plants, bio-gas plant and wind mills should be given priority; the plan should identify suitable locations for eco-town development to lower carbon impact.

Implementation Agency

In Bangladesh, several agencies and organizations are involved in the implementation of renewable energy initiatives. Some of the key implementing agencies for renewable energy in Bangladesh include: Sustainable and Renewable Energy Development Authority (SREDA), Infrastructure Development Company Limited (IDCOL), Bangladesh Power Development Board (BPDB) and Grameen Shakti.

Disaster Mitigation and Climate Change aspect

Disaster arising from climate change or non-climate change phenomena is very common in Bangladesh. People of the country are highly resilient to disasters like, flood, cyclone, and river bank erosion. Remarkable disasters that strike Taltali Upazila are, tropical storm, Salinity and monsoon flooding.

DPM-01: Ensure better flood control, Control riverbank erosion, Control sea-water intrusion and reduce salinity.

Justification

Natural disasters, such as floods, inundation of water, cyclones, erosion etc, are threats to safety and loss of human life and properties. This has to be given due consideration in the development processes.

Strategies

Building new and enhancing existing drains; identifying inundation area and depression area for taking necessary measure for infrastructure development; facilities such as water treatment plant, septic tanks, toilets etc should be constructed above flood level to avoid inundation level.

The strategy of implementing disaster-resilient infrastructure can be adopted to face the challenges of future disasters.

Implementation Agencies

The local government authorities, particularly the Upazila Parishad should work through different committees formed as per National Disaster Management Plan at the local levels.

The Disaster Management Directorate under the Ministry of Disaster and Relief should be monitoring such actions for people's safety and national security purposes.

DPM-02: Construct adaptive and flood-storm-surge resilient building; extension and improvement of multipurpose cyclone shelters.

Justification

Proactive action for sustainable infrastructure is necessary to tackle climate change impacts. Multipurpose cyclone shelter should be a solution to comprehensive and productive use of structure. The plan should propose embankment construction considering people who live in the area between the rive and the wall (strategies or compensation provision to their homes, farms, animals, pastures, livelihoods); the plan should also recommend measures to include protection from saline water, river bank and khal protection schemes, rehabilitation of polders, as well as an extension of polders, canal excavation, construction of new embankments, protection and extension of irrigation systems, excavation of river and branch channels, and multipurpose cyclone shelters.

Strategies

Infrastructure should be built higher above the flood plain. Build Using Flood Resistant Materials – Materials that can withstand contact with floodwaters for at least 72 hours without suffering major damage are considered flood resistant.
Construct coastal embankments and polders to control flooding; construct sluices to facilitate drainage.

Flood proofing the critical infrastructures such as hospitals, power stations, industrial plants, major communication networks require development of embankments, barriers, water control structures etc. Steps are also needed for extension and improvement of multipurpose cyclone shelters and preparation of guidelines for designing climate change resilient infrastructure. Upazila level public sector development agencies need to follow guidelines during development of infrastructure.

Implementation Agencies

The local government authorities, particularly the Upazila Parishad should work through different committees formed as per National Disaster Management Plan at the local levels. The Disaster Management Directorate under the Ministry of Disaster and Relief should be monitoring such actions for people's safety and national security purposes.

CLI-1: Take necessary measures to educate people about the dangers of climate change in all spheres of life.

Justification

Awareness would cause people to take proactive measures to create resilience against the negative impacts of climate change.

Strategies

Program initiative by the Upazila Parishad in collaboration with the Department of Disaster Management to educate people about climate change and its consequences.

CLI-2: Adopt climate change resilient production technology in agriculture including seed.

Justification

To avoid disaster in agricultural production, prior action to evolve new agro-tech in agriculture is necessary to cope with climate change.

Strategies

Research program initiative by BADC and BRRI to evolve new technology and paddy Resilient to climate change.

CLI-3: Identification, protecction and management of environmentally sensitive and biologically potential areas.

Justification

Preservation of environmentally sensitive areas can serve as safe guard to bio-diversity and disaster.

Strategies

1.Identify critical habitat areas of crab, crocodile, deer, dolphins, fox, migratory ducks, reptiles, resident birds, resident waterbirds, sea turtles, sea gull, wild boar, wild buffalo, wild cat, hilsha sanctuary etc. proposal has been made considering the mentioned areas to remain undisturbed.
2. Earmark environmentally sensitive areas in the master Plan.
3. Control development in those areas; take over land if possible to preserve the areas.

CLI-4: Organize and keep activated the disaster management committees at various levels of the administration

Justification

Regular meeting of Disaster Management Committees will keep members conscious about their responsibilities.

Strategies

Hold regular meeting of Upazila, Union Disaster Management Committees.
Implementing Agency
In Bangladesh, the implementing agency responsible for addressing climate change is the Ministry of Environment, Forest and Climate Change (MoEFCC). The MoEFCC is the primary government body in Bangladesh responsible for formulating and implementing policies, plans, and programs related to environmental conservation, forest management, and climate change mitigation and adaptation.

Conservation Zone

CZ-1: Promote conserve and sustainable management natural/environmental resources and use of terrestrial ecosystems and forests

Justification

Conserving natural and environmental resources, such as water bodies, forests, and char lands (riverine islands), is critical for maintaining ecosystem services, supporting livelihoods, and preserving biodiversity.

Strategies

1. River and Khal protection zone has been created to protect existing water bodies. 50m buffer zone has been created from the edge of the river and 10m buffer zone has been created from the edge of the khals. Continental embankment, road and beautification with tree plantation have been proposed in this buffer zone. It will protect the river and khal from further development.
2. For conservation of forests, GOs and NGOs should assess forest resources, delineate reserved areas, identify suitable locations for reforestation by categorization of forest areas, control the economic exploitation of forest products, defend against calamities, create national parks, and promote growth of social forestry, agroforestry and other forestry practices. Moreover, master plans for both the long and short terms should be made.
3. Fresh water needs to be conserved as much as possible. In this case, water banking through conserving big water bodies could be a solution.
4. Trees and forests should be preserved, especially large trees and mature forests, as they serve as habitat for a variety of species, store carbon, uphold water quality, regulate climate, and offer areas for recreation and contact with nature
5. Plant trees in the coastal and terrestrial environments or the intertidal zone, along coasts which will work as a barrier against disaster.
6. Ocean acidification needs to be reduced, because its impact could potentially jeopardize the marine food web and undermine the adaptability of marine ecosystems, notably corals.
7. Nutrient inputs must be decreased by sewage treatment and measures targeting agricultural practices in order to combat the threats of coastal eutrophication.
8. Coastal plants will serve as a mitigation measure to lower coastal erosion and retain silt by slowing the current.
9. Coastal plantation can minimize the risks of loss and damage to individuals and property during natural disasters such as cyclones and storm surges by reducing wind and water velocity.
10. To reduce environmental degradation, preserve wetlands and conserve wildlife habitats and biodiversity. All food, wood plants, livestock, microorganisms and farm animals should be protected. All economically significant organisms should be recognized and protected. First and foremost, unique ecosystems should be protected. The resources should be used as efficiently as possible.
11. To conserve wildlife habitats and biodiversity, wild animal poaching and hunting should be prohibited, reserves and protected places must be carefully planned, pollutant levels in the environment should be lowered, and deforestation should be stopped at all costs by enforcing environmental rules.

CZ-2: Execute land use planning for the enhancement of ecosystem and species diversity.

Justification

Land use planning plays a crucial role in enhancing ecosystem and species diversity by promoting sustainable and responsible land management practices. Here are some steps that can be undertaken to execute land use planning for the enhancement of ecosystem and species diversity.

Strategies

1. Conservation Zone has been created in the char area to protect char area from further development. This zone will preserve the natural condition and attract tourist more.
2. The government must be convinced that the ecosystem of a particular area has reached or is in danger of reaching a critical state or condition as a result of environmental deterioration before proclamation of ECA.
3. Following factors must be considered while declaring any ECA: a) human habitat, b) ancient monument, c) archeological site, d) forest sanctuary, e) national park, f) game reserve, g) wild animals' habitat, h) wetland, i) mangrove, j) forest area, k) biodiversity of that area along with other relevant factors.
4. Plants and animals that are useful and endangered should be conserved in their natural and artificial habitats.
5. The importance of biodiversity protection should be made known to the general public. Elected public body must be held accountable for taking action on behalf of ecosystems and biodiversity.

Implementation Agency

There are some of the key agencies involved in conservation zone protection in Bangladesh. However, it's important to note that conservation efforts in Bangladesh also involve collaboration and partnerships among various stakeholders, including government agencies like Ministry of Environment, Forest and Climate Change (MoEFCC), Bangladesh Forest Research Institute (BFRI), Bangladesh Wildlife Conservation Trust (BWCT), Bangladesh Forest Department (BFD), National River Conservation Commission (NRCC), NGOs, local communities, and other relevant organizations.

Economic Zone

EZ-01: Light industries need to be developed to flourish the industrial sector development

Justification

In order to accelerate the economic development of Taltali Upazila in the long run, it is required to encourage the establishment of industries within Upazila area.

Strategies

To control the haphazard growth in the midst of industrial development, measures will be undertaken as follows:

- Following the category of industries as categorized by DOE (Green Category) and Bangladesh National Building Code (low and medium category hazards)
- Following Bangladesh National Building Code, 1993 & 2006 and Building

Construction Regulation, 1952 (amendment in 1996) for providing Road, setback etc. before construction of any industrial structures.

EZ-02: Promote Agro based Industries in the Growth Centers

Justification

Taltali Upazila is dependent on agriculture and small business through direct or indirect involvement of private and public sectors. Emphasis is required for accelerating the economic development trend by restoring the economic base of the area. Small growth centers should be developed in different unions. Public and private investment should concentrate in tsuch growth centers. This policy will create opportunities for developing basic agro-based industries in Taltali Upazila .

Strategies

Agro-based industries will help the existing producers to increase their earning and increase the employment opportunities through ensuring increased capacity.

EZ-03: Promotion of Rural Growth Centers as Trading Hub of the Rural Area.

Justification

Promoting rural growth centers as trading hubs in rural areas can contribute to the economic development of rural communities by facilitating trade and commerce, creating employment opportunities, and promoting local entrepreneurship.

Strategies

If national business establishments can be encouraged to locate in the Upazila, they will provide earning capacity for their locally recruited employees. However, this would depend on the availability of services to support the businesses. The Upazila will assist central government in promoting Upazila as potential location for inward investments.

EZ-04: Employment Generation through Development of Potential Sectors

Justification

Generating employment opportunities through the development of potential sectors can be a key strategy for economic growth and poverty reduction.

Strategies

In order to promote economic activity of the Upazila for longer period with proper sustenance, particular attention should be given on agriculture and small scale business. Proper planning and coordination among these sectors and future potential sectors would make it possible to engage local active labor force. Following measures will be encouraged to implement this policy implication:

- Industrial Zone declaration in Land Use Zone (mainly light industries)
- Infrastructure development to flourish agro industry (Market, Storage facility, electricity etc.)
- Involvement of active labor force and community participation in different management activities of Upazila such as solid waste management, road

maintenance, public sanitation etc.

Implementation Agency

In Bangladesh, the implementing agency for economic zones is the Bangladesh Economic Zones Authority (BEZA). BEZA is a government agency under the Prime Minister's Office which is responsible for planning, development, operation, and management of economic zones in Bangladesh.

Forest Area

Policy FA-01: Conserve forest resources and improve bio-diversity, foster development through conservation, increase forest cover and protect biodiversity; take steps for forest regeneration and afforestation; bring coastal areas under mangrove rehabilitation program; give priority to the creation of a coastal green belt.

Justification

The forest area in Bangladesh is approximately 2.62 million hectares, which is about 17% of the country's total land area. Perspective Plan (2021-2041) has set the target to achieve 20% area under forest resources by 2041. However, it's worth noting that the forest cover in Bangladesh has been declining over the years due to various factors such as deforestation, illegal logging, encroachment, and infrastructure development.
Preserve trees and forests, especially large trees and mature forests, as they serve as habitat for a variety of species, store carbon, uphold water quality, regulate climate, and offer areas for recreation and contact with nature.

Strategies

1. Forest, char areas and areas which are still on Geological formation stage have been proposed as Conservation Zone for forest resources.
2. Encourage establishment of parks and discourage detrimental suburban sprawl and other development in order to preserve forests; Reforestation is a crucial component of the fight against climate change, and recovering ecosystems that have been damaged creates vital habitat for endangered species.
3. Expand social forestry program
4. For conservation of forests, GOs and NGOs should assess forest resources, delineate reserved areas, identify suitable locations for reforestation by categorization of forest areas, control the economic exploitation of forest products, defend against calamities, create national parks, and promote growth of social forestry, agroforestry and other forestry practices. Moreover, master plans for both the long and short terms should be made.
5. To conserve wildlife habitats and biodiversity, wild animal poaching and hunting should be prohibited, reserves and protected places must be carefully planned, pollutant levels in the environment should be lowered, and deforestation should be stopped at all costs by enforcing environmental rules.
6. Afforestation may lead to a more balanced regional water cycle by minimizing run-off and flooding, tightening control over groundwater recharge and protecting watersheds. Additionally, a well-established tree cover can improve water quality and prevent surface erosion.

Implementation Agencies

Several agencies and organizations are involved in forest conservation efforts in Bangladesh. Some of the key implementing agencies for forest conservation in Bangladesh include- Bangladesh Forest Department (BFD) Local Government Department (LGD), Bangladesh Forest Research Institute (BFRI), and Community-based Organizations (CBOs).

Tourism Development

The PKCP area has been identified as having high potential for attracting tourists. One of the key strategies to increase tourism in the PKCP area is through ecotourism. Ecotourism is a form of tourism that focuses on visiting natural areas in a way that is ecologically sustainable and socially responsible. In addition, a massive tourism marketing strategy should be developed to promote the PKCP area as a tourist destination. The marketing strategy should emphasize the unique features of the PKCP area, such as its natural beauty, cultural heritage, and recreational opportunities. Capacity building in the tourism sector is also an important instrument for expanding tourism in the PKCP area. Expanding tourism in the PKCP area can have a significant impact on the local economy by creating jobs, boosting GDP growth, and supporting conservation efforts. To achieve this, a combination of strategies is required as mentioned below.

TD-01: Encouraging eco-tourism development

Justification

Investments in eco-tourism can be positive for environmental conservation as well as income generation. The natural sites at the Upazila level have potential for such investments and development.

Strategies

Eco-tourism development prospects in the Upazila should be explored for investment in ecotourism. Attractive natural sites will be identified and offered for eco-tourism development.
Establishing independence. Local communities want to develop their standard of living and secure their future. Create a cooperative ownership system. The degree to which the tourism experience is successful depends on the sense of community ownership. Let them manage their own tourism industry and reap the rewards.
Incorporating interactive components. In the age of the experience economy, tourists need engaging, instructive, imaginative, and visually appealing activities. Instead of just watching and visiting, they seek for activities in which they may take part. Give them a truly one-of-a-kind experience by including them in the local culture and letting them try, taste, and do things.
Ensure social Infrastructure facilities such as, restroom, worship place for Muslim, health center facility, security facility, education and leisure facilities, arts and culture facilities, sports facilities, traffic signs, safety signs, information center, the facility for disabled, locker-room.

Implementation Agencies

Bangladesh Parjaton Corporation and the National Tourism Development Board should be supporting and guiding tourism development at local levels by enacting favourable policies

and laws. Local and regional trade associations are important for promoting tourism development in the Upazila.

TD-02: Promoting and attracting public and private investments in Tourism Development

Justification

Tourism can be an important sector for revenue earning by the local authorities. The process of development in this sector attracts investments in various services. There is scope for promoting tourism development in the Upazila.

Strategies

Identifying, demarcating and developing suitable locations within the Upazila for creating attractions may be potential for attracting investment. Investment can be encouraged by creating attractive sites for development in the tourism locations. The local and regional investors can be attracted with possible options of incentives.
Provide economic infrastructure facilities such as, route to the tourism destination, ticket window, public transportation availability, parking area, bus stops, gazebo, hotel/resort, restaurants, souvenir shops, minimart, relevant telecommunication, electricity, ATM/Money Changer.

Conclusion

The policies set for various sectors in this chapter are in conformity with the broad national sector policies. The strategic measures suggested are targeted to achieve these policies at Upazila level. The implementing agencies are identified in consideration of direct and indirect involvement in the plan implementation process. The diverse supportive role of many local stakeholders and local and national agencies will also be important for implementing the plans.

CHAPTER FIVE: COMPREHENSIVE STRUCTURE PLAN

5.1 Existing Land Use

Taltali Upazila is mainly rural in nature. Some wards are mainly containing urban characteristics. But in recent years, communication development has already impacted the growth and expansion of activities. The existing land use of the Upazila shows that 54.12 percent of the land is used for agricultural activity, and another mentionable land-use area is 12.41 percent rural settlement, 20.57 percent waterbody and 10.91 percent forest area. Table 34 illustrates existing landuse statistics in detail.

Table 34: Existing Land use of Taltali Upazila

Land use Category	Area (in acre)	%
Administrative/ Public Service	12.74	0.02
Agriculture	34179.54	54.12
Beach	222.73	0.35
Commercial	40.40	0.06
Community Service	98.49	0.16
Education and Research	92.40	0.15
Forest	6890.30	10.91
Health Service	4.92	0.01
Manufacturing and Processing	183.83	0.29
Mixed Use	25.64	0.04
Residential	7836.90	12.41
Service Activity	28.15	0.04
Transportation and Communication	451.73	0.72
Vacant Land	51.05	0.08
Vegetation	50.46	0.08
Waterbody	15869.08	20.57
Total	**66038.36**	**100.00**

5.2 Government Projects

Government Projects are very important aspect of planning for an area. While proposing the structure plan zones, govt. projects must be considered. Several govt. projects have already taken for Taltali Upazila such as Cyclone Centres, Thermal Power Plant, Ship Yard etc. The projects are Taltoli Fire Service Office, Taltoli Sub Registry Office, Taltoli Upazila Land Office, Ship construction and Breaking project, Construction of Cyclone Shelter Project (2nd Phase), Construction of Cyclone Shelter Project (2nd Phase) and Bangladesh-China Coal based Thermal Power Plant.

Figure 44: Existing land use of Taltali Upazila

Source: PKCP Project, UDD, 2022

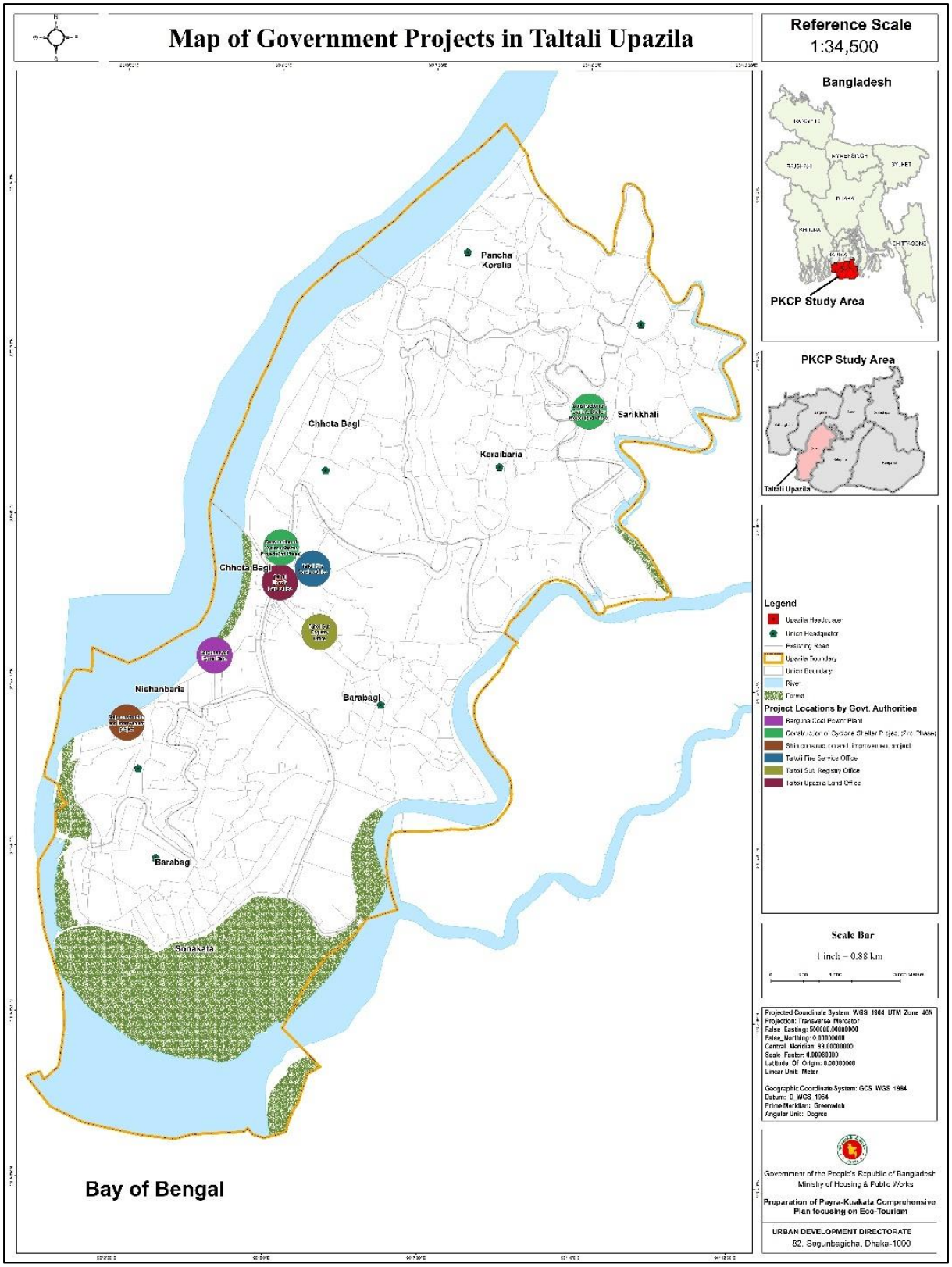


Figure 45: Govt. Projects in Taltali Upazila

Source: PKCP Project, UDD, 2022

5.3 Suitable site ranking-findings from suitability analysis

5.3.1 Ranking Suitable Areas based on Geological Attributes

Geological attributes are important to ensure safe, stable and economic design and construction of governments or authorities' project. For example, ground motion is more directly related to damage to buildings and infrastructure in an earthquake than the magnitude of the earthquake itself.

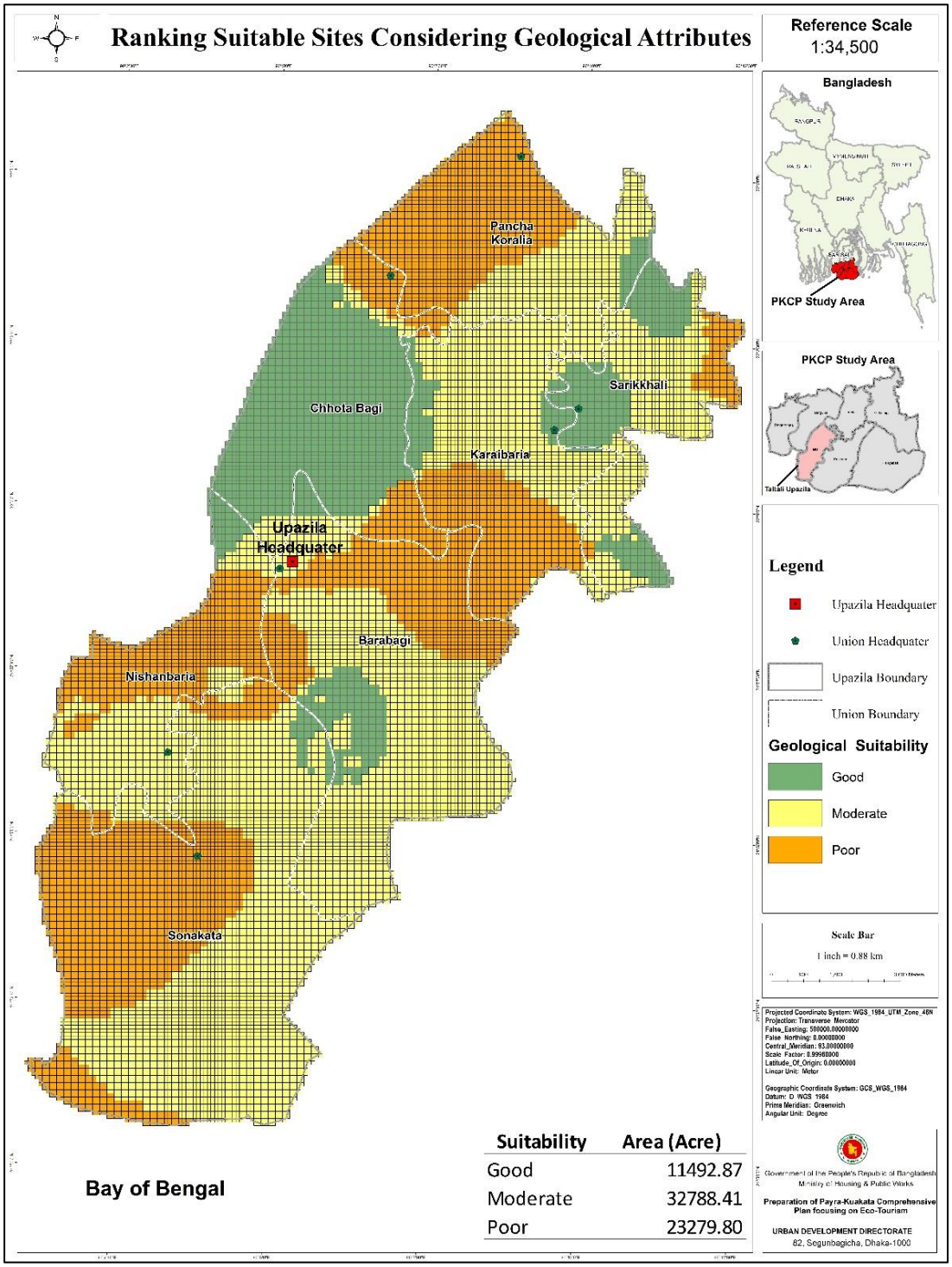


Figure 46: Ranking of suitable sites considering geological attributes

Source: PKCP Project, UDD, 2022

Construction technology commonly employees pile foundation in a variety of scenarios, such as when there is an unstable layer of soil beneath the surface which is incapable of supporting the weight of the building in case like earthquake- in such case the load must be transmitted to the layer of firmer soil or rock beneath the weak layer.

Beside earthquake, liquification phenomenon which is an unsupportive environment of built structures by altering previously solid ground into a liquefied softened condition. these damages increase during earthquakes. Two-step multi-criteria decision making (MCDM) technique has been applied to rank Geological suitability sites.

PGA, Foundation layer depth, Soil Type, Liquefaction Potential Index, and Building Height Recommendation has been considered as important dependent variable and to find out the relative weight of these variable AHP pairwise comparison has been applied.

After getting the weighted value, the weighted sum model was applied to find the final suitability map. Around 49 percent area were found moderately suitable and 17 percent found suitable for infrastructure development such as government buildings, hospitals, cyclone centres etc.

Most natural processes rely on water. It shapes the landscape by transporting silt and solutes to lakes and oceans. Hydrogeological study has been conducted to understand water flow and distribution below the earth's surface Suitable sites based on hydrological attributes have been judged considering the availability of quality groundwater for human use.

To rank the water quality, WQI has been taken into account and to rank the availability of freshwater findings from slug tests and water head depth in the dry season has been considered. 45 illustrates the findings of the suitability analysis. It is found that the only one percent of the area was found hydro-geologically poor and only 2 percent of area was found hydro-geologically suitable and most of the areas 97% are moderately suitable.

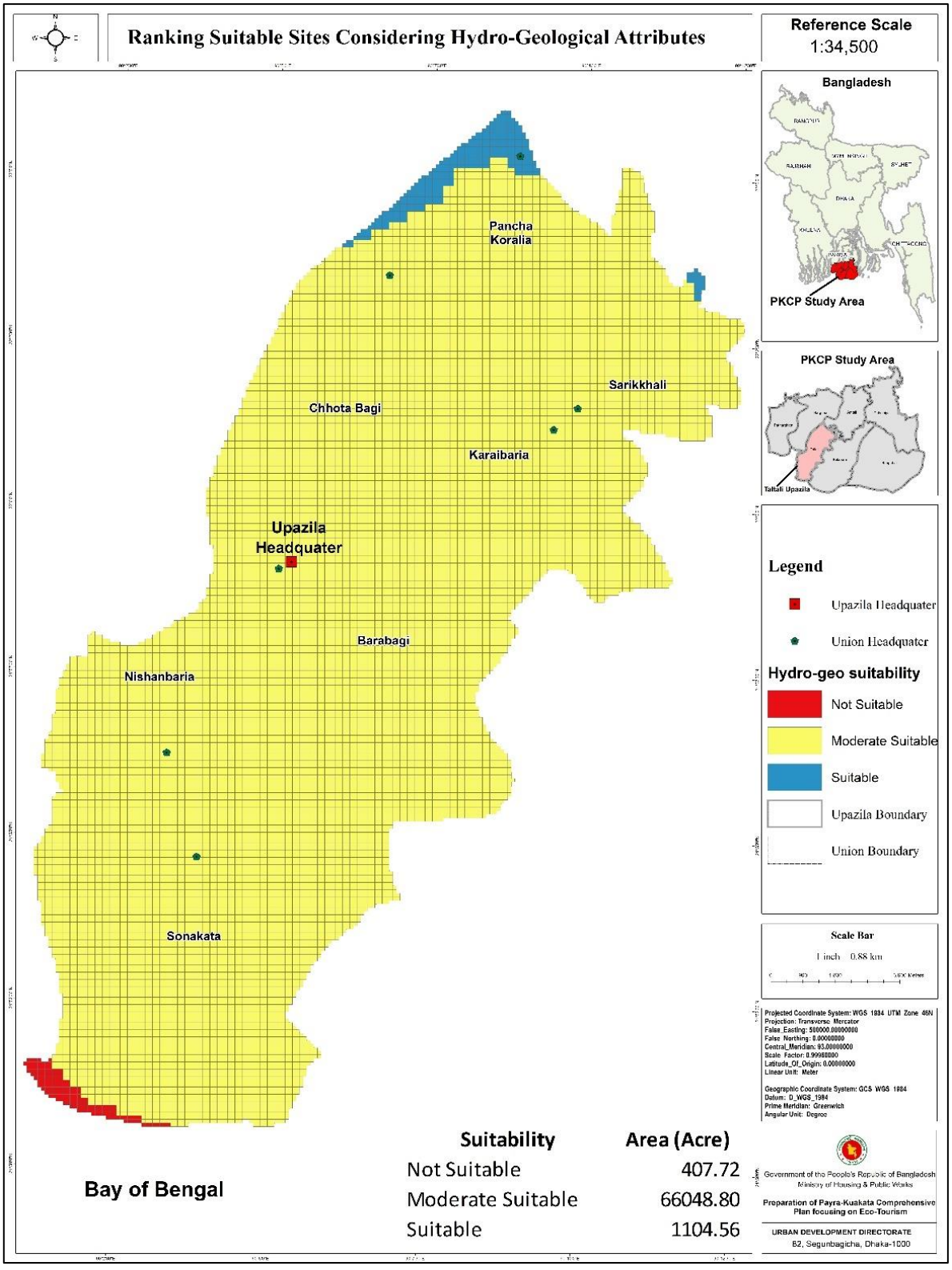


Figure 47: Ranking of suitable sites considering quality and quantity of ground water
Source: PKCP Project, UDD, 2022

5.3.2 Ranking Strategic Service Centres considering existing function

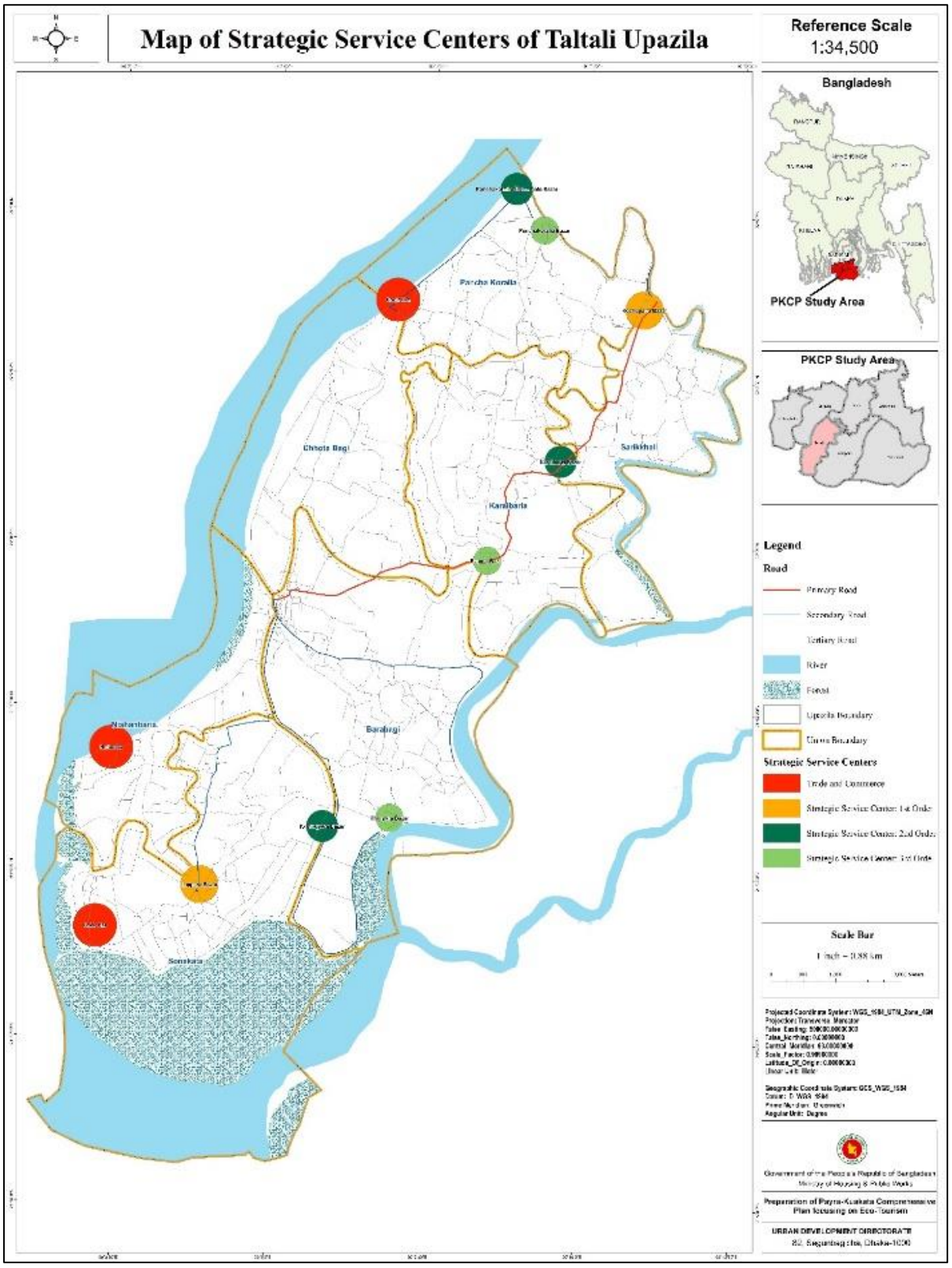


Figure 48: Ranking of growth centres considering existing function

Source: PKCP Project, UDD, 2022

Numeric range has been explored to classify Strategic Service Centres into rural trade and commerce centre, higher order or 1st Order service centre, middle order or 2nd Order service centre and lower order or 3rd Order service centre based on score given by weighted method.

Public services such school, college, health centres etc. will be encouraged within the different level service centres and major economic activities like light or heavy industries will be encouraged within rural trade and commerce centre.

5.4 Suitable site ranking- findings from multicriteria analysis

5.4.1 Ranking Suitable Areas for Infrastructure Development

Infrastructures are the basic facilities and equipment required to produce a product or deliver a service. Infrastructures should supply the necessary conditions and equipment to carry out the necessary business tasks and operations, as well as aid in reaching the intended product and service conformance. As a result, it is intimately linked to the product or service and has a direct bearing on its quality. The primary purpose of a suitability analysis for infrastructure development is to ensure infrastructure are intact, sustainable and stable; will support organization in achieving quality targets and plans. Infrastructures encompass all of the tools, applications, interfaces, and facilities required to bring products or services to market, from concept to delivery and post-delivery. To rank suitable sites for infrastructure development geological attribute of the Upazila, disaster risk, elevation and building height has been considered. Due to upgradation of construction technology, it is possible to reach foundation depth 25 to more than 30 m. side by side the Upazila's soil condition is suitable for low-rise and high-rise building construction.

Table 35: Area percentage of ranks for Infrastructure Development

Ranks	Area in Acre	Area in percentage
Highly Suitable Area	318.77	0.48
Suitable Area	19212.44	29.09
Moderate Suitable Area	23264.97	35.23
Less Suitable Area	4124.19	6.25
Not Suitable for any Development	19117.99	28.95
Grand Total	**66038.36**	**100.00%**

5.4.2 Ranking Suitable Areas for Human Settlement

The human settlement location includes surface spaces that are inextricably linked to human activity and life. Taltali Upazila is a seaside location with a low level of urbanization. However, it comes with a slew of issues, including a scarcity of high-quality water and the threat of disaster. As a result, development geological attribute of the Upazila, Hydro-geology, Road Proximity, Elevation and Disaster risk has been taken into account when ranking human settlement sites (Figure 50).

Table 36: Area percentage of ranks for Human Settlement

Ranks	Area in Acre	Area in percentage
Highly Suitable Area	1937.31	2.93
Suitable Area	16803.17	25.44
Moderate Suitable Area	18177.07	27.53
Less Suitable Area	8339.81	12.63
Highly Less Suitable Area	511.51	0.77
Not Suitable for any Development	20269.49	30.69
Grand Total	**66038.36**	**100.00%**

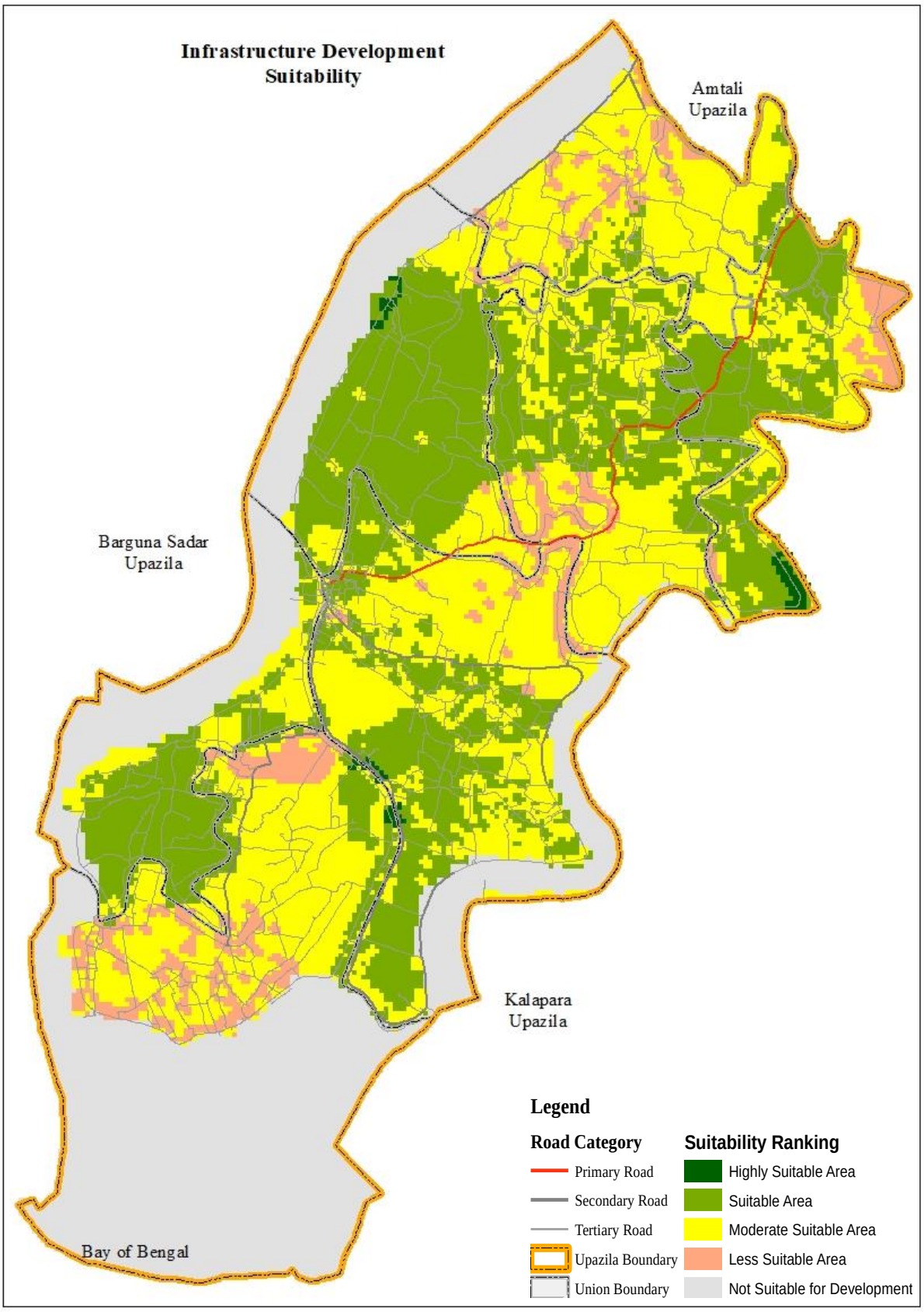


Figure 49: Ranking of Suitable sites for infrastructure development

Source: PKCP Project, UDD, 2022

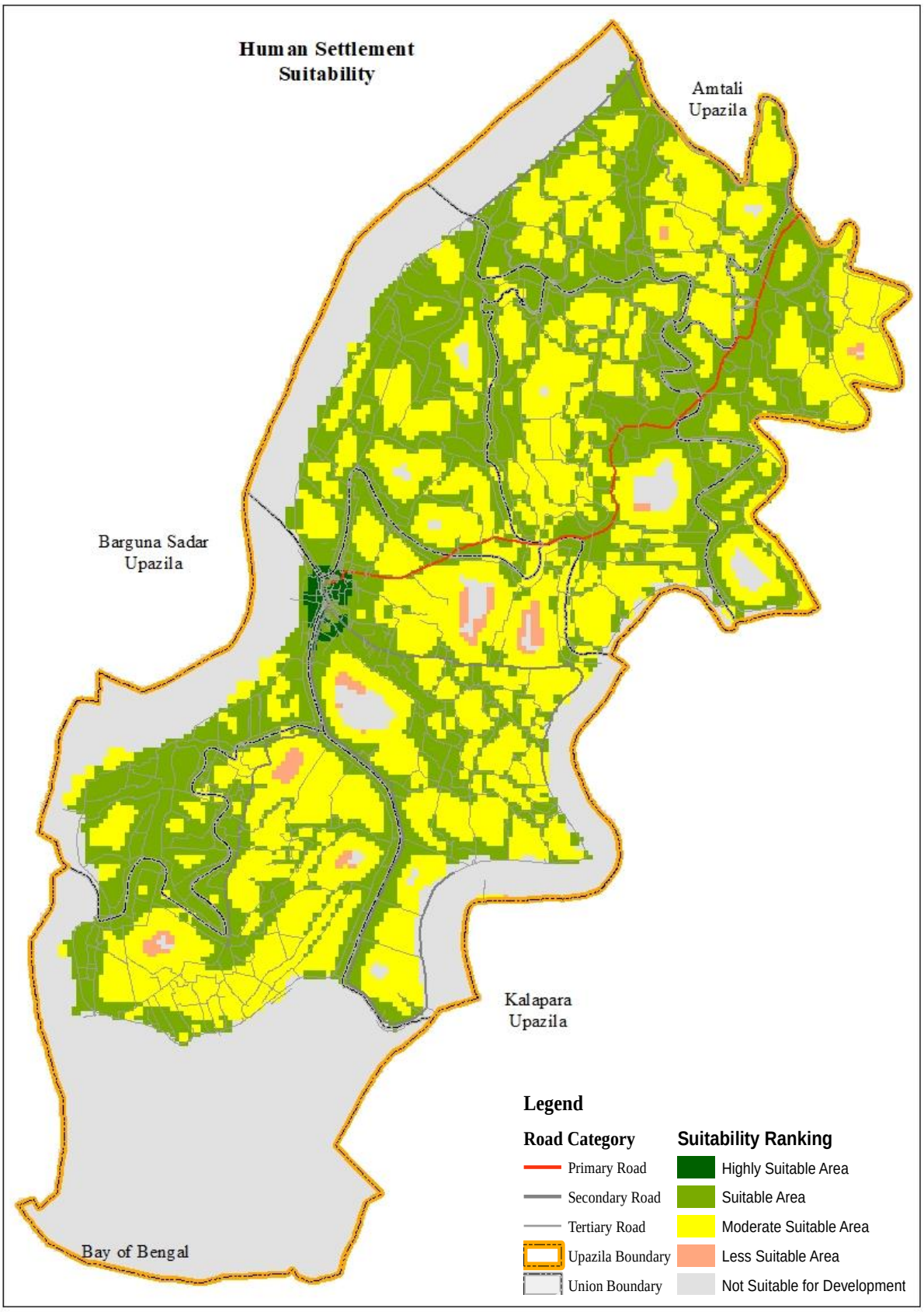


Figure 50: Ranking of suitable sites for human settlement

Source: PKCP Project, UDD, 2022

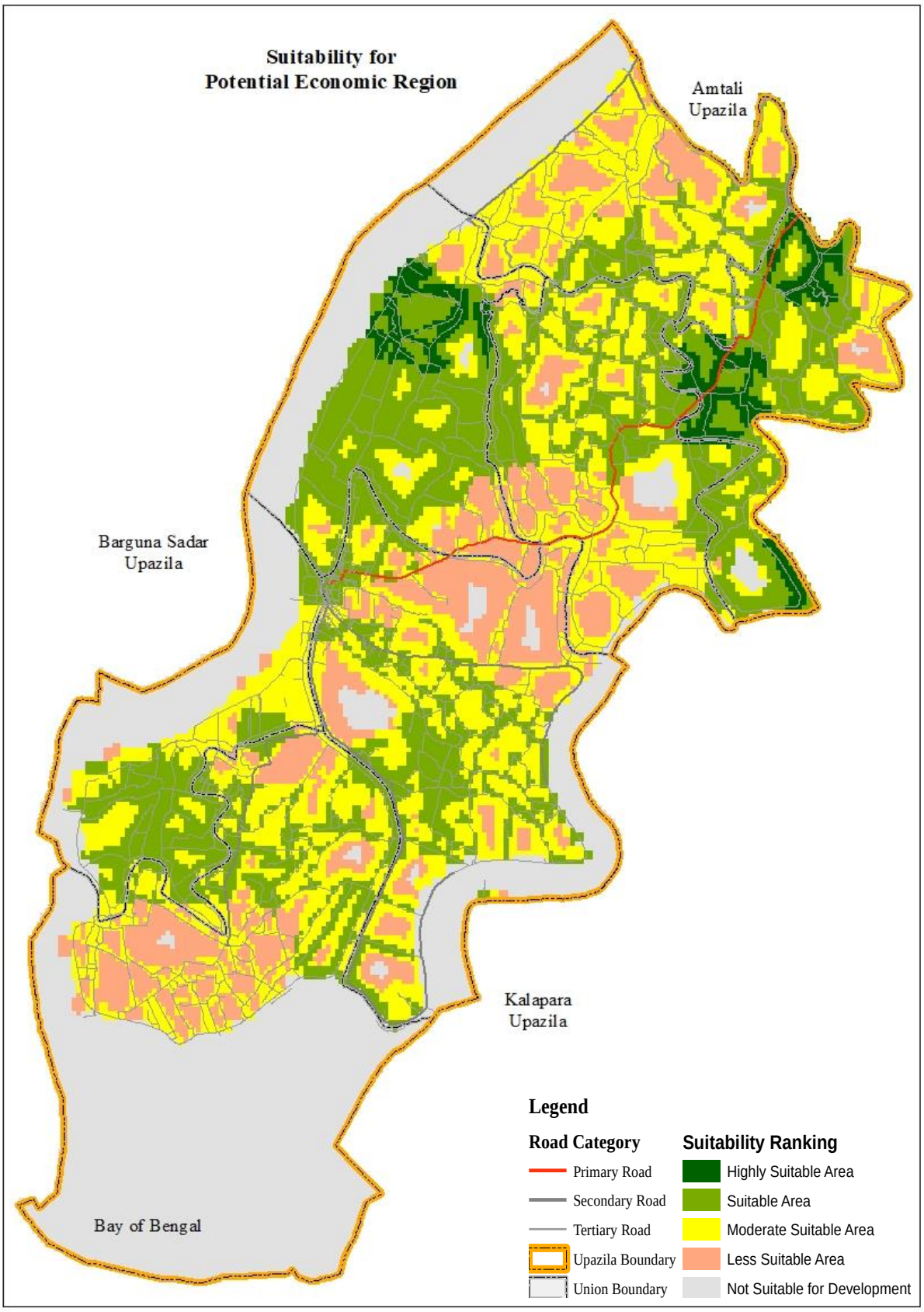


Figure 51: Ranking of suitable sites for potential economic region

Source: PKCP Project, UDD, 2022

5.4.3 Ranking Suitable Areas for Potential Economic Region

Location of economic regions directly affect the land use and ecosystem. Rapid infrastructure development and the uncontrolled growth of economic hubs result inefficiencies of infrastructure facilities, loss of agricultural land, water bodies, open spaces and a variety of microclimatic changes. The Upazila's exceptional rise of economic regions will result in an uneven distribution of basic services such as transportation and communication. To rank suitable sites for Potential Economic Region geological attribute, Hydro-geology, Road Proximity and Disaster risk of the Upazila has been considered.

Table 37: Area percentage of ranks for Potential Economic Region

Ranks	Area in Acre	Area in percentage
Highly Suitable Area	289.11	0.44
Suitable Area	22333.38	33.82
Moderate Suitable Area	22227.13	33.66
Less Suitable Area	494.21	0.75
Not Suitable for Any Development	20694.52	31.34
Grand Total	**66038.36**	**100.00%**

5.5 Composite structure plan

5.5.1 Structure plan policy zoning

For future planned development of the Upazila and as well as to protect natural resources including agriculture and major water body, a strategic land use zoning plan has been prepared for the entire Upazila. The Upazila has been divided into 16 strategic zones named Agriculture, Beach, Forest, Coastal Afforestation and Foreshore, Potential Economic Region, Potential Agro-Fisharies Zone, Road Network, Rural settlements, Energy Generation Zone, Potential Future Urban Area, Trade and Commerce, 1st Order Strategic Service Centre, 2nd Order Strategic Service Centre, 3rd Order Strategic Service Centre and waterbody**.**

Agriculture: Agricultural zoning is a type of zoning that allows people to keep their farming tradition. The term "agriculture zone" refers to area that is ideal for agricultural production, including both crops and livestock. Land used for annual crops such as cereals, other technical crops, potatoes, vegetables, sun flower and watermelons, as well as land left fallow, land used for permanent crops such as fruit plantations, and land used for natural grasses and livestock grazing. The permissible activities in the agricultural zone are: Vegetable Cultivation, Livestock, Horticulture, Dairy Farming, Cash Crop Cultivation, Botanical Garden, Aquaculture and Fisheries, Agricultural Shelter and Gazing.

Potential Urban Area: The term "Urban Area" refers to places with high population density, as well as strong roadways, pathways, and market share. The built-up area is another name for this area. The location with the greatest concentration of services is referred to as this. It also has the population density and concentration at its highest point. There are disparities in the amount of service provision within this area, especially between the formally constructed and planned areas and the majority of unplanned areas. In the planned area, the level of service should be maintained. Autorickshaw stands, banks and financial institutions, bus and auto passenger stop, highways, garages, retail shops, restaurants, rickshaw stands, educational facilities, electric substation, fire station, health facilities, high school, hospitals, parking facilities are all permitted activities in the Potential Urban Area.

Rural settlement: Rural settlement encompasses rural housing structures and surrounding vacant land and vegetations- which is the second heights land use. People living in a vast

landscape with a few houses with greeneries where people are often depending on agriculture, farming and fishing activity for their sustainability. the areas with relatively low density of population and located outside the Pourashava area, rural roads, or high way where there are isolated houses or open ground are called rural settlement area. This zone will be facilitated with all type of amenities so that people can live healthy and happy life. Any kind of activities that will not hamper natural and cultural environment and will follow national laws and regulation will be allowed within the zone. Basic facilities for living will be provided within the zone.

Waterbody: A waterbody is defined as any natural or manmade collection of water, including rivers, streams, creeks, ditches, swales, lakes, ponds, marshes, wetlands, and ground water. This category includes water with an area equal to or more than 0.25 acres, excluding canals, irrigation canals, and rivers. Development and building activities are prohibited within 10 metres on either side of the canal in this region. There is no development or industrial activity allowed within 50 metres on both banks of the river.

Potential Economic Region: Potential economic region is a specially marked territory within the Upazila that has attributes to attract national as well as foreign investment to generate employment opportunities. In this zone, the investor will get geological, hydrological and better communication facility benefit to earn profit within short time. The zone has been declared in order to facilitate rapid economic growth and to connect the Upazila with the mainstream of the national economy. Authority will offer special incentives and security to attract local, national and international investment. Autorickshaw stands, banks and financial institutions, bus and auto passenger stop, highways, cottage industry, dairy farming, garages, garments, knit factories, industrial classes 1, industrial classes 2, retail shops, restaurants, and rickshaw stands are all permitted activities in the potential economic zone.

Beach: A beach is a narrow, gently sloping strip of land that lies along the edge of an ocean, lake, or river. Materials such as sand, pebbles, rocks, and seashell fragments cover beaches. Most beach materials are the products of weathering and erosion.

Coastal Afforestation and Foreshore: By stabilizing coasts and creating a green belt, coastal afforestation attempts to improve climate-resilient ecosystems and livelihoods. The landmass is also successfully protected from excessive flooding and erosive processes by this green belt. To establish well-stocked plantations, vacancy filling and sometimes replanting are done. Furthermore, during land quiver recharging, a green belt along the coastline acts as a filter. Botanical garden and gardening are permitted activities in the coastal afforestation.

Forest: A sizable area primarily covered in trees and vegetation. It does not include land that predominantly under agricultural use or other use. This could be naturally made or man-made.

Road Network: major circulation covering primary, secondary and tertiary roads

Waterbody: River is a naturally occurring watercourse that flows in one direction—typically toward an ocean, sea, lake, or other rivers. A river could finish up in the ground at the end of its journey without flowing into another body of water. Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season.

5.5.2 Structure plan of Taltali Upazia

Agricultural lands are cultivated and cultivable lands that have to be protected for food safety of the country, it is about 39.41% of the total Upazila area. It is the dominated Land use. The

second dominated land use is Rural Settlement which is about 12099.69 acres covering almost 18% land. Road network (1.37%) which includes primary, secondary and tertiary roads; Beach covers 0.34% land of the Upazila. Potential Urban Area covers about 2% of the Upazila which includes densely developed area about 1400 acre (excluding waterbodies, coastal afforestation and foreshore and roads), Coastal afforestation and foreshore covers 4.35% area mainly proposed near river side, forest area 10.74 % and 20.52% water body that includes canals and ponds with 13554 acres area. This structure plan has proposed 638.22 acres land as Potential economic region. It is expected this zone will assist and encourage government and private investor to invest. In Taltali Upazila under this zone three major things are included- Energy Generation Zone, Potential Agro-processing zone and Potential Agro-fisheries Zone. Strategic Service Centre is also sub-divided into four categories named- Trade and Commerce Investment for industrial development will help to achieve the objective of the structure plan that is to enhance the residents' socioeconomic position.

Table 38: Percentage of area of proposed zones

Structure Plan Zone	Area (acre)	%
Agriculture	26027.91	39.41
Conservation Zone	7313.94	11.08
Economic Region	973.91	1.47
Thermal Energy Plant Site	169.81	0.26
Costal Afforestation and Foreshore	2870.86	4.35
Circulation Network	902.59	1.37
Strategic Service Center 1st Order	179.92	0.27
Strategic Service Center 2nd Order	138.46	0.21
Strategic Service Center 3rd Order	237.51	0.36
Trade and Commerce Center	170.06	0.26
Water Body	13553.47	20.52
Rural Settlement	12099.69	18.32
Potential Urban Area	1400.22	2.12
Total	66038.36	100.00

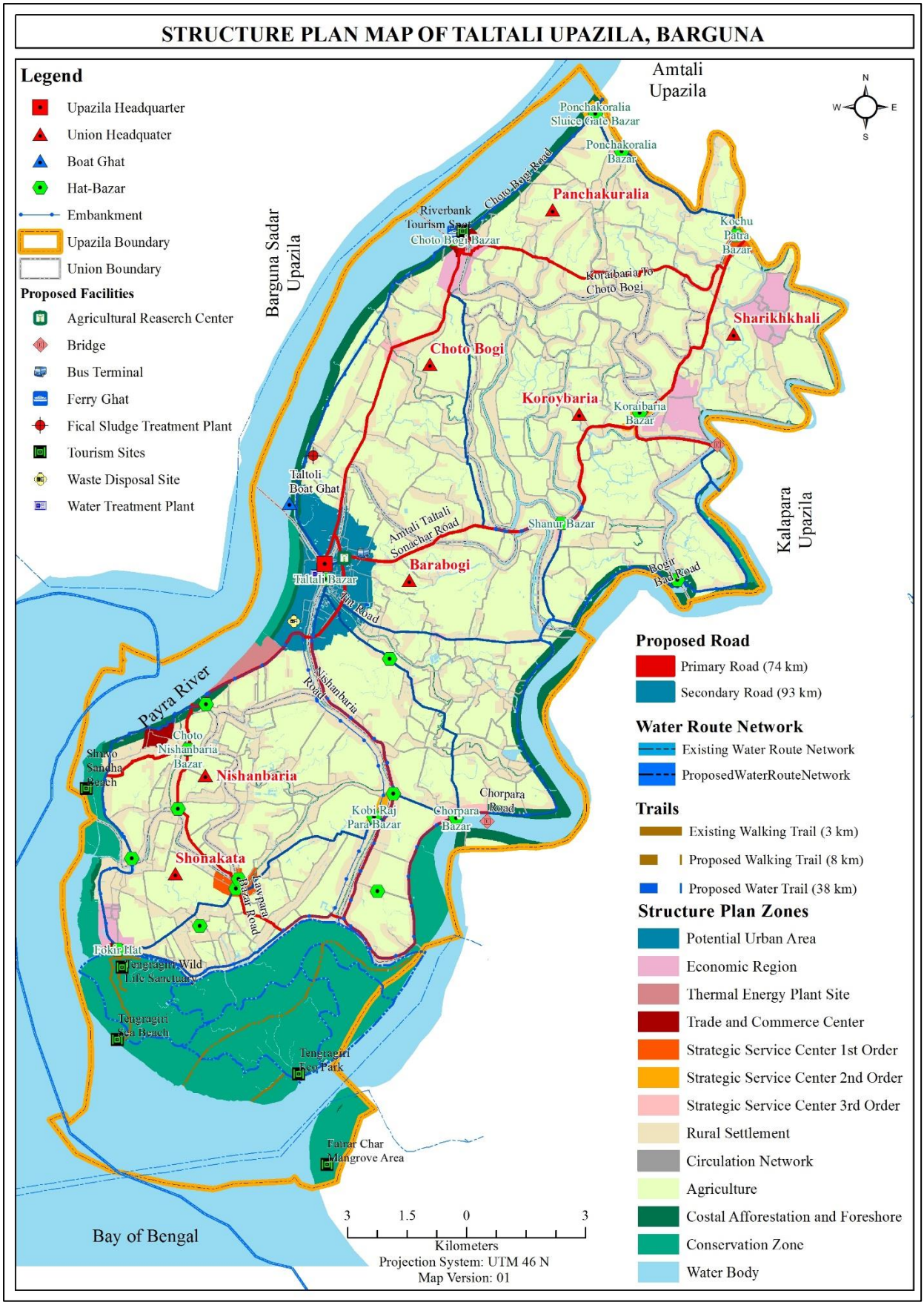


Figure 52: Structure plan map of Taltali Upazila

Source: PKCP Project, UDD, 2022

5.6 Structure Plan Proposals

Proposed Road

The Road Condition of Taltali Upazila is very poor and narrow with earthen surface. Therefore, a lot of roads is proposed to be widened and upgraded as primary and secondary roads. Moreover, as a riverine Upazila the local people are dependent on the embankments. Almost all the embankments are used for not only walking but also for the vehicular movement.

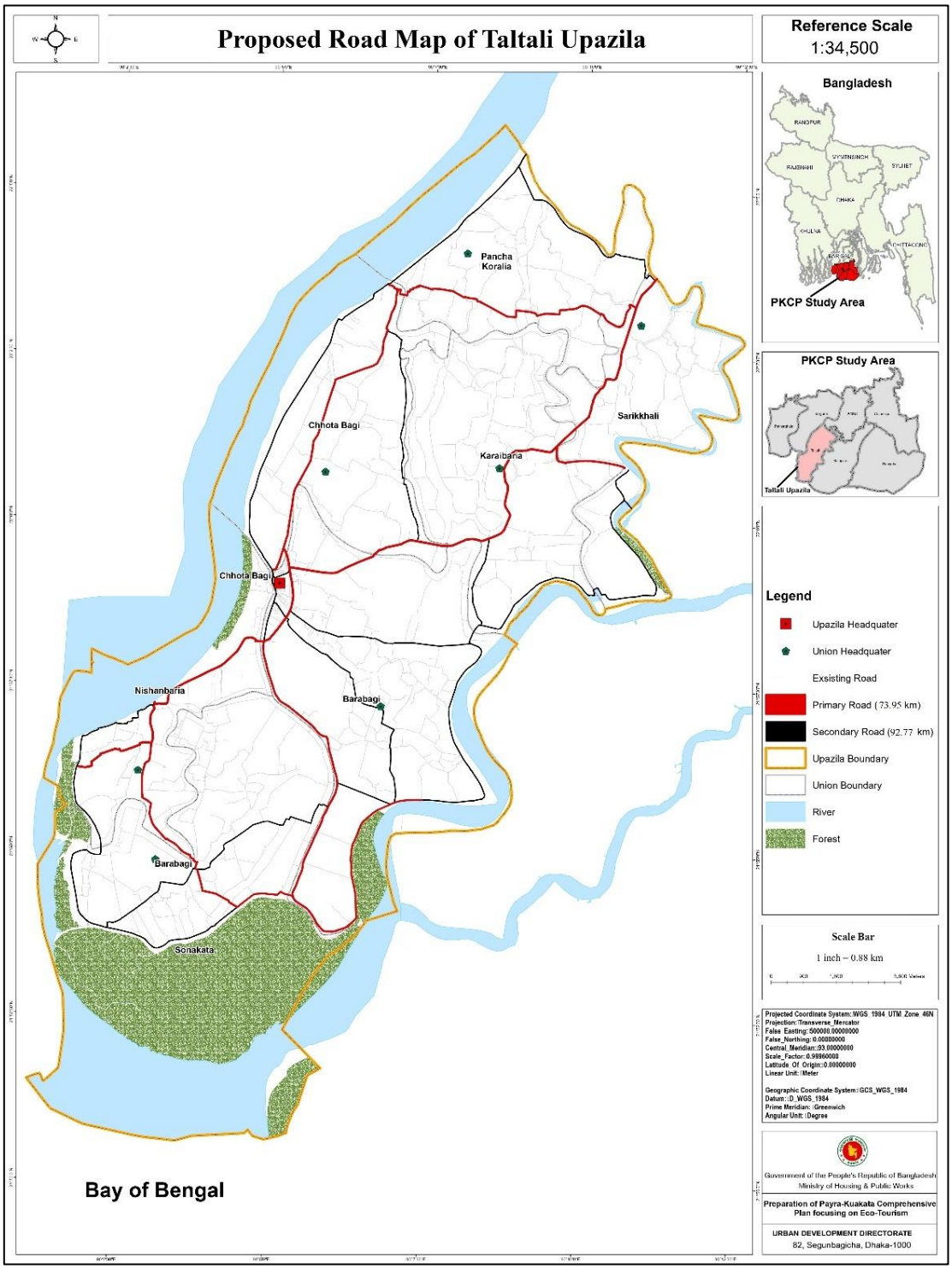


Figure 53: Proposed Structure Plan Road of Taltali Upazila

Source: PKCP Project, UDD, 2022

The only Upazila Road of Taltali is Amtali-Taltali-Shuvo Shondha Beach Road via Thermal Plant is proposed to be improved and widened as 80ft primary road. All other primary roads are proposed as 60ft roads connecting the growth centres, agro-fisheries zones, agro-processing zones and proposed trade and commerce centre as well as the major Tourist Spots. Another important proposed road is Taltali to Kuakata road via Chorpara Bazar. One bridge is proposed over Andharmanik River.

Table 39: Length of Proposed Road Categories

Road Category	Length (Km)
Primary Road	73.95
Secondary Road	92.77

All the important embankment roads are proposed as secondary roads as 40ft road. The Strategic Service Centres are mainly connected through the secondary roads. Several primary Road, Secondary Roads and Tertiary Roads are proposed to be upgraded as Primary and Secondary Roads with a better pavement and width.

Proposed Trails in Fatrar Char Forest Area

Taltali Upazila is potential for developing the Tourism Industry. Fatrar Char Forest is one of the vital areas. The area has an Eco Park named Tengragiri Wild Life Sanktuary. Two walking Trails are already there. One new walking Trail of about 8 km. and several Water Trails, a total length of about 38 km. have proposed in the Structure Plan to attract the Local and outsider Tourists.

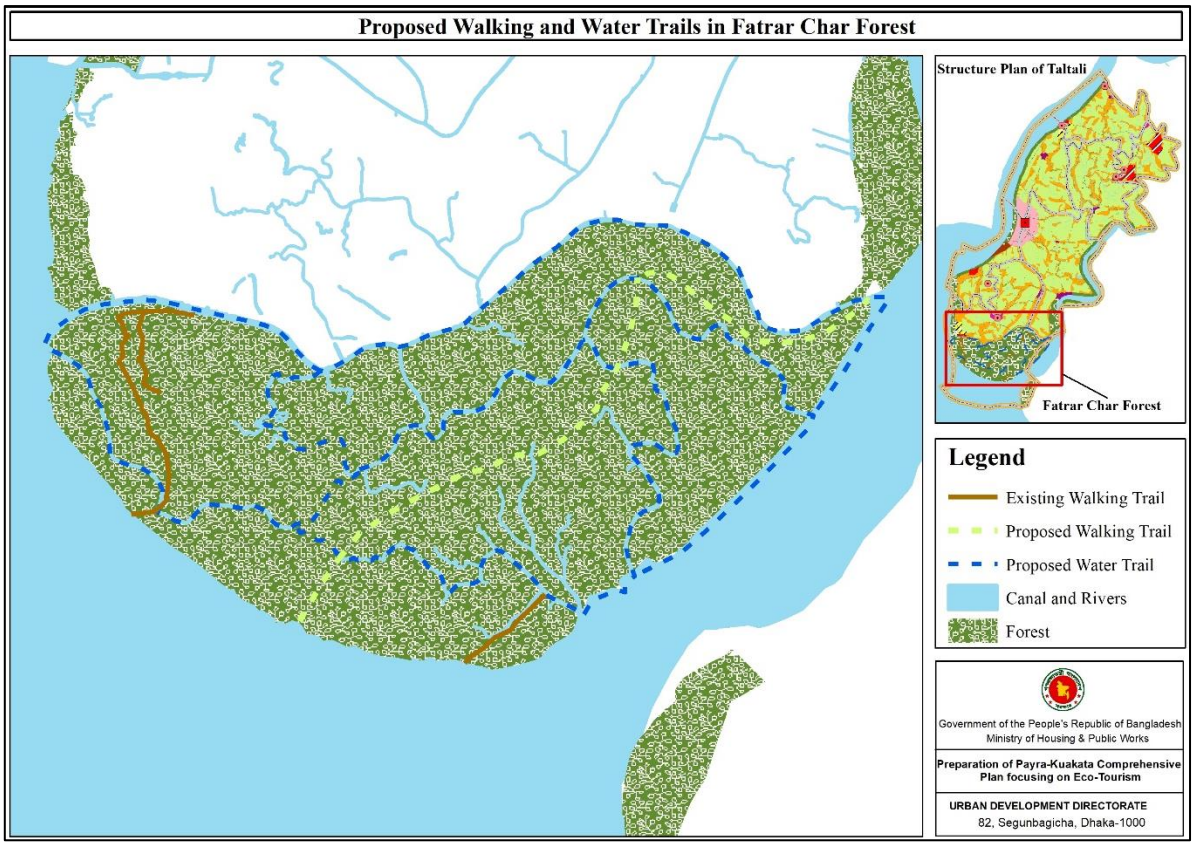


Figure 54: Proposed Walking and Water Trails
Source: PKCP Project, UDD, 2022

Proposed Facilities

Taltali Upazila is comparatively underprivileged area of this region. It has lacking of several Public Facilities and Utility Services. One Agricultural Research Institute has proposed for this Upazila as a huge number of people is live on agriculture here and there is possibility of turning the single crop lands into double and triple cropped. Two bridges have proposed to improve the road connectivity mainly with the Kalapara and Kuakata Pourashava. Moreover, one Bus Terminal, one Fiscal Sludge Management Point, one Waste Disposal Site, one Water Treatment Plant and one River Bank Tourism Site have proposed here.

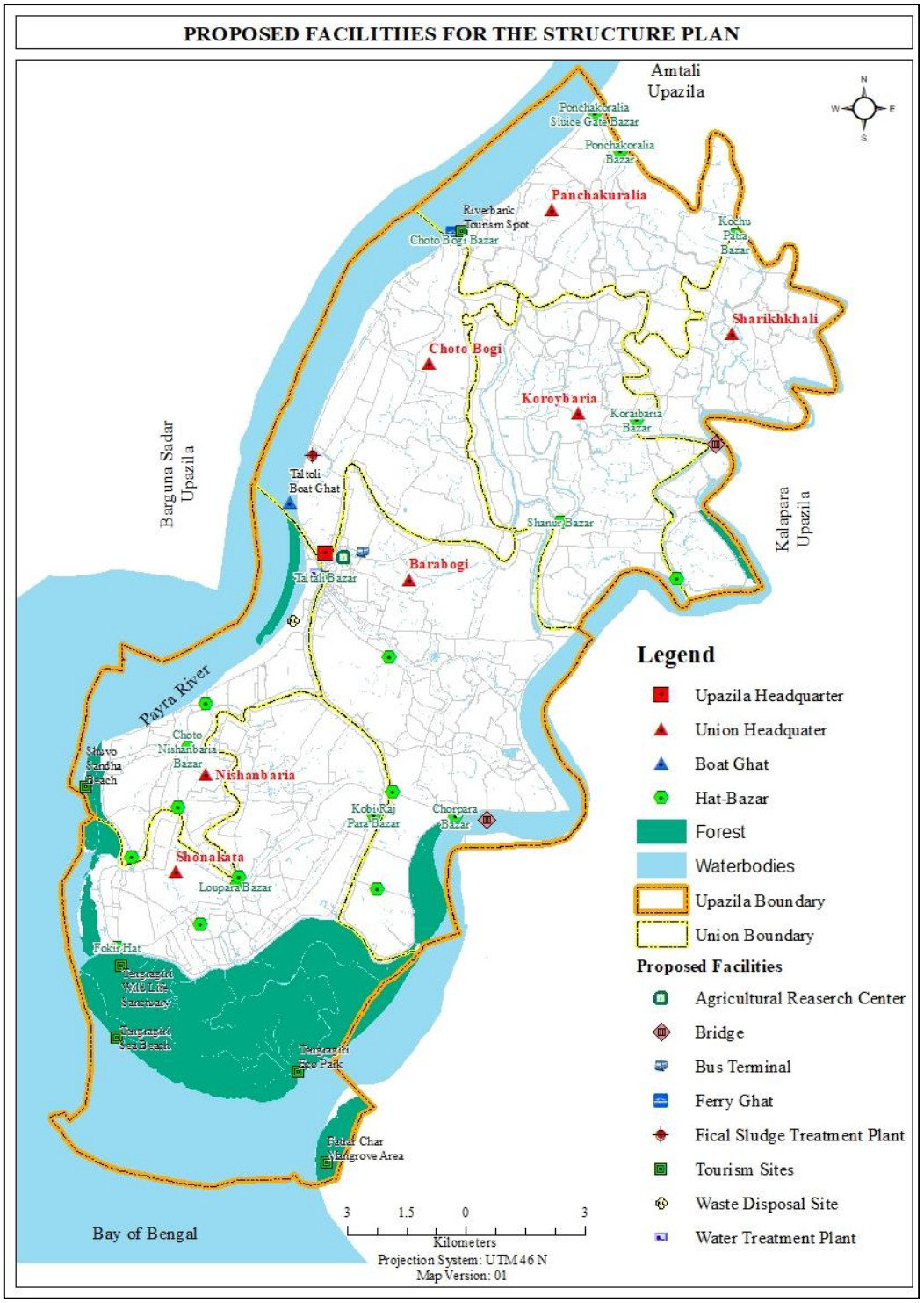


Figure 55: Proposed Facilities for Taltali Upazila

Source: PKCP Project, UDD, 2022

Proposed Cyclone Shelter

As Taltali Upazila is just beside the bank of Bay of Bengal, the area has a great threat in the case of life and property loss due to cyclone hazard. On the basis of the local peoples' requirements, location of the present cyclone shelters, structure density, disaster risk and future population several cyclone shelters are proposed in different places all over the Upazila. The proposed cyclone shelters are shown in the below map.

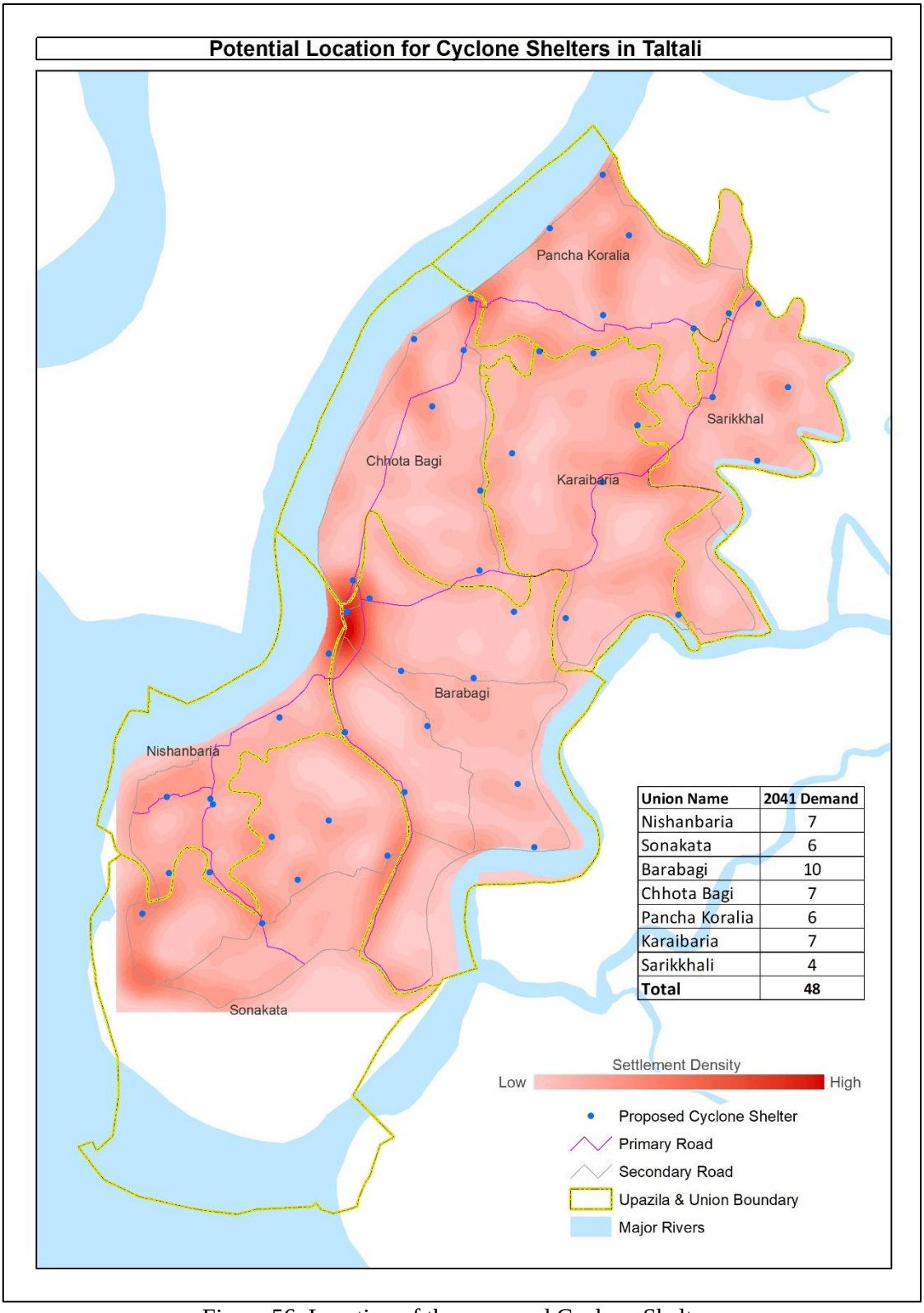


Figure 56: Location of the proposed Cyclone Shelters

Source: PKCP Project, UDD, 2022

5.7 Recommendations

The Structure Plan identified some strategic areas which are very potential for the future development. Designation criteria for each strategic management area are provided in structure plan proposal Table. The proposed zones are as following and are shown in structure plan map. The proposal of structure plan descriptions has been given below:

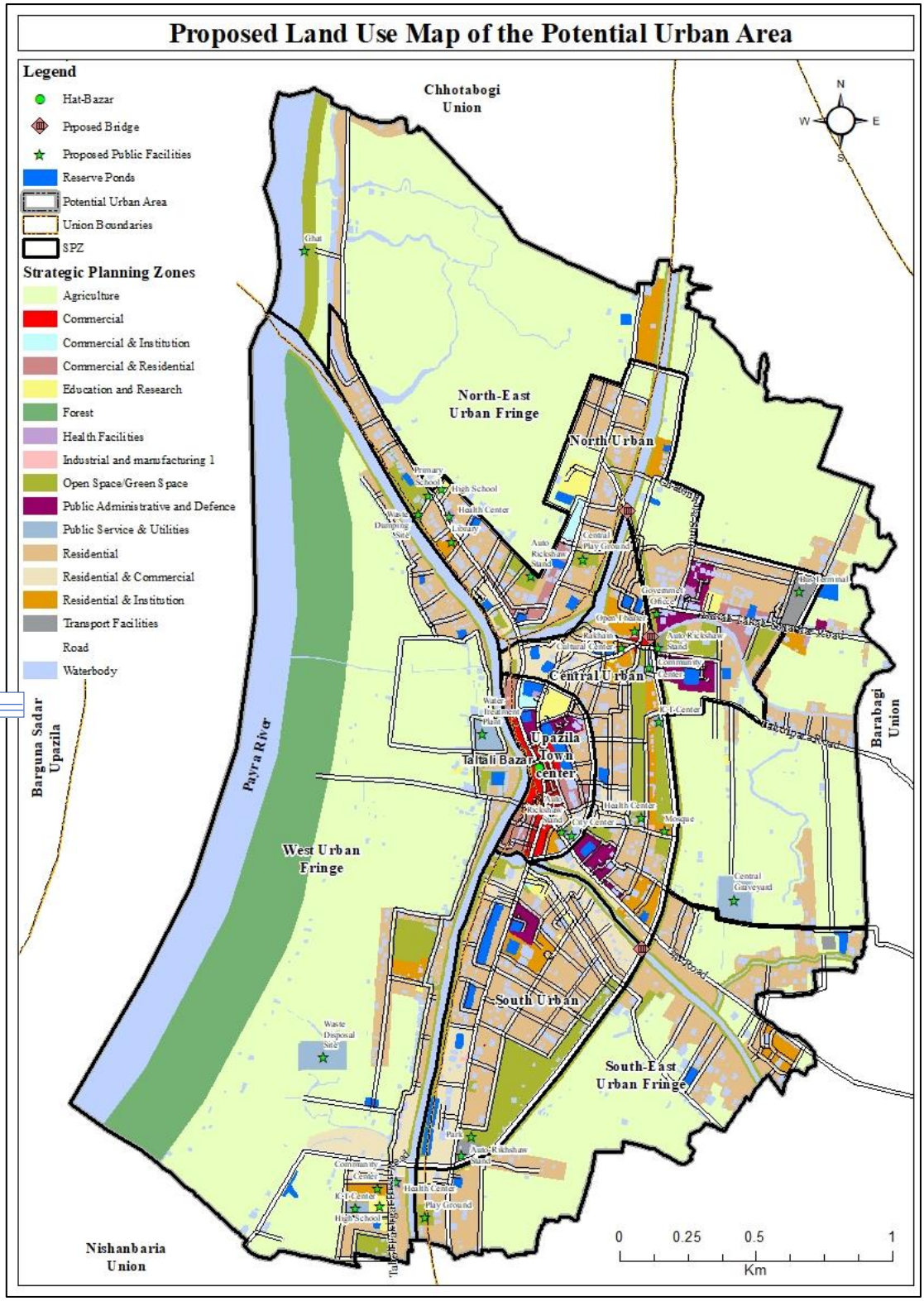


Figure 57: Proposed Potential Urban Area in Taltali Upazila

Source: PKCP Project, UDD, 2022

5.7.1 Potential Urban Area

Taltali Bazar is one of the fastest growing areas in Taltali Upazila. The structure plan recommends the area as future potential urban area for the development. It comprises the area of 1400 acres. LGED has already declared this bazar as a Growth Centre. At the same time,

this area is the centre point of communication with other growth centre, hat-bazar and union. A lot of Urban Facilities are proposed in this area.

5.7.2 Potential Economic Region

Potential Economic Region is proposed on the basis of multicriteria analysis on economic region. These are the future potential Areas for investment of developing industries. If anyone wants to develop major industries and invest in this sector must follow the industrial rules and regulations. These areas are proposed considering the factors- Geological Attribute of the Upazila, Hydro-geological Status, Disaster Risk and Road Proximity.

Agro-processing Zone

The economy of Taltali Upazila is mainly based on fisheries. Agriculture is also dominated here. By considering the nature of the crops, the structure plan recommends an agro based industry for the development and conservation of agro products. The demand for food in Bangladesh and around the world is changing rapidly. Driven by economic growth, rising incomes, and urbanisation, demand is shifting away from traditional staples toward high-value food commodities. High value commodities of Agriculture include fruits, vegetables, spices, fish, and livestock products, many of them processed before reaching the market. This represents an enormous opportunity for food producers, processors, and sellers. Owing to the greater labour intensity characteristic of high value agricultural production, it also provides an opportunity to generate rural employment and raise rural incomes. The main products of Taltali Upazila are Sunflower, water-melon, Fish and rice. The agro based industry can manufacture and process any type of agro product for the betterment of the employment opportunities. The agro based industry can be-

Processing units – These units are not involved in manufacturing and mainly deal with the preservation of perishable products and utilization of by-products for other uses. Rice and Dal processing mills are perfect examples of these kinds of units.

Manufacturing units – These units engage in the manufacturing of new products where the finished goods are entirely different from the raw materials used. Sugar factories, oil mills, solvent extraction units and textile mills are some of the examples of these kinds of units.

Service Centres – Agro-fishery service centres are workshops and service centres, which are engaged in the repairing and servicing of pump sets, diesel engines, tractors and other types of farm equipment

Agro-fisheries Zone

Local people catch fish from sea and river. It's one of the main professions of the majority people. The marine fisheries sector contributes significantly to the country's food and nutrition security as well as economy through direct income, employment and foreign exchange. So, the agro-fisheries area is a place of abundant supply of fisheries and agricultural products. For this reason, the structure plan recommends to develop the place as a hub of agro-fisheries area.

Ship yard

Shipyards are constructed near the sea or tidal rivers to allow easy access for their ships. The proposed place of Taltali upazila located on the bank of Payra River. A shipyard, also called a dockyard or boatyard, is a place where ships are built and repaired. These can be yachts, military vessels, cruise liners or other cargo or passenger ships. Dockyards are sometimes

more associated with maintenance and basing activities than shipyards, which are sometimes associated more with initial construction.

5.7.3 Strategic Service Centers

They are mostly transitional areas changing from rural to urban, and could have much potential for future urbanization and development activities. It is understood that new land conversion will continue to occur, particularly in locations adjacent to presently developed and developing areas and in spite of high flood risk and a paucity of infrastructure services and other social and community services provision.

The hierarchy of Strategic Service Centres created under the conceptual framework is a functional one. To begin with, the whole concept of the upazila area has evolved with the assumption that the key services or functions performed by the trade and commerce centre have spread their influence to outer areas.

Trade and Commerce center

It is the centre of activities in the established of Taltali Upazila having its service area in the whole upazila area. This is the place for high density mixed used structure, public and private structure and services. It is mainly Fokir Hat Bazar, Nolbunia and Bogir Hat bazar area of the Taltali Upazila. The following facilities can be developed in the Trade and Commerce center.

- □ Commerce and Shopping
- □ Open Space and Recreation
- □ Miscellaneous
- □ Utilities
- □ Transportation

Strategic Service center-1st Order

This type of Strategic Service Centres is the main retail, business and employment centre for its community. It supports local employment and provides goods and services of a wide range to meet the local demand. It has high levels of health and education services to cater to the needs of the local demand. It also has better communication network. These are Lowpara and Kochupatra Bazar. This is the major facilities which have the potentiality for development.

- □ Community Facilities
- □ Government Services
- □ Health
- □ Education
- □ Transportation
- □ Open Space and Recreation
- □ Residential
- □ Miscellaneous
- □ Utilities

Strategic Service center-2nd order

It has an economic activities and public gathering place for the local community. It is basically an employment destination providing work for a specialized sector e.g. manufacturing / service industry, health facilities etc. The growth center analysis identifies

seven places as second order like Ponchokoralia Sluice Gate Bazar, Koraibaria Bazar and Kobirajpara Bazar. The second order service centre include the following facilities-

- Community Facilities
- Health
- Education
- Transportation
- Open Space and Recreation
- Residential
- Miscellaneous
- Utilities
-

Strategic Service center- 3rd order

Centre to support the convenience of residents; designated community centre with consideration of accessibility by transportation, adjacency to other centres. The Ponchokoralia Bazar, Shanur Bazar and Charpara Bazar are categorized as third order and include the following categories service.

- Health
- Education
- Community Facilities
- Transportation
- Open Space and Recreation
- Residential
- Miscellaneous
- Utilities

5.7.4 Beach Area

Taltali Upazila is an attractive place for natural beauty with a sandy beach named Shuvo-Shondha. The beach facility will be provided at two locations for the tourist. The beach facility will include showers, sun loungers, water sports, eating & drinking facility etc. Shuvo-Shondha Sea beach is a habitat for the depleting red crabs, nesting sites for endangered sea turtles and also serve as high tide roosting sites for the birds. Another Sea beach Located at the end of the Fatrar Char Forest area.

5.7.5 Improvement of Existing Road and Embankment

The present condition of the embankments in several places are very poor even most of the parts are not suitable for walking. This embankment-cum road needs huge repair. If this embankment-cum road will be renovated and repair properly, the communication will improve which enhance the attraction of this area for eco-tourism.

Moreover, the road condition is very poor which needs a huge development. There is only one Upazila Road and no RHD Road. The proposed road has already discussed in the 5.6 section.

5.7.6 Water Route Network

The river network of Taltali Upazila as the most important transport artery which plays a vital role in their daily life. For the betterment of waterways communication system, the structure plan recommends one new route from the south side of Barguna Sadar to Fatrar Char to Kuakata for the attraction of tourist as well as local people.

5.7.7 Bridge

Communication is time consuming and difficult in the Taltali Upazila. To ease travelling and for better connection with Kalapara and Kuakata Paurashava two bridges have proposed.

5.7.8 Foreshore and Coastal Afforestation

Mangrove afforestation and tree plantation are very much beneficial for environment. Mangroves are a group of trees and shrubs that live in the coastal intertidal zone. These roots allow the trees to handle the daily rise and fall of tides, which means that most mangroves get flooded at least twice per day. The roots also slow the movement of tidal waters, causing sediments to settle out of the water and build up the muddy bottom. Mangrove forests stabilize the coastline, reducing erosion from storm surges, currents, waves, and tides. The intricate root system of mangroves also makes these forests attractive to fish and other organisms seeking food and shelter from predators. A 250m buffer area is proposed as coastal afforestation along with the sea and main rivers and 50 m buffer area is proposed as foreshore area for other rivers and 10 m buffer area is proposed as foreshore area for main canals.

5.7.9 River Bank Tourism Point

A river bank tourism point is proposed near the Bogir Hat on the bank of Payra River. This area can be furnished and decorated with facilities like sitting arrangements, canteen, plantation, public toilet, landscaping etc. There is no recreational place inside the Upazila. Developing this area will promote local tourism.

CHAPTER SIX: DEVELOPMENT CONDITIONS/RESTRICTIONS/PERMISSION

Existing agricultural land has been classified by cropping pattern in order to promote the high agricultural value of high yielding agricultural land. In order to secure food security, the structure plan recognizes high agricultural value lands. Given the expected future population growth in settlement areas, high agricultural lands, such as triple and double-cropped land, will continue to be used for agriculture. It is necessary to specify existing rural settlement areas to be kept in their morphological characteristics during the Structure Plan period in order to achieve compact development and preserve high-value agricultural fields.

According to the Structure Plan's policy and strategy, developed in the sub-central zones will be regulated and only limited interventions in service demand will be permitted in the intermediate zones. Non-agricultural activity expansion will be discouraged and the development of non-permitted land uses will be regulated.

Any non-compatible development will be controlled in the central area of the potential urban area and rural trade and commercial zones. Activities, as specified in the sector policy in Structure Plan Report, will be allowed only in the national interest /societal interest. The high initial investment in developing tourism facilities can be questionable as the site is directly exposed to the sea.

Table 40: Permitted and Conditional Uses of the Structure Plan Zones

Permitted Use P Conditional Use C Plan Review Required R Not Permitted N	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Agricultural Shelter & Gazing	P	C	N	N	C	P	C	C	P	P	P	N
Agri Business & Services	P	C	N	N	P	C	P	P	P	P	P	N
Aquaculture & Fisheries	C	C	N	N	P	P	P	C	P	P	P	C
Arboriculture	P	P	P	C	P	P	C	C	C	C	C	C
ATM Booth	N	N	N	N	P	C	P	P	P	P	P	N
Auditorium Meeting Hall	N	N	N	N	C	N	P	C	N	N	N	N
Automobile Works	N	N	N	N	P	C	C	P	C	C	C	N

	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Permitted Use P Conditional Use C Plan Review Required R Not Permitted N												
Autorickshaw Stand	N	N	N	N	P	P	P	N	P	P	P	N
Bank & Financial Institutions	N	N	N	N	P	N	P	P	P	P	P	N
Billboard (Advertisement Structure)	N	N	N	N	C	C	C	P	P	N	N	N
Boitanical Garden	N	P	N	N	P	N	N	C	C	C	C	N
Boarding & Rooming House	N	N	N	N	P	C	P	P	P	P	P	N
Brick Fields	N	N	N	N	N	C	N	N	C	C	C	N
Bus/Auto Passenger Shelter/Stops	N	N	N	N	P	C	P	C	C	P	P	N
Causeways: Road, Railways	N	N	N	P	R	R	R	R	R	R	R	N
Cash Crop Cultivation	P	C	N	N	P	P	P	P	P	P	P	N
Carnival & Fair	N	N	N	N	C	C	C	C	C	C	C	N
Cemetaries/ Graveyard	N	N	N	N	P	P	N	N	N	N	N	N
Cinema Hall	N	N	N	N	C	N	N	N	N	N	N	N
Clinics/ Medical	N	N	N	N	P	P	P	P	P	P	N	N
Clubs, Private	N	N	N	N	N	N	C	P	C	C	N	N
Colleges/Universities	N	N	N	N	P	N	N	P	N	N	N	N
Convention Center	N	N	N	N	P	N	P	P	C	N	N	N
Communication Service Facilities	N	N	N	P	P	C	P	P	P	P	P	N

Permitted Use P Conditional Use C Plan Review Required R Not Permitted N	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Communication Tower with Height	N	N	N	N	C	C	P	P	P	P	P	N
Community Center	N	N	N	N	P	N	P	P	P	P	P	N
Cottage Industry	N	N	N	N	P	N	P	N	P	P	P	N
Cultural Exhibits & Library	N	N	N	N	C	C	C	C	C	C	C	N
Cyber Café/IT Center	N	N	N	N	P	N	P	P	P	P	P	N
Dairy Farming	P	C	C	N	P	P	P	P	P	P	P	N
Deep Tubewell	C	N	N	N	P	P	P	N	P	P	P	N
Diagonistic Centres	N	N	N	N	P	P	P	P	P	P	P	N
Docks & Jetties	C	N	N	N	P	N	P	P	C	C	C	P
Dormitory / NGO Rest House	N	N	N	N	P	N	P	P	P	P	P	N
Bakery	N	N	N	N	P	C	P	P	P	P	P	N
Dwellings, Farm	C	N	N	N	P	C	P	P	P	P	P	N
Dwellings,Minimal Housing	N	N	N	N	P	P	N	N	N	N	N	N
Dwellings,Single/ MultiFamily	N	N	N	N	P	P	P	P	P	P	P	N
Educational Facilities	N	N	N	N	P	P	P	P	P	P	P	N
Electric Sub Station	N	N	N	N	P	P	P	P	P	P	P	N
Emergency Shelter	C	N	N	N	P	P	P	P	P	P	P	N
Explosive Manufacture & Storage	N	N	N	N	N	N	P	N	N	N	N	N

Permitted Use P Conditional Use C Plan Review Required R Not Permitted N	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Fire Station	N	N	N	N	P	N	P	P	P	P	P	N
Food Kiosk	N	N	N	N	P	P	P	P	P	P	P	N
Flood Management Structures	P	P	P	P	P	P	P	P	P	P	P	P
Freight Transport Facilities	N	N	N	N	P	C	P	P	P	P	P	N
Garages/ Workshops	N	N	N	N	P	N	P	P	P	P	P	N
Garments & Kneeting Factory	N	N	N	N	P	N	P	P	P	P	P	N
Golf Courses & Golf Club	N	N	N	N	C	N	P	P	P	P	P	N
Government Office / Guest House	N	N	N	N	C	N	P	P	P	P	P	N
Green Belt/ Green Space	N	P	P	P	P	P	C	C	C	C	C	N
Hatchery	P	N	N	N	P	P	P	P	P	P	P	N
Health Facilities	N	N	N	N	P	P	P	P	P	P	P	N
High School	N	N	N	N	P	N	N	P	P	P	P	N
Horticulture	P	N	N	N	P	P	P	P	P	P	P	N
Hospitals/ Health Centers	N	N	N	N	P	N	P	P	P	P	P	N
Hotel Guest House	N	N	N	N	C	N	P	P	P	P	P	N
Hotel International Class	N	N	N	N	C	N	P	P	P	P	P	N
Husking/ Grinding(Rice, Wheat, Pulse)	N	N	N	N	P	P	P	P	P	P	P	N
Industrial Class 1	N	N	N	N	P	N	P	N	N	N	N	N

Permitted Use P Conditional Use C Plan Review Required R Not Permitted N	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Industrial Class 2	N	N	N	N	P	N	P	N	N	N	N	N
Institutions	N	N	N	N	C	N	N	P	P	P	P	N
Irrigation Facilities (Flood Wall/ Canal)	C	N	N	N	C	C	C	C	C	C	C	P
Livestock	C	C	N	N	P	P	P	P	P	P	P	N
Major Development	N	N	N	N	P	N	P	C	C	C	C	N
Multi stored Car park	N	N	N	N	C	N	C	C	C	C	C	N
Nursery School	N	N	N	N	C	N	N	N	P	P	P	N
Offices/ Services	N	N	N	N	C	N	P	P	P	P	P	N
Open Theatre	N	N	N	N	C	N	P	P	P	P	P	N
Orphanage	N	N	N	N	P	N	P	P	P	P	P	N
Outdoor Religious Events	N	N	N	N	P	C	P	P	P	P	P	N
Parking Facilities, Commercial	N	N	N	C	C	N	P	P	P	P	P	N
Parking Facilities	N	N	N	P	C	N	P	P	P	P	P	N
PC Culture	C	C	N	N	P	C	P	P	P	P	P	N
Petrol Stations	N	N	N	N	N	N	P	P	P	P	P	N
Plantations	N	P	P	P	P	C	N	N	N	N	N	N
Mosque/ Temple	N	N	N	N	P	P	P	P	P	P	P	N
Places of Worship	N	N	N	N	C	N	N	N	N	N	N	N
Packaging & Processing	N	N	N	N	P	N	P	P	P	P	P	N

Permitted Use P Conditional Use C Plan Review Required R Not Permitted N	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Play Field	N	N	N	N	P	C	N	N	N	N	N	N
Police Box/ Barrak	N	N	N	N	C	N	P	P	P	P	P	N
Post Office	N	N	N	N	C	N	P	P	P	P	P	N
Postal Facilities/ Courier	N	N	N	N	C	N	P	P	P	P	P	N
Poultry	P	N	N	N	C	C	P	P	P	P	P	N
Primary School	N	N	N	N	C	N	N	N	N	N	N	N
Prisons	N	N	N	N	P	N	P	P	P	P	P	N
Printing/ Publishing House	N	N	N	N	C	N	P	P	P	P	P	N
Public Uses & Structures	N	N	N	N	P	N	P	P	P	P	P	N
Public Transport Facilities	N	N	N	N	P	C	P	P	P	P	P	N
Recreational Facilities, outdoor	N	N	N	N	P	C	P	P	P	P	P	N
Religious Facilities & Structures	N	N	N	N	P	N	P	P	P	P	P	N
Repair Shops, Major	N	N	N	N	P	N	P	N	N	N	N	N
Repair Shops, Minor	N	N	N	N	C	N	N	P	P	P	P	N
Retail Shops & Restaurants	N	N	N	N	C	N	P	P	P	P	P	N
Retention Ponds	N	N	N	N	P	C	N	N	N	N	N	C
Rickshaw Stands	N	N	N	N	P	P	P	P	P	P	P	N
Salvage, Storage & Processing	N	N	N	N	P	N	P	P	P	P	P	N
Saw- Mill	N	N	N	N	C	N	P	C	C	C	C	N

Permitted Use P Conditional Use C Plan Review Required R Not Permitted N	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Schools, Private	N	N	N	N	N	N	N	P	P	P	P	N
Scientific Research Establishment	N	N	N	N	P	N	P	C	C	C	C	N
Ship & Boat Servicing	N	N	N	N	P	N	P	P	P	N	N	N
Social Forestry	P	P	P	N	C	P	C	C	C	C	C	N
Special Function Tent	N	N	N	N	C	N	P	P	P	P	P	N
Stadium Sports	N	N	N	N	C	N	P	P	P	P	P	N
Swimming Court/ Pool	N	N	N	N	C	N	P	P	P	P	P	N
Tea Stall/ Coffee Shops	N	N	N	N	C	C	P	P	P	P	P	N
Tennis Court / Club	N	N	N	N	P	N	P	P	P	P	P	N
Termminals, Train, Bus, Truck, Freight	N	N	N	C	P	N	P	P	P	P	P	N
Trade Centers	P	N	N	N	P	N	P	P	P	P	P	N
Transformer stations	N	N	N	N	P	N	P	P	P	P	P	N
Transmission Lines	N	N	N	N	P	C	P	P	P	P	P	N
Utility Installations/ Lines	N	N	N	N	P	C	P	P	P	P	P	N
Vegetable Cultivation	C	N	N	N	P	P	N	N	N	N	N	N
Ware Housing & Distribution	N	N	N	N	P	N	P	P	P	P	P	N
Water pump, Reservoir	C	N	N	N	P	C	P	P	P	P	P	N
Waste Disposal & Processing / Minarator	N	N	N	N	C	C	C	C	C	C	C	N

	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Potential Urban Area	Rural Settlement	Economic Region/ Industrial Zone	Trade and Commerce Center	Strategic Rural Center Zone-1st Order	Strategic Rural Center Zone-2nd Order	Strategic Rural Center Zone-3rd Order	Water body
Permitted Use P Conditional Use C Plan Review Required R Not Permitted N												
Water Based Recreational Park	N	N	N	N	C	N	C	C	C	C	C	P
Water Treatment / Purification Plant	N	N	N	N	P	C	C	C	C	C	C	C
Wood / Iron Furniture Production	N	N	N	N	P	N	P	P	P	P	P	N
Zoo	N	N	N	N	C	N	C	N	N	N	N	N
Eco Tourism	C	p	p	N	C	P	P	C	C	C	C	N

*P= Permitted Use, C= Conditional Use, R= Plan Review Required, N= Not Permitted

CHAPTER SEVEN: PLAN IMPLEMENTATION

7.1 Introduction

The most important responsibility for the stakeholders is to implement the plan. This chapter outlines the numerous steps that must be followed to carry out the plan's recommendations. The whole planning process's most crucial step is effective implementation.

7.2 Legal Framework for Implementation

The implementation of Structure Plan, Urban Area Plan, Rural Area Plan, and Action Area Plan will be legally guided by the Local Government Acts of all Local Government Units within the Upazila - (i) Local Government (Upazila Parishad) Act, 2009; (ii) Local Government (Paurashava) Act, 2009; and (iii) Local Government (Union Parishad) Act, 2009.

Ministry of Housing and Public Works has already proposed Payra-Kuakata Development Authority Act, 2023. According to the proposed Act Kalapara, Amtali and Taltoli Upazila will be included in this Authority. The Authority may extend its area towards Barguna and Patharghata as well as Galachipa and Rangabali. The implementation of Structure Plan, Urban Area Plan, Rural Area Plan, and Action Area Plan will be legally guided by the Act after the enactment of the Act.

Some other Acts are relevant for taking actions in matters of preserving and conserving the water bodies and environment of the Upazila. The Water Act 2011 and Act 2000 for protecting the water bodies, playfields, and environment are particularly important.

There are national policies for most of the sectors. The relevant sector policies are consulted in this project for the preparation of Structure Plan of the Upazila, Urban Area Plan for the urban areas, and Rural Area Plan for the rural area and Action Area Plan for the selective areas. These sector policies will be important for adopting measures of executing development projects as indicated in the plan documents. For further details of the policies and strategies, the implementing agencies may consult the national policy documents for any sector.

7.3 Custodian of the Plan

Payra Development Authority is the custodian of the Plan prepared under the current project. The present planning project of the Urban Development Directorate (UDD) addresses all aspects of development within the Upazila. There are multi-sectoral tasks to be carried out by multiple stakeholders at the Upazila including Upazila Parishad, Paurashava, and Union Parishad.

All the stakeholders must be involved in carrying out the implementation of the plan proposals. Planning proposals are essentially much time-bounded, therefore, execution of the proposals should move ahead once the government formally approves the plan. The Development Authority will be the main custodian of the total plan package. It will also be responsible for executing the monitoring and implementation phase of the development projects by other development as well as Upazila Nirbahi Officer (UNO).

The Payra Development Authority as well as Agricultural Extension Department of the Ministry of Agriculture, the Ministry of Water Resources and the Ministry of Fisheries and

Livestock with the help of Upazila Parishad will play the key role to control development in the Urban Promotion Control Area (UPCAs). For any non-agricultural development within the UPCAs will require No Objection Certificate (NOC) from these authorities.

The Upazila Parishad have the overriding tasks of supervising the implementation of the Action Area Plans across the UPAs within the Upazila with the help of Union Parishads. The governmental agencies performing diverse sectorial responsibilities within the Zila, Upazila, Paurashava and Union Parishads have to coordinate their functions with the local governments of the respective areas of jurisdiction. The Payra Development Authority is to assist this implementation process and provide No Objection Certificate (NOC) for governmental projects. The Payra Development Authority will be responsible for the implementation of the Structure Area Plan of the Upazila as per the Local Government Act.

7.4 Institutional strengthening

In Bangladesh, the central Government Grant is an important source of income. Such grant supplements the income of an area from local sources in order to fulfil its functional responsibilities. At present, Central Grants are of the following types:

a. Direct grants (non-development grants)
b. Subvention (Salary Support)
c. Matching grants (Linked to Projects)
d. Development grants (Block grants)

Block grants can be used effectively to influence resource enhancing behaviour. Block grants, therefore, should be distributed on the basis of a fixed formula. The current distribution mechanism of intergovernmental transfers (ADP block grants) in Bangladesh is not based on any formula. A formula based on Area, Population and level of development of the potential urban area could be adopted. Once adopted, it should not be tampered with or changed for an extended period of time; otherwise, it would lose its effectiveness. To influence the revenue generation, allocation of block grants may be done in two stages.

The priority areas constituting coastal development strategy need to be translated into programs and projects. Projects must be formulated through an institutional process. These projects intended for implementation over a specified duration will form part of the Investment Plan to be updated on an annual basis. Projects will have indicative budget requirements and duration of implementation, as well as implementation arrangements.

7.4.1 Priority areas

The Coastal Development Strategy puts forward a set of priority areas that should constitute the Investment Strategy which has a direct correspondence to the objectives of the investment strategy spelt out in the coastal zone policy as indicated above. These are as follows:

- Mitigation of natural disasters, safety and protection.
- Environmental management – protection and regeneration of the environment.
- Water resources management.
- Rural livelihoods and sustainable economic opportunities for coastal communities.
- Productive economic activities and focused development of tourism and fisheries sectors.
- Infrastructure development.
- Social development includes health and nutrition, education, and water and sanitation.

7.5 Capacity Building of Local Actors

Local governments lack the capacity and resources to carry out their responsibilities properly. To raise working capability, training programs should be arranged and modern office and working equipment should be installed.

7.5.1 LOCAL ACTORS

They represent the public and the private sectors. The public sector encompasses all relevant central government agencies, Paurashavas and city corporations, while the private sector includes formal and informal enterprises and services, local communities and relevant NGOs.

Local Government Bodies

Capacity building of local government bodies needs to focus on strengthening managerial, technical, financial and regulatory capabilities. Capacity building in holding tax administration is also vital as it is a major source of revenue. Further, enhanced capacity in cost accounting systems is needed to control service and monitor cost-effectiveness and efficiency.

Private Sector Organizations

Both formal and informal private sector enterprises need to build capacity in various aspects affecting urban development.

7.5.2 Capacity building tools

Appropriate capacity building tools need to be developed to acquire the skills related to urban development and management. Public sector training and technical assistance programmes would be very useful for local government technical and managerial staff. Public information and outreach programs can be designed by local governments and NGOs to promote public participation and support.

7.5.3 Institutions for capacity building

Undergraduate and post-graduate level education in managerial, technical, financial and regulatory aspects is offered by various Universities and Institutes in the public and private sectors. Particular emphasis should be placed on planning education. Steps should be taken to strengthen planning education and increase the output of graduate planners. Steps should also be taken to train various professionals, especially engineers, in various aspects of urban planning so that they can carry out development activities in conformity with urban planning principles and regulations.

7.5.4 Involving Local Stakeholders in Urban Development

Effective partnerships between local governments and the private sector can generate considerable benefits. Private companies, informal sector enterprises, CBOs, and NGOs can provide urban services, mobilize finance (or voluntary labour), introduce innovative technologies and undertake land development activities. Private sector actors with whom partnership arrangements can be made include the following:

7.5.5 Community-based organizations (CBOs)

These organizations are formed when neighborhood residents get organized and join forces to improve local security, housing quality, basic utilities, social services and the neighborhood environment. Municipal community partnership (MCP) has now emerged as an innovative institutional model. MCPs are particularly suitable for delivering specific goods and services,

e.g. sanitation, refuse collection, roads and environmental maintenance, social housing etc. MCPs should be developed as part of an overall municipal strategy.

7.5.6 Non-governmental Organization (NGOs)

Unlike CBOS, Non-governmental organizations usually originate outside of the communities with which they work. NGOs may be understood as a "third system" between the public and private, concentrating their support at the community level while at the same time mediating between the community and the government. NGOs are effective agents for building local awareness, mobilizing community action, enabling access to credit, strengthening CBOs etc. In the context of vast needs, limited capacity and constrained financial resources, the local governments should recognize the role of NGOs as partners in urban development and management activities.

7.5.7 Private enterprises

These include informal workers and small-scale enterprises as well as large-scale business firms that may be entrusted with the task of operating or developing infrastructure facilities and urban services. The private sector enterprises can play more productive and sustainable roles in urban development by working in partnership with local government, especially in delivering certain urban services, formulating and implementing local economic development strategies and taking part in Philanthropic activities for the promotion of social good and environmental quality.

7.6 Role of Urban Development Directorate

The multifaceted professional requirements of the plan for execution make it difficult to implement the Structure Plan. For the plan to operate effectively, an appropriate authority to oversee the tasks undertaken under the plan would be needed.

Urban Development Directorate (UDD) is directly involved with the Upazila development plan and UDD is currently doing the Upazila Development Plan. The role of the Urban Development Directorate (UDD) should expand to monitor and evaluate the development plans of Upazilas directly to make it more practical and fruitful. Urban Development Directorate (UDD) can provide technical services for the effective implementation of the plan.

7.7 Monitoring, Review and Updating of the Plan Components

Planning is always a continuous process. The plan package needs to be updated regularly to make it respond to the spatial changes over time. The proposed Payra Development Authority always monitor and review the implementation of the plan. The review will aim to analyse the status of implementation of plan provisions, the changing physical growth pattern, infrastructure development, and the trend of public and private physical development including growth direction. Structure Plan will be reviewed periodically once in every 10 years. For regular updating and changes and plan implementation monitoring, the Upazila should immediately set up a planning section with planners and staff.

7.8 Circulation of the Plan Documents

The strength of the statutory plan is yet to be established among the stakeholders including common citizens and the public sector development agencies. As the custodian of the plan, Urban Development Directorate (UDD) will be responsible to disseminate and establish the true spirit of the plan. UDD will remain responsible to inform all the government

organizations that a statutory plan has been prepared for the corridor, because of its statutory nature; it has to be followed by all. It should be adhered to by them while taking up development programs and projects within the jurisdiction of the plan area.

To achieve the objective of the plan, it has to be disseminated among all the government agencies. Copies of the plans including maps and reports will have to be sent to them with a letter stating under what legal authority the plan has been prepared.

The plan would be uploaded on the UDD website so that people can download, study, and be aware of the plan. Besides, hard copies of the document would be made available for sale at a reasonable price. UDD can also contact the line agencies through the letter to make them aware of the projects proposed under this plan and the role of the respective line agencies to implement the same.

7.9 Plan Review Committee

Urban Development Directorate has already proposed Payra Development Authority. The Structure Pan as well as all the plans will be reviewed by this authority in every 10 years. A Plan Review Committee would be required for reviewing the cases of demand for change the plan. A Plan Review Committee can serve this purpose following the recommendation made by Proposed Authority. Composition of this Plan Review Committee can be as follows:

Convener – Secretary, Ministry of Housing and Public Works

Member – Joint-Secretary (Local Government Division), Ministry of Local Government, Rural Development and Cooperatives

Member – Joint-Secretary, Ministry of Agriculture,

Joint-Secretary, Ministry of Land,

Joint-Secretary, Ministry of Environment,

Joint-Secretary, Ministry of Water Resources,

Joint-Secretary, Ministry of Road Transport and Bridges

Member – President, Bangladesh Institute of Planners (BIP)

Member – Head, Department of Urban and Regional Planning, BUET.

Member – Deputy Commissioner (DC), Patuakhali District

Member-PD, PKCP Project, Urban Development Directorate (UDD)

Member Secretary – Director, Urban Development Directorate (UDD), Ministry of Housing and Public Works

7.10 Development Control

Any unauthorized or unlawful development within the Upazila should be controlled to fulfil the aim of planned development. Following are some measures that the concerned Local Government Authority may apply.

Restrictions on development are required in certain cases in order to stop illegal construction and encroachment. For example, no low land can be filled up and no obstruction to drainage system will be allowed. Prior permission of the Local Governments in the respective areas of

jurisdiction will be required for filling of any low lands. Ponds should not be allowed to fill up as they are a good source of urban water supply as well as serve as open space.

Infrastructures are developed by public sector agencies for public benefit. But in case of some developments, it is observed that major benefits are reaped by a particular section of the community where development takes place. This is particularly true for road construction.

In the BC Rules 1996, specific provisions are made for parking in housing and commercial areas. But no provision has been suggested for mixed use areas. According to the rules in commercial area, 23 sq.m area has to be reserved for every 200 sq. m of commercial space. The BC Rules for parking in the commercial area can also be applied for mixed-use areas under the current plan.

7.11 Execution of Development Proposals

The government agencies should respect the plan provisions and the legal provisions of EBBC Act 1952. When the plan will be ignored by the government agencies, the general public will have little respect for it and plan will gradually lose its credibility as a statutory document.

Many public agencies will be responsible for carrying out infrastructure development. The Local Governments within the Upazila will execute many projects for public interests. The extent of execution of proposals by public sector agencies will largely depend on the size of resources made available for implementing the development schemes. The PPP approach for execution of development projects can be adopted by the local governments.

It should be recognized that planning is an integral part of administration. It should not be expected that planned development would be highly remunerative in the immediate future, but it is sure that execution of development proposals, in the long run, will accrue positive dividends. It will improve health and comfort of the people that will lead to increased comfort for living and efficiency for working.

The plan proposals are time-bound and proposals that are not executed in time will lose their viability over time. As development proceeds, it will be difficult to find suitable vacant land for infrastructure development, which may negatively impact on physical and social environment. Timely execution of development project is therefore important.

7.12 Resource Mobilization for Development

Implementation of development projects proposed in the plan will be a challenging task as they will require huge number of resources. The development projects are expected to be executed by a number of agencies. However, it is beyond doubt that the Local Governments will have to shoulder the heaviest financial burdens. The Local Governments suffer from resource constraint. This calls for increasing revenue earning by generating new revenue sources.

7.13 Scope for Land Acquisition

Due to low supply and higher demand, land value is higher in urban areas compared to rural hinterland. As a result, land acquisition through legal process is cumbersome and lengthy in urban areas.

Land acquisition is expensive in the urban areas as land owners are generally unwilling to offer their lands for development as it is a lucrative source of income in urban areas. It is comparatively easier to acquire land in fringe than in the core areas. Fringe areas are usually characterized by low density, where land value is also comparatively low.

CHAPTER 8: CONCLUSION

8.1 Concluding Remarks

The Structure Plan study summarized the general state of affairs, significant planning concerns, and anticipated population growth in the Upazila. If carefully implemented, national policies and initiatives are seen to have significant effects. The strategic measures suggested are targeted to achieve these policies at the Upazila level. The implementing agencies will have an important role to play once the Development Plan gets approval of the government for execution.

The success of the plans will depend on the capacity of the local governments in implementing the plans. The supports of the national government for the execution of the plans are always necessary. The national government should be increasingly engaged with the local governments at the Upazila level in improving the policy and legal framework for the implementation of local physical plans. This will enhance the institutional strength of the local governments in the execution of the planned development process.

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APPENDIX-A

Water Quality of Major Rivers

Table-A1: Status of Physical and Aggregate Properties

Parameters	Unit	Buriswar-Payra	Tetulia	3D Standards	Remarks
Temp.	^{0}C	30	30	20-30	Within the range
pH	Value	7.1	7.2	6.5-8.5	Within the range
TDS	mg/l	74	340	1000	Complied the standard
EC	µS/cm	148	700	1200	Complied the standard
Salinity	ppt	0.1	0.1	0	Complied the standard
TSS	mg/l	11	22	50-150	Within the range
Turbidity	NTU	52	60	50	Higher than the standard
Alkalinity	mg/l	40	20	20-120	Within the range
Hardness	mg/l	180	200	200-500	Within the range

Source: PKCP Project, UDD, 2022

Table-A2: Status of Inorganic Non-metallic Constituents

Parameters	Unit	Buriswar-Payra	Tetulia	BD Standards/WHO*	Remarks
Chloride	mg/l	20	22	250	Complied the standard
Sodium	mg/l	6	20	200*	Complied the standard
Potassium	mg/l	4	5	12*	Complied the standard
Nitrate	mg/l	6.6	1.5	2.5	Higher than the standard
Phosphate	mg/l	0.1	0.6	0.5	Complied the standard
Sulphate	mg/l	15	40	400	Complied the standard

Source: PKCP Project, UDD, 2022

Table-A3: Status of Aggregate Organic Constituents

Parameters	Unit	Buriswar-Payra	Tetulia	BD Standards	Remarks
DO	mg/l	5	6	5 or more	Within the standard
BOD	mg/l	2	4	Less than 10	Complied the standard
COD	mg/l	8	11	Less than 25	Complied the standard

Source: PKCP Project, UDD, 2022

Table-A4: Status of Metal Constituents

Parameters	Unit	Buriswar-Payra	Tetulia	EPR'86, India	Remarks
Iron	mg/l	0.4	1.0	0.1	Higher than the standard
Zinc	mg/l	0.03	0.03	2	Complied the standard
Manganese	mg/l	0.23	0.24	3	Complied the standard
Lead	mg/l	0.005	0.005	2	Complied the standard
Chromium	mg/l	0.012	0.010	0.05 (BD, Drinking)	Complied the standard
Nickel	mg/l	0.030	0.069	5	Complied the standard
Copper	mg/l	0.030	0.011	1 (BD, Drinking)	Complied the standard
Cadmium	mg/l	0.00015	0.013	0.005 (BD, Drinking)	Complied the standard except Tetulia

Source: PKCP Project, UDD, 2022

Table-A6: Status of Oil & Grease and Phenol

Parameters	Unit	Buriswar-Payra	Tetulia	Standards	Remarks
Oil & Grease	mg/l	<2.0	<2.0	10 (ECR'2017 ammed.)	Within the standard
Phenol	mg/l	<0.5	<0.5	-	-

Source: PKCP Project, UDD, 2022

Table-A7: Soil pH, EC and Soil Texture of the sampling sites

Sampling site	**Soil pH**	**Electrical conductivity(EC) (dS/m)**	**Soil Texture**			
			Sand	Silt	Clay	Type
Agricultural field	6.3	1.74	39.46	38.34	22.2	Loam
	4.5	1.34	43.61	36.25	20.14	Loam
	8.1	5.26	44.9	44.89	10.2	Loam
	7.7	2.24	41.47	44.4	14.13	Loam
	5.0	6.63	48.15	40.61	18.27	Loam
	8.0	4.30	55.38	34.48	10.14	Sandy Loam
Urban area	7.6	4.69	43.55	28.22	28.23	Clay Loam
	5.5	1.35	44.79	38.85	16.36	Loam
Peri urban area	7.3	5.29	48.51	39.13	12.36	Loam
	8.0	5.23	53.25	36.58	10.16	Sandy Loam
	4.1	0.78	47.1	42.73	10.17	Loam
Mangrove forest	7.3	1.47	57.19	32.62	10.19	Sandy Loam

Source: PKCP Project, UDD, 2022

Table-A8: Air Quality of the Study Area

Unit	PM10 µg/m3	PM2.2 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	VOC µg/m3
Averaging Period	24h	24h	24h	24h	8h	-
AAQ-1	82.6	41.6	6.8	32.6	0.75	<4.2
AAQ-2	79.6	39.6	6.2	30.2	0.65	<4.2
AAQ-3	86.2	44.6	7.3	35.6	0.56	<4.2
AAQ-4	75.6	40.8	6.5	32.5	0.65	<4.2
AAQ-5	78.4	42.5	6.2	28.2	0.72	<4.2
AAQ-6	77.3	39.2	<6.0	26.9	0.68	<4.2
AAQ-7	79.4	38.6	<6.0	26.4	0.62	<4.2
AAQ-8	80.7	40.8	6.5	30.2	0.66	<4.2
AAQ-9	83.9	45.2	6.3	30.8	0.73	<4.2
AAQ-10	82.7	42.7	6.2	29.8	0.78	<4.2
AAQ-11	81.2	41.3	6.4	29.7	0.72	<4.2
AAQ-12	86.3	44.7	7.4	36.5	0.69	<4.2
Standard (National)	150	65	80	80 (Annual)	5 (8 Hr)	-
Standard (International)	150	75	125	200 (1Hr)	-	-

Source: PKCP Project, UDD, 2022

Table-A9: Noise Quality of Different Land Use Types in the Study Area

Taltoli					
Location ID	**Zone**	**Morning (dB)**	**Std. (Noise control rules, 2006) (dB)**	**Evening (dB)**	**Std. (Noise control rules, 2006) (dB)**
NL-1	mixed	61	60	65	50
NL-2	Commercial	87	70	94	60
NL-3	mixed	65	60	74	50
NL-4	mixed	80	60	95	50
NL-5	mixed	82	60	78	50

Source: PKCP Project, UDD, 2022

APPENDIX-B

Appendix B: ESO Objectives, Indicators and Institutions Responsible for Monitoring

This table is an updated table for the Final SEMP, and will require to be further developed, and kept under rolling review throughout the next 20 years.

Appendix

Themes	Objective	Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
Forest, Protected areas and biodiversity	1	Reduce over-exploitation/ degradation of habitats, loss of biodiversity and ecosystem(s) integrity and services	1	Status of the mud crab (Scylla spp.) as a key indicator of aquatic biodiversity in the PKCP region	None yet	None yet	Non e yet	None yet	Ministry of Fisheries and Livestock (MoFL) Secretary, MoFL, email: secretary@mofl.gov.bd, Phone: 9545700 & Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481	Department of Fisheries (DoF) Director General, DoF email: dg@fisheries.gov.bd, Phone: 9562861 & Bangladesh Forest Department (BFD) Chief Conservator of Forests, BFD email: ccf-fd@bforest.gov.bd, Phone: 01999000001	Department of Fisheries (DoF) 1. Director, Finance & Planning, DoF. email: ddfinance@fisheries.gov.bd Bangladesh Forest Department (BFD) 2. Conservator of Forests, Wildlife and Nature Conservation Circle, BFD, Dhaka. email: mihir_fd@yahoo.com, Cell: 01712566001	Annual	Survey needed and the SCU will finalize all the need assessment.
			2	Status of suitable habitat for dolphin (in sanctuaries & hotspots)	Poor Good Very good2	Very good	2018 -19	BFD, 2020	Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481	Bangladesh Forest Department (BFD) Chief Conservator of Forests, BFD. email: ccf-fd@bforest.gov.bd Phone: 01999000001	BFD 1. Conservator of Forests, Wildlife and Nature Conservation Circle, BFD, Dhaka. email: mihir_fd@yahoo.com,	Propose Every 3 years	
			3	Area of Protected (PA) Forests and other designated	Hectare	Reserve forests 43,453	2022	BDF 2022	Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email:	Bangladesh Forest Department (BFD) Chief Conservator of Forests,	BFD 1. Conservator of Forests, Wildlife and Nature Conservation Circle, BFD,	Propose Every 3 years	

2.Poor: Where the environmental factors and food accessibility for dolphins is not enough for basic life cycle requirements and where interference by fishermen and boat movement disturbance is high.

Good: Where the environmental factors and food accessibility for dolphins is enough for basic life cycle requirements, and interference by fishermen and boat movement disturbance is low.

Very good: Where the environmental factors and food accessibility for dolphins is abundant for basic life cycle requirements, and there is no interference by fishermen and boat disturbance.

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
				areas					secretary@moef.gov.bd, Phone: 9540481	BFD. email: ccf-fd@bforest.gov.bd Phone: 01999000001	Dhaka. email: mihir_fd@yahoo.com,		
Waste and Pollution	2	Reduce poor management and unsafe disposal of solid and liquid waste (urban & industrial)	4	Capacity of recycling plants in the PKCP Area	Very good/Good/ Moderate / Poor/ Very poor3	0	2022	Local consultations	Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481	Department of Environment (DoE) Director General, DoE email: dg@doe.gov.bd Phone: 8181800	DoE 1. Director, NRM, DoE, email: dirnrm@doe.gov.bd, Cell: 01718114188 2. Director, Barishal Divisional Office, DoE,	Annually	
			5	Total volume waste per capita in Amtali, Kalapara and Brguna Sadar	Kg/ person/ day	0.11, 0.20, 0.24 respectively	2022	Calculated	Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481	Department of Environment (DoE) Director General, DoE email: dg@doe.gov.bd Phone: 8181800	DoE 1. Director, NRM, DoE, email: dirnrm@doe.gov.bd, Cell: 01718114188 2. Director, Barishal Divisional Office, DoE,	Annually	
			18	No hrs. in which noise exceeds 45dBA in the ‘Silent Zone’ in the reserve forests)4	Hrs./day	0 5	2022	CEGIS 2022	Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481	Department of Environment (DoE) Director General, DoE email: dg@doe.gov.bd Phone: 8181800	DoE 1. Director, Department of Environment, Dhaka Laboratory Office E-mail: dhakalab@doe.gov.bd,	Methodology, duration and coverage to be revised	Survey needed

3Very good =The state where all the municipal solid waste in urban areas of PK Region is recycled and properly managed without posing any threats to environment, and 70-90%) of waste is converted into resources.

Good = The state where all the municipal solid waste in the urban areas of PK Region is recycled and properly managed without posing any threats to environment, with 50-69% of waste converted into resources.

Moderate = The state where 50 –75% of the municipal solid waste in the urban areas of PK Region is recycled and properly managed without posing any threats to environment, with 30-49% of waste converted into resources.

Poor = The state where around 25% of the municipal solid waste in the urban areas of PK Region is recycled and properly managed only, with no waste comverted into resources.

Very Poor = The state where less than 25% of municipal solid waste in the urban areas of PK Region is recycled and properly managed, with no waste converted into resources.

4Bangladesh standard (Environmental Conservation Rule-ECR-1997) for Silent zone (45 dBA)

Appendix

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
											Cell: 01712125880 2. Director, Air Quality Management, Department of Environment. Mail: nazmul@doe.gov.bd, Cell: 01819427358		
Climate change and disasters	4	Reduce vulnerability to climate change and natural disasters (floods, storm surges, etc.)	26	Storm surge inundation	% of PK Region	Cyclone Sidr: 10	2007	WB, 2011	Ministry of Disaster Management and Relief (MoDMR) Secretary, MoDMR email: secretary@modmr.gov.bd Phone: 9540877	Department of Disaster Management (DDM) Director General, DDM email: dg@ddm.gov.bd, Phone: 8835 495	DDM 1. Deputy Director (Research) Disaster Management Division, email: nurulhaquechowdhury@gmail.com, Mobile: 01711399633	Event based – the data are only collected after the event	Storm surge inundation
			27 (a)	Salinity intrusion (Surface water & ground water)	% of Region: 1PPT in SW	71.5	2011	CEGIS Bay of Bengal Model	Ministry of Water Resources (MoWR) Secretary, MoWR email: secretary@mowr.gov.bd, Phone: 9576773 & Ministry of Local Government, Rural Development & Co-operatives	Bangladesh water Development Board (BWDB) Director General, BWDB email: dg@bwdb.gov.bd, Phone: 222230011 & Department of Public Health Engineering (DPHE) Chief Engineer, DPHE, email: ce.dphe@gmail.com. Phone: 55130752	BWDB Chief Engineer (Civil), Hydrology, email: ce.hydrology@bwdb.gov.bd, Phone: 029550815 DPHE Superintending Engineer (Ground Water Circle), email: se.gwc Phone: 02-9342483	Continuous	Measure this in wells. There are a number of monitoring wells. The already in place
			27	As above	% of Region:	52.5	As abov	As above	As above	As above	As above	As above	As

Source: PKCP Project, UDD, 2022

5Discontinuously when Cargo and ships move and honk

Appendix

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
			(b)		5PPT in SW		e						above
			28	Number of Households severely affected6 during cyclone, storm surge, extreme flood or related climate change event	No.	31,228 on average per annum (from 2015-2020)	2015 - 2020	BBS, 2022	Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481	Bangladesh Bureau of Statistics Statistics and Informatics Division Ministry of Planning	Bangladesh Bureau of Statistics Statistics and Informatics Division Ministry of Planning	calamity/ event based Data collated every 5 years	Existing monitoring system already in place
Economic growth	5	Ensure significant economic development and diversification, and increase in economic growth	29	Per capita GDP for PK Region (in constant price of 2010)	PPP7 international $	2096	2018 -19	BBS, 2019	Ministry of Planning Secretary, Statistics and Informatics Division (SID) email: secy@sid.gov.bd, Phone: 02-55007373	Planning Commission Director General, Planning, Commission, E-mail: hamidul.haque@imed.gov.bd Phone (Office): 9180677, Mobile: 01718022712 & Statistics and Informatics Division (SID), Additional Secretary, Informatics Wing, SID email: addlsecy@sid.gov.bd, Phone: 55007377	Bangladesh Bureau of Statistics (BBS) Director General, BBS, E-mail: dg@bbs.gov.bd, Phone: 02-55007056	Annually	
			30	GDP for PK Region (in constant prices of 2010)	PPP international $ billion	44.29			same as above	same as above	same as above	Annually	
			31	GDP in PK	%	14	2018	Est.	same as above	same as above	same as above	Annually	

6Severely affected means: house, crops, livestock, fish farms destroyed

BBS (2022). Bangladesh Disaster-related Statistics 2021: Climate Change and Natural Disaster Perspectives—Final Draft. Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.

7 PPP: purchasingpowerparity

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
				Region as share of national GDP			-19						
			32	Industry as share of GDP of PK Region	%	24.08	2018 -19	BBS, 2019	same as above	same as above	same as above	Annually	
Employment	6	Enhance opportunities for employment and new/improved livelihoods (particularly for fisheries, agriculture, eco-tourism)	33	People employed in industry in PK Region	% of total people employed	5	2012	BBS, 2012	Ministry of Industries (MoI) Secretary, MoI, email: indsecy@moind.gov.bd, phone: 02-47120800	Bangladesh Industrial Technical Assistance Centre (BITAC) Director General, BITAC email: dg@bitac.gov.bd, phone:8870700	Bangladesh Industrial Technical Assistance Centre (BITAC)	Annually	
Health and sanitation	7	Improve health services and health of society (e.g. by reducing vulnerability to diseases)	34	No of health service providing organization	No.	352 beded 5 hospitals in five Upazilas, 60 bedded private hospitals in two upazila	2021	PKCP Regional Plan	Ministry of Health and Family Welfare (MoHFW) Secretary, Health Service Division, MoHFW email: secretary@hsd.gov.bd, phone: 9577199	Directorate General of Health Services (DGHS) Director General (Health), email: alamdr2003@ yahoo.com, phone: 55067172 & Bangladesh Bureau of Statistics (BBS) Director General, BBS, E-mail: dg@bbs.gov.bd, Phone: 02-55007056	DGHS 1. Director DGHS, Khulna Division Email: kdho@ld.dghs.gov.bd Mobile: 01711195754, 01716821339 BBS 2. Director, Census/computer Wing, Bangladesh Bureau of Statistics (BBS), email: mahfuz.k phone: 02-	Annually	
			35	Life expectancy	Yrs	72.10	2018	BBS, 2019	Ministry of Health and Family Welfare (MoHFW) Secretary, Health Service	Directorate General of Health Services (DGHS) Director General (Health),	RPTI 1. Regional Population Training Institute (RPTI),	Annually	

Source: PKCP Project, UDD, 2022

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
									Division, MoHFW email: secretary@hsd.gov.bd, phone: 9577199	email: alamdr2003@ yahoo.com, phone: 55067172 & National Institute of Population Research and Training (NIPORT) Director General, NIPORT, email: dg.niport1977@gmail.com, phone: 9662495	Barishal 2. Director, Census/computer Wing, Bangladesh Bureau of Statistics (BBS), email: mahfuz.bablu@gmail.com, phone: 02-55007331		
Education. skills and training	8	Improve access to education for all, increase attendance (by reducing drop-out rates), and improve skills development and training	36	Enrolment in higher secondary education (16+ years)	% of population	22.42	2019	PKCP Regional Plan, 2019	Ministry of Education (MoEDU) Secretary, MoEDU, email: Secretary@moedu.gov.bd Phone: 9576679	Directorate of Secondary and Higher Education (DSHE) Director General, DSHE, email: dg@dshe.gov.bd, Phone: 9553542 & BANBEIS Director General, BANBEIS, email: dg@banbeis.gov.bd, phone: 02-9665457	DSHE 1. Deputy Director, DSHE, Khulna Email: ddkhl@yahoo.com, Mobile: 01712141429 BANBEIS 2. Chief Statistics, BANBEIS, email: alamgir_asif@yahoo.com, phone: 02-55151815	Annual	
Migration	9	Reduce migration from rural (including disaster-prone and risk-prone) areas to urban areas	37	Rate of migration to urban areas in PK Region	%	3.24	2019	BBS, 2019	Ministry of Planning Secretary, Statistics and Informatics Division (SID) email: secy@sid.gov.bd, Phone: 02-55007373 & Ministry of Expatriates' Welfare and Overseas Employment	1. Bangladesh Bureau of Statistics (BBS) Director General, BBS, E-mail: dg@bbs.gov.bd, Phone: 02-55007056 2. Bureau of Manpower, Employment and Training (BMET) Director General, BMET, email: dg@bmet.gov.bd, phone: 49349925 3. Statistics and Informatics Division (SID)	Statistics and Informatics Division (SID) 1. Additional Secretary, Informatics Wing, SID email: addlsecy@sid.gov.bd, Phone: 55007377 BBS 2. Joint Director, BBS, Khulna, Email: mostofa43@gmail.com, Mobile: 01720212215 2. Refugee and Migratory	Annually	Rate of migration to urban areas in PK Region

Appendix

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
										Additional Secretary, Informatics Wing, SID email: addlsecy@sid.gov.bd, Phone: 55007377	Movements Research Unit (RMMRU), University of Dhaka E-mail: info@rmmru.org, Tel: + 880-2-9360338		
Conflicts and security	10	Reduce conflicts over use of land	38	No of fisher-farmer land-related disputes / clashes	No.	None yet	Non e yet	http://peaceobservatory-cgs.org/#/division/district	Ministry of Public administration (MoPA) Secretary, MoPA, email: secretary@mopa.gov.bd, Phone: 02-9570100	Divisional Commissioner, Khulna Division email: divcomkhulna@mopa.gov.bd, phone: 01713400394	Divisional Commissioner office. 1. Additional Divisional Commissioner (Revenue)	Annual	Need Study to cover both reported and unreported cases
Food	11	Improve food security	39 (a)	Status of food security - as measured by availability,	Very good8	Moderate	2020	https://foodsecurityindex.eiu.com/Index	Ministry of Food Secretary, Ministry of Food, email: secretary@mofood.gov.bd, phone: 029540088	Directorate General of Food Director General, Directorate of Food, Dhaka, emial: dg@dgfood.gov.bd, phone: 02-9584834	Regional Food Regional Food Department, Barishal Division	annual	
		Improve food security	39 (b)	quality	Good	Moderate	As abov e	As above	As above	As above	As above	As above	
		Improve food security	39 (c)	safety food to all people at all	moderate	Moderate	As abov	As above	As above	As above	As above	As above	

Source: PKCP Project, UDD, 2022

8Very Good: Food affordability, availability, quality and safety is good enough or surplus to all people at all time. It includes safe and nutrition food to meet dietary need.

Good: Food affordability, availability, quality and safety is sufficient or just enough to feeding all the people at all time.

Moderate Good: Food affordability, availability, quality and safety is not enough to feeding all the people at all time.

Poor: Food affordability, availability, quality and safety is insufficient or deficit to meet demand and need improve access to sufficient, safe and nutrition food to meet dietary need.

Link SEA

https://en.wikipedia.org/wiki/Global_Food_Security_Index

https://foodsecurityindex.eiu.com/Index

Appendix

Themes		Objective		Indicator	Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
				time			e						
Power and energy	12	Enhance the capacity of power generation and distribute sustainable power to the consumer.	40	At present total power Generation in the Barishal Region (PKCP is the part of Barishal Region)	MW	2265	2020	BPDB, 2020; Daily Production Report, PGCB	Ministry of Power Energy and Mineral Resources (Power Division) Secretary, Power Division, email: secy@pd.gov.bd, phone: 02-9511030	Bangladesh Power Development Board (BPDB) Chairman, BPDB, email: chairman@bpdb.gov.bd, Phone: 9562154 Bangladesh Rural Electrification Board (BREB) Chairman. BREB Mobile: 88028900007 Email: chairman@reb.gov.bd	BPDB 1. Member, Generation, BPDB, email: member.generation@bpdb.gov.bd, phone: 9564667 2. Deputy Secretary, Development-5, Power Division Mobile: +8801817508251 Email: dev-5@pd.gov.bd	Standing indicator – only changes when a new power station is built	
		Increase production and consumption of energy	41	Power production per capita (installed capacity	W / capita	122	2020	BPDB, 2020 and Expert Judgement	Ministry of Power Energy and Mineral Resources (Power Division) Secretary, Power Division, email: secy@pd.gov.bd, phone: 02-9511030	Bangladesh Power Development Board (BPDB) Chairman, BPDB, email: chairman@bpdb.gov.bd, Phone: 9562154	BPDB 1. Member, Generation, BPDB, email: member.generation@bpdb.gov.bd, phone: 9564667 2. Deputy Secretary, Development-5, Power Division Mobile: +8801817508251 Email: dev-5@pd.gov.bd	25	
	13	Increase access to affordable energy	42	Power production per GDP (installed capacity)	W / 1000 $ international (PPP, constant prices of 2010)	58.1	2020	BPDB, 2020	Ministry of Power Energy and Mineral Resources (Power Division) Secretary, Power Division, email: secy@pd.gov.bd, phone: 02-9511030	Bangladesh Power Development Board (BPDB) Chairman, BPDB, email: chairman@bpdb.gov.bd, Phone: 9562154	BPDB 1. Member, Generation, BPDB, email: member.generation@bpdb.gov.bd, phone: 9564667 2. Deputy Secretary, Development-5, Power Division Mobile: +8801817508251,	26	

Source: PKCP Project, UDD, 2022

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
											Email: dev-5@pd.gov.bd		
Tourism	14	Improve tourism management and behaviour to limit noise, pollution and other negative impacts and remain within the carrying capacity of the Exclusive Tourist Zone (ETZ)	43	Visitors to the various destinations of the project area. Like: Number of visitors to the Exclusive Tourist Zone, Sonar char No. of tourists for river/sea cruising	No.	On the weekend, Sonar Char was visited by 80-100 tourists, compared to 30-40 tourists on Sunday through Thursday. Still there were no river or sea cruising facilities	Jan 2023	Union level Consultation	1. Ministry of Environment Forest and Climate Change (MoEFCC) Secretary, MoEFCC, email: secretary@moef.gov.bd, Phone: 9540481 2. Ministry of Civil Aviation & Tourism (MOCAT) Secretary, MoCAT, email: secretary@mocat.gov.bd, phone: 02-9514884	A K Shamsuddin Chairman, Char Montaz 01715332567 Md. Mosaref Hossain Union Parishad Member, 7 no. ward 01735727636 1. Bangladesh Forest Department (BFD) Chief Conservator of Forests, BFD. email: ccf-fd@bforest.gov.bd Phone: 01999000001 2. Bangladesh Parjatan Corporation (BPC), Chairman, BPC, email: chairman@parjatan.gov.bd, phone: +88 02 44826504	BFD 1.Conservator of Forests, Barishal Circle. MOCAT Deputy Secretary (Tourism 1) Email: dstourism1@mocat.gov.bd	Daily	
Infrastructure, transportation and communications	15	Improve connection of communities, and improve access to infrastructure, services and facilities	44	Number of Educational Institute (Primary School, Secondary school, College, Technical and Vocational	Nos	1230	2021	UDD, 2021	Ministry of Education (MoEDU) Secretary, MoEDU, email: Secretary@moedu.gov.bd Phone: 9576679 Ministry of Primary and Mass Education (MoPME) Secretary, MoPME, email:	Directorate of Secondary and Higher Education (DSHE) Director General, DSHE, email: dg@dshe.gov.bd, Phone: 9553542 & BANBEIS Director General, BANBEIS, email: dg@banbeis.gov.bd,		Standing figure until new railway is built Update figure	

Appendix

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
				institutes)					scy@mopme.gov.bd Phone: +88-02-55100484 9576679	phone: 02-9665457			
			45	Density of roads in PK Region	Km roads per 100 Km2	22.13	2022	RHD & LGED 2022	Ministry of Road Transport and Bridges Secretary, Road, Transport and Highways Division, email: secretary@rthd.gov.bd, phone: 02-9511122	Road, Transport and Highways Division Secretary, Road, Transport and Highways Division, email: secretary@rthd.gov.bd, phone: 02-9511122	Roads and Highways Division Deputy Secretary, Estate Branch, Roads and Highways Division, Email: dsestate@rthd.gov.bd, Mobile: 01716442348	Standing indicator – only changes when a new road is built	
	16	Optimize the existing and future physical footprint of transport services (rail, road, air, waterways)	46	Extent of railways in PK Region	Km	214	2022	BR, 2022	Ministry of Railways (MoR) Secretary, Ministry of Railways, email: secretary@mor.gov.bd, phone: 9578199	Ministry of Railways (MoR) Secretary, Ministry of Railways, email: secretary@mor.gov.bd, phone: 9578199	Addl. Director General (Infra), Bangladesh Railway, Email: adgi@railway.gov.bd, Mobile: 01711505301	Standing figure until new railway is built Update figure annually	
			47	Ships carrying coal handled at Payra Port	Nos	102	2022 9	PPA website	MoS	Traffic Department, Payra Port Authority			
			48	Amount of Coal handled at Payra Port	Metric Ton	28,12,669	2022	PPA website	MoS	Traffic Department, Payra Port Authority			
			49	Other Commercial Cargo Ships handled at Payra Port	Nos	19	2022	PPA website	MoS	Traffic Department, Payra Port Authority			
			50	Other Commercial Cargo Handled	Metric Ton	210,387	2022	PPA website	MoS	Traffic Department, Payra Port Authority			

9 Data available up to December 31, 2022

Source: PKCP Project, UDD, 2022

Appendix

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
				at Payra Port									
			51	Domestic Lighterage/Bulkhead ships handled at Payra Port	Nos	825	2022	PPA website	MoS	Traffic Department, Payra Port Authority			
			52	Domestic Lighterafe/Bulkhead cargo handled at Payra Port	Metric Ton	980,909	2022	PPA website	MoS	Traffic Department, Payra Port Authority			
Urban area expansion	17	Sustainable and eco-friendly development of urban area	53	Existing urban area (Paurashava)	%	1.38	2023	Payra Kuakata Comprehensive Plan Focusing on Eco-Tourism	Ministry of Housing and Public Works Ministry of Housing and Public Works Secretary, Ministry of Housing & Public Works secretary@mohpw.gov.bd, phone: 55100465 (office)	UDD Director, Urban Development Directorate director.UDD1965@gmail.com Phone: 223382728 (Office)		Standing figure until new plans are implemented.	
Agriculture	18	Increase agricultural productivity	54	Milk demand	M M Ton/yr	0.21	2018	DLS, 2018	Ministry of Fisheries And livestock (MoFL) Secretary, MoFL, email: secretary@mofl.gov.bd, phone: 9545700	Department of Livestock Services (DLS), Dhaka DG, DLS	Upazila Livestock Officer (ULO), of respective Upazila	Annually	
			55	Meat demand	M M Ton/yr	0.20	2018	DLS, 2018	Ministry of Fisheries And livestock (MoFL) Secretary, MoFL, email: secretary@mofl.gov.bd, phone: 9545700	Department of Livestock Services (DLS), Dhaka DG, DLS	Upazila Livestock Officer (ULO), of respective Upazila	Annually	
			56	Rice and Non-Rice crop production	Million Metric (MM Ton)/yr	Rice – 451,578 MT; Non-rice – 352,202	2021-22	DAE field report and CEGIS calculation based on	Ministry of Agriculture (MoA) Secretary, MoA, email: secretary@moa.gov.bd,	Department of Agriculture Extension (DAE) Director General, DAE	Deputy Director of Department of Agricultural Extension (DDDAE) of Barguna and Patuakhali District	Annually	

Appendix

Themes	Objective		Indicator		Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
					MT		field survey, 2022	phone: 9540100	email: dg@dae.gov.bd,	email: dg@dae.gov.bd, Phone: 55028369 Upazila Agriculture Officer (UAO) of the respective upazila		
Fisheries	19	Promoting inland fisheries	57	Fish production in PKCP Region	MT/yr	0.81	2018	DoF, 2019	Ministry of Fisheries and Livestock (MoFL) Secretary, MoFL, email: secretary@mofl.gov.bd, Phone: 9545700	Department of Fisheries (DoF) 1. Director General, DoF email: dg@fisheries.gov.bd, Phone: 9562861	District Fisheries Officer (DFO) Director, Finance & Planning/ PSO(FRSS), DoF Email: ddfinance@fisheries.gov.bd, Mobile: 01712581599	Annually	
		Promoting inland fisheries	58	Fish production in PKCP Region	MT/yr	0.81	2018	DoF, 2019	Ministry of Fisheries and Livestock (MoFL) Secretary, MoFL, email: secretary@mofl.gov.bd, Phone: 9545700	Department of Fisheries (DoF) 1. Director General, DoF email: dg@fisheries.gov.bd, Phone: 9562861	District Fisheries Officer (DFO) Director, Finance & Planning/ PSO(FRSS), DoF Email: ddfinance@fisheries.gov.bd, Mobile: 01712581599	Annually	
Water Resources	20	Increase dry season freshwater flow in rivers	59	Average daily dry season (Jan-May) discharge on Gorai at Railway Bridge	Cumec	84	1997 - 2019	BWDB	MoWR	Bangladesh Water Development Board Director General dg@bwdb.gov.bd, dg.bwdb.bd@gmail.com Phone: 01318234567	Bangladesh Water Development Board (relevant district office)	Daily	
		Reduce high/peak water level in Tetulia channel during monsoon	60	Average daily monsoon (Jul-Aug-Sept) WL in Tetulia Channel	mPWD	2.75	1989 - 2002	BIWTA	MoWR	Bangladesh Water Development Board Director General dg@bwdb.gov.bd,	Bangladesh Water Development Board (relevant district office)	Daily	

Appendix

Themes	Objective	Indicator	Unit	Baseline figure	Year of baseline data	Source	Concern Ministry	Institution responsible for data Gathering	Supported by	How often	Resources needed (budget, equipment, training, etc…)
	season							dg.bwdb.bd@gmail.com Phone: 01318234567			

APPENDIX-C: PROJECT TEAM

Prepared by:

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Payra Kuakata Comprehensive Plan Focusing on Eco-Tourism

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