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

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বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা

কর্তৃপক্ষ কর্তৃক প্রকাশিত

বৃহস্পতিবার, আগস্ট ২৯, ২০২৪

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

গৃহায়ন ও গণপূর্ত মন্ত্রণালয়

পরিকল্পনা শাখা-৩

প্রজ্ঞাপন

তারিখ: ০৬ ভাদ্র ১৪৩১ বঙ্গাব্দ/ ২১ আগস্ট ২০২৪ খ্রিষ্টাব্দ

নং **২৫.০০.০০০০.০৩২.১৪.০১৬.১৫(অংশ-১)/৩৬৪**—তদানিন্তন পূর্ব পাকিস্তান সরকারের ১৭ জুলাই ১৯৬৫ তারিখের ৪৬৪ নং স্মারকে গঠিত 'Urban Development Directorate' এর কার্যাবলির ২নং ক্রমিকে বর্ণিত "to prepare and co-ordinate regional plans, master plans and detailed layout and site plans for the existing as well as the new urban centres excluding the areas covered by the present town development authorities of Dhaka, Chittagong and Khulna" এর প্রদত্ত ক্ষমতাবলে গণপ্রজাতন্ত্রী বাংলাদেশ সরকার "পায়রা বন্দর নগরী ও কুয়াকাটা উপকূলীয় অঞ্চলের পরিবেশ পর্যটনভিত্তিক সমন্বিত পরিকল্পনা প্রণয়ন" শীর্ষক প্রকল্পের আওতায় মাস্টার প্ল্যান (১টি রিজিওনাল প্লান, ০৭ টি স্ট্রাকচার প্ল্যান, ০৭টি রুরাল এরিয়া প্ল্যান, ০৬টি আরবান এরিয়া প্ল্যান এবং এ্যাকশন এরিয়া প্ল্যান ফর সোনার চর এক্সক্লুসিভ টুরিস্ট জোন) প্রণয়ন সম্পন্ন করিয়াছে।

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মূল্য : টাকা ৪.০০

বিশেষ দ্রষ্টব্যঃ অনুমোদিত প্ল্যানসমূহ নগর উন্নয়ন অধিদপ্তরের প্রধান কার্যালয়, বরিশাল আঞ্চলিক অফিস, বরগুনা ও পটুয়াখালী জেলার জেলা প্রশাসকের কার্যালয় এবং সংশ্লিষ্ট উপজেলা ও পৌরসভা কার্যালয়ে জনসাধারণের পরিদর্শনের সুবিধার্থে সংরক্ষিত থাকিবে।

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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. The overarching purpose of the Structure Plan is to promote long-term, comprehensive development of the Patharghata Upazila through integrated planning and implementation involving several organizations and community participation for optimal resource utilization and poverty reduction. The planning area includes seven unions, namely Raihanpur, Nachnapara, Charduani, Kalmegha, Kakchira, Kathaltali and Patharghata Sadar. Patharghata is the only paurashava in the Upazila. The overall goal of this structure plan is to lead the development or redevelopment of Patharghata Upazila in order to enhance the residents' socioeconomic position by following the guidelines laid out in the regional plan.

This report provides overall process of preparing the structure plan keeping in view the guidelines and recommendations of the regional plan. Inputs from experts of different sectors have also been incorporated in the plan preparation process as described in the report. Secondary databases also provided information for relevant analyses for decision making during interim phase and survey report preparation phase. In depth analyses and findings have been presented in several working paper reports. To prepare the base map and primary reference points of the plan, all the mouzas of the project area have been digitized. Databases were prepared in Geographic Information System compatible format. The entire procedure has been described in planning approaches section of this report.

In 2022, the population of Patharghata Upazila was 1,63,927 (BBS, 2011). The Structure plan report used population data for a twenty-year plan period in the future from the estimates of the cohort method for Upazila, Union, and Pourashava Area. The projected figure of the population is 2,18,402 for the year 2041.

Different types of thematic maps were prepared based on different types of surveys during the survey stage. Each survey has a distinct output. The outputs of survey works were presented in the form of thematic maps. The thematic maps are Digital Elevation Model (DEM), existing Land Use, Road type, cropping pattern, Salinity level in deep water, groundwater recharge area, foundation depth, etc.

Suitability analysis is a prime requirement for the preparation of the structure plan of any urban and rural area. Different types of suitability maps were prepared after analyzing the suitability of the existing features. Through this analysis, suitable areas for infrastructure, economic region, human settlement, and development potentiality were identified. Tourism suitability had been carried out for identifying tourist spots for tourist zone at Haringhata Forest and the surrounding area.

The stakeholder’s views were gathered through PRA at Upazila and Union levels for consideration in the planning decisions. Based on the analysis of survey information, critical planning issues of the Upazila have been identified. Estimates on the future growth pattern

for potential sectors have been useful in planning decisions and land use allocations following planning standards.

Structure Plan consists of a report which is a policy document with various supporting maps and an appropriate scale composite map depicting the key elements of the major strategic decisions. From the existing land use survey, it is found that 56.55% of the land is used for agricultural activity, and other mentionable land-use area are: 17.51% rural settlement, 7.62% vacant land and 6.99% forest area. Embankment, Water logging, Cyclone, flood, Communication Network among unions (mostly katcha road) and transportation problems like narrow and earthen roads, Recreational facilities, solid waste management system, Insufficient drinking water are major problems in the upazila. 14 zones has been proposed in the Structure Plan . Agricultural lands constitute about 31.17 % of the total upazila area. Road network (2.22%) includes primary, secondary and tertiary roads. Conservation Zone covers 4.96 % of land of the Upazila. Rural settlement (21.31%) encompasses rural housing structures and surrounding vacant land and vegetations- which is the third highest land use. Potential Urban area covers 0.71% of the upazila which includes densely developed area named as Core Urban Area (0.48%) area within pourashava area. Foreshore and coastal afforestation cover 3.93 % area mainly proposed near river side. Agro-fishery Zone covers 0.11 % and water bodies cover 29.32 % area that include canals and ponds. This structure plan has proposed 0.98 % land as Potential economic zone.

Moreover, the plan proposes widening of roads, reconstruction of embankments, economic zones, bridges and culverts to improve road management and connectivity with other unions and municipalities. Here, a Bridge has been proposed on Bishkhali River. Besides, 47 km water-route and 5 dockyards also has been proposed for smooth water based communication. Haringhata Forest, Bihango Island & Charkhali Island has been proposed as tourist sites in the Structure Plan. The plan identifies the extent and direction of expected urban growth incorporating the future broad functions of various strategic areas and defines a comprehensive set of sectoral policies considered necessary to achieve the vision and objectives of the overall plan. Also, regional planning guidelines are also followed in the structure plan by following policy guidelines. It is expected that this zone will facilitate the investment of public and private investors.

CHAPTER ONE: INTRODUCTION

Structure Plan of Patharghata Upazila is a comprehensive and detailed plan that has been developed to ensure sustainable and integrated development of Payra-kuakata region. The success of developing the region as a vibrant upazila depends much on good communication facilities and availability of modern amenities. Moreover, it is predicted that the Payra sea port would generate many port related new activities including huge vehicular traffic such as air, rail, road and water. This phenomenon would have both positive and negative impact on the socio-economic condition and existing land use pattern of the region. The proposed plan would guide such probable changes in the socio-economic condition and land use pattern of the Upazila . This plan will also address the adverse impact of changes generated by the Payra port.

1.1 DEFINITION OF THE STRUCTURE PLAN

The term Structure Plan includes a full analysis of the existing scenarios, highlights the existing condition of different sectoral infrastructure, identification of sectoral issues and interventions, prescription of solution for each sector and setting proposal and recommendations for the future action to be taken within the mentioned period, say 20 years. This is a longer-term plan. Generally, Patharghata Structure Plan is to propose a strategic and integrated landuse 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 Patharghata 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 paths for regional plan considering functional and landuse requirements with hazard vulnerability.

To reach the objective the plan has been prepared considering existing physical feature, socio-economic scenario, transportation system, disaster risk, hydro-geology, geology, hydrology and natural resources like Forest, River, Char etc.

1.3 APPROACHES TO PLANNING

Different approaches and methodologies were adopted for the preparation of the Structure Plan. These were followed in different stages - from mobilization of the project to finalization of the plan. Collection of mouza maps and secondary documents, conduction of different surveys, application of 3D Photogrammetric technology for preparation of base-map and GIS database, consultation with stakeholders, fixation of planning standards, review of secondary information, analysis of national policies and laws and preparation of planning documents were the key activities and methodologies. Structure Plan was prepared based on the agreed planning standards and land use categories. Development proposals of Patharghata Upazila were made considering different propositions on future growth and development. The flow diagram of approaches and methodologies are given below.

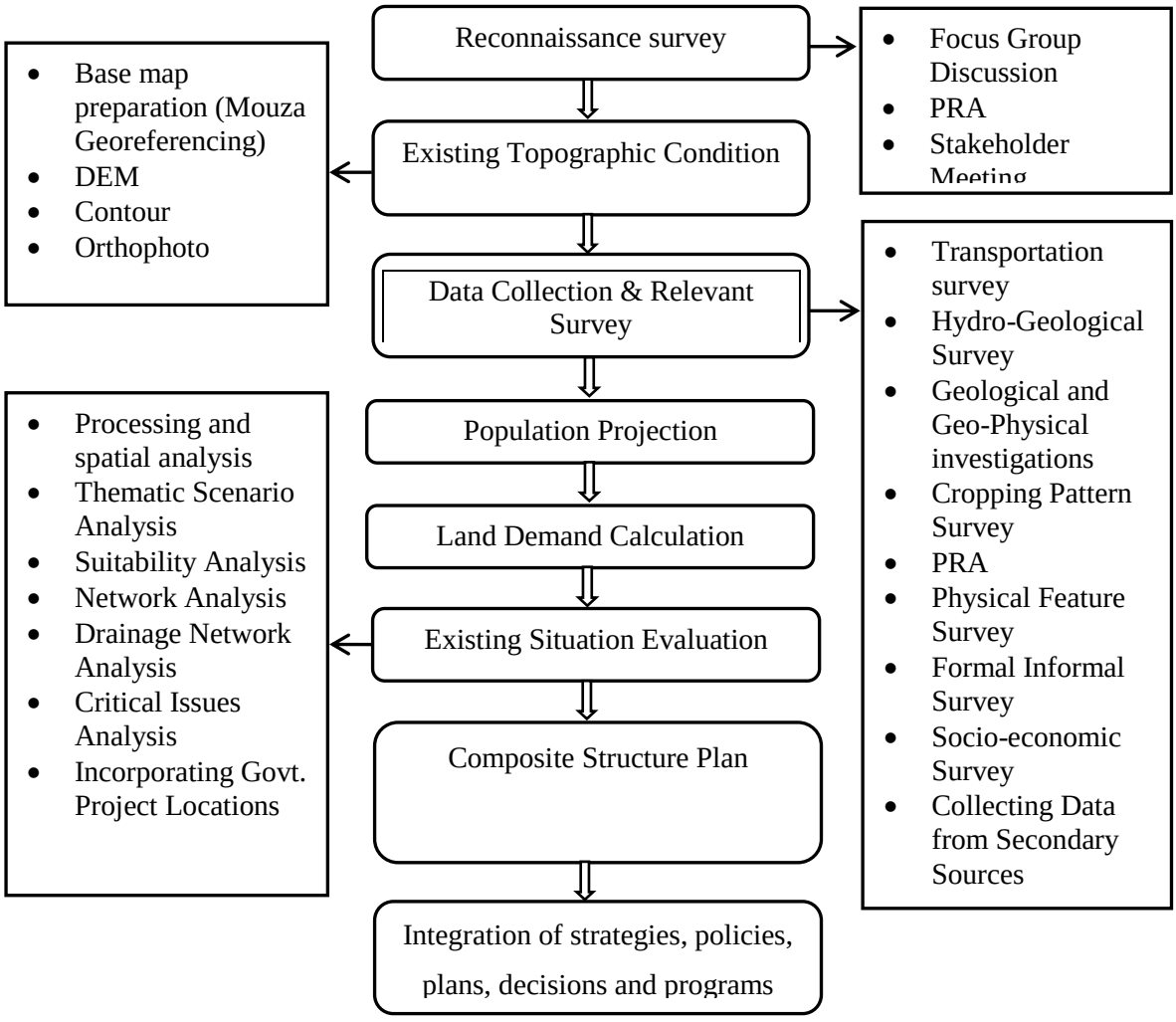


Figure-1: *Technical Methodology of Structure Plan Preparation*

1.4 COMPONENT OF THE STRUCTURE PLAN

The preparation of the structural plan involves examining both above-ground and below-ground scenarios and multiple components have also been considered. These components include physical feature survey, socio-economic survey, transportation, disaster, hydro-geology, geology and forest. The physical feature survey collects location and dimension data using RTK GPS and total station survey method. The socio-economic survey aims to analyze societal concerns and needs statistically. Transportation survey provides an idea about the existing traffic demand and available infrastructure. Disaster assessment includes disaster risk assessment and proposing possible solutions. Hydro-geological study assesses the availability and quality of water. Geology investigates the local geology to plan infrastructure sustainably. Hydro-geology studies are critical for water resource planning and development. The forest component involves identifying existing biodiversity and selecting suitable native plant species to control pollution and enhance biodiversity.

1.5 BACKGROUND OF STUDY AREA

Patharghata Upazila is a part of the district of Barguna and is located on Bangladesh's outer coast. Patharghata Upazila (Barguna district) consists of an area of 387.36 sq km (National Web Portal). located in between 22°14' and 22°58 north latitudes and in between 89°53' and 90°05' east longitudes. It is bounded by mathbaria and bamna upazilas on the north, bay of bengal on the south, barguna sadar and the bishkhali river on the east, sarankhola upazila and the Haringhata river on the west.

The Upazila consists of a B category Paurashava established in 1990 (Bangladesh National Portal, 2022), with 9 Wards, 9 mahallas, 7 unions (Char Duanti Union, Kakchira Union, Kalmegha Union, Kanthaltali Union, Nachna Para, Patharghata Union, Raihanpur Union), 42 populated Mouzas and 66 villages (BBS, 2011).

The upazila is renowned for its iconic and diverse coastline. With over 10 kilometres of coastline, 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 the coastal resources. Horinghata mangrove forest attracts domestic and international visitors keen to experience a slice of paradise. The coastline along the upazila are 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.

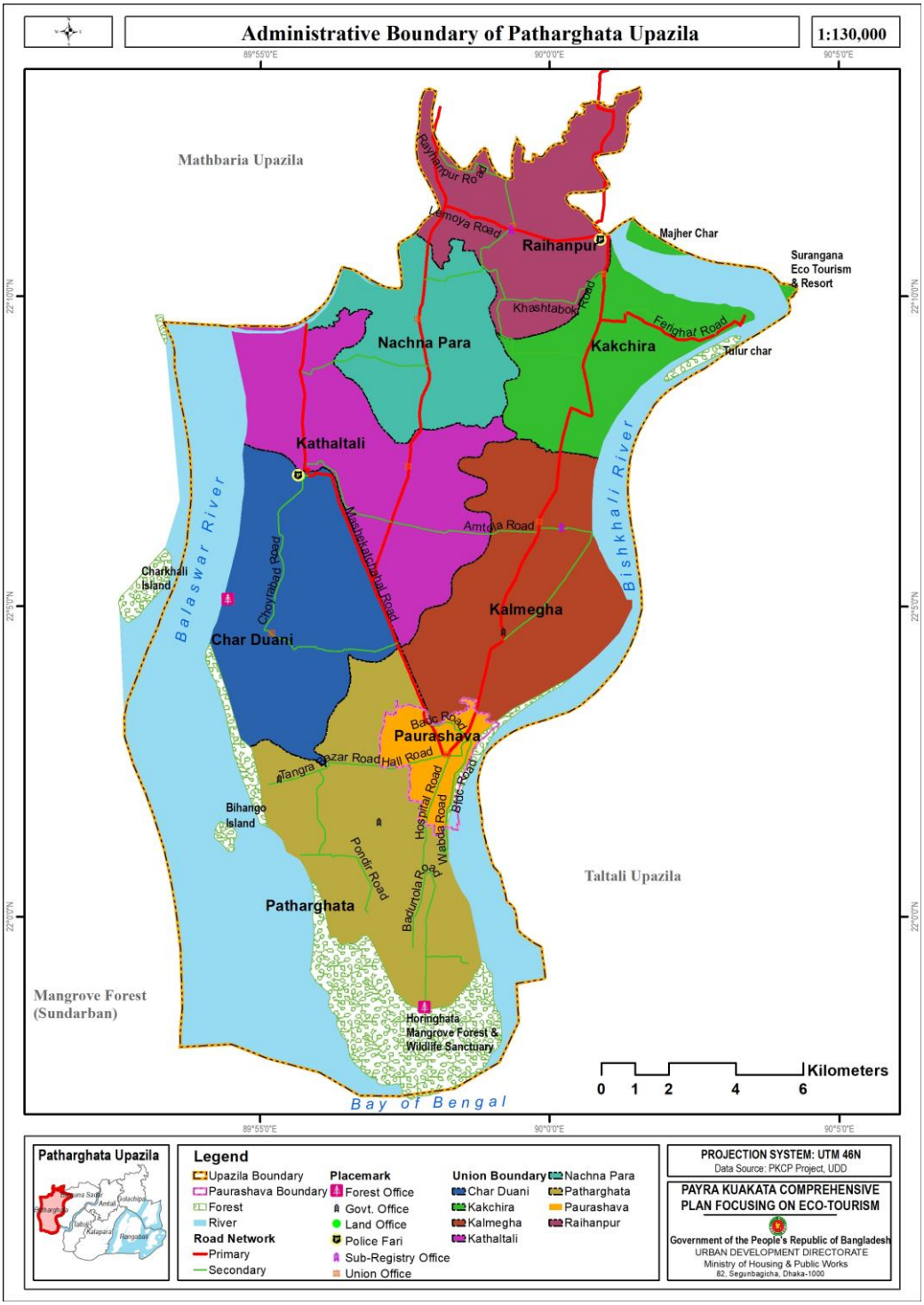


Figure-2: *Administrative Boundary of Patharghata Upazila*
Source: PKCP project, UDD, 2022

CHAPTER TWO: CRITICAL PLANNING ISSUES

In this chapter particular issues and key challenges are discussed to guide physical development of Patharghata In doing so, we combined various types of primary and secondary survey, conduct PRA, Strategic Environmental Assessment (SEA), analyse various future and ongoing projects of Govt. departments with spatial analyses of urban and rural land use plans, as well as current and future urban land cover maps derived from Geographic Information Systems and remote sensing.

2.1 DEMOGRAPHIC SETTING OF THE UPAZILA

In 2011 the total population of the Patharghata Upazila was 163,927, of which 80544 were males, 83383 were females. The sex ratio of Upazila was 97, which has remarkably decreased in 2022, the ratio is 93. Analysing the population growth history, it is explored that in 1991, the total population of the Patharghata Upazila was 134,635, of which 68,567 were males, and 66,578 were females. The sex ratio was 103, which also decreased in 1991 compared to 106 in 1981. The population growth rate of Patharghata Upazila from 2011 to 2022 is 1.11. Therefore, insight could be drawn that in the coming years Patharghata needs more employment opportunites to sustain livelihood of the residents and to support elderly dependent population.

2.2 ECA AND PLANTATION

The communities of Patharghata Upazila under Barguna coastal districts are vulnerable to different natural disasters because of their proximity to the Bay of Bengal, surrounded by Bishkhali and Boleswar River. The major hazards are flood, storm surge, cyclone, salinity intrusion, riverbank erosion, and waterlogging. The people's vulnerability to these disasters has intensified due to the dense population and poverty (Rahim et al., 2018). Moreover, some villages are connected to the Sundarbans Mangrove Forest (SMF), which is declared an 'Ecological Critical Area (ECA)' (Polin & Alam, 2020). Because of this close proximity, the people of the area are dependent on the forest which and this makes the forest as ECA. Thus, alternative livelihoods for the local people are a pressing demand. Different afforestation programs have so far been taken along the chars and river banks to provide the needs of forest resources of the local people and to protect the Sundarbans by reducing their dependency on it.

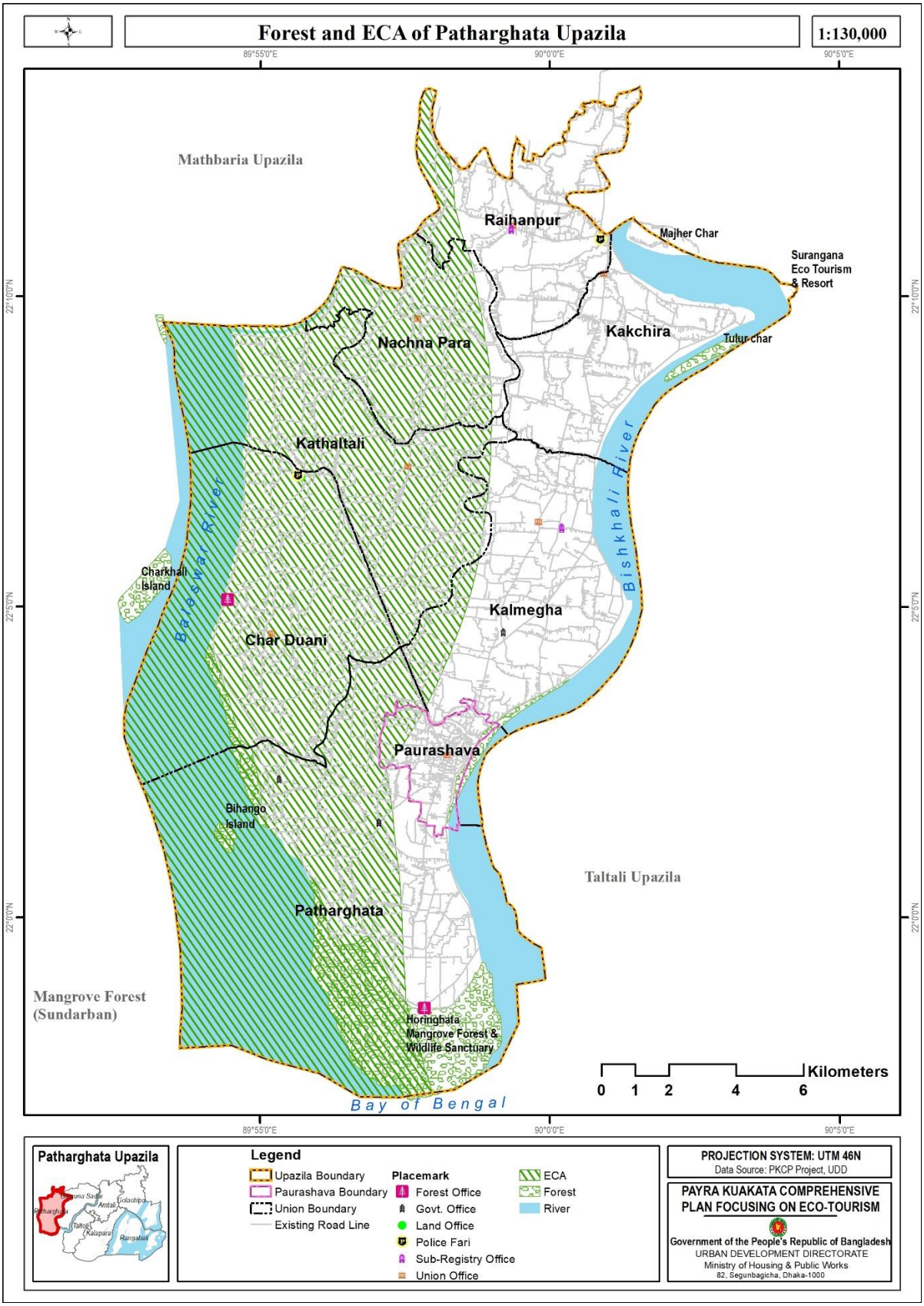


Figure-3: *Forest and ECA of Patharghata Upazila*
Source: PKCP project, UDD, 2022

2.3 HOUSING AND HOUSE BUILDING MATERIAL

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. With proper construction techniques, houses will be able to withstand storm surges, possibly increase survival rates and decrease property damage. The catastrophe is especially severe in this area because of the shape and nature of its coastline.

A typical cyclone forms in the deep sea, passing over one of the largest continental shelves along the coastal area of Bangladesh. Because of the shallow depth of the continental shelf, the energy of the cyclone is forced to come to the shore with a sea surge and is further constricted because of the funnel-shaped coastline of the northern Bay (Sadeque, 2018).

Following house construction characteristics were found:

- RCC post and metal/wooden frames are dominant in structure.
- CGI/plain metal sheets are used as wall and roofing material.
- The timber is used as door and window frames.
- Both pucca and semi-pucca plinths are found in the structure.
- Bamboo mats/ tarpaulins are used under roofs in order to mitigate the heating.
- An additional semi-outdoor space known as “Pashchati” surrounds the main core house and helps in accommodating various service-oriented functional requirements of households.

2.4 NEIGHBORHOOD CHARACTERISTICS

Neighborhood residents sourrounding patharghata upazila generally have similar incomes, as well as similar social characteristics such as education level, housing preference, occupation and life style. Patharghata Upazila and sourrounding areas are very much vulnerable to natural disasters like Cyclone.

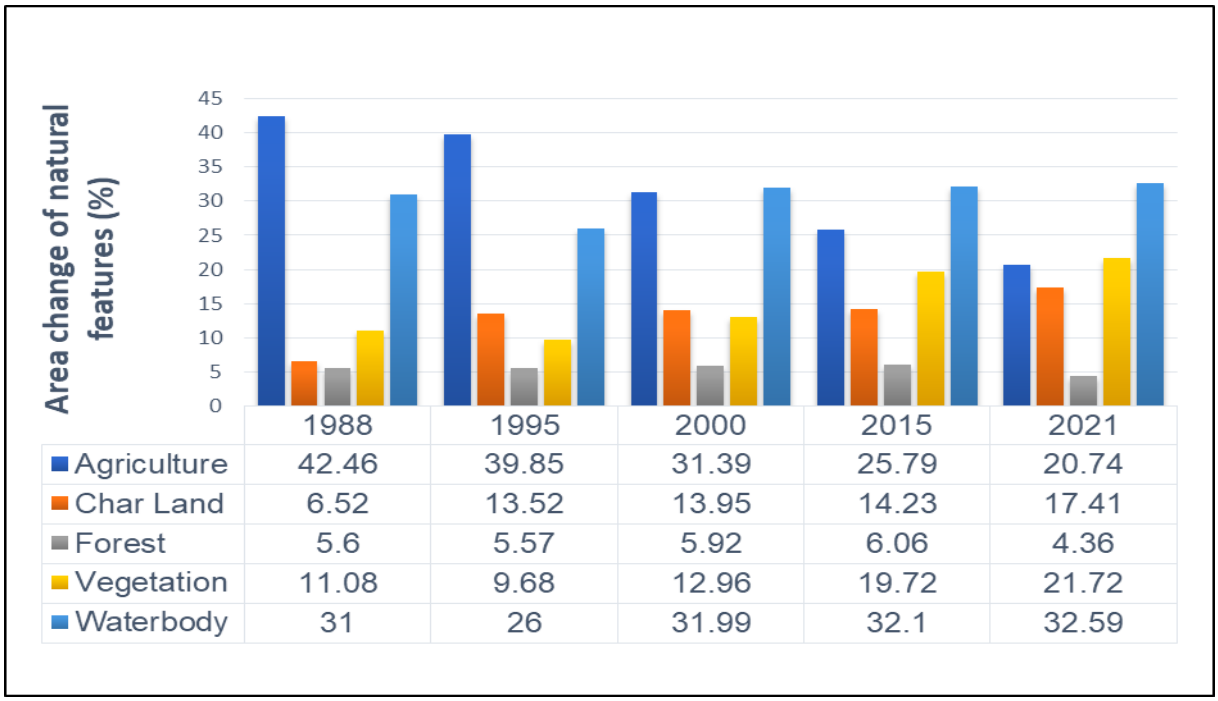
2.5 HISTORICAL SITES

During the liberation war, one of the places where the Pakistani army and the Razakars indiscriminately killed freedom fighters and innocent people in Barguna’s Patharghatais

Shingrabunia area of Nachnapara union of the upazila. On October 10, 1971, the army surrounded the Bepari house of Shingrabunia village in Manikkhali area of Patharghata, and blindfolded seven people and took them to the nearby Har canal and shot them dead. Later the bodies were buried in a pit on the bank of the canal. Soptorsi Monument is a reminder of the barbaric genocide perpetrated during the liberation war.

2.6 Land Cover Change

The study area has observed rapid changes in land use and landcover 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 Figure-5 shows land use map in 1989, 1999, 2009 and 2021. A summary the upazila-wise changes in water bodies, forests, bare land, cultivable land, and buildup areas in the study area are presented in the table respectively.



	1988	1995	2000	2015	2021
Agriculture	42.46	39.85	31.39	25.79	20.74
Char Land	6.52	13.52	13.95	14.23	17.41
Forest	5.6	5.57	5.92	6.06	4.36
Vegetation	11.08	9.68	12.96	19.72	21.72
Waterbody	31	26	31.99	32.1	32.59

Figure-4: *Area Change of natural features of Patharghata Upazila*
Source: PKCP project, UDD, 2022

It has been observed that forest cover has decreased while urban areas have expanded and agricultural land has been converted to natural vegetation in patharghata upazila.

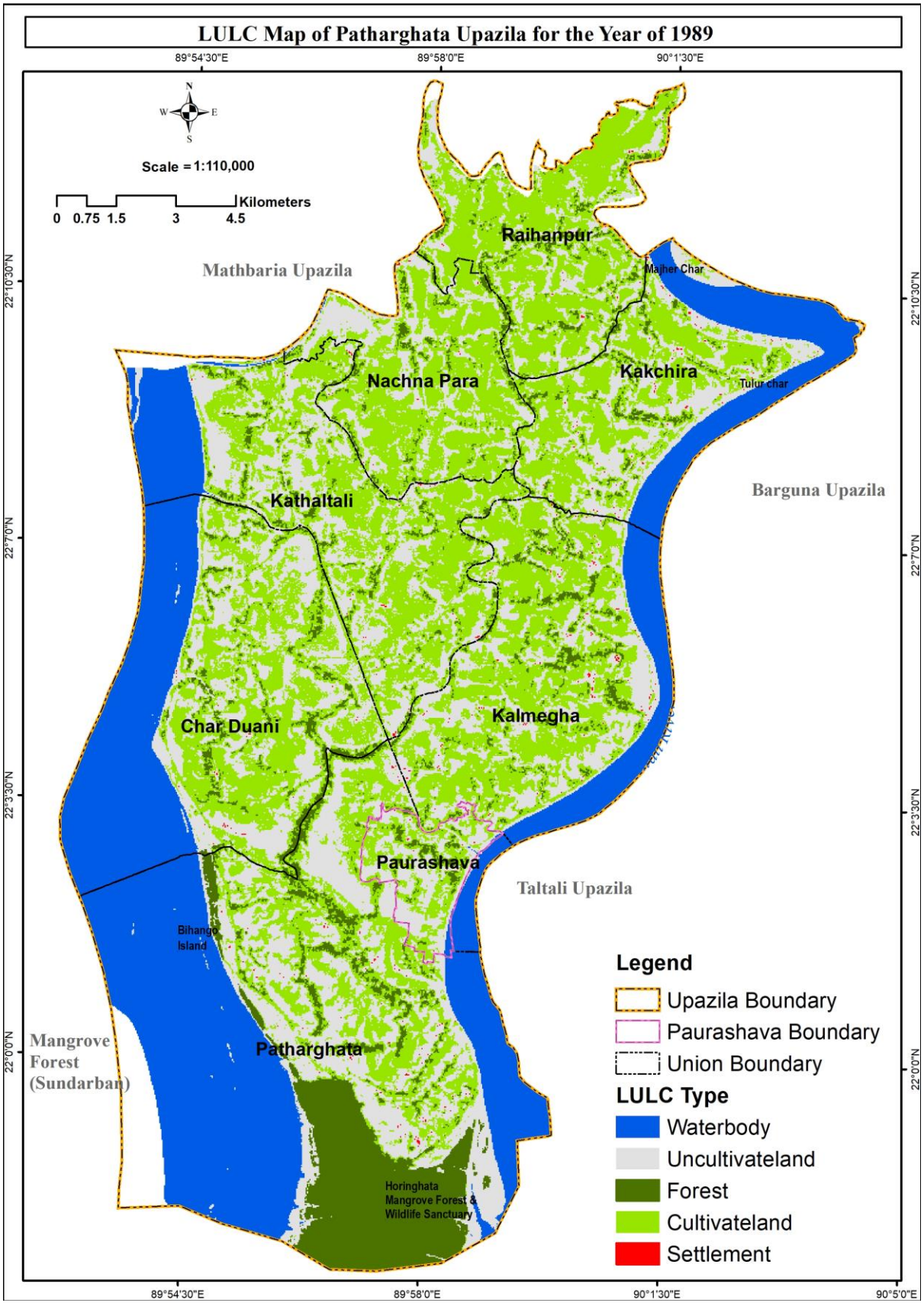


Figure-5: *LULC Map of Patharghata Upazila for the Year of 1989*
Source: PKCP Project, UDD, 2022

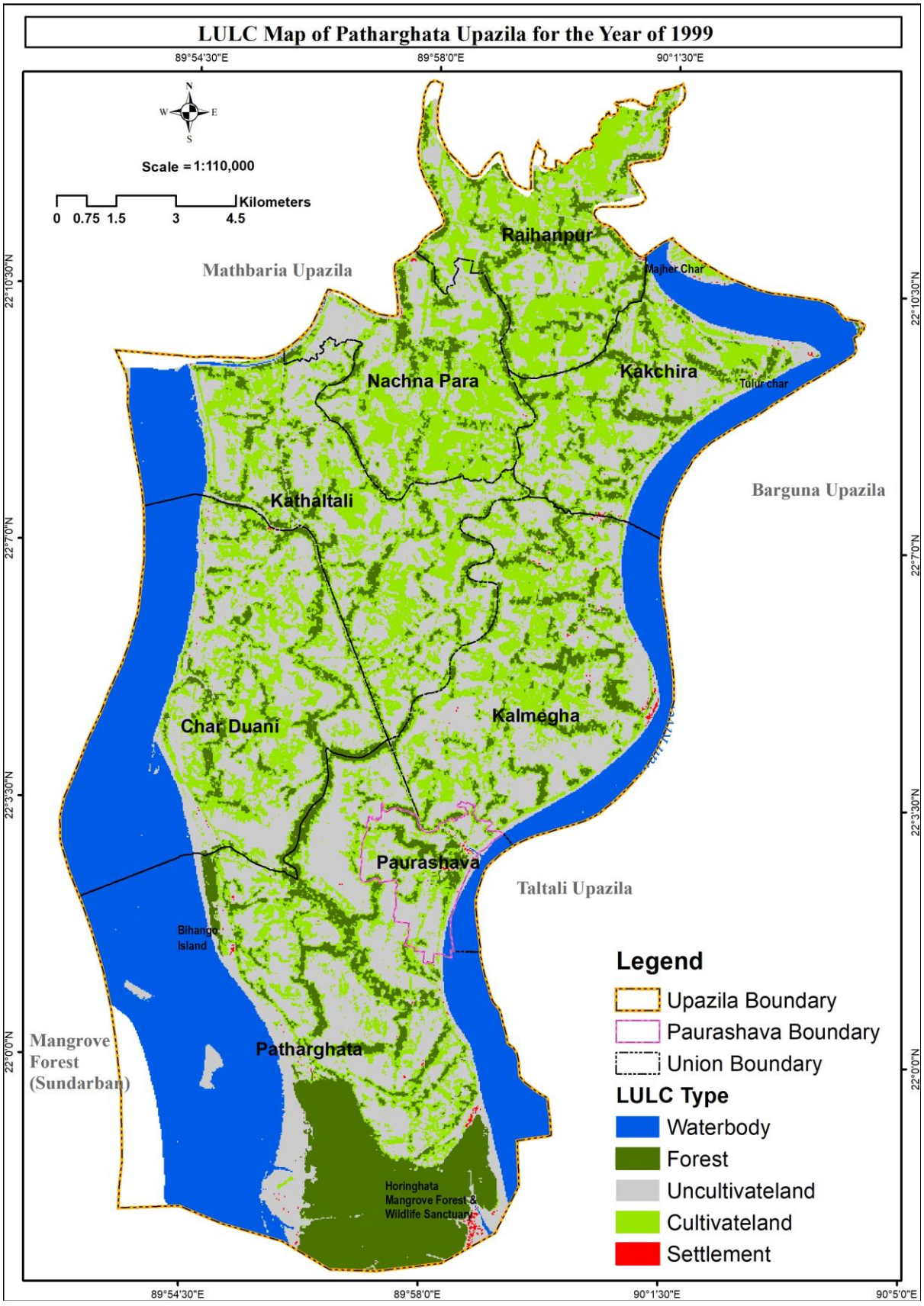


Figure-6: *LULC Map of Patharghata Upazila for the Year of 1999*
Source: PKCP Project, UDD, 2022

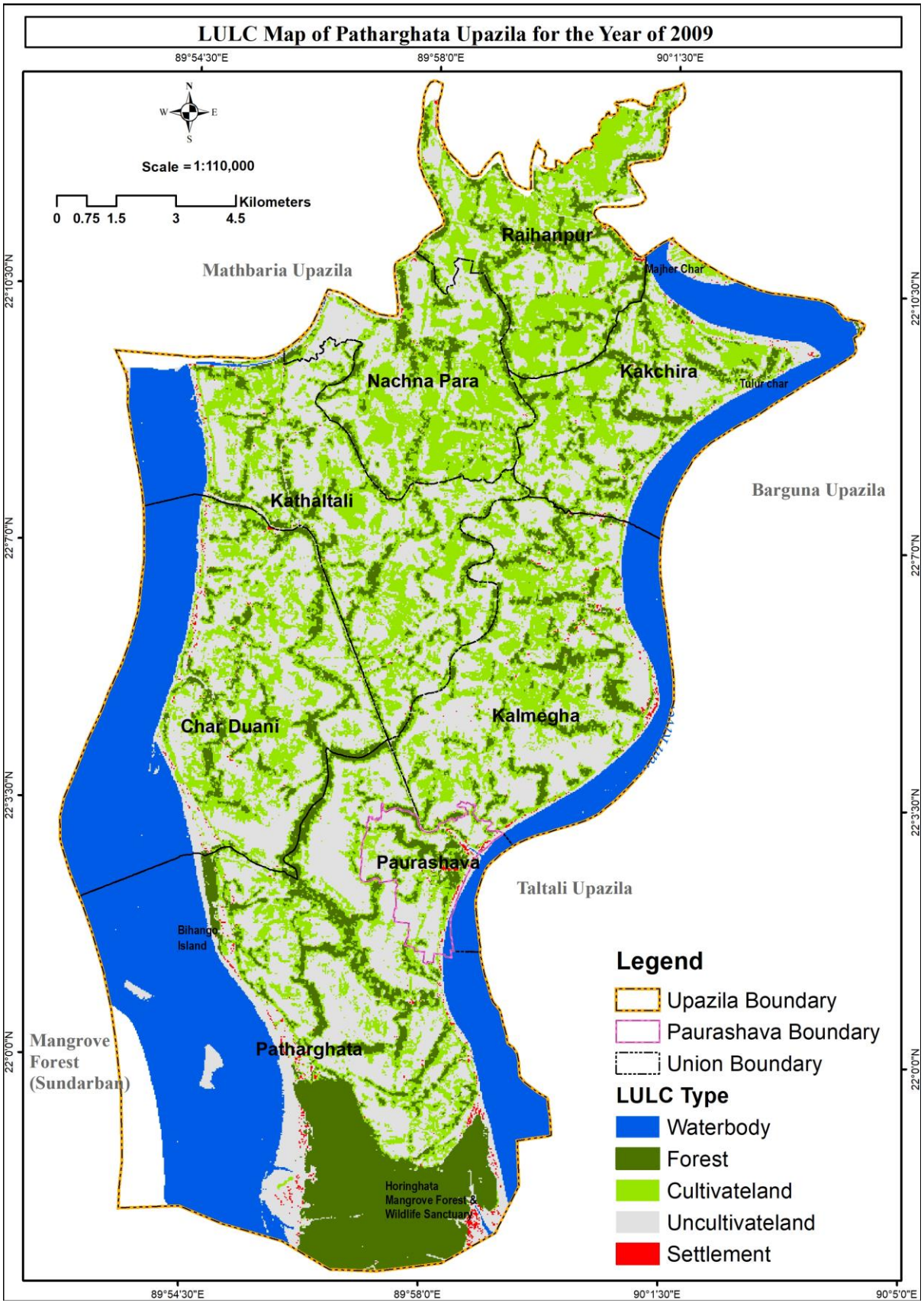


Figure-7: *LULC Map of Patharghata Upazila for the Year of 2009*
Source: PKCP Project, UDD, 2022

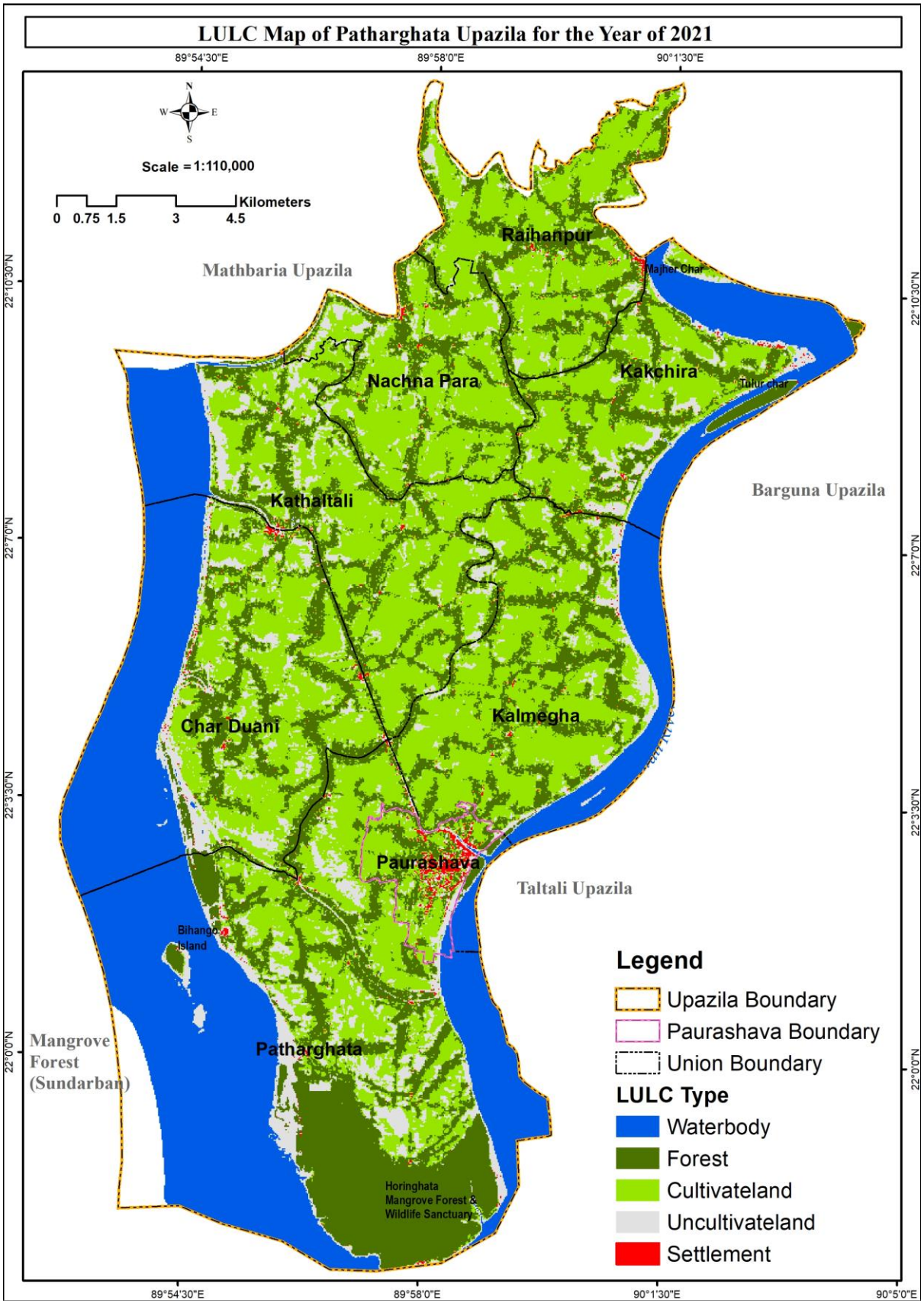


Figure-8: *LULC Map of Patharghata Upazila for the Year of 2021*
Source: PKCP Project, UDD, 2022

2.7 DISASTER AND VULNERABILITY

Patharghata Upazila in Barguna District is one of the most vulnerable coastal areas in Bangladesh. According to the INFORM sub-national risk index of 2022 Barguna district is ranked at 4th and Patuakhali is ranked at 11th according to the multi-hazard risk level within the country. The villages Padma, Tengra and Harinbaria of the Patharghata union under the Patharghata Upazila are mostly vulnerable due to different natural disasters because the villages are surrounded by the Bishkhali River, Horinghata River and Dhulashor River and for its closer location to the Bay of Bengal.

Salinity Intrusion

Analysing secondary information from DoE it is found that, for an SLR of 0.50 m, Patharghata Upazila will be affected by 1 ppt, and 5 ppt salinity and 15 ppt salinity. For an SLR of 0.62 m, Patharghata Upazila will be affected by up to 15 ppt salinity and 25 ppt salinity. For an SLR of 0.95 m, this upazila will be affected by up to 15 ppt salinity and 25 ppt salinity. Salinity ingress is a serious threat to soil and water in coastal Bangladesh. Agriculture is the worst sufferer posing a threat to food security.

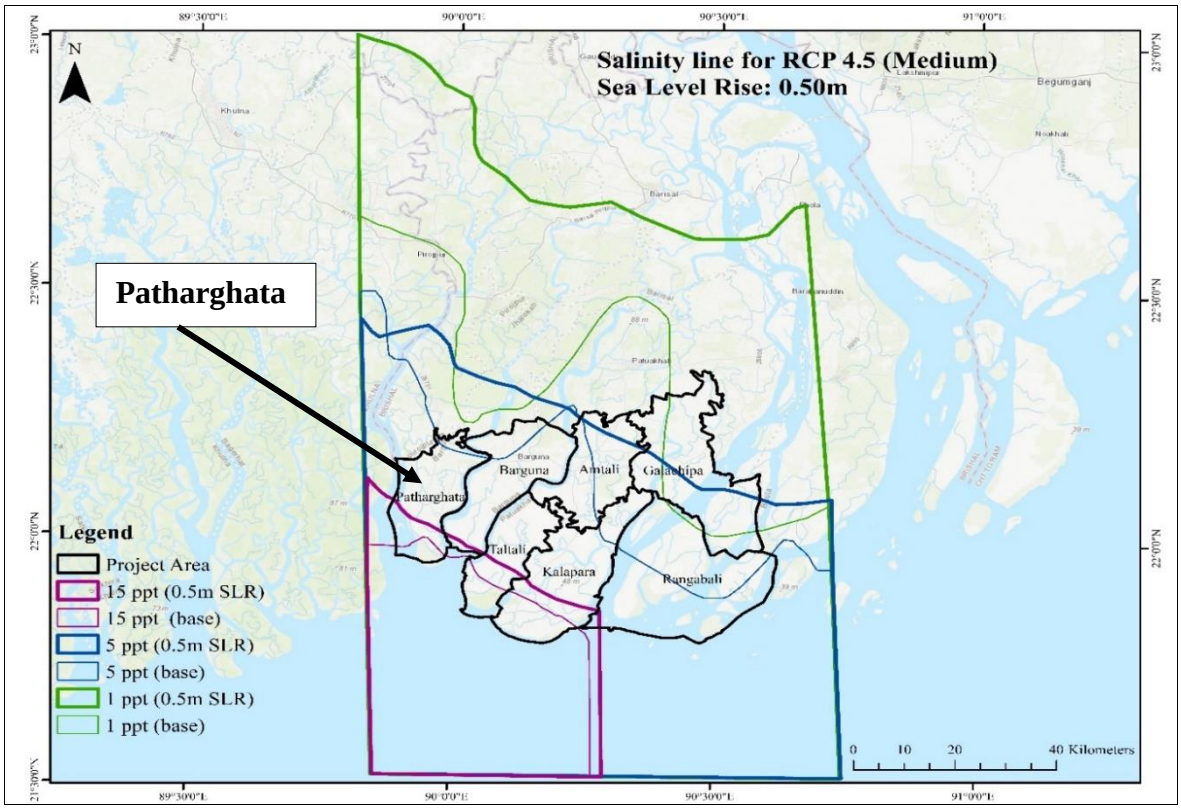


Figure-9: *Salinity Map for 0.5m SLR*
Source: PKCP Project, UDD, 2022

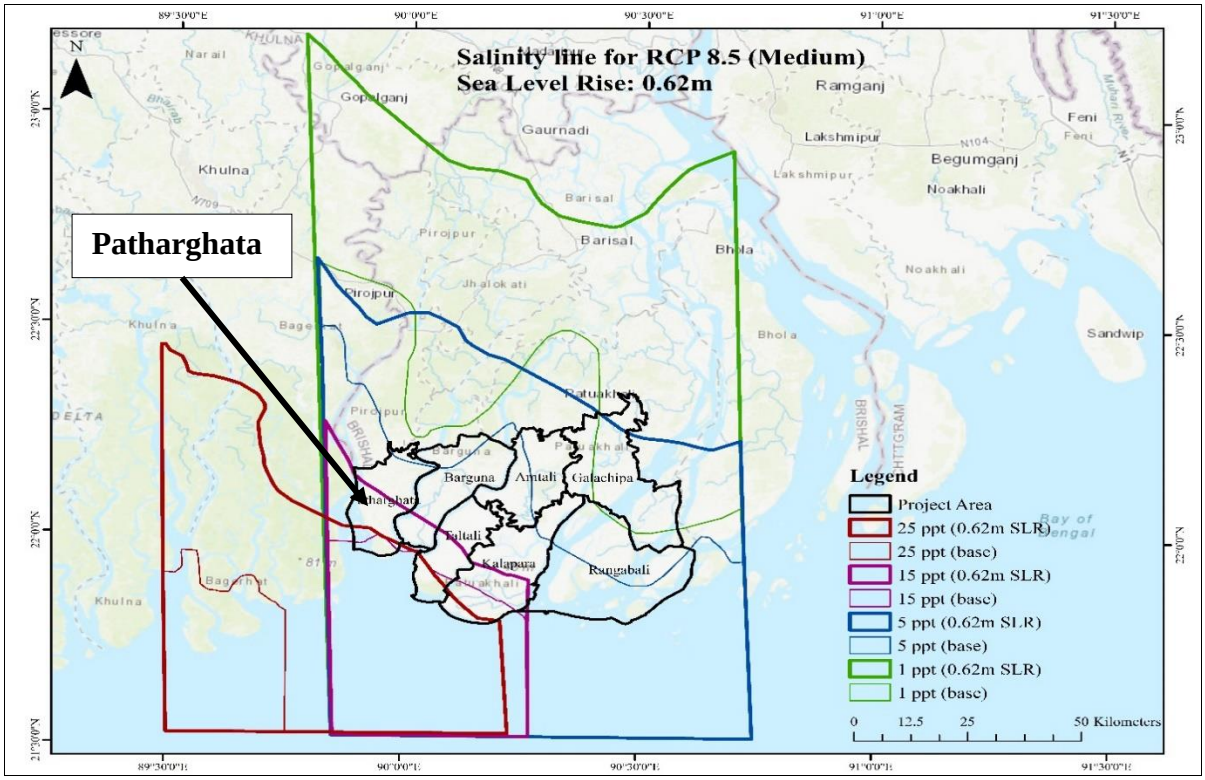


Figure-10: *Salinity Map for 0.62m SLR*
Source: PKCP Project, UDD, 2022

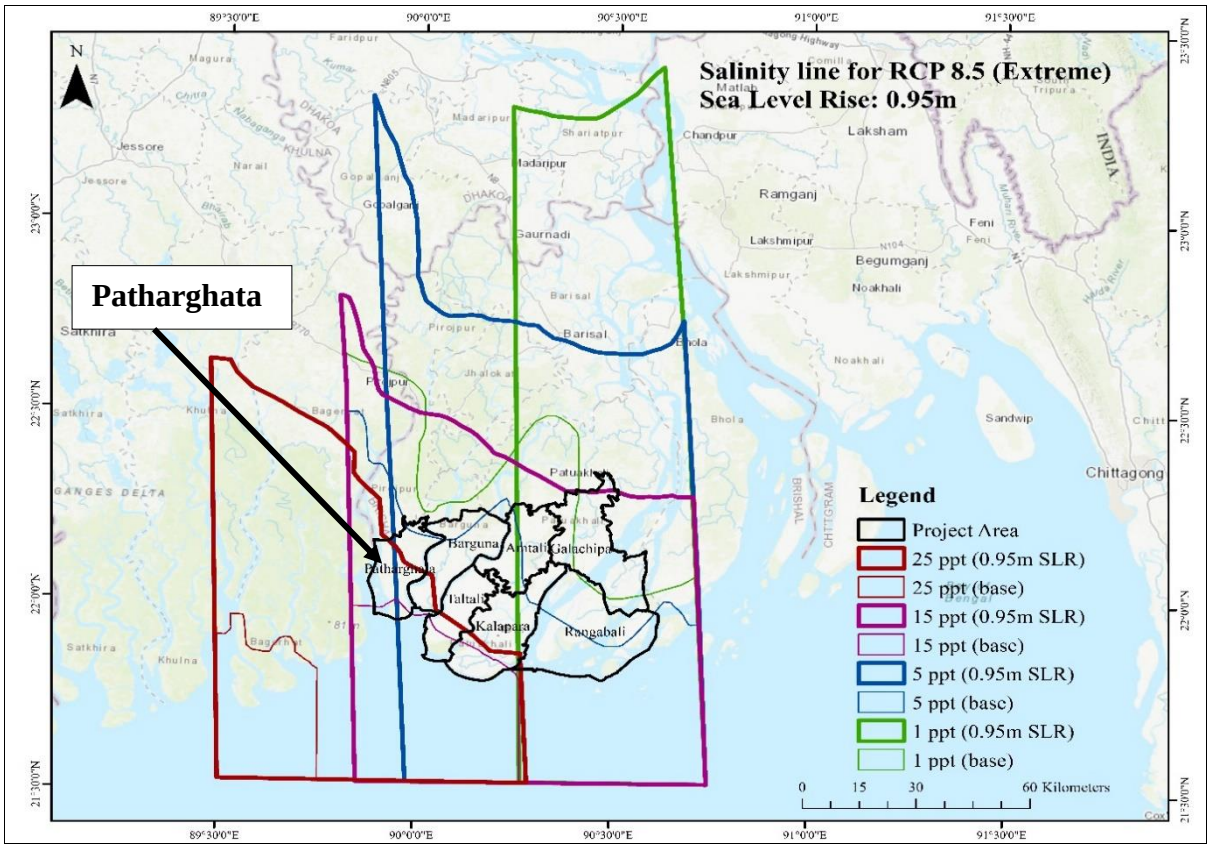


Figure-11: *Salinity Map for 0.95m SLR.*
Source: PKCP Project, UDD, 2022

Sea Level rise

Bangladesh has been experiencing a rising trend in sea level because of its geographic location and the nature of the delta. Recent estimation of sea-level rise by DoE (2020) indicated the rising trends at different locations of the coastal zone of Bangladesh. Between 1901 and 2010 sea level has risen at a rate of 1.7mm/year. From 1993 to 2010, tidal variation indicates a rise of 2.8±0.8mm/year, and it is further validated by satellite altimetry data with a rise of 3.2±0.4mm/year. Ocean warming is a global phenomenon due to climate change. The Bay of Bengal is also experiencing increasing sea surface temperature and subsequent changes in pH (Sridevi et al., 2021). A significant decreasing trend in pH is observed in the region near the Bangladesh coast during the winter and fall seasons. The sea surface temperature is showing an increasing trend during the spring and summer months.

A recent study of by DOE (2022) using coastal model simulations for the four sea level rise scenarios (0.50m SLR, 0.62m SLR and 0.95m SLR) have been analysed for potential inundation in the coastal areas of Bangladesh. Findings from the study shows that no area within the study region will be affected for up to 0.95m because of the comprehensive flood protection system. So, proper operation and maintenance of the flood protection system is an effective adaptation strategy against climate change. In addition, transfer (Insurance), land use planning, vulnerability zoning, integrated agriculture aquaculture (IAA-crop-fishery-aquaculture), salt-tolerant varieties, intensive floating agriculture, alternative livelihoods, technology and financing for potential employment sector area are some alternative adaptation strategies.

Erosion and Accretion

As Patharghata 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.

Table-1: Accretion and erosion areas between 1989 and 2021 (in sq.km)

1989-1999		1999-2009		2009-2021		1989-2021	
Accretion	**Erosion**	**Accretion**	**Erosion**	**Accretion**	**Erosion**	**Accretion**	**Erosion**
7.09	8.52	4.39	8.52	3.29	4.89	7.76	14.43

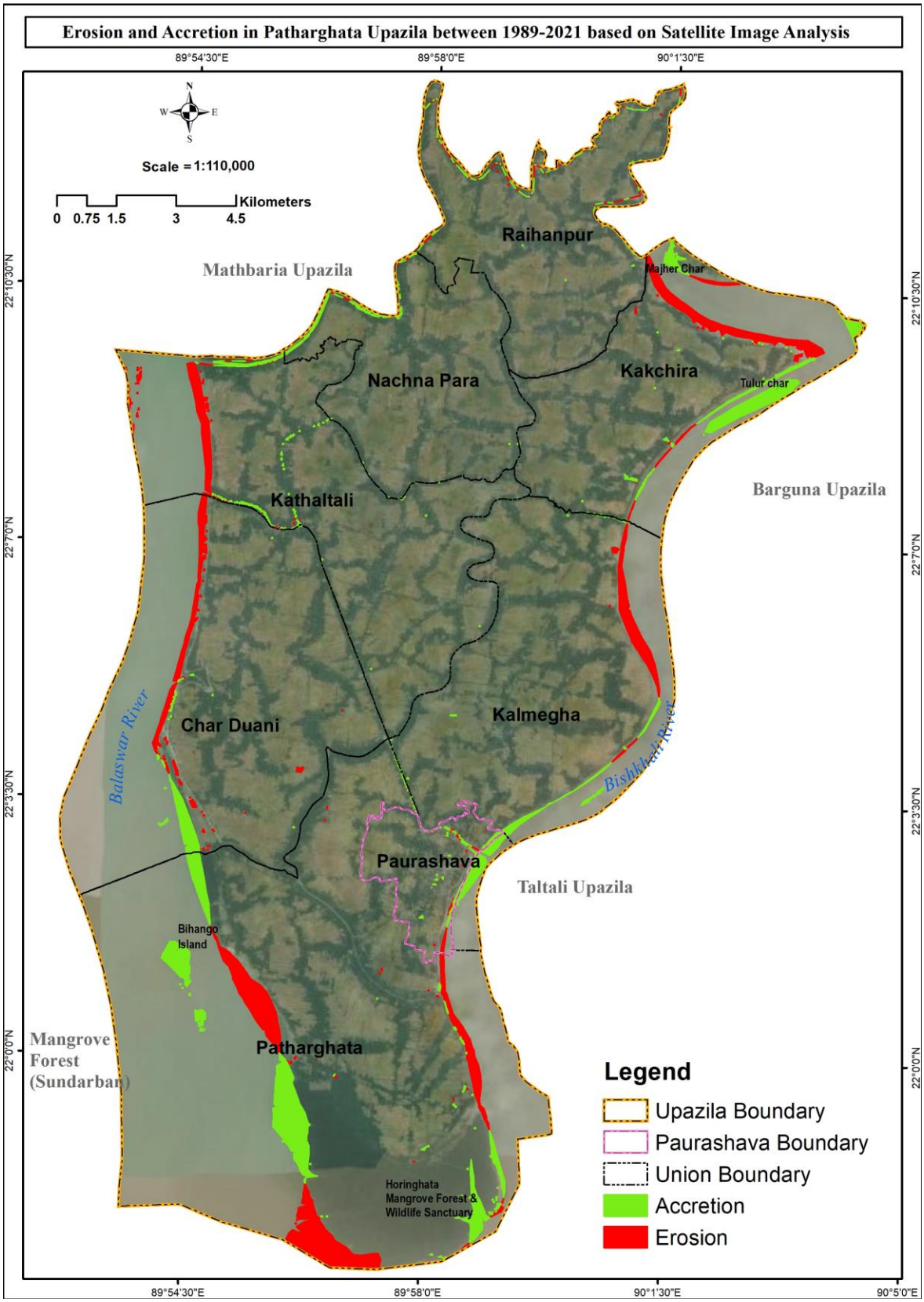


Figure-12: *Erosion and Accretion in Patharghata Upazila between 1989-2021 based on Satellite Image Analysis*

Source: PKCP Project, UDD, 2022

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.

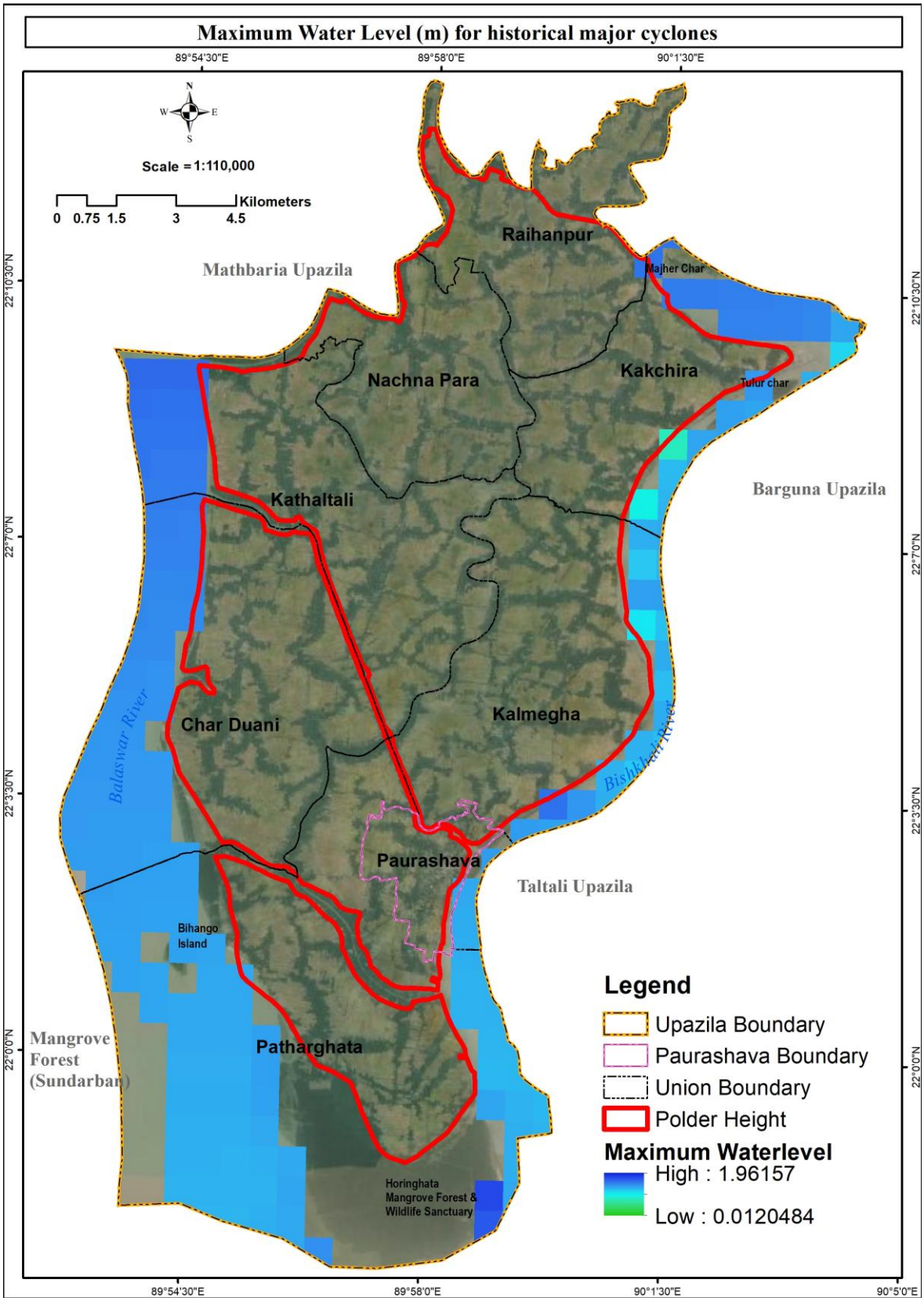


Figure-13: *Maximum Water Level (m) for historical major cyclones*
Source: PKCP Project, UDD, 2022

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-2: 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. Out of 139 polders in coastal Bangladesh, 3 are located in Patharghata Upazila. 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.

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.

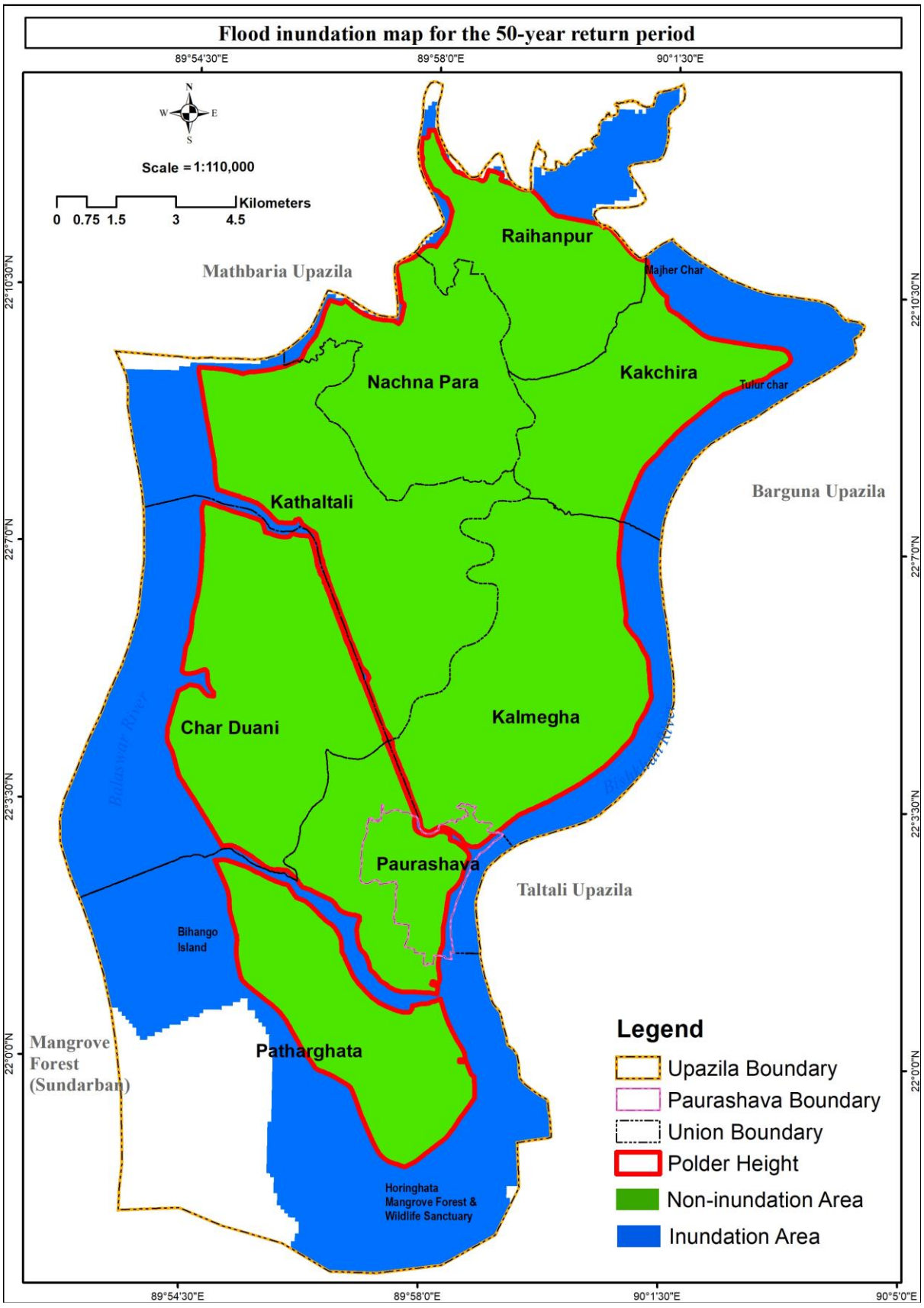


Figure-14: *Flood inundation map for the 50-year return period*
Source: PKCP Project, UDD, 2022

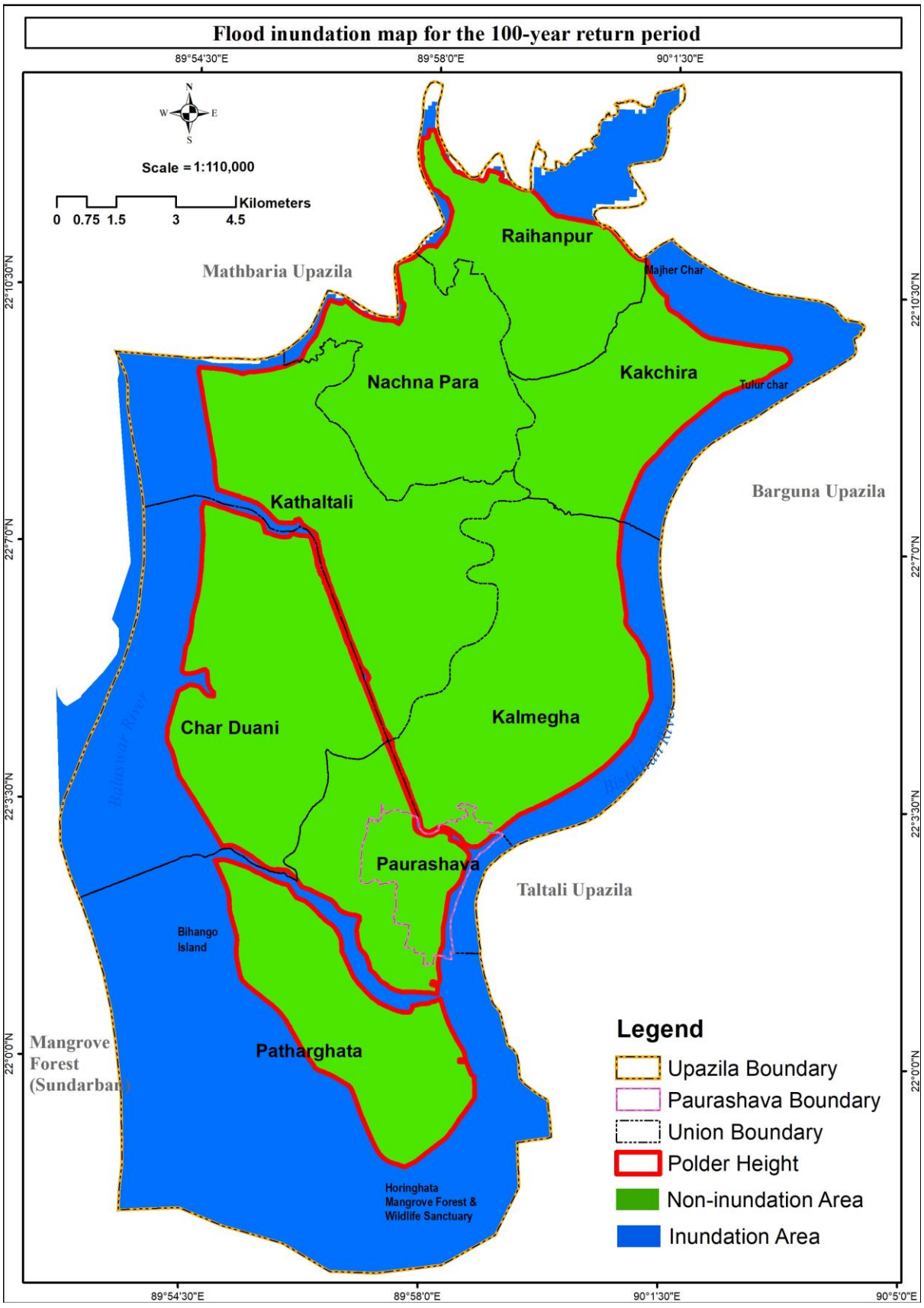


Figure-15: *Flood inundation map for the 100-year return period*
Source: PKCP Project, UDD, 2022

2.8 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-3: 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.

It is observed that most of the areas of Patharghata Upazila is moderately hazard risk prone areas. Only Patharghata Union is under high risk area. Nachna Para and Char Dunia unions are under low risk area.

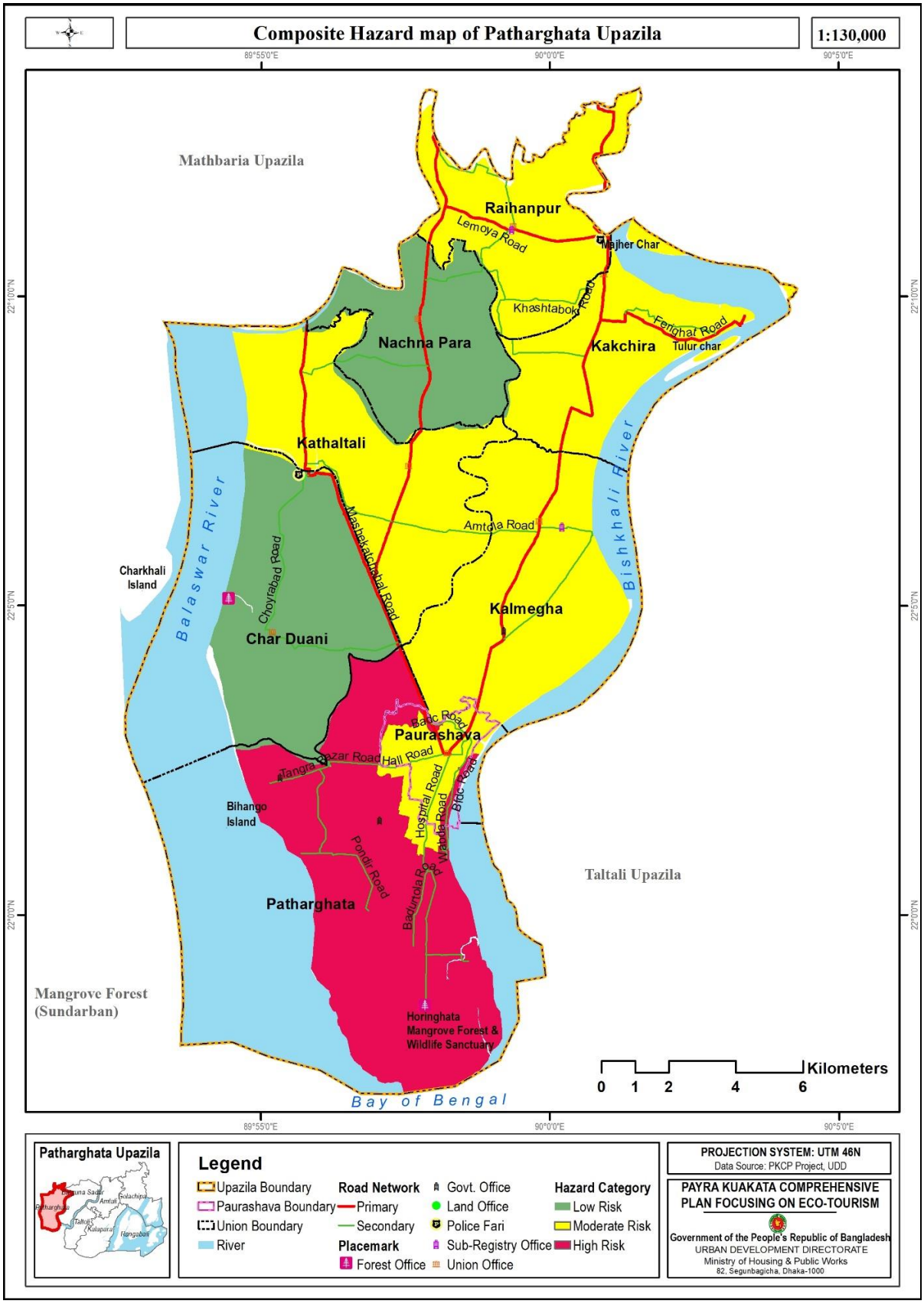


Figure-16: *Composite Hazard map of Patharghata Upazila*
Source: PKCP project, UDD, 2022

2.9 KEY FEATURES IN THIS UPAZILA

Fishing and fishing related activies are the key features in this upazila. 60.3% people are dependent on agriculture. The trade and commerce of this Upazila are mainly fisheries. Main Agricultural product in this upazila is rice, potato, vegetable, Kesari dal and mung bean. There are many fishing grounds, and in the centre of it, there are a total of 22 ice mills. There is a branch of Bangladesh Fisheries Development Corporation in this Upazila. Besides, rice trading is also conducted here. Main export product in this upazilas are rice, hilsa fish, shrimp. Kalmegha Tourist Spot, Nilima Point, Bihango Dip, Laldiya Forest, & Haringhata are key features in Patharghata Upazila.

2.10 LAND USE PATTERN

In Patharghata Upazila, major landuse is Agriculture (56.55%). Rural settlements occupy second position (17.51%) and Vegetation occupies third position (7.62%) of the category. A negligible percent (1.30%) land is used for Transportation network. Though, agricultural landuse dominates the land use of the Upazila but, after the preparation of the Master Plan, more residential development will be followed. If development proceeds according to the master plan agricultural land could be saved in the long-run.

2.11 NATURAL RESOURCES

Mineral Resources*:* the inhabitants searched for substances by digging soil in Matharkhal village of the Upazila in 1970. No mineral resources were found in the Upazila.

Forest Resources: Patharghata Upazila was originally part of the Sundarbans pargana. People started clearing forests for planting. Forests are reproduced for human needs. The forest department declared Haringhata as a reserve forest in 1966. The forest department released deer in the reserved forest in 1968. At present, deer, wild boar, monkey, forest rooster, fox, beige, guitar, and guest birds of different species live in the forest.

The study area consists about 19,000 ha of mangrove forest coverage (CEGIS Land Use Analysis, 2022). Most of the forests are lies within the intertidal area and south facing along the coastal part of the forest area of the PKCP. In last 5 years in Patuakhali and Barguna districts under Coastal Forest Division, Patuakhali total 1164.5 seedling kilometre plantation had been raised under social forestry program.

Fisheries Resources*:* Fisheries are one of the natural resources of Patharghata Upazila. The livelihood of most people of this Upazila is dependent on fishery resources. In the Patharghata Upazila, the amount of fish resources extracted from the sea is higher than that of freshwater fish. The Bangladesh Fisheries Development Corporation (BFDC) established a fishery landing centre on 19th March 1981 to support fishermen in the collection, conservation and marketing of marine fish in Patharghata Upazila. Through this centre, thousands of tons of hilsa and other fish are exported abroad and shipped within the country. Due to the coastal Upazilas, sea fish are more available here.

Livestock Resources: Due to the gradual decline of pasture land, the number of cattle in the Upazila has decreased compared to the past. As per the statistics of 2009, the livestock of the Upazila consisted of 2708 buffalo, 47103 cattle, 24245 goats, and 90 sheep. In addition, there were 48210 duck and 320150 chicken-.

2.12 NATURAL BARRIERS

Patharghata Upazila in Bangladesh is located in a vulnerable coastal area that is exposed to various natural hazards. Despite this, there are some natural barriers in place that help protect the area from these hazards. Some of these natural barriers are:

Mangrove forests: Patharghata Upazila has extensive mangrove forests (Haringhata Forest) that act as a natural barrier against tidal surges, storm surges, and other coastal hazards. These forests can absorb large amounts of water and reduce the impact of flooding.

Sand dunes: The coastal areas of Patharghata also have natural sand dunes that act as barriers against tidal surges and storm surges. These dunes can reduce the impact of flooding by absorbing and dissipating the energy of the waves.

Rivers and creeks*:* The area is crisscrossed by numerous rivers and creeks that act as natural drainage channels and help to reduce the impact of flooding. These waterways also provide a source of livelihood for the local population, through fishing and other water-related activities.

Overall, while Patharghata Upazila is vulnerable to natural hazards, the presence of these natural barriers helps to mitigate the impact of these hazards and protect the local population and their livelihoods. However, these natural barriers can be degraded by human activities

such as deforestation, pollution, and land use change, which can increase the area's vulnerability to natural hazards.

2.13 ECO-TOURISM POTENTIALITY

Patharghata Upazila in Barguna District, Bangladesh, has significant eco-tourism potential due to its rich natural resources and cultural heritage. Some of the main eco-tourism potentialities in Patharghata Upazila are:

Sundarbans and Haringhata Forest: Patharghata Upazila is located near the world-famous Sundarbans, the largest mangrove forest in the world. The Sundarbans is a UNESCO World Heritage Site and a major tourist attraction in Bangladesh, with a diverse range of flora and fauna, including the Royal Bengal Tiger, saltwater crocodiles, and various species of birds and fish.

Coastal beaches and riverbank: The coastal areas of Patharghata Upazila have some beautiful and pristine beaches, such as Ruhita beach, Bihango Island, Nilima Point which are famous to local tourist for its views of the sunrise and sunset.

Adventure tourism: Patharghata Upazila has opportunities for adventure tourism, such as trekking, hiking, and kayaking in the mangrove forests and waterways.

Overall, the eco-tourism potential of Patharghata Upazila is significant, and with proper planning and development, it can contribute to the local economy while also promoting conservation and sustainable development practices.

2.14 CRITICAL HABITAT

Patharghata Upazila is Situated on the bank of Bay of Bengal and has forest areas about 4120 acres which includes a wildlife sanctuary named Haringhata Forest. Thus, there are several wildlife habitats. Most of the Habitats such as Deer, Wild Boar, Wader Birds are marked in Patharghata Union and Char duani Union also contains some critical habitates like Resident Birds and Wader Birds. Wild Boars which are a very rare habitat is seen in the forest areas.

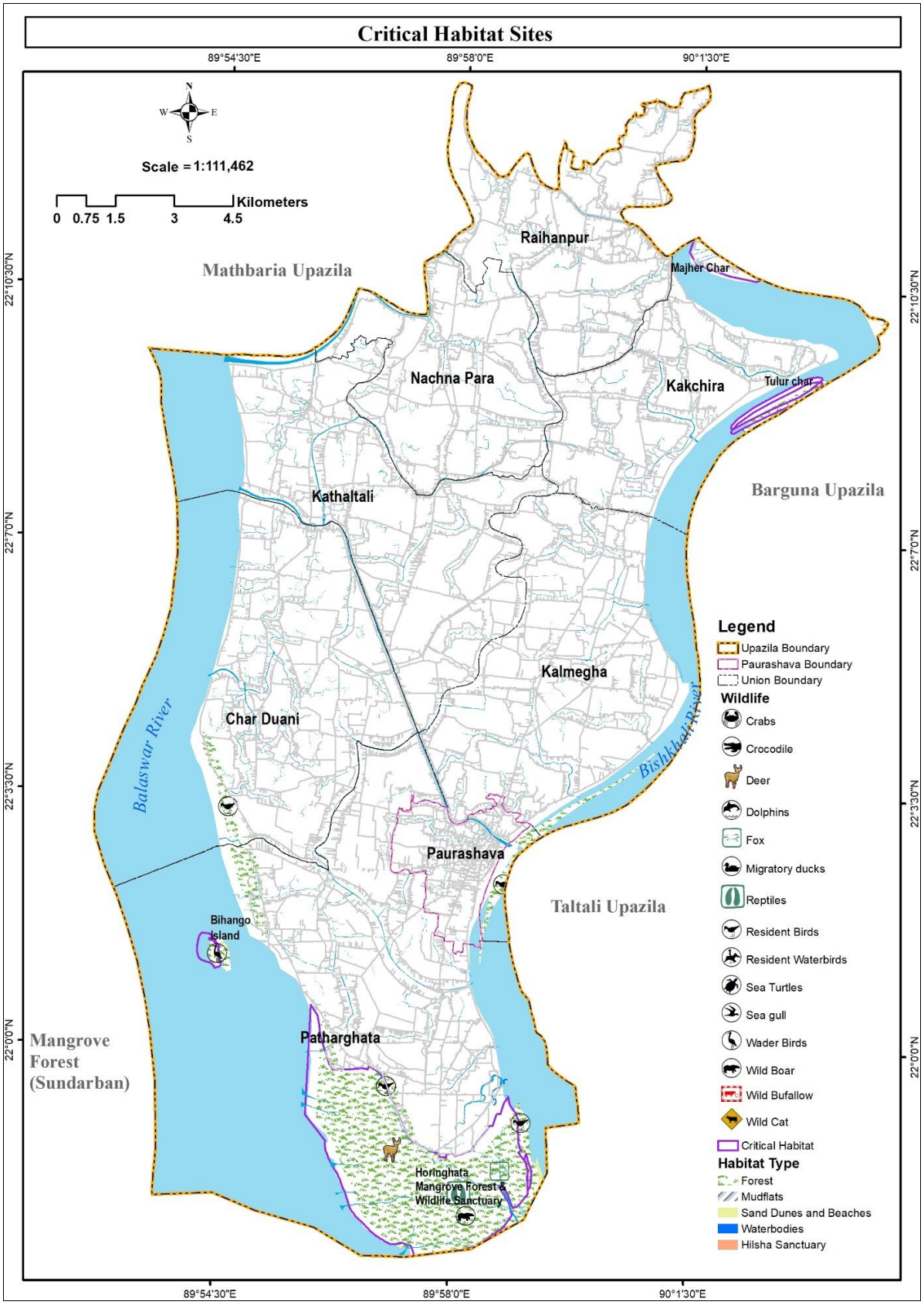


Figure-17: *Critical habitat Sites in Patharghata Upazila*
Source: PKCP project, UDD, 2022

2.15 Economic Growth of the Area

Growth Centres (GC) are those areas where maximum economic growth in a certain region is expected. For the study area, it is assumed that most economic activities in the present scenario take place in the major growth centres. Considering existing economic functions growth centers have been identified on the basis of the scores given to these functions where functions include commercial activity, service facilities and manufacturing and processing activities. Functional hierarchy has been explored considering union wise population-which means the ratio between union population and economic finctions (Figure 19). However, it is expected that lower scored GCs will gradualy gain higher score based on population's demand . Following are some gross findings on existing growth centers:

- **Catchment Area:** Growth centres serve mainly the nearest and surrounding villages and unions.
- **Road Network:** Every growth centre is connected with mainly Upazila or union roads. Some GCs are accessible via waterways. Some other village roads are connected with the prominent access road. These connected roads ease the accessibility to other areas.
- **Road Condition:** Most of the road conditions are so bad that it becomes risky for motorized vehicles to move on the roads. Pavement depleted at many points with a lot of holes and shattered. Most of the roads are Katcha and Brick soling roads, which are not in good condition. During a flood, the road goes under water and becomes muddy. Roads are also narrow. The condition of the culvert is also miserable. Condition of launch ghat is not also good.
- **Traffic Congestion:** Traffic congestion is noticeable mainly on typical hat days. Most business activities are done in hat day/days. Goods loading and unloading occur on that day, and many people come for different purposes on the hat day, so the growth centre becomes crowded on that day. The volume of vehicles also becomes high. So traffic congestion occurs on typical hat days rather than on other days of the week. On-street parking encroaches the road, which leads to traffic jams.
- **Parking Facility:** There is no parking facility in the growth centres. Vehicles are parked on the street. There are some bus depots where people can access the growth centre by bus. There are also some ghats for goods loading and unloading, especially fish products.

- **Mode of Travel:** The major modes of travel are motorbike, tomtom, easy bike, auto-rickshaw, three-wheeler, Mahindra, cycle-rickshaw, bicycle, borak, passenger pickup, tempo, bus etc. In the waterway, trawler, boat and launch areas are available to travel.

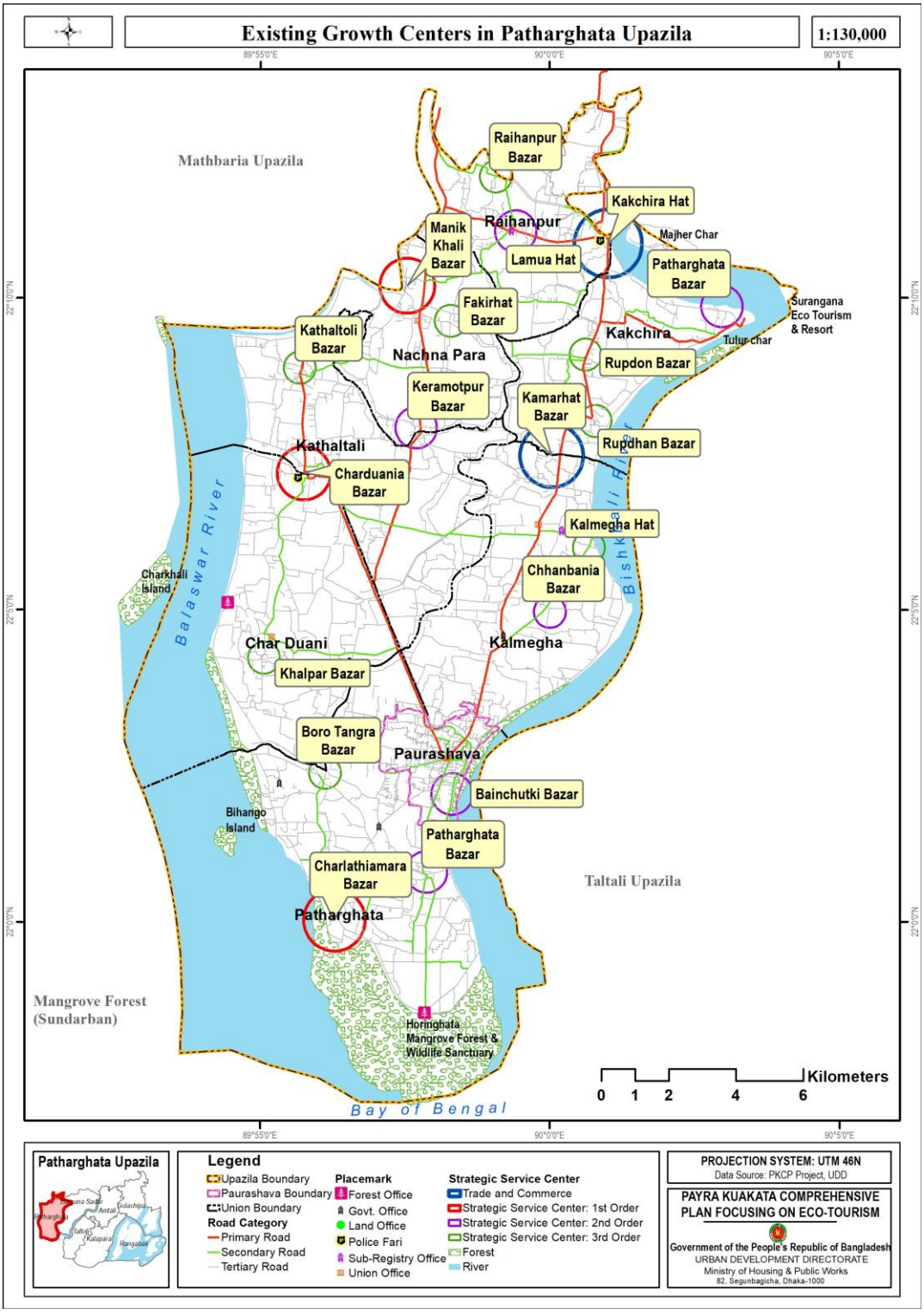


Figure-18: *Existing growth centers in Patharghata Upazila*
Source: PKCP project, UDD, 2022

2.16 CROPPING PATTERN

The economy of the Patharghata Upazila is dominated by agricultural activities. Most the households are engaged in farming activities that produce varieties of crops, namely local and HYV of rice, wheat, vegetables, spices, cash crops, pulses and others.

Figure-19: *Cropping pattern map of patharghata Upazila*
Source: PKCP project, UDD, 2022

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 41 percent of total agri land are double cropped, 12.13 percentage are triple cropped, and 3.24 percent are single cropped land. Table 4 Presents cropping pattern of Patharghata.

Table-1: Cropping Pattern of Patharghata Upazila

Cropping pattern	Percentage
Single cropped	3.42
Double cropped	41
Tripple cropped	12.13
Other Landuse	43.45

Source: PKCP project, UDD, 2022

2.17 Language and Culture

The geography and geographical location of the Upazila have have an influence on the language and culture of the people of this Upazila. Cultural events are are organised in Patharghata Upazila on the basis of seasonal events such as Nowkabaich (boat recessing), Baishakhi Mela, Pausch Sanchini, Maharram Mela etc

2.18 Water, Sanitation and Hygiene

From a physical feature survey, it is found that 76.48 percent of toilets are in average condition, 18.9 percent are in poor condition, and only 4.6 percent are in good condition. This scenario clearly illustrates that the sanitation facility is low in quality.

Based on walking distance of a household to a tube-well, it is spatially calculated that only 73.47 per cent of a household has somewhat access to a quality drinking water source while only 5.45 percent has easy accessibility to such a source.

Easy accessibility to a water source: drinking water from an improved water source that is accessible on premises, available when needed: 5.45%

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: 73.47%

Limited accessibility to a water source: drinking water from an improved source for which collection time exceeds 30 minutes for a roundtrip, including queuing: 21.07%

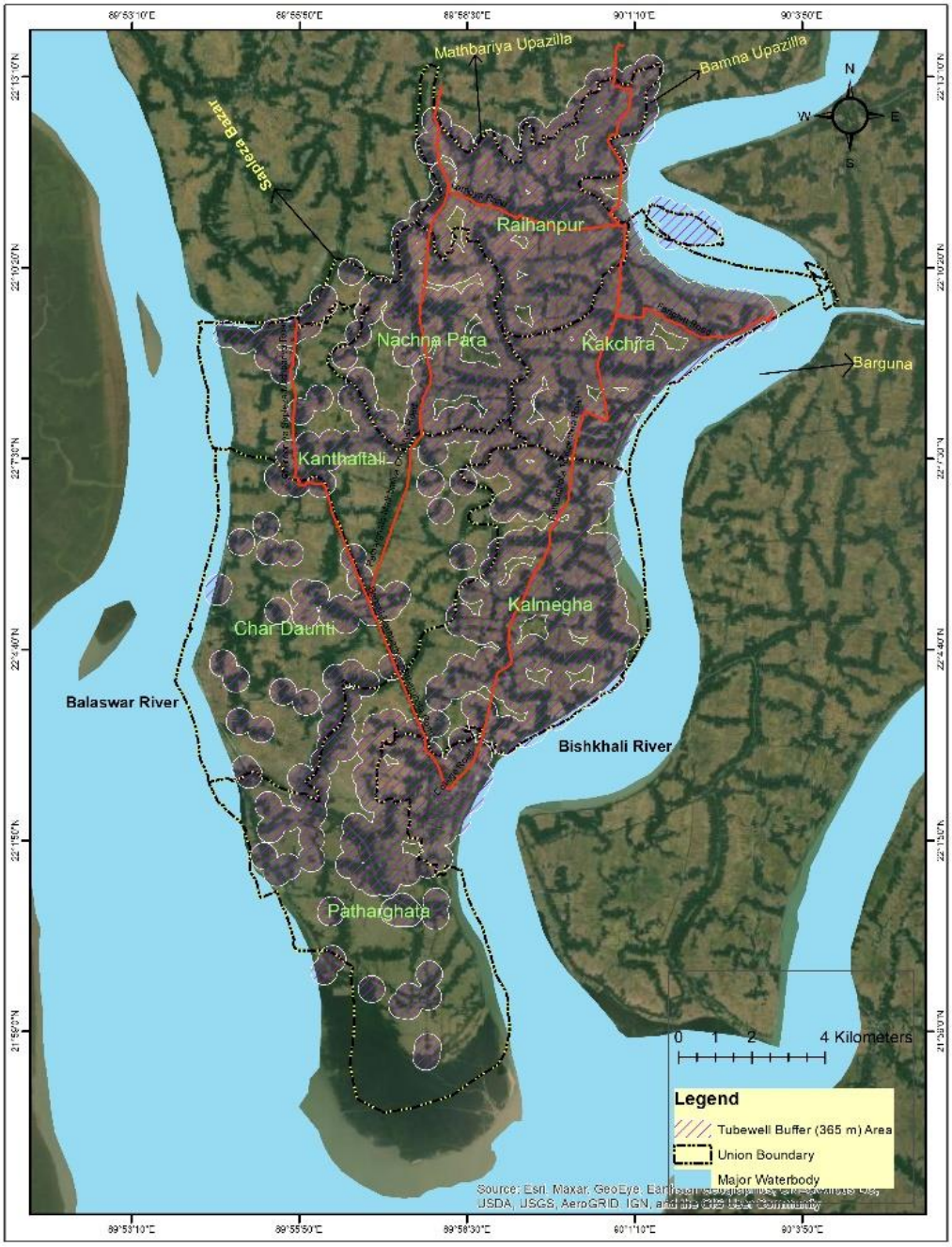


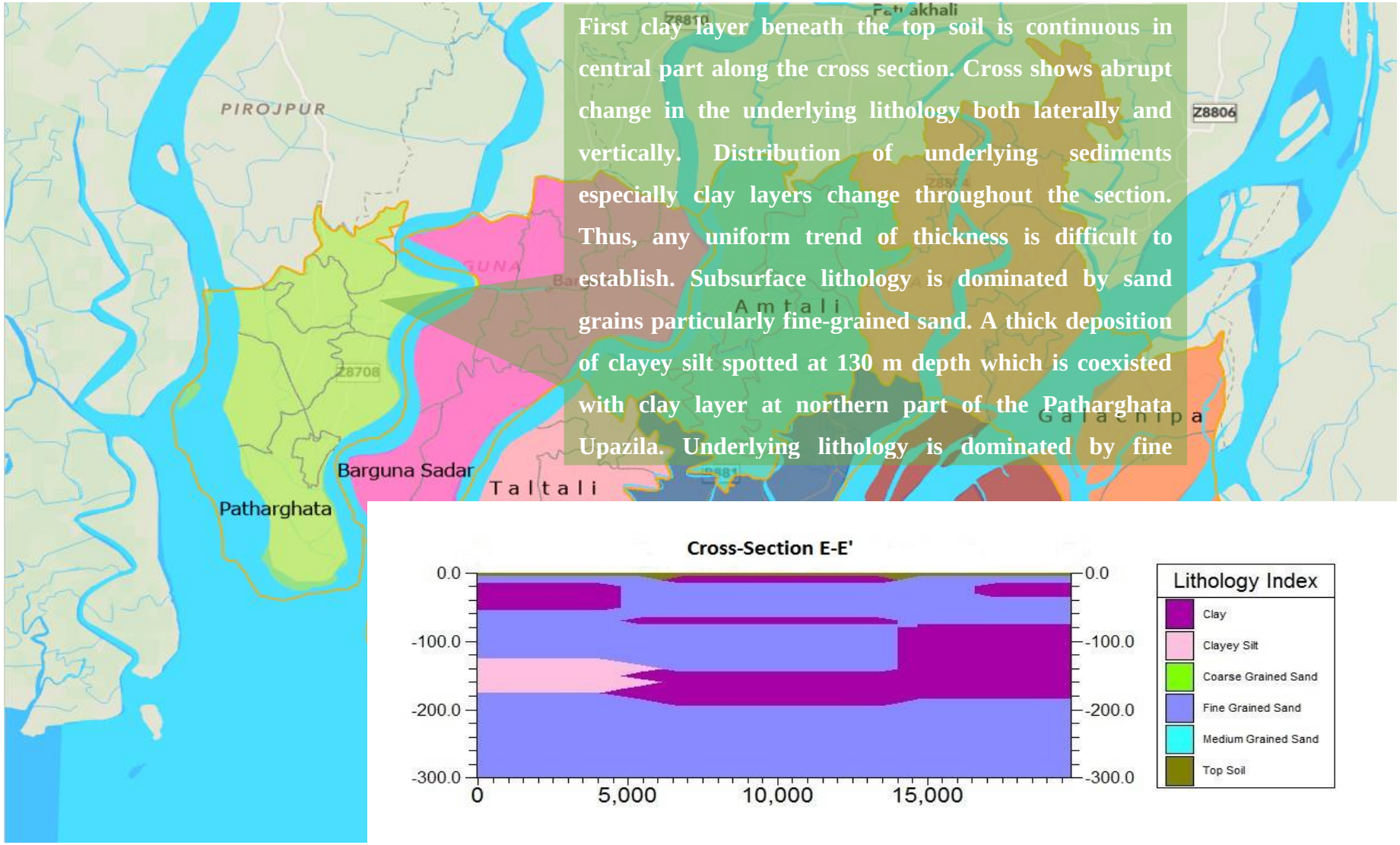
Figure-20: *Safe water coverage of Patharghata Upazila*
Source: PKCP project, UDD, 2022

From the socio-economic sample survey, it is explored that pipeline (71.5%) is the main water source for the people of Patharghata paurashava. The second main source of water in the paurashava area is pond water (14.1%). Without these two sources in the paurashava area, people collect water from their own tube well, a common tube well, rainwater and a pump. Except for the paurashava area, the pipeline water service is available in Patharghata union (4.1%) and Raihanpur union (2%). A tube well is the main water source for the people of Kalmegha, Kakchira, Nachna Para and Raihanpur union, where 77.6%, 98.5%, 63.3%, and 98% of people collect water from a tube well, respectively. Residents of Patharghata Upazila claimed that 80.9% of water is drinkable, 18.5% is non-drinkable, 0.1% is contaminated with arsenic, and another 0.5% is contaminated with bad smell. The main problem related to water collection in Patharghata Upazila is dominated by the location of sources far away from the people's residents. Secondly, people also mention spending a long time during water collection as their water collection problem. Tube-well vs walking distance of household is also demonstrated the same.

2.19 HYDRO-GEOLOGICAL ATTRIBUTES

Groundwater in the study area is found in deltaic sediments and is highly heterogeneous, with three depth zones. The shallow aquifer is connected to surface water bodies and receives less than 300 mm of recharge annually from rainfall. During the rainy season, groundwater flows from topographic high to low areas and towards the river or sea, while during the dry season, it flows towards pumping sections.

The intermediate aquifer seems to be connected to the shallow aquifer, and the deep aquifer is completely isolated from the overlying aquifers, likely receiving recharge from the regional aquifer system. Water quality and quantity were evaluated through WQI and slug tests to explore the hydro-geological conditions in the Patharghata Upazila study area.



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 at northern part of the Patharghata Upazila. Underlying lithology is dominated by fine

Figure-21: *Subsurface lithology of Patharghata Upazila*

2.20 Flooding and Drainage

As the area lies at the southernmost tip of Patharghata 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 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.

2.21 Geological Attributes

Geomorphological units of the study area is covered by recent sediments divided into tidal deltaic and mangrove swamp deposits. Layer 4 and Layer 6 are considered the deep foundation layers based on the SPT-N value of boreholes. Seismic hazard maps for the study area are presented showing the spatial distribution of PGA and PSA, with PGA ranging from 0.167g to 0.239g for a 0% probability of exceedance in 50 years and from 0.339g to 0.509g for a 2% probability of exceedance in 50 years. A building height map is produced using PSA, representing low-rise and high-rise buildings.

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).

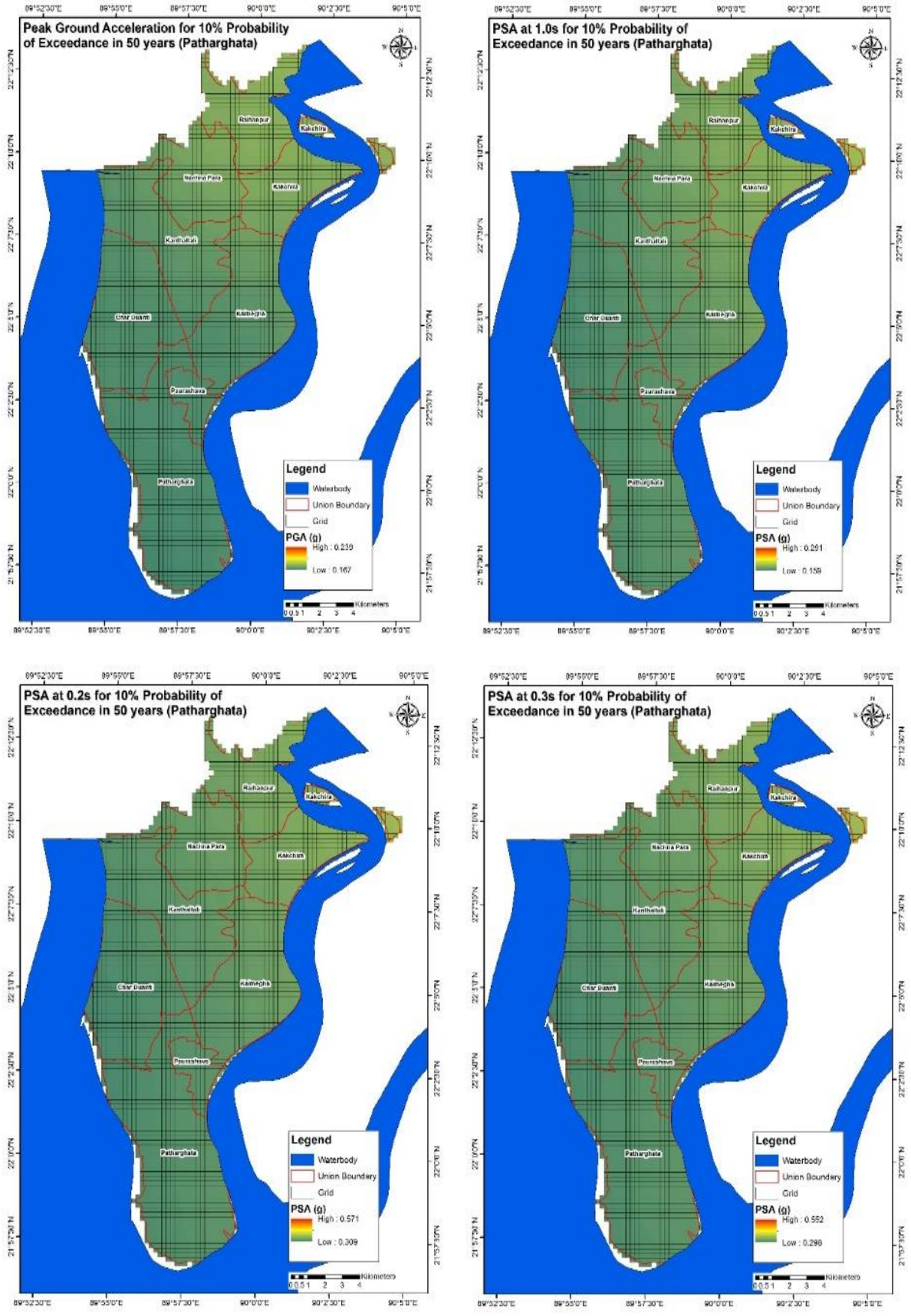


Figure-22: *Probabilistic Seismic Hazard Assessment (PSHA): PGA and PSA*

Source: PKCP project, UDD, 2022

2.22 SOCIO-ECONOMIC STATUS OF THE SAMPLE POPULATION

Family type of the respondent: In total, 88.51 percent of the respondents live in nuclear families in Patharghat Upazila.

Religion: More than 90 percent of the respondents were Muslim, and the rest of the respondent were Hindu-there was no Christian or Buddies in Patharghata Upazila.

Status of living outside: In total, 82.77 percent of respondents live with their family members in the locality, 7.12 percent of families have members who live in other regions within the country, and 10.11 percent families have members who live in a foreign county.

Land and housing status: More than 90 percent of the respondents live on their own land/house. Among 80.40 percent of respondent lives in each house, and only 6.12 percent lives in pucca structure-among. The pucca structures majority of percent are one-story buildings.

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.

Plan Approval Status: In total, 61.62 percent of the owner do not have building plan approval which is mainly because of a lack of knowledge about the rule of building approval.

Problem faced in the main road: Respondents claimed that narrow road width is the key problem of the main road and also mentioned the worse condition of the main road. Almost 100 percent of the respondents have expressed their dissatisfaction regarding road condition.

Modification of the embankment height-required or not: Most of the respondents have said that embankment height is enough to protect the area., The point to be noted is that only 16 percent of the total respondents have somewhat knowledge regarding the height of the embankment. So, the planning team might need relevant authority or expert opinion if any recommendation is to be given in the structure plan..

Drainage facility*:* This Upazila has almost no man-made drainage facility. In total, 5.37 percent of respondents claimed that only in the paurashava have this facility exists.

Drinking water source, availability and water quality*:* Pipeline supply, pond water and common tube-well are the available water sources in the Upazila. It is noted that 41.7 percent of the respondents expressed their dissatisfaction as the supply of water is inadequate.

The fuel source for household activity*:* For fuel sources, people are mainly dependent on natural resources. In total, 64.17 percent of the respondents use firewood, and 35.21 percent of the respondents buy cylinder gas as a fuel source.

Energy source: In total, 70.29 percent of the respondents are connected with electricitywhile 26.09 percent of the respondents depend on solar power systems for lighting.

Hygienic status of the septic tank: Regarding the hygienic level of the septic tank, 63.80 percent of the respondents claimed that their septic tank is hygienic. Data show that 46.82 percent of respondents have septic tanks that are katcha, which are also not in hygienic condition.

Waste disposal practice: In the case of waste disposal, the respondents practise an unhealthy way, that is throwing outside of the house. Only 8.61 percent use mud holes to dispose of waste.

School attending children status and reason for attending school: It is found that 77.53 percent of the respondents are aware about sending their child to school, and for 21.35 percent of respondents, this question was not applicable.

Type of entertainment*:* Patharghata Upazila's residents' entertainment pattern is irregular. Around 50 percent of the respondent has to travel 1 km to visit a recreational place, and around 36 percent of the people have to travel 2 km distance for such recreation.

Mode of transport, travel time to visit market and service quality: Patharghata Upazila respondents are comfortable to go by walking to visit the market. The maximum respondents have to travel 10-20 minutes to the market. Regarding the quality of service in the market, 54.20 percent of patharghata's respondents were found moderately satisfied, and 44.17 percent were satisfied.

Mode of transport, travel time to visit the shopping centre and service quality: To visit a shopping centre majority of the respondents of Patharghata Upazila equally prefer rickshaw and walking. In total, 76.63 percent of the respondents of Patharghata Upazila travel 10-20

minutes to visit the market, and around 14.31 percent of respondents travel 30 minutes to reach the shopping centre.

Occupation Status of Patharghata Upazila: In Patharghata Upazila majority of the respondents claimed that agriculture-related activity is the main source of income.

Landuse change scenario and reason behind the change: In Patharghata, 63.13 percent of the respondents claimed that there is no change in land use of the Upazila.

Willingness to give land for the road: In Patharghata Upazila, a significant percentage of the respondents have expressed their willingness to give land for road development.

2.23 PHYSICAL FEATURE

Structure use: The physical feature survey explored that 83.62 percent of structures were used for residential purposes, and in total, 57. 22 precent of the structures were single stories (Table 5).

Table-2: Structure use statistics of patharghata Upazila

Structure Use	Number	Percentage (%)
Agricultural	366	0.79
Commercial	2730	5.91
Community Service	1037	2.24
Educational	505	1.09
Governmental	57	0.12
Manufacturing & Processing	185	0.40
Mixed	454	0.98
Residential	38628	83.62
Service Activity	1402	3.03
Transport & Communication	88	0.19
Under Construction	745	1.61
Total	**46197**	**100**

Source: PKCP project, UDD, 2022

Table-3: Floor statistics of patharghata Upazila

Structure Floor	Number	Percentage
1	26435	57.22
2	19623	42.48
3	108	0.23
4 and above	31	0.06
Total	**46197**	**100**

Source: PKCP project, UDD, 2022

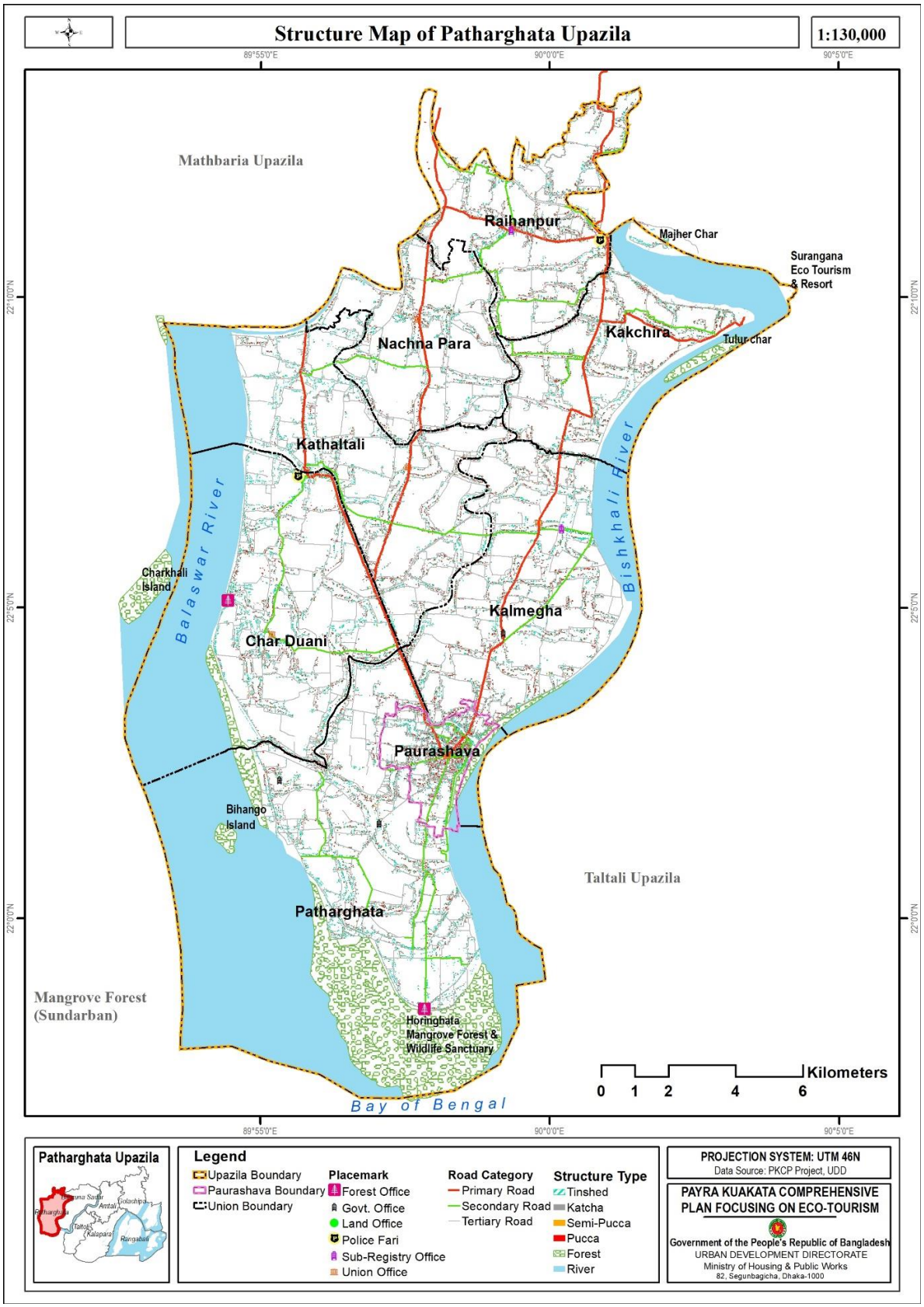


Figure-23: *Structure Map of Patharghata Upazila*
Source: PKCP project, UDD, 2022

Administrative Area: One of the most important areas of a place are administrative areas. Total 47 administrative areas are found in Patharghata Upazila according to the physical feature survey, which is covering almost 14.56 acres of land.

Educational and Resaerch: According to the physical feature survey, there are total 95 educational institutions in Patharghata Upazila. There is only 6 College, 31 High Schools and 149 Primary Schools. There are also some kindergartens, Madrasas and NGO schools. Moreover, there is a Special School for the disables.

Embankment: As Patharghata 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.

Hut-Bazar: Hat-Bazars are the key to economic activities of an area. According to the physical feature survey, there are 43 local huts and bazars. According to the Growth Center list of LGED there are 19 Growth Centers in Patharghata Upazila.

Health Center: According to the physical feature survey, there are 31 health facilities in Patharghata 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.

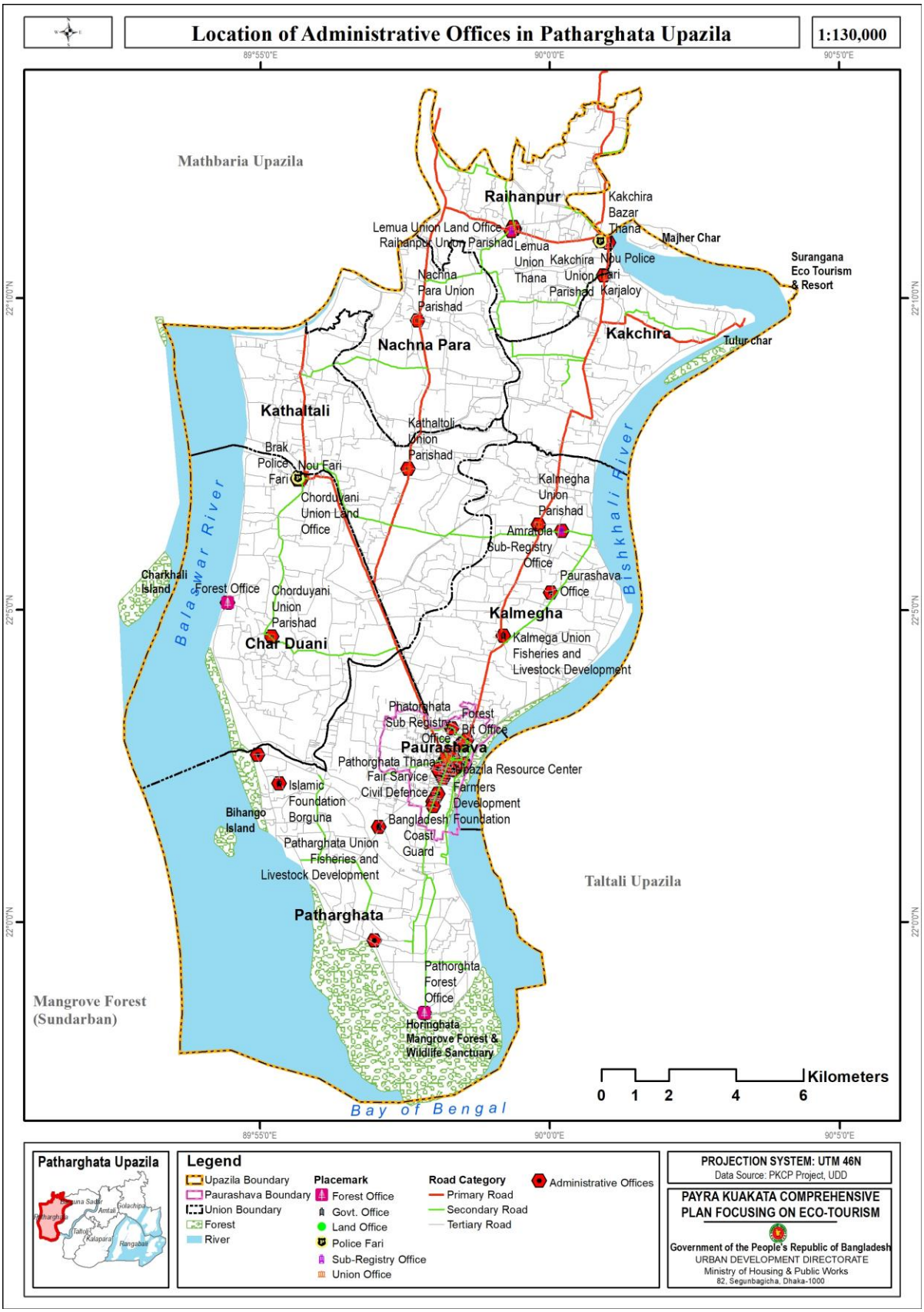


Figure-24: *Location of Administrative Offices in Patharghata Upazila*

Source: PKCP project, UDD, 2022

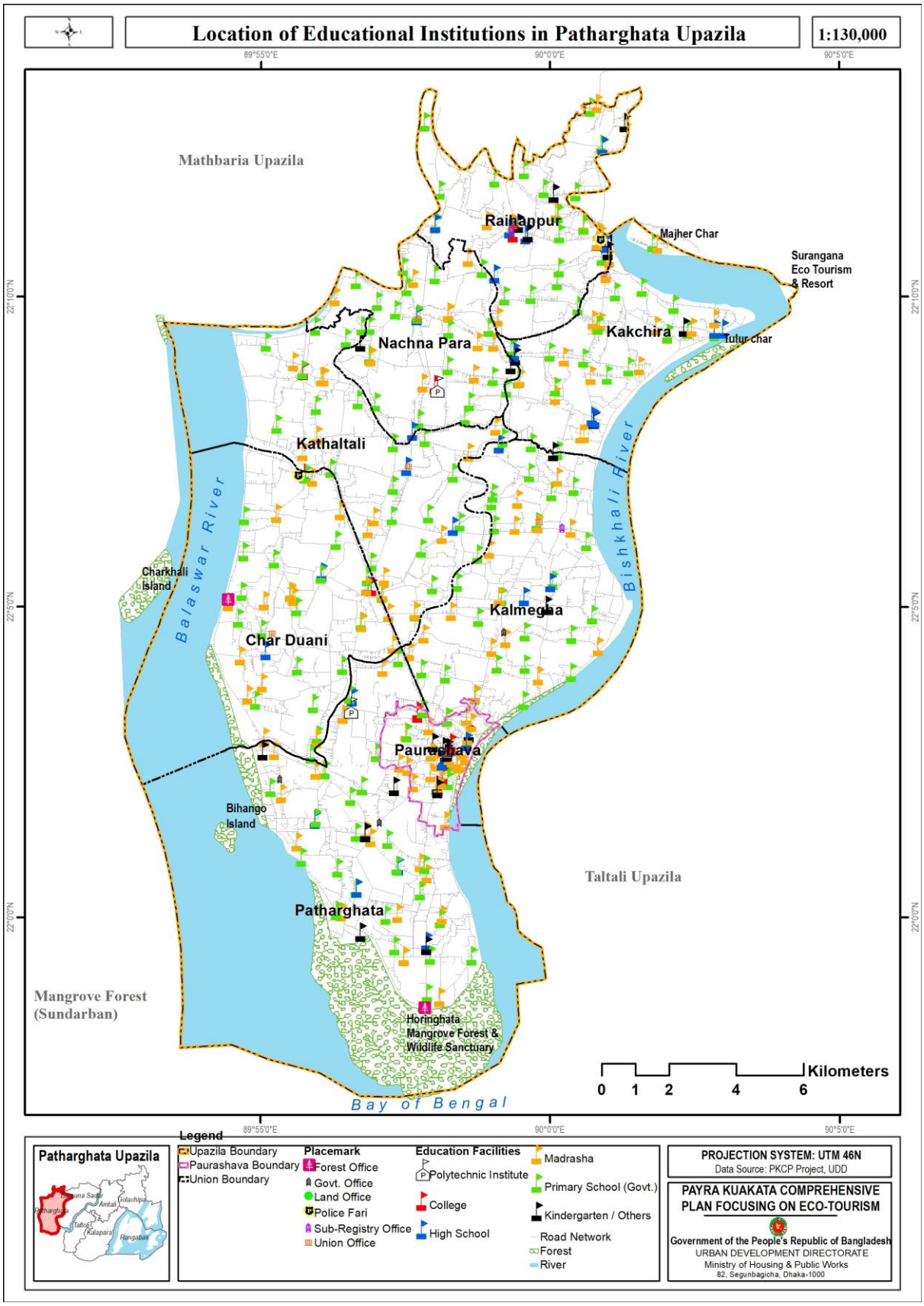


Figure-25: *Location of Educational Institutions in Patharghata Upazila*
Source: PKCP project, UDD, 2022

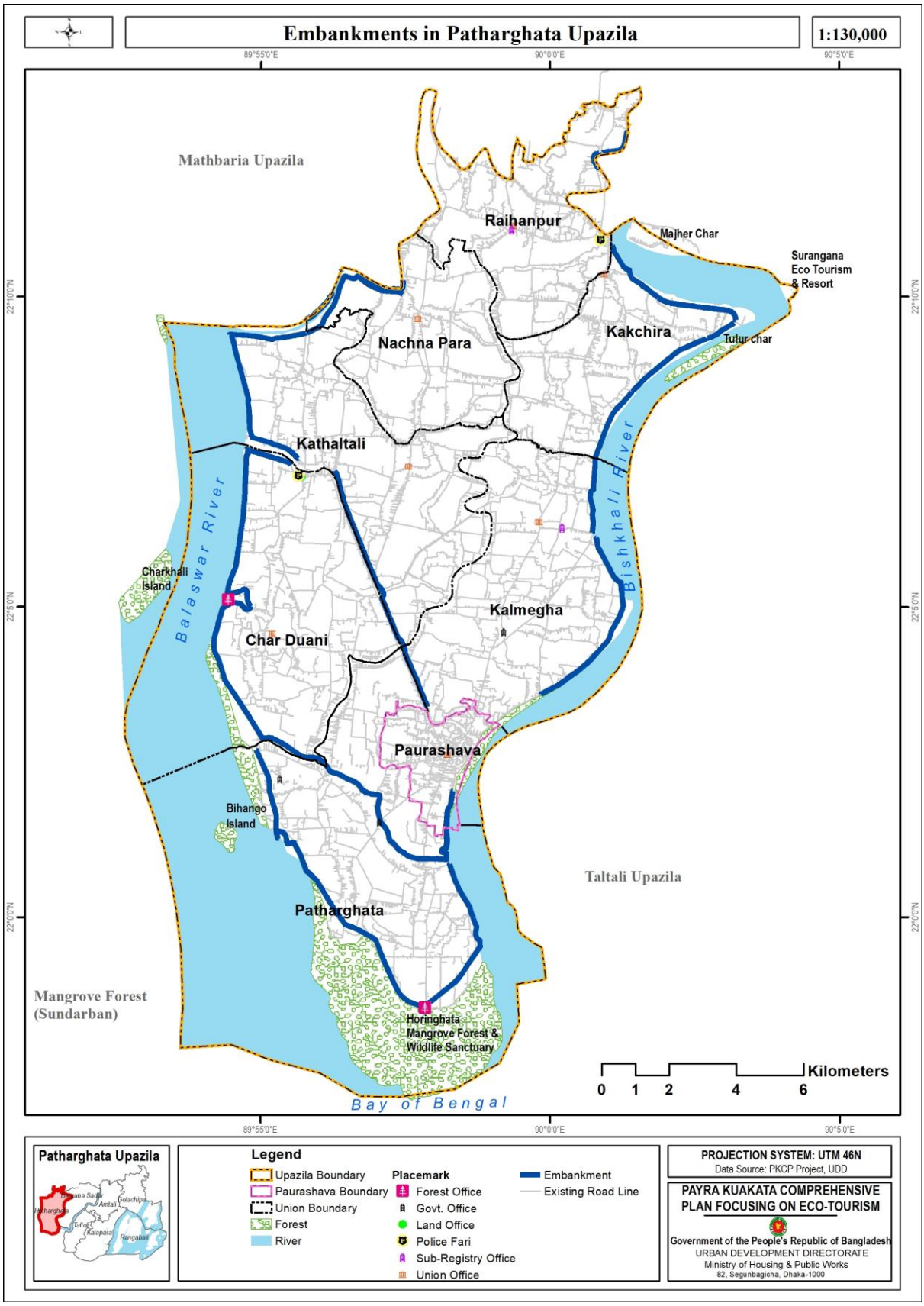


Figure-26: *Embankments in Patharghata Upazila*
Source: LGED, 2013

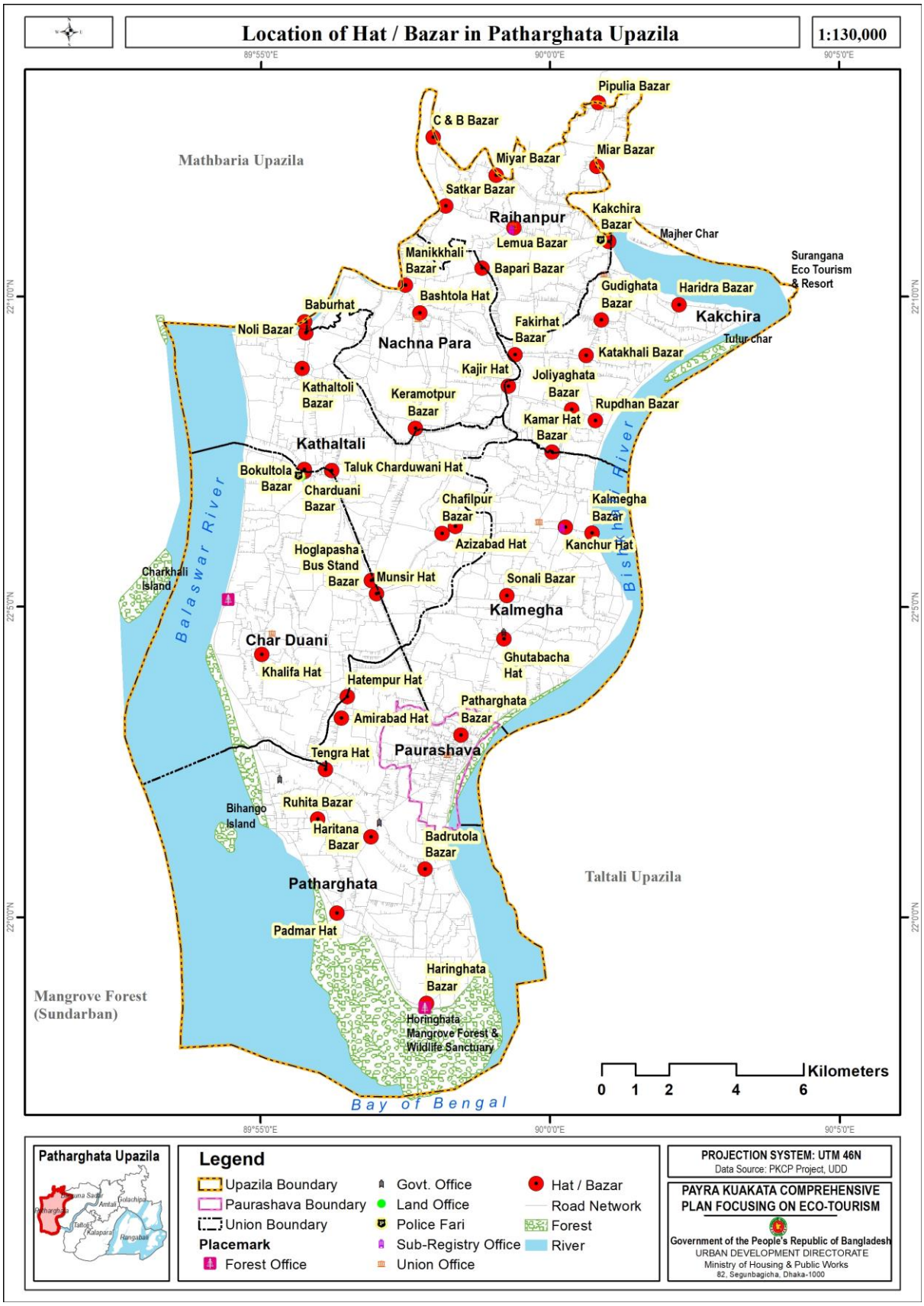


Figure-27: *Hat- Bazar locations in Patharghata Upazila*
Source: PKCP project, UDD, 2022

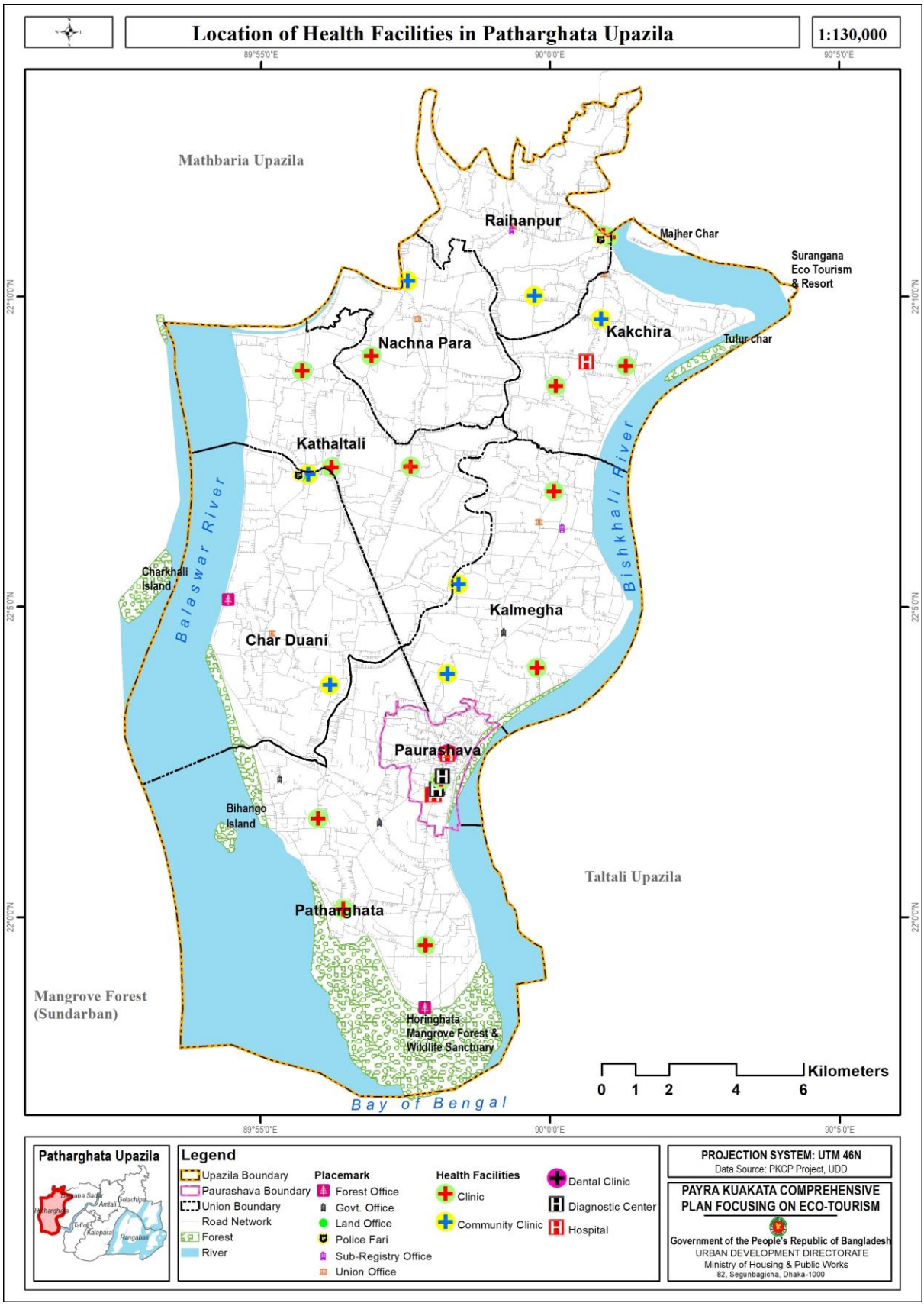


Figure-28: *Location of Health Facilities in Patharghata Upazila*
Source: PKCP project, UDD, 2022

2.24 TRANSPORT AND COMMUNICATION

To estimate the future traffic demand on the future road network of Payra-Kuakata, the following surveys have been conducted: 1) Reconnaissance Survey, 2) Household Interview Survey, 3) Passenger Interview Survey, 4) Survey on Growth Centre/ Attraction survey, 5) Traffic Count Survey (including Motorized Vessel Count), 6) Pedestrian and Vehicle Count at Kuakata Sea Beach, 7) Survey at Fishing Boat Terminal, 8) Origin-Destination Survey of both motorized vehicle and vessel, 9) Public Transport Interview Survey, 10) Stakeholder Interview Survey and 11) Travel Time Survey.

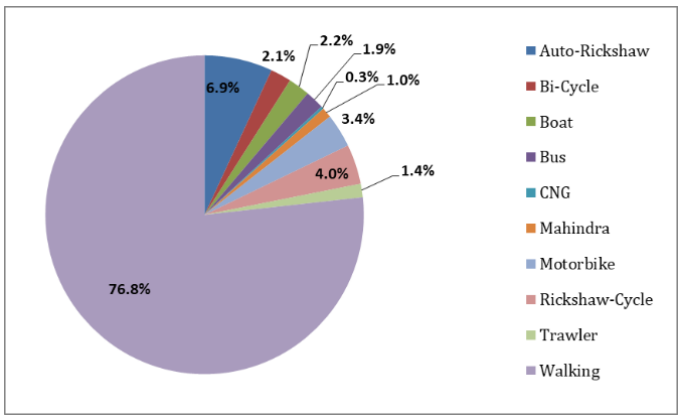


Figure-29: *Modal Share of Patharghata Upazila*
Source: PKCP project, UDD, 2022

From the Figure: 29, it can be easily identified that major modes in the upazila. The major travel mode of Patharghata Upazila Auto-rickshaw. Other important modes are rickshaw-cycle and motorcycle. Short distance travel and traveling for surrounding areas of any upazila motor bike is used. Vehicular trips are distributed within the upazila mainly in Patharghata and Kakchira which are two well established unions in this upazila. As this upazila is connected with other upazila by zila road and regional highway so trips are distributed to other upazilas and other external area; Barisal, Bhola, Patuakhali etc.

From the transportation survey and public consultation in the PRA session, it is unveiled that congestion is caused by on-street parking, a narrow road network, and a lack of parking. Local people also emphasized how ferry crossings add a significant amount of time to travel. Land use, environmental quality, economic growth and viability and achieving lifestyle objectives are obvious factors that must be considered in evolving a comprehensive plan. However, there are subtler factors that will have a bearing on the outcome of these comprehensive transportation studies. The condition of existing internal connecting roads is very bad. Traffic

congestion occurs during the rainy season and flooding as roads go underwater and become muddy.None availability of parking facilities for vehicles, lack of public transport facilities, unplanned ghat and terminal design, insufficient numbers of ghats and terminals, lack of access to Rivers and Canals that are not properly dredged and narrow roads are major critical issues in the transport sector.

In Patharghata Upazila, considering road length, it is found that the majority of the roads are tertiary category (Table 7) which area mainly Katcha road with narrow road width and bumpy surface. Primary roads directly connect this Upazila with Mathbariya, Bamna and Barguna Sadar Upazila.

Table-4: Road category of Patharghata Upazila

Category	Length (km)	Percentage (%)
Primary	63.25	5.091
Secondary	84.78	6.824
Tertiary	812.50	65.399
Path	281.84	22.686
Total	**1242.38**	**100**

Source: PKCP project, UDD, 2022

From Physical feature survey, it is found that around 61.68% of Roads are katcha in Patharghata upazila and also the total length of katcha roads are longer than others. In patharghata Upazila, only 22.33% of roads are pucca.

Table-5: Road type based on construction material of roads

Road_Type	Length in m	Length in KM	%
HBB	171033.21	171.03	18.20
Katcha	501904.60	501.90	53.40
Pucca	266790.80	266.79	28.39
Grand Total	939728.61	939.72	100

Source: PKCP project, UDD, 2022

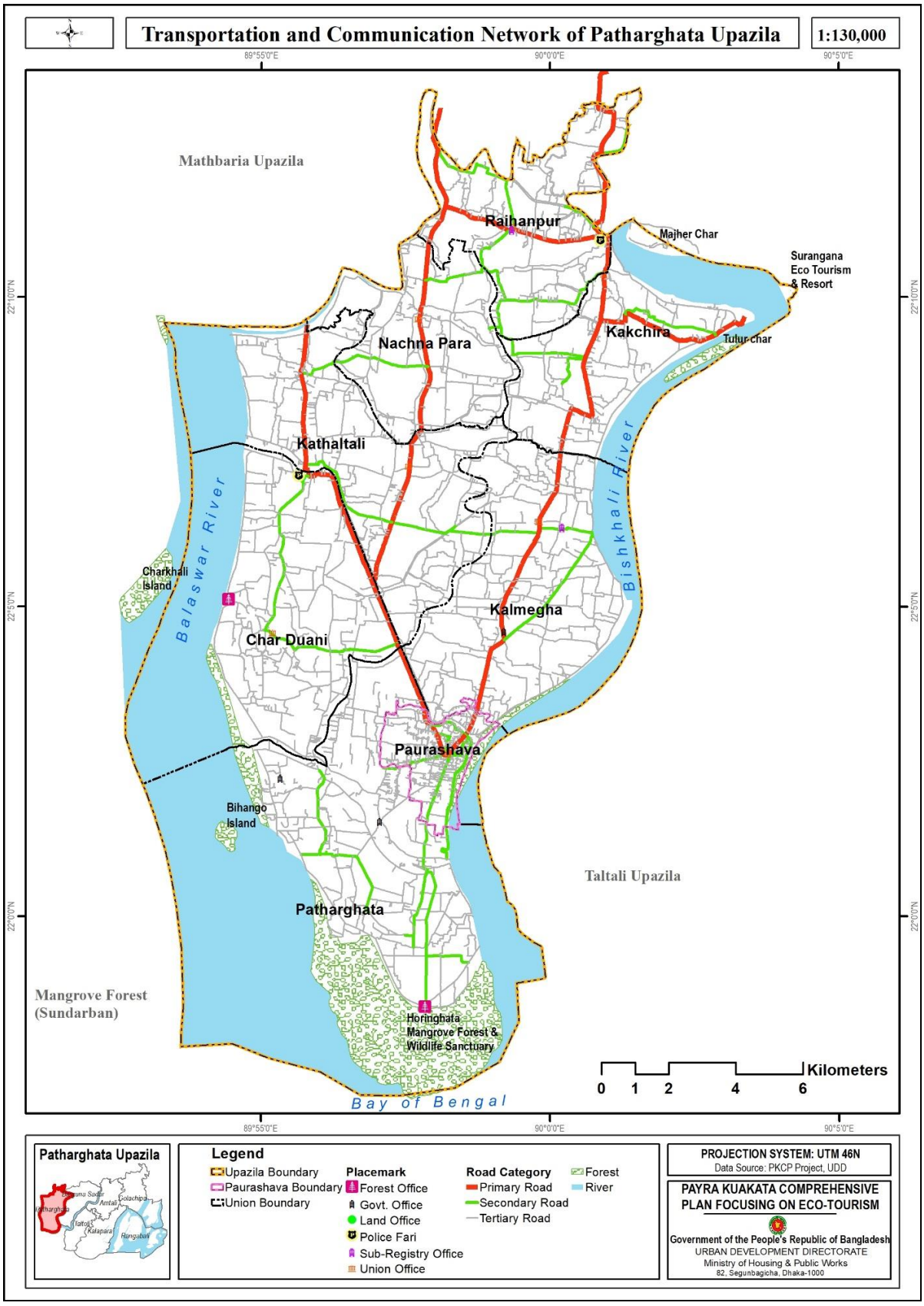


Figure-30: *Transportation and communication network of Patharghata Upazila*
Source: PKCP project, UDD, 2022

2.25 WATERBODIES

Table 6 represents the present scenario of existing waterbody of patharghata Upazila. There is existence of canals, ditches, ponds, fish ponds, and river. Majority of water bodies of this upazila are river which is 90.31% and Bishkhali is the major river flowing through this Upazila.

Table-6: Existing Waterbody of Patharghata Upazila

Waterbody_Type	Total Area (Acre)	%
Canal	1121.76	4.41
Ditch	102.02	0.40
Fish pond	728.92	2.86
Pond	539.12	2.12
River	22964.98	90.21
Total	**25456.81**	**100.00**

Source: PKCP project, UDD, 2022

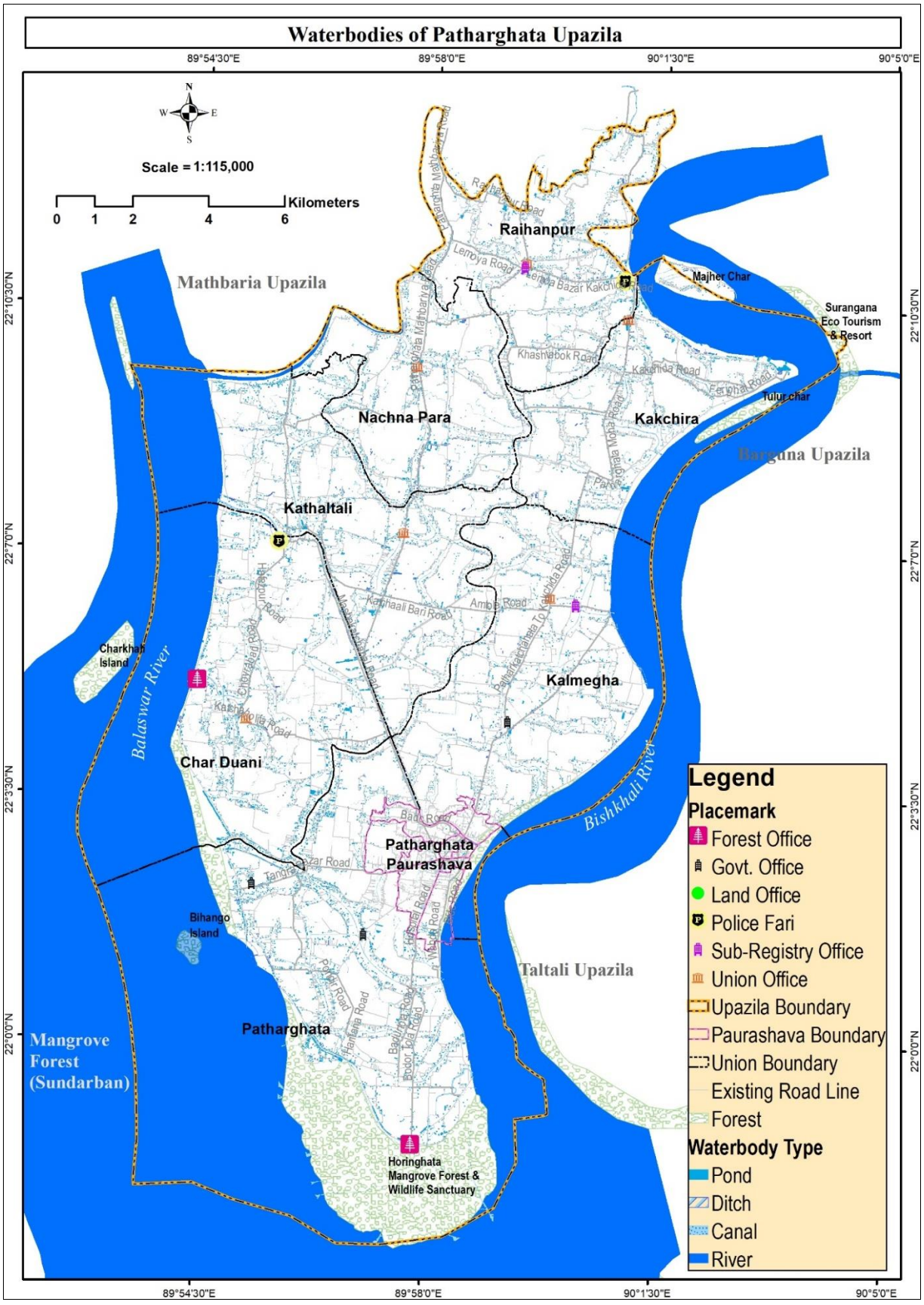


Figure-31: *Waterbodies of patharghata upazila*
Source: PKCP project, UDD, 2022

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 Patharghata Upazila in 2022 was 177,893, and annual growth rate was 1.15. Table 10 shows the population in 2026, 2031, 2036 and 2041.

Table-7: Projected Population till 2041 and annual growth rate

Year	Population /Projected Population	Annual Growth Rate
2011	163,927 (BBS, 2011)	**1.1**
2022	177,893 (Provisional)	**1.15**
2026	193,917	1.24
2031	205,266	1.27
2036	215,769	1.28
2041	217,981	1.11

Source: PKCP project, UDD, 2022

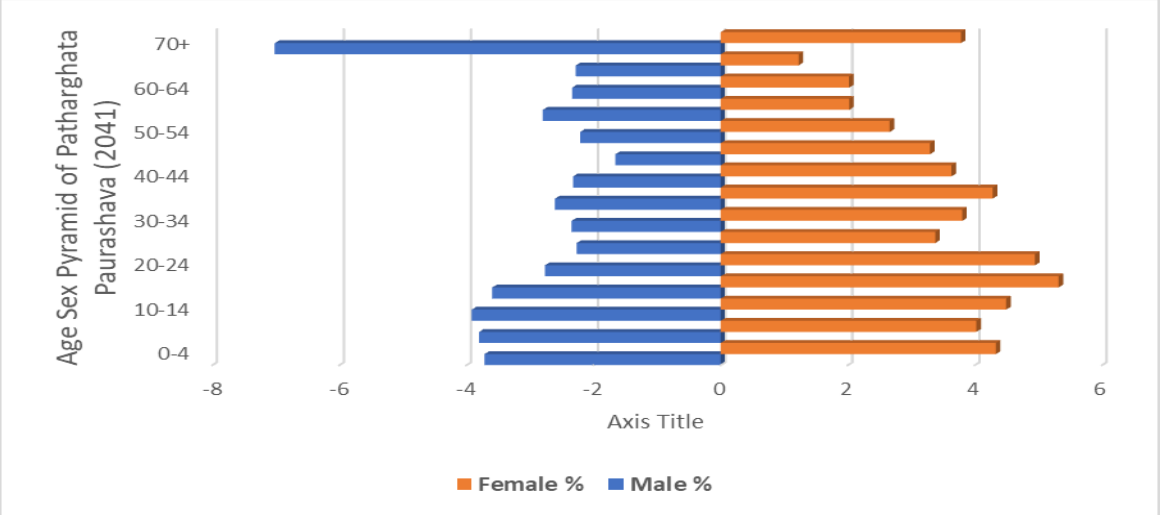


Figure-32: *Age-sex pyramid of Patharghata Upazila -2041*
Source: PKCP project, UDD, 2022

3.2 HOUSING DEMAND PROJECTIONS

The use of historical data to project future housing demand is known as demand forecasting. 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. After that, considering the projected population, future demand for housing units has been quantified. From the existing condition in Patharghata Upazila, 177,893 population uses 46197structures. In 2041, Patharghata Upazila have 217,981 populations. There will be needed 54496 livable building considering the household size is 4.0.(Barguna District Dwelling Unit BBS,2011).

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 Patharghata Upazila, basic employment has increased by 105 percent, and total employment has increased by 74 percent. Basic employment contributes to total employment. Basic employment constitutes 25% in Patharghata. 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.

Findings from Economic Base Multiplier: Economic base multiplier is used to evaluate employment as a measure of activities and can be used for projection purposes. The future total employment of a region can be evaluated by estimating the future prospects of the basic activities in the regional economy and by using a multiplier.

It can be seen that the economic base multiplier has increased from 0.2 to 0.25 for Patharghata Upazila between 2003 to 2013. The economic base multiplier is the ratio of total basic and non-basic employment to basic employment. So, the increase in multiplier indicates that the percentage of basic employment to total employment has decreased over 10 years. This means that Upazila is declining in some economic activities and are not able to earn as much from export and outside the region.

Findings from Shift-Share Analysis: The growth of a region can be attributed to a national trend or unique regional factors. The industry combination of the nation or the region itself may play a role in the regional growth also. Shift-Share analysis helps answer these questions

by splitting 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 Upazila. It has been seen that Patharghata Upazila lags behind the national growth rate as the Growth is lower than National Share . Wholesale and Retail Trade was supposed to grow to 3463, whereas it grew to 942. This is a result of an unfavourable industry mix and regional disadvantage. The manufacturing sector shows quite a lot of potential as it grew more than national growth. This sector has both industry and local advantages resulting in a positive Net Shift Component. The transportation, Storage and Communication sector also has an advantage from the industry mix. The hotel and Restaurant sector benefitted from a local advantage.

General Findings: General findings have been drawn by comparing patharghata Upazila with other six Upazilas within the project region.

Figure 33 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). It is done by comparing the G_j of each region with their NS; if it is higher than NS, then the region is considered Fast-Growing, otherwise Slow-Growing. It is found that only Patharghata Upazila is lagging behind the national growth. This means that the overall growth rate of employment in the region was lower than the overall growth rate of employment in the nation.

Figure 34 delineates the Upazilas in Fast-Growing or Slow-Growing regions based on their Industry Mix (IM). If the value of IM is positive, then the region is considered Fast-Growing. Otherwise, Slow-Growing region. Patharghata Upazila has been found to be a Slow-Growing region in terms of IM. This means that the Upazilas do not have significant employment in those sectors which are fast-growing (sectoral growth rate is higher than the national average growth rate) at the national level.

Figure 35 is 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. Patharghata 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.

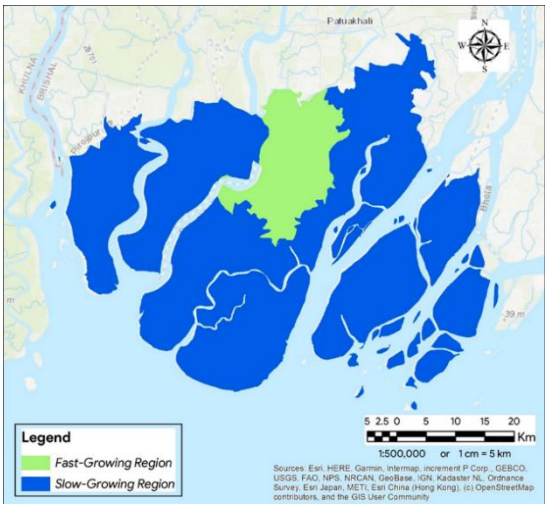


Figure-33: *Delineation of Fast Growing and Slow Growing Regions on the Basis of Industry Mix Component (Sectors with High Growth Rate at National Level)*

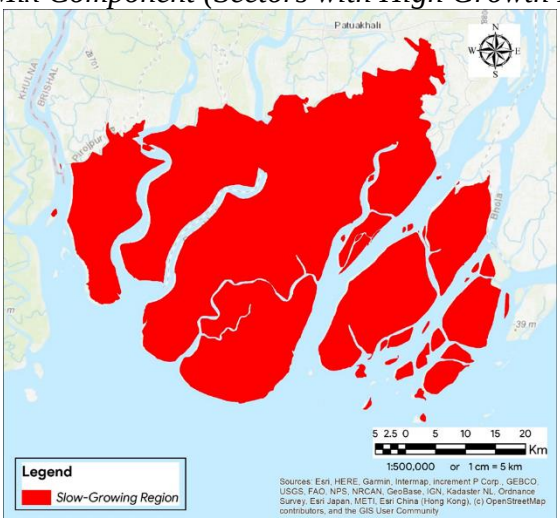


Figure-34: *Delineation of Fast Growing and Slow Growing Regions Based on Net Regional Growth*

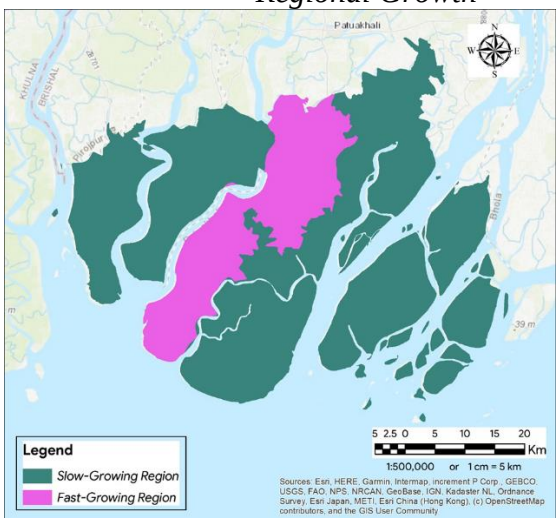


Figure-35: *Delineation of Fast Growing and Slow Growing Regions on the Basis of Regional Shift Component (Sectors with High Growth Rates at Regional Level)*

3.4 DRAINAGE & FLOOD CONTROL

Drainage and flood management are important considerations for assessing the development prospect of the project site. The hydrological assessment would be based on flood level analysis as well as drainage analysis. The flood analysis would focus on the estimation of the design flood level. The analysis involves the frequency analysis with different probability distributions functions for the selected design return period. The historical data on annual peak water levels are used for the purpose. The gage station nearest to the project site at Pathargata is located at Patharghata on the Bishkhali River. The gage station measures the daily water level. These data would be used to assess the extent of inundation area during flooding.

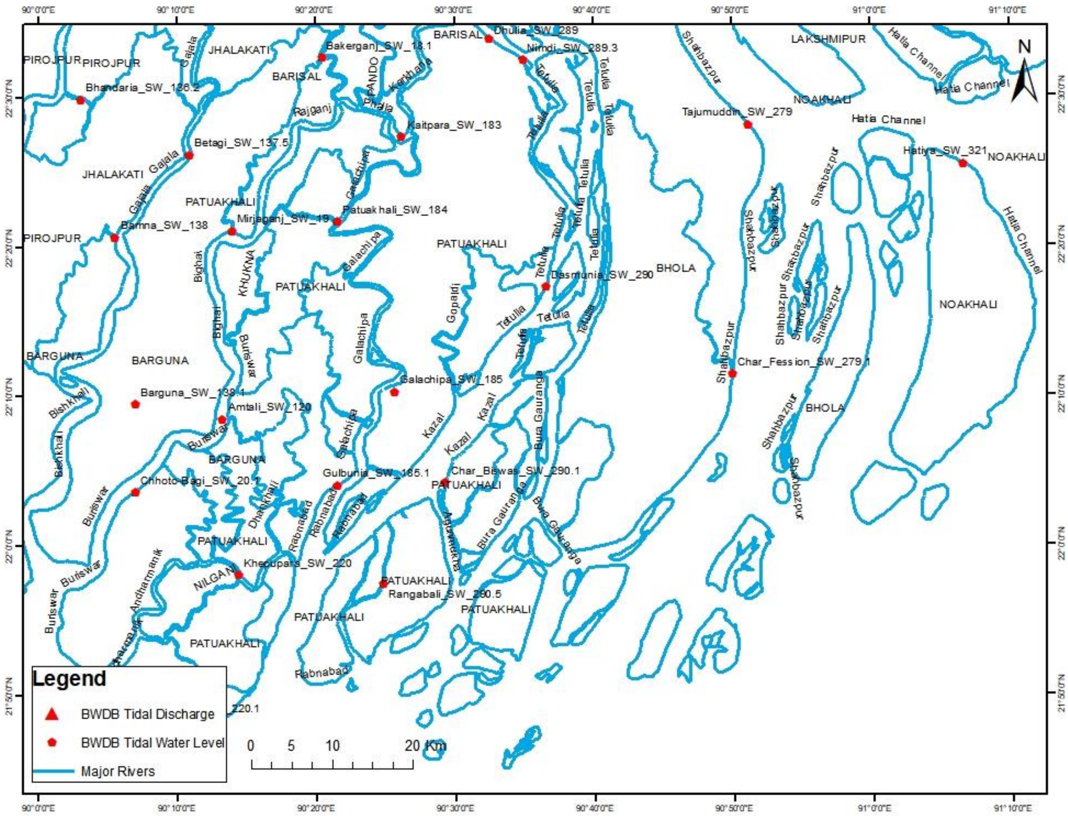


Figure-36: *Location of Surface Water Gauge Station for collecting water level and discharge.*

In Patharghata Upazila, drainage system exists mainly in the Paurashava areas. All small drains are connected to the main drainage network, and the drainage outlets mainly depend on the main river system and adjusted canals near the main drainage site. There are a few storage basins in the upazila.

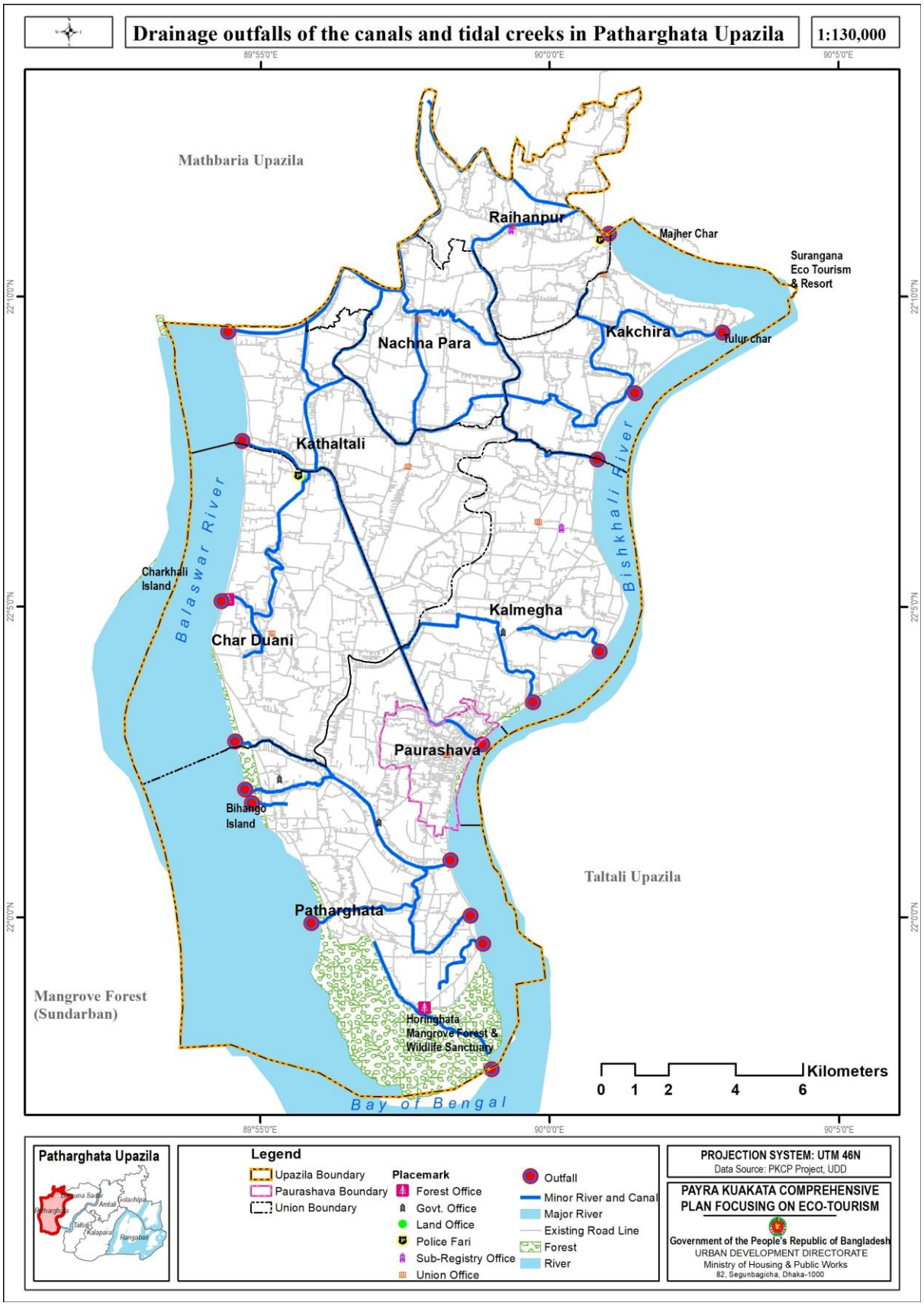


Figure-37: *Drainage outfalls of the canals and tidal creeks*
Source: PKCP project, UDD, 2022

3.5 Tourism Potentiality and Activities

Patharghata Upazilla has a Haringhata Eco-tourism site and wildlife sanctuary. However, no major development activities in this area have taken place. As a result, additional areas can be developed as tourist destinations with proper infrastructure development. Local entrepreneurs can be aided in promoting ecotourism. Small family cottages for isolation, as well as group cottages for group tourism, can be developed using locally sourced construction materials. Additionally, the representation of local housing can be used as a tourist attraction site. Presentation of local cultural events throughout the year can be supported to attract tourists. Additional game-enhancing events, such as sea surfing, sea sky surfing, and skimboarding, should be developed. Additionally, with adequate infrastructure, river tourism can be developed. Areas beside Haringhata Eco-Tourism & Wildlife Sanctuary can be developed as tourist destinations with appropriate erosion control measures. Traditional indigenous cuisine, as well as other dishes, can be served to entertain tourists. Security must be ensured here, as well as adequate support for connectivity to the rest of the world. The eastern side can be reserved for foreigners as well as high paying national tourists.

3.6 Basic Services and Facilities Forecasting

Existing Facilities*:* The distribution of existing socio-economic facilities by Upazilas is presented in Table 12, while Table 11 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 Patharghata Upazila, there is only 0.67 or less than one high School per 10,000.

Requirements of Social Facilities in Future: Requirements of socio-economic facilities 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-8: 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

For calculating threshold population, Mouza, Union and Upazila level population data are required. That is why population data from the 2011 population Census have been used for this purpose.

Table-9: Distribution of Existing Facilities by Upazilas

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]
Patharghata	11	196	22	2	8	20	10	39	49	5

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-10: Existing Facilities per 10,000 People in Different Upazilas

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]
Patharghata	0.67	11.95	1.34	0.12	0.49	1.22	0.61	2.38	2.99	0.31

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-11: Projected Requirement of Facilities by Upazilas 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]
Patharghata	26	416	23	1	9	8	5	66	73	6

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-12: Projected Requirement of Facilities by Upazilas 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]
Patharghata	28	455	25	1	9	8	5	72	80	6

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-13: Projected Requirement of Facilities by Upazilas 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]
Patharghata	31	493	27	1	10	9	6	78	86	7
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-14: 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]
Patharghata	1.40	22.19	1.22	0.05	0.45	0.41	0.27	3.51	1.40	0.37
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 DEMAND PROJECTION BASED ON ACQUIFIER

Scenario prediction: According to the model simulated recharge assessment, the water balance calculation was done for shallow and intermediate aquifers, which are recharged by rainwater. Table 18 shows the water demand and water resources calculation summary for the whole PKCP area.

Table-15: Water Balance Calculation

Water Balance Calculation for Shallow and Intermediate aquifers sourrounding Patharghata Upazila					
Aquifer	***Set Up***	***Population status***	***Water Demand in million m3/year***	***Water Availability in 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 abstruction 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 and Urban	12,00,000	23 million m3/year	13 million m3/year	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

There is no visible recharge area in/near the project area, and it is supposed to be far from there. The water age defines the water in deep aquifers as 10000 years back as per the water age dating of the study area. Recommendation is given to use deep acquifer water only for drinking purpose. If the deep water is used for industrial purposes, the water reserve of the deep aquifer will be finished as there is no active recharge area for this aquifer, and the people may face water scarcity of fresh drinking water, which may cause seawater intrusion.

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 Pyra 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 model simulated result shows that the water level drops greatly from the base case condition and goes down to the MSL (mean sea level) Figure 38, which indicates that there is a very high possibility for saltwater intrusion during the dry season. § 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.

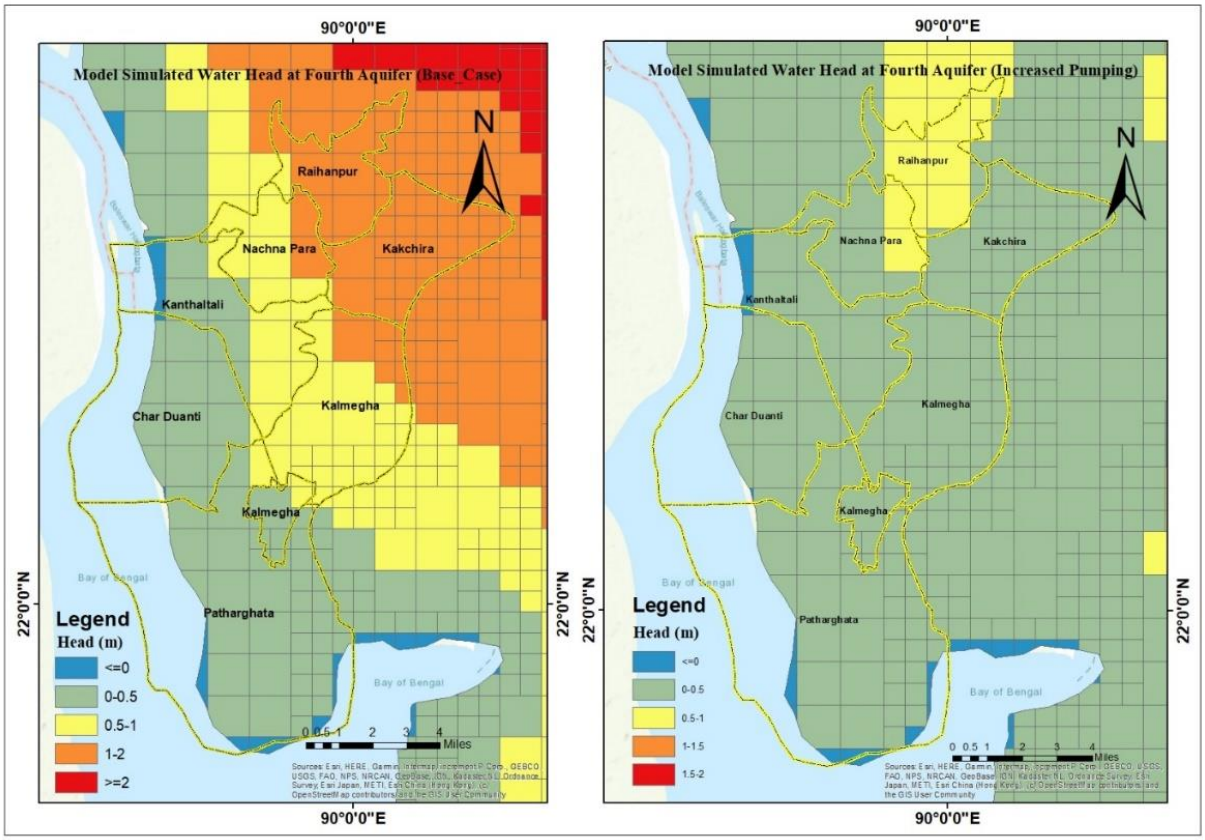


Figure-38: *Comparison between deep aquifer in Base Case condition in December 2019 (left) and in increased pumping condition in December 2025 (right)*

Source: PKCP project, UDD, 2022

The observed groundwater level data indicate that the groundwater level in the deep aquifer in all upazila decline annually by 0.3 to 0.5 m.

3.8 WATER DEMAND PROJECTION BASED ON POPULATION

For the purpose of future planning of the water supply system in the Upazila, estimates of water demand over the plan period are determined. According to Journal of Water and Health published by IWA and funded by AusAID in 2006 water consumption pattern of rural area of Bangladesh has been calculated as following

1. Drinking purpose- 3.53 (l/D)
2. Cooking -6.71(l/D)
3. Bathing -27.26 (l/D)
4. Domestic washing -12.18 (l/D)
5. Toileting and cattle feeding- 12.75 (l/D)

Total consumption- 62.47 (l/D). The planning team uses this rate to calculate water demand for the planning area.

Majority of the people in the Upazila have access to safe drinking water. The scenario is different for the rural areas. For the purpose of future planning of the water supply system in the Upazila, estimates of water demand over the plan period are determined (Table 19).

Table-16: Projected water demand

Union / Pourashava	Area (Acre)	Population, 2021	Water demand (litre)	Population, 2026	Water demand (litre)	Population, 2031	Water demand (litre)	Population, 2036	Water demand (litre)	2041	Water demand (litre)
Patharghata Paurashava		21175	1322802.25	20440	1276881.99	21578	1348001.60	22624	1413329.35	22848	1427330.77
Char Duanti Union	**8,921**	26438	1651581.86	29097	1817660.74	30778	1922682.00	32359	2021444.57	32712	2043499.53
Kakchira Union	**6,519**	21722	1356973.34	24399	1524217.26	25806	1612116.02	27105	1693236.48	27359	1709103.43
Kalmegha Union	**12,431**	28785	1798198.95	30554	1908712.82	32357	2021334.99	34038	2126368.70	34378	2147563.18
Kanthaltali Union	**5,793**	21078	1316742.66	23335	1457720.72	24696	1542752.44	25943	1620686.21	26173	1635056.07
Nachna Para Union	**5,551**	12329	770192.63	14827	926245.60	15685	979865.41	16463	1028468.33	16621	1038310.61
Patharghata Union	**12,521**	30692	1917329.24	33574	2097390.96	35581	2222725.46	37439	2338803.73	37880	2366333.18
Raihanpur Union	**6,114**	15674	979154.78	17692	1105188.39	18785	1173477.31	19797	1236737.66	20011	1250068.04
Total in Litre	**57850**	**177893**	**11112975.71**	**193917**	**12114018.50**	**205266**	**12822955.23**	**215769**	**13479075.04**	**217981**	**13617264.81**

Source: PKCP project, UDD, 2022

Total projected water demand for Patharghata Upazila is 13617264.81 Litre or 3597300.79 Gallon.

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. From the World Bank standard, at present Energy consumption per capita is around 497 kWh of electricity. As the growth of our country people's lifestyle, its assume that every year this demand will increase 3% per year. An estimation of electricity consumption for the Upazila is given below: (Table 17).

Table-17: Projected water electricity demand

Union / Pourashava	Area (Acre)	Population, 2022	Electricity Consumption (kwh)	Population, 2026	Electricity Consumption (kwh)	Population, 2031	Electricity Consumption (kwh)	Population, 2036	Electricity Consumption (kwh)	Population, 2041	Electricity Consumption (kwh)
Patharghata Paurashava		21175	10523975	20440	11691635.9	21578	14176997.8	22624	17126465.84	22848	19923682.3
Char Duanti Union	8,921	26438	13139686	29097	16643219.8	30778	20220939.2	32359	24495494.43	32712	28524597.3
Kakchira Union	6,519	21722	10795834	24399	13956335.4	25806	16954701.9	27105	20518329.04	27359	23856862.4
Kalmegha Union	12,431	28785	14306145	30554	17476928.7	32357	21258477.5	34038	25766945.82	34378	29977190.5
Kanthaltali Union	5,793	21078	10475766	23335	13347466.9	24696	16225201.8	25943	19639178.22	26173	22823257.4
Nachna Para Union	5,551	12329	6127513	14827	8481070.67	15685	10305291.7	16463	12462790.61	16621	14493466.6
Patharghata Union	12,521	30692	15253924	33574	19204540.3	35581	23376510.7	37439	28341194.59	37880	33030935.4
Raihanpur Union	6,114	15674	7789978	17692	10119541.6	18785	12341517.4	19797	14986560.14	20011	17449324.9
Total		177893	88412821	193917	110920739	205266	134859638	215769	163336958.7	217981	190079317
Total in mwh			**88412.82**		**110920.74**		**134859.64**		**163336.96**		**190079.32**

Source: PKCP project, UDD, 2022

According to Ministry of Power Energy and Mineral Resources (Power Division), At present total power Generation capacity in the Barishal Region 2265 MW, in which Patharghata upazila's capacity is 21.69 mw.

3.10 IDENTIFICATION OF FLOOD RISK IN DIFFERENT AREAS AND CAPACITY OF DRAINAGE SYSTEM

As the area lies at the southernmost tip of Patharghata 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. The analysis involves the frequency analysis with different probability distributions functions for the selected design return period. The historical data on annual peak water levels are used for the purpose. The gage station nearest to the project site at Pathargata is located at Patharghata on the Bishkhali River. The gage station measures the daily water level. These data would be used to assess the extent of inundation due to floods. 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. The drainage analysis would require the estimation of design rainfall.

3.11 ECOLOGY, ENVIRONMENT AND FOREST AREAS

Ecologically Critical Area ecologically defined areas or ecosystems are affected adversely by the changes brought through human activities. The Bangladesh Environment Conservation Act (BECA), 1995, has provision for Ecologically Critical Area (ECA) declarations by the Director-General of the Department of Environment in certain cases where the ecosystem is considered to be threatened to reach a critical state. In April 1999, the Director-General of the Department of Environment (DOE) officially declared nearly 40,000 ha, within seven separate wetland areas, as ECAs where Sundarbans Reserved Forest with a 10 km buffer zone is one of them which were deemed to meet the 'urgency criterion' required by BECA, i.e., they were 'threatened to reach a critical state'. Within Patharghata Upazila, about fifty percent of land area has fallen into ECA. Beside ECA, the Upazila contains some areas of mangrove plantation, particularly in Haranghata forest and char lands (Figure 40).

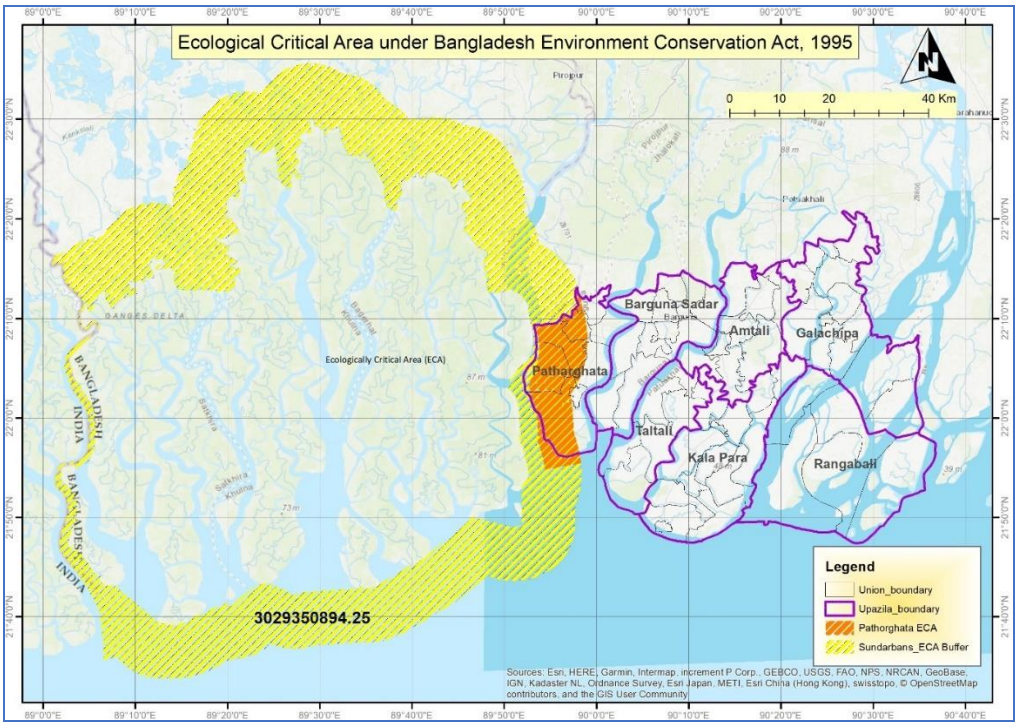


Figure-39: *Ecological Critical Area*
Source: SPARRSO

Figure-40: *Haringhata forest of Patharghata*

3.12 FISHERIES & AGRICULTURE

This structure plan has addressed the fishermen's condition, as the development activities in the area will reduce fisheries activities. Numerous fishermen would lose their jobs or will be unable to meet their basic needs. Through communication infrastructural development and tourism sector development, this plan has proposed several alternative sources of income for the local people, which include fishermen and farmers.

3.13 CLIMATE CHANGE AND VULNERABILITY ASSESSMENT

The coastal zone of Bangladesh sustains the livelihoods of over 40 million people with a diversity of natural resources that include fisheries, shrimp farms, forests, and deposits of salt and minerals. It also provides sites for export-processing zones, harbours, airports, land ports, and tourism. However, the coast of Bangladesh is vulnerable. A combination of natural events, including storm surges, cyclones, flooding, high groundwater arsenic levels, and anthropogenic hazards such as erosion, waterlogging, soil salinity, pollution, and increasing population pressures have adversely affected the pace of social and economic development in this region. Compounding these issues are increasing risks from climate change, particularly sea-level rise. There is strong evidence that the global sea level has risen during the last century at an increased rate (approximately 1.7 millimetres per year). The sea level is not rising uniformly around the world. The two major causes of sea-level rise are thermal expansion of the oceans (water expands as it warms) and the loss of land-based ice due to increased melting.

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 Patharghata 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 Patharghata 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, stormwater 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 Patharghata 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. It is crucial to implement educational initiatives aimed at enhancing knowledge regarding the significance of conserving and sustainably managing coastal resources within local communities and among tourists. Therefore, employ social media platforms, workshops, and community activities as means to distribute and communicate information pertaining to the importance of conserving coastal ecosystems.
2. Incorporate the participation of local communities in decision-making processes pertaining to resource management, with a focus on acknowledging and incorporating their traditional knowledge and practices. Promote community-driven endeavours aimed at conservation, including activities such as organized efforts to clean beaches, projects to plant mangroves, and the adoption of sustainable fishing methods.
3. Alongside this, an evaluation of the forest resources, the delineation of reserved areas, the identification of appropriate spots for afforestation and replanting, an evaluation of the local necessity, and the formulation of a strategy to work with a variety of local stakeholders to improve the existing forest areas are all steps that should be taken. Establish and enforce regulations that govern responsible resource use in coastal areas.
4. Engage in cooperative efforts with non-governmental organizations (NGOs) and conservation groups to effectively utilize their specialized knowledge and available resources for the

implementation of conservation initiatives. it will help to tackle shared obstacles and advancing the adoption of environmentally sound approaches to coastal management.

5. 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.
6. 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.
7. Fresh water needs to be conserved as much as possible. To maintain water quality, it is advisable to plant suitable native species along the canal and river banks. In this case, water banking through conserving big water bodies could be a solution.
8. 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
9. Plant trees in the coastal and terrestrial environments or the intertidal zone, along coasts which will work as a barrier against disaster. This initiatives with native species to enhance biodiversity, stabilize soils and provide alternative income generating options for local poor.
10. 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.
11. Nutrient inputs must be decreased by sewage treatment and measures targeting agricultural practices in order to combat the threats of coastal eutrophication. Promote recycling, reduce single-use plastics, and conduct regular clean-up campaigns to maintain the cleanliness of beaches and water bodies.
12. Coastal plants will serve as a mitigation measure to lower coastal erosion and retain silt by slowing the current.

13. 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.
14. 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.
15. 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.
16. Developing incentive programs that provide rewards to communities and organizations for embracing and adopting sustainable practices and behaviors. Propose the provision of financial incentives or tax benefits to enterprises that demonstrate adherence to ecologically sustainable practices.
17. Promote sustainable forest management by protecting local communities' forest resource rights and promoting income-generating activities. It protects livelihoods and promotes resource responsibility. Ecotourism and sustainable harvesting promote community commitment to forest preservation, fostering a balanced link between communities and the environment.

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 ex-situ and in -situ.
5. Roadside plantations should be made with suitable native species.
6. By utilizing native species for ecological restoration, Assisted Natural Regeneration (ANR) preserves the integrity of degraded ecosystems. The aforementioned strategy fosters a more resilient ecosystem that can resist environmental challenges and contribute to the long-term well-being of the landscape by promoting biodiversity, reducing soil erosion, and providing home for local animals.
7. 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.
8. Parks and recreational spaces with native plant species enhance the local ecosystem, promote better health, and preserve biodiversity. These green spaces facilitate community recreation in visually appealing settings, while also encouraging physical fitness and supporting the preservation of biodiversity. Adopting a comprehensive approach not only benefits the local communities but also enhances environmental conditions and biodiversity conservation at the regional level.

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 Patharghata 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

Patharghata 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 Patharghata 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: Enforce Ecologically Critical Areas (ECA), promote mangrove afforestation

Justification

Ecologically Critical Areas (ECAs) are essentially classified as ecologically protected zones by the legal authorities because they require protection from damaging activities or conservation due to their unique biodiversity or environmental significance.

Strategies

1. Urban Promotional Control Zone should be proposed under ECA area.
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.

Implementing 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) Bangladesh Forest Research Institute (BFRI), and Community-based Organizations (CBOs).

Policy FA-02: 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/participatory program such as co-management. Make clear property rights to ensure local ownership.
4. Prioritize the creation of a coastal green belt by planting native vegetation along coastlines, acting as a buffer against erosion, providing habitat for coastal species, and enhancing the overall resilience of coastal ecosystems.
5. Determine the best places for reforestation by classifying forest areas, evaluating forest resources, defining reserved areas, limiting the commercial exploitation of forest products, establishing national parks, and encouraging the development of social forestry, agroforestry, and other forestry practices are all necessary for the conservation of forests. Furthermore, master plans must to be created for both the short and long horizons.
6. Conduct regular biodiversity assessments and scientific research to understand the composition and health of forest ecosystems, informing conservation strategies and management plans.
7. 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.
8. Launch mangrove rehabilitation programs, emphasizing the restoration of coastal mangrove ecosystems to protect against storm surges, provide habitat for marine life, and sequester carbon.
9. 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.
10. Implement regeneration initiatives, including natural regeneration methods and assisted natural regeneration (ANR), to allow forests to regenerate naturally and recover from disturbances.

11. Develop strategies for climate change adaptation in forested areas, considering potential shifts in ecosystems and the introduction of climate-resilient species.
12. Implement community-based conservation initiatives, involving local communities in decision-making processes and raising awareness about the importance of forest resources and biodiversity.

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 Patharghata Upazila 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 Patharghata Upazila as a tourist destination. The marketing strategy should emphasize the unique features of the Upazila , 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 Patharghata Upazila 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

- Facilitate the engagement of local populations in the strategic planning and decision-making procedures pertaining to ecotourism, hence fostering their active involvement and empowerment.

- Advocate for the implementation of community-based tourism initiatives that actively engage local communities in guiding, cultural experiences, and service supply.
- Offer training initiatives aimed at equipping community people with enhanced skills in the areas of hospitality, guiding, and sustainable tourist practices.
- Present and endorse the local culture, customs, and legacy as essential elements of the tourism encounter.Facilitate the coordination of cultural festivals and events that align with the visitation of international visitors, thereby fostering avenues for cultural exchange and engagement.
- One potential suggestion is to establish designated locations within the community that are specifically reserved for foreign tourists. These exclusive zones would be situated in secluded parts of the town, such as isolated char regions. The aim would be to provide a tailored and immersive experience for tourists, while also ensuring that local customs and traditions are respected.
- The organization aims to facilitate homestay programs, when local people graciously offer their homes to international tourists. These programs serve as a platform for developing cultural exchange and offering guests with distinctive housing experiences.
- The objective is to formulate marketing strategies that effectively emphasize the distinctive cultural and natural assets of the community, with the aim of enticing international tourists. This will be achieved by capitalizing on internet platforms and collaborating with travel companies.
- Integrate environmental education elements into tourism activities, thereby enhancing the knowledge and understanding of international tourists on the significance of conservation and the adoption of sustainable practices.
- To promote equitable distribution of economic advantages within the community, it is imperative to implement pricing systems that are fair and build mechanisms for revenue-sharing in the context of tourism.
- Our company specializes in curating personalized tour packages for international visitors, with a particular emphasis on highlighting distinct cultural or natural aspects. These meticulously crafted itineraries offer individualized experiences that are thoughtfully aligned with the unique strengths and attributes of the local community.

- Implementing feedback methods is crucial for gathering input from both international visitors and the local population, so facilitating a process of ongoing enhancement and adjustment of tourism products.
- It is imperative to provide resources towards the development of essential infrastructure in order to augment the tourism experience. This includes the establishment and upkeep of well maintained trails, visitor centers, and other pertinent amenities that are specifically designed to cater to the requirements of international tourists.
- Establish a correlation between ecotourism endeavors and conservation undertakings, thereby strengthening the interdependence between tourism-related activities and the safeguarding of the indigenous ecosystem.
- The imperative lies in the development and implementation of regulatory frameworks that facilitate and oversee community-based tourism, thereby ensuring its compliance with both local statutes and global benchmarks.

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

- Promote synergistic partnerships between the public and commercial sectors to effectively pool resources, leverage knowledge, and mobilize investments for the purpose of advancing tourist development initiatives.
- One potential strategy to stimulate private investments in tourism infrastructure and services is the implementation of financial incentives and tax cuts.

- To foster private tourism investments, it is advisable to allocate resources towards the development of public infrastructure, namely in the areas of transportation, roads, and utilities. This strategic approach aims to enhance the overall appeal of the environment, hence attracting potential private investors in the tourism sector.
- The objective is to design inclusive destination marketing strategies that effectively entice private investors through the strategic presentation of the area's tourism prospects.
- Propose the establishment of dedicated funds or financial assistance mechanisms tailored to cater to the needs of local entrepreneurs who exhibit interest in venturing into tourism-related enterprises.
- Promote and facilitate community-based tourism initiatives spearheaded by indigenous entrepreneurs, so assuring the retention of economic advantages within the local community.
- Encourage the expansion of a wide array of tourism offerings and experiences in order to appeal to a diversified group of investors with varying interests in the tourism industry.
- Develop open and investor-friendly regulatory frameworks that establish a stable and predictable environment conducive to both public and private investments.
- The prioritization of heritage and cultural preservation in the context of tourist development renders it an appealing prospect for investors with a vested interest in promoting sustainable and responsible tourism practices.
- Incorporating local communities into the planning process is essential to meet their wants and concerns, hence enhancing the attractiveness of the destination to potential investors.
- Engage in collaborative efforts to develop marketing strategies that collaboratively promote the destination, leveraging resources from both the public and private sectors.
- Implement strategic digital marketing campaigns on various social media platforms with the aim of promoting the distinctive attractions and investment prospects of the destination. Develop compelling and aesthetically pleasing content that effectively highlights the tourism prospects, investment prospects, and triumphs of indigenous business owners.

- The objective is to establish a robust and unified brand identity for the destination, emphasizing its distinctive selling characteristics and its conducive climate for investment.
- Promote community involvement via social media platforms by disseminating information about the beneficial effects of tourism growth on the local community and economy.
- Utilize social media platforms as a means to disseminate interactive maps and virtual tours of the area, thereby furnishing prospective investors with a thorough perspective on the array of prospects that are now accessible. Promote the active engagement of contented investors and entrepreneurs in disseminating testimonials and favorable reviews through social media platforms, so fostering the establishment of credibility and engendering trust in the targeted destination.
- Facilitate interactive question and answer sessions on various social media platforms, providing a venue for possible investors to directly contact with important players and decision-makers.

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

Except for the core area of paurashava, topographically, Patharghata 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 within the paurashava. The existing land use of the Upazila shows that 56.55 percent of the land is used for agricultural activity, and other mentionable land-use area are: 17.51 percent rural settlement, 7.62 percent vacant land and 6.99 percent forest area. Table 21 illustrates existing landuse statistics in detail.

Table-18: Existing Landuse of Patharghata Upazila

Landuse Category	Area (Acre)	%
Administrative/Public Services	14.56	0.02
Agriculture	33323.88	56.55
Commercial	19.11	0.03
Community Service	50.08	0.08
Educational/Research Institute	110.71	0.19
Forest	4120.60	6.99
Growth Centre	86.71	0.15
Health Service	3.37	0.01
Manufacturing/Processing	55.96	0.09
Mixed Use	5.09	0.01
Open Space & Recreation	3.39	0.01
Rural Settlements	10318.41	17.51
Service Activity	18.77	0.03
Transportation & Communication	764.55	1.30
Urban Residential	580.68	0.99
Vacant Land	1455.62	2.47
Vegetation	4491.04	7.62
Waterbody	3502.72	5.94
Total	**58925.23**	**100.00**

Source: PKCP project, UDD, 2022

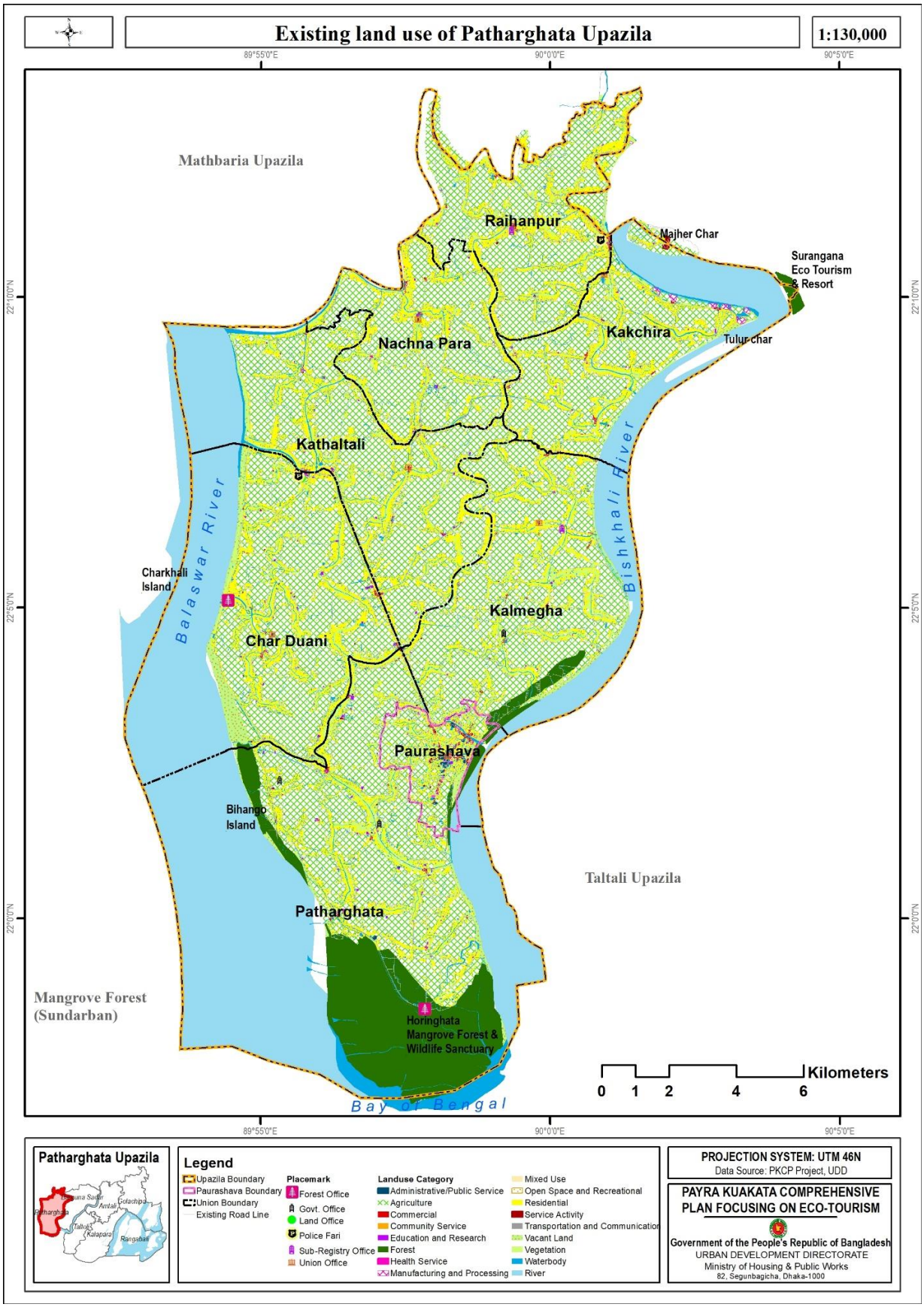


Figure-41: *Existing land use of Patharghata Upazila*

Source: PKCP project, UDD, 2022

5.2 SUITABLE SITE RANKING-FINDINGS FROM SUITABILITY ANALYSIS

5.2.1 Ranking Suitable Areas based on Geological Attributes

Geological attributes are important to ensure safe, stable and economic design and construction of government's or authoritie's 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. Construction technology commonly employes pile foundation in a variety of scenarios,such as when there is a 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 have been considered as important dependent variables 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 (Figure 42). Around 89.29 percent area were found moderately suitable and 10.30 percent found suitable for infrastructure development such as government buildings, hospitals, cyclone centers etc.

5.2.2 Ranking Suitable Areas based on Hydro-geological Attributes*:* -

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 qroundwater 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 have been considered.

Figure 43 illustrates the findings of the suitability analysis. It is found that the 09.96 percent of the area were found hydro-geologically poor and only 2.66 percent of area that is situated in Kanthaltali union were with good attributes.

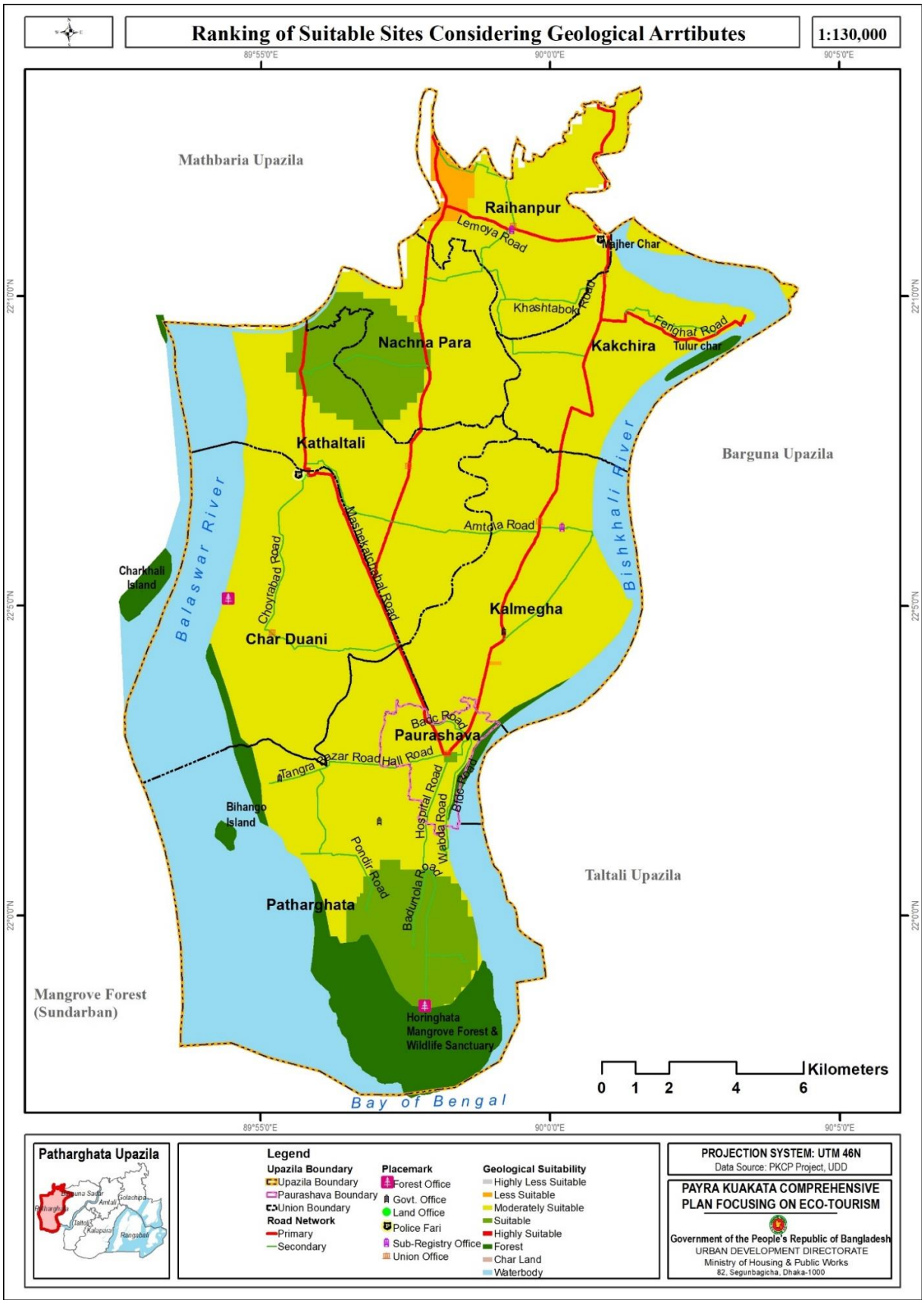


Figure-42: *Ranking of suitable sites considering geological arrtibutes*
Source: PKCP project, UDD, 2022

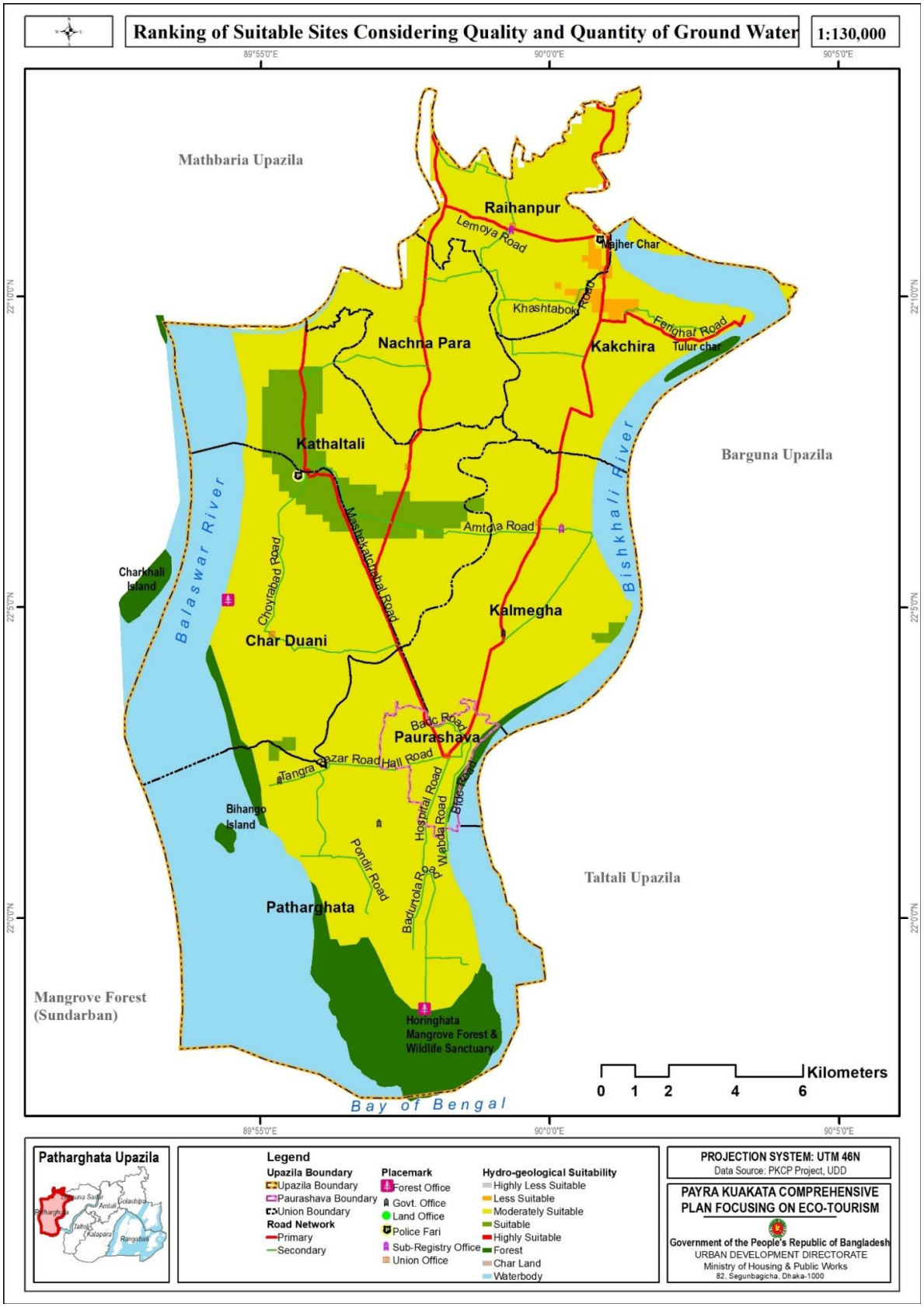


Figure-43: *Ranking of suitable sites considering quality and quantity of ground water*
Source: PKCP project, UDD, 2022

5.2.3 Ranking Growth Centers considering existing function

Numeric range has been explored to classify growth centers into rural trade and commerce center, higher order rural service center, middle order rural service center and lower order rural ervice center based on score. Public services such school, college, health centers etc. will be encouraged within the different level service centers and major economic activities will be encouraged within rural trade and commerce centers.

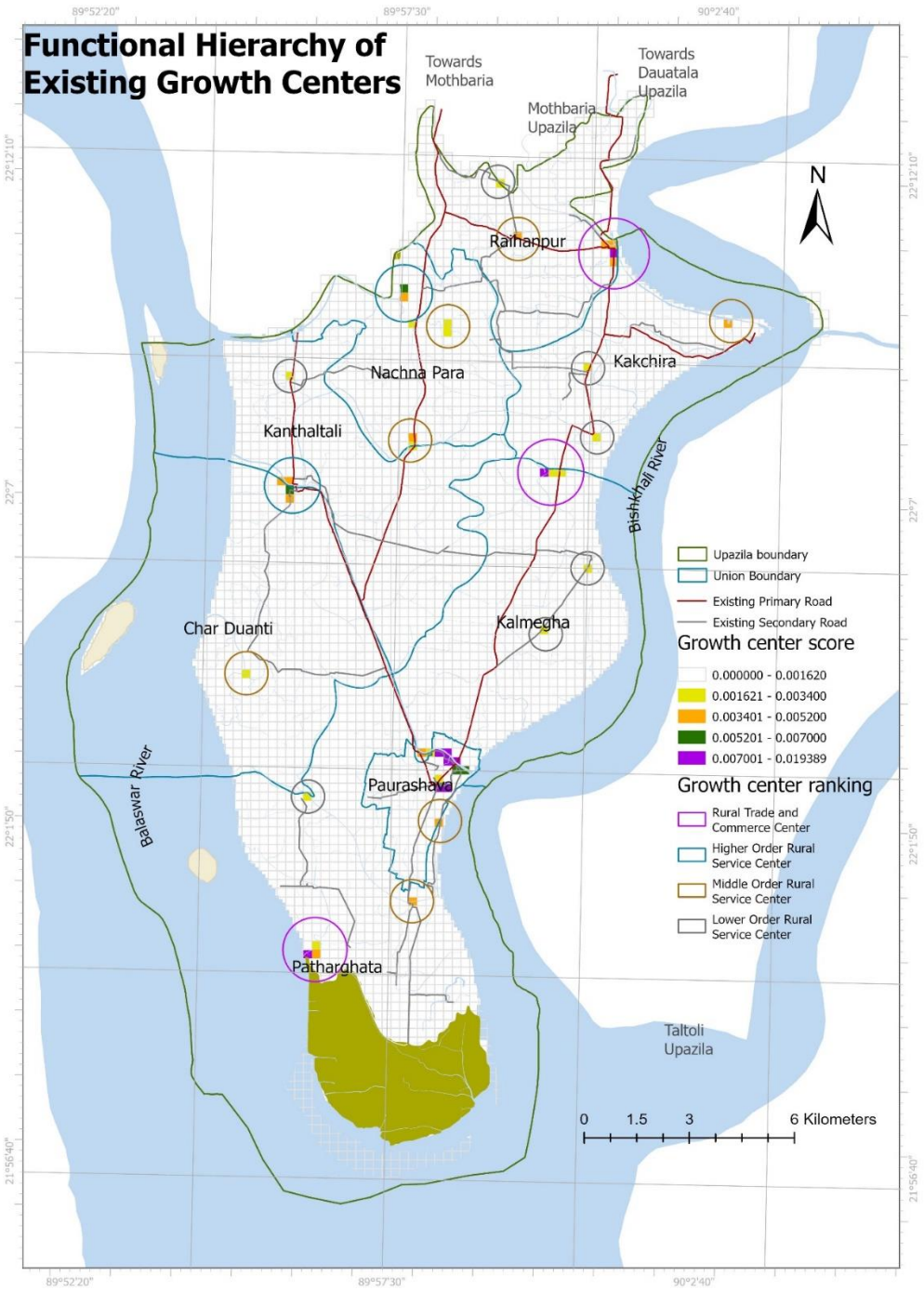


Figure-44: *Ranking of growth centers considering existing function*
Source: PKCP project, UDD, 2022

5.3 SUITABLE SITE RANKING- FINDINGS FROM MULTICRITERIA ANALYSIS

5.3.1 Ranking Suitable Areas for Infrastructure Development

Infrastructures are the basic facilities and equipment required to produce a product or deliver a service. Infrastructure 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. Infrastructure 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 (16.6 % influence) of the upazila, disaster risk (41.4 % influence), elevation (25 % influence) and building height zones (16.6% influence) have been considered. Due to upgradation of construction technology it is possible to reach foundation depth 25 to more than 30 m. while the Upazila's soil condition is suitable for lowrise and high rise building construction (Table 22).

Table-19: Area percentage of ranks and other landuses

Ranks	Area in percentage
Less suitable	1.33%
Moderately suitable	14.15%
Suitable	8.82%
Highly suitbale	11.90%
Other landuses	
Agriculture	26.16%
Forest	4.63%
Char	0.26%
River	32.74%
Grand Total	100.00%

Source: PKCP project, UDD, 2022

5.3.2 Ranking Suitable Areas for Human Settlement

The human settlement environment includes surface spaces that are inextricably linked to human activity and life. Patharghata Upazila is a seaside location with a low level of urbanization. However, it comes with a number of issues, including a scarcity of high-quality water and the threat of disaster. That is why geological attribute (14.28 % influence) of the upazila, Hydro-geology (28.57%), Road Proximity (21.42% influence), Elevation (14.28%

influence), and Disaster risk (21.42% influence) have been taken into account when ranking human settlement sites (Table 23).

Table-20: Area percentage of ranks and other landuses

Ranks	Area in percentage
Less suitable	1.50%
Moderately suitable	17.58%
Suitable	17.12%
Other landuses	
Agriculture	26.16%
Forest	4.63%
Char	0.26%
River	32.74%
Grand Total	100.00%

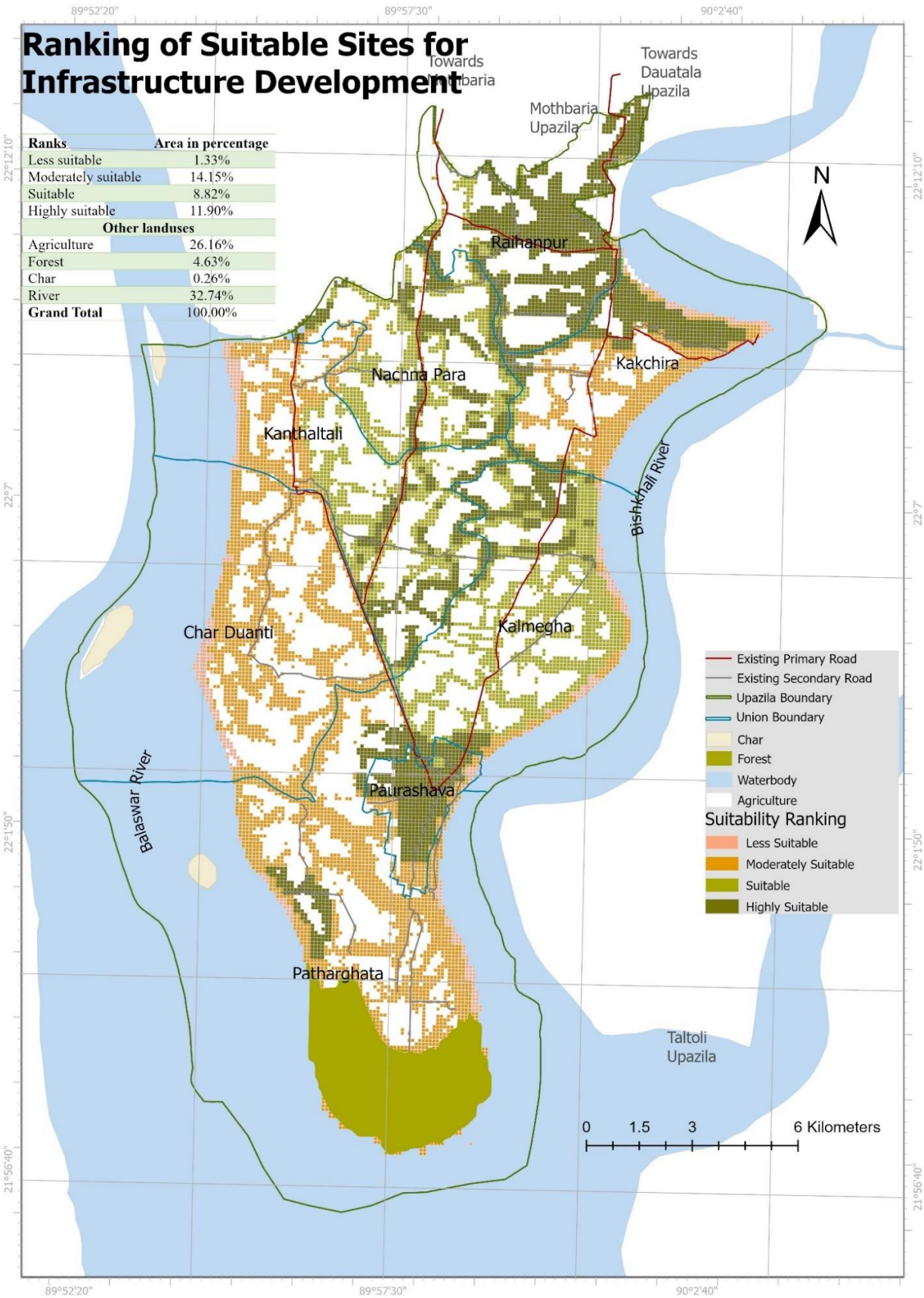
Source: PKCP project, UDD, 2022

5.3.3 Ranking Suitable Areas for Potential Economic Region

Location of growth centers directly affect the land use and ecosystem. Rapid infrastructure development and the uncontrolled growth of cities' economic hubs result inefficience of infrastructure facilities, loss of agricultural land, water bodies, open spaces, and a variety of microclimatic changes. The upazila's exceptional rise of growth centers will result in an uneven distribution of basic services such as transportation and communication. To rank suitable sites for infrastructure development geological attribute (17.64 % influence) of the upazila, Hydro-geology (23.74% influence), Road Proximity (29.41% influence), and Disaster risk (29.41% influence) has been considered. (Table 24).

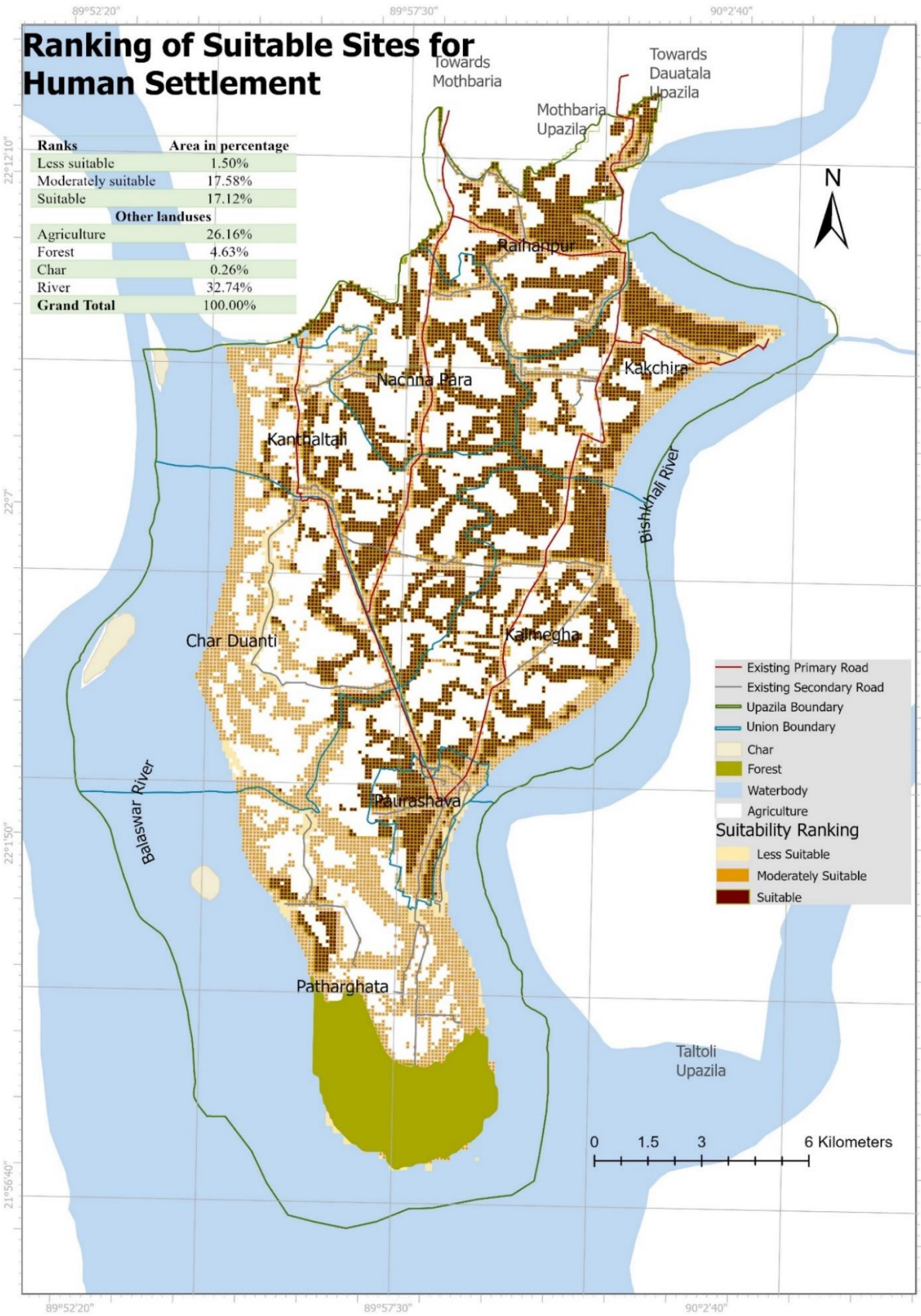
Table-21: Area percentage of ranks and other landuses

Ranks	Area in percentage
Highly less suitable	0.09%
Less suitable	3.45%
Moderately suitable	20.73%
Suitable	11.88%
Other landuses	
Agriculture	26.18%
Forest	4.63%
Char	0.26%
River	32.77%
Grand Total	**100.00%**



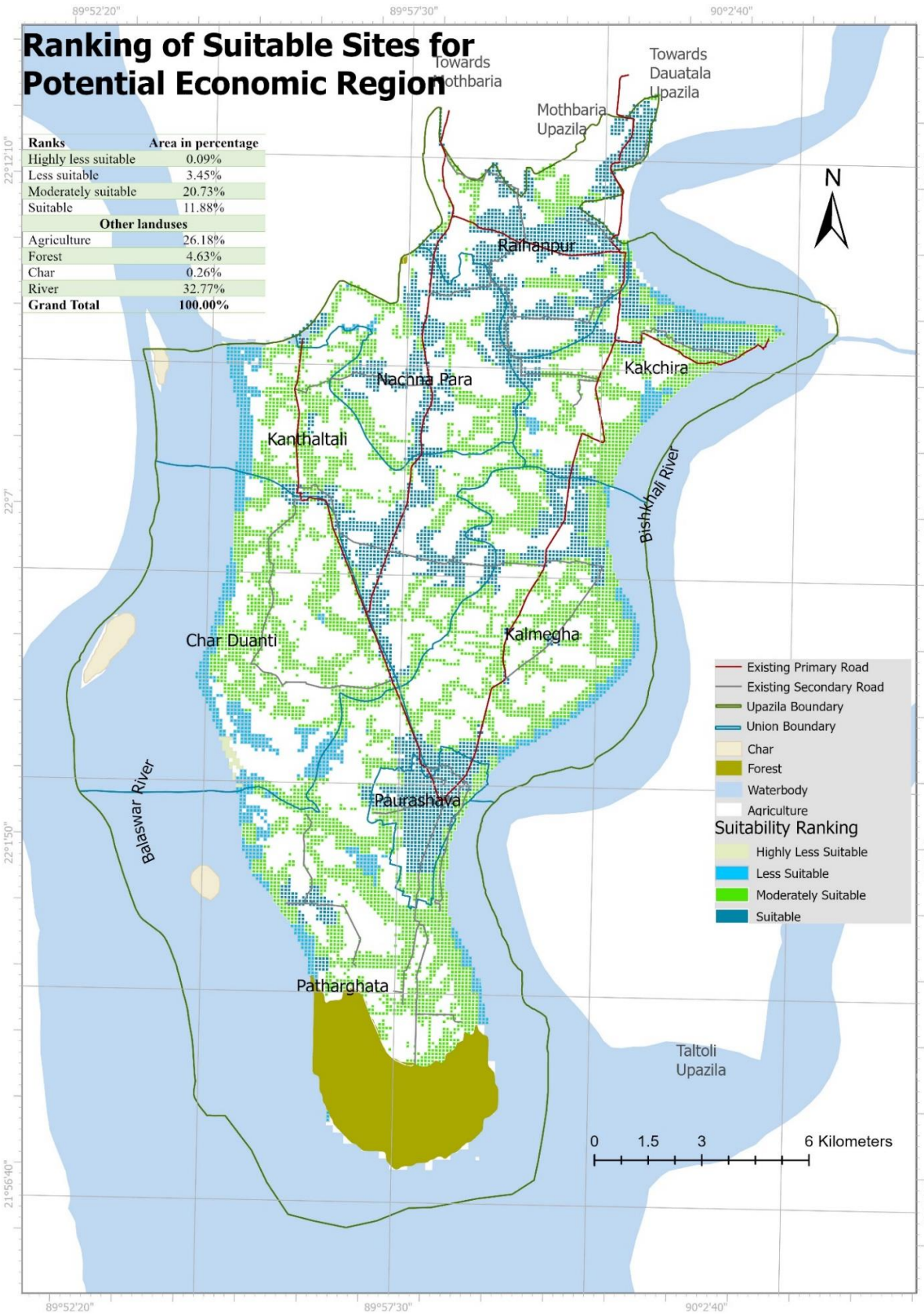
Ranks	Area in percentage
Less suitable	1.33%
Moderately suitable	14.15%
Suitable	8.82%
Highly suitable	11.90%
Other landuses	
Agriculture	26.16%
Forest	4.63%
Char	0.26%
River	32.74%
Grand Total	100.00%

Figure-45: *Ranking of Suitabile sites for infrastructure development*
Source: PKCP project, UDD, 2022



Ranks	Area in percentage
Less suitable	1.50%
Moderately suitable	17.58%
Suitable	17.12%
Other landuses	
Agriculture	26.16%
Forest	4.63%
Char	0.26%
River	32.74%
Grand Total	100.00%

Figure-46: *Ranking of suitable sites for human settlement*
Source: PKCP project, UDD, 2022



Ranks	Area in percentage
Highly less suitable	0.09%
Less suitable	3.45%
Moderately suitable	20.73%
Suitable	11.88%
Other landuses	
Agriculture	26.18%
Forest	4.63%
Char	0.26%
River	32.77%
Grand Total	**100.00%**

Figure-47: *Ranking of suitable sites for potential economic region*
Source: PKCP project, UDD, 2022

5.4 COMPOSIT STRUCTURE PLAN

5.4.1 Directives from Regional Plan

From regional plan, some proposals are taken into account and integrated into structure plan. From analysis, it was observed that Patharghata was deprived of necessary facilities and in structure plan these facilities have been incorporated and that is why some zones are proposed as structure plan zones. Below key points are directives fromregional plan:

- Conservation of forest resources and protection of biodiversity through proposal of ConservationZone
- Ensuring sustainable management of natural resources through proposal of Conservation Zone
- Construction of wind mills and solar plants to promote sustainable energy sources
- Construction of polders and coastal green belt to prevent saline water intrusion
- Preference of temporary structures with local raw materials (like floating hotels, eco-resortsetc.)
- Promotion of eco-friendly water based transportation for tourists
- Promotion of employment generation through development of tourism sector

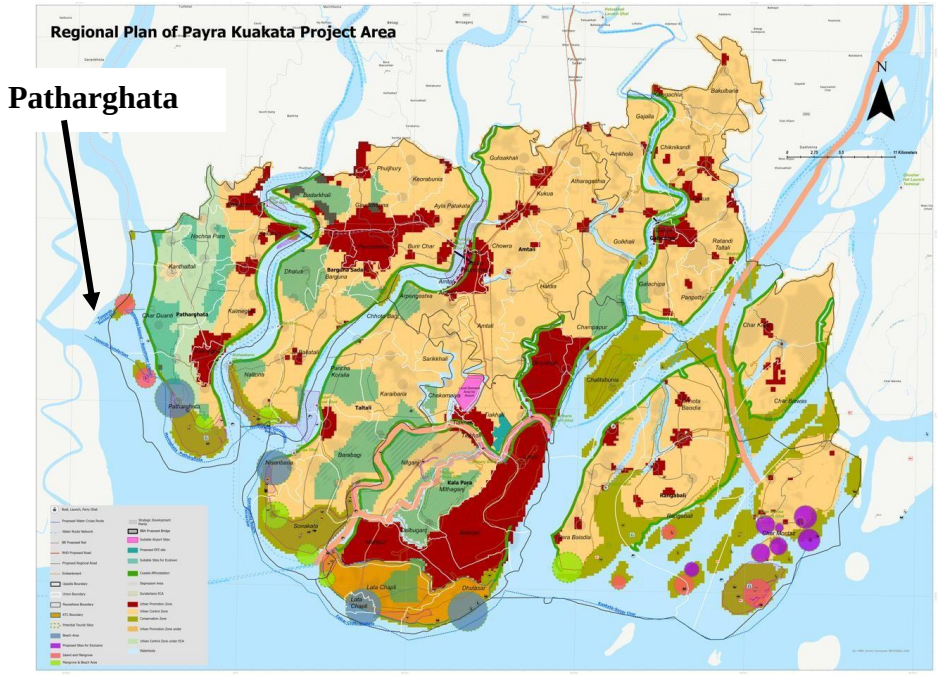


Figure-48: *Regional Plan Map of Seven Upazila*
Source: PKCP project, UDD, 2022

5.4.2 Various Govt. Projects locations

Government has some projects for Patharghata Upazila such as the construction of cyclone selters, road, land port and coastal afforestation.The project proposals have been taken into consideration in the structure plan. List of Government Projects for Patharghata Upazila has been given below.

Table-22: List of Govt projects for Patharghata Upazila

Name of the Project	Location
Costal Embankment Improvement Project	Overall Project Area
Patharghata Circle ASP Office	Patharghata
Patharghata Farmar Tranning Institute Construction	Patharghata
Patharghata Model Mosque	Patharghata
Proposed project under implementation of Forest Department	Overall PKCP Area
Barguna-Patharghata Road over Biskhali River	Patharghata and Barguna
Construction of Cyclone Shelter Project (2nd Phase)	Patharghata
Construction of Cyclone Shelter Project (2nd Phase)	Patharghata

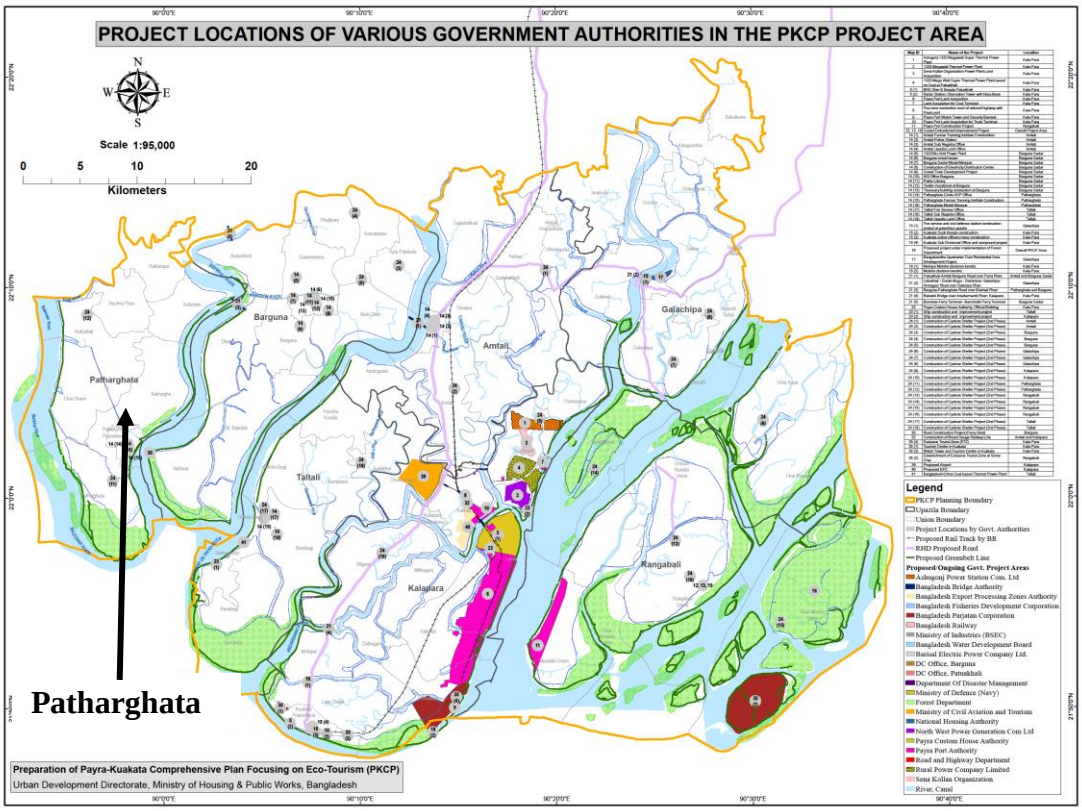


Figure-49: *Govt. Project Locations*
Source: PKCP project, UDD, 2022

5.4.3 Structure Plan Policy Zoning

For future planned development of the upazila and as well as to protect natural resources including agriculture and major water bodies, a strategic land use zoning plan has been prepared for the entire upazila. The Upazila has been divided into 11 strategic zones, these are, Agriculture,Char land, Forest, coastal afforestation, Potential Economic region, River, Circulation Network, Rural settlements, Urban core area, Urban fringe, and waterbody**.**

Agriculture Zone: 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, and melons, 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.

Core Urban Area: The term "urban core" 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 is also with the greatest concentration of services. 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 areas, the level of service should be maintained. Autorickshaw stands, banks and financial institutions, bus and auto passenger stops, 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 Core Urban Area.

Urban Frienge Area: The urban fringe, also known as the outskirts, urban, peri-urban, or urban hinterland, is a terrain boundary between town and country, or a transition zone where urban and rural activities mix and frequently clash. According to demographic projections, this zone will require additional land for future urban planning. Existing physical growth patterns and potential areas must be taken into account when planning new urban land development. Road, drain, walkway, waste transfer station, and other civic services will be provided as new facilities and services. In the year 2032, this area is expected to expand. 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 Urban Fringe Area.

Rural settlement area: 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 area with relatively low density of population and located ourside the paurashava 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 regulations 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.

Economic Region: 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 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 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 stops, highways, cottage industry, dairy farming, garages, garments, kneeting factories, industrial classes 1, industrial classes 2, retail shops, restaurants, and rickshaw stands are all permitted activities in the potential economic region.

It also includes Agro-fishery Zone typically includes a range of farming practices, such as crop cultivation, livestock rearing, and fish and shrimp farming, fishing activities and is designed to promote sustainable agricultural and fishery practices, support rural development, and increase food security

Conservation Zone: Depending on the desired intervention in spatial planning, the opportunity areas are identified. To make a rural-urban balanced framework, the areas beyond the established urban area, are the opportunity areas. This is aimed to define specific landscape areas, where conservation action is likely to have the most benefit for biodiversity based on the existing biodiversity interests and physical opportunities. Natural forest, Island and Char areas have been also consevered. Living in the chars is risky and insecure since these areas are prone to violent and unexpected flooding as well as erosion and land loss. Vegetable cultivation, livestock, dairy farming, cash crop cultivation, agricultural shelter, and gazing for a prescribed length of time in a year are all permitted activities in the char.

Coastal Afforestation and Foreshore: By stabilising 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. Botanical garden and gardening are permitted activities in the coastal afforestation.

Circulation Network: major circulation covering primary and secondary roads.

Potential Urban Area: Potential urban areas refer to areas that are likely to experience rapid urban growth and development in the future. These areas are typically characterized by factors such as population growth, economic development, infrastructure development, and urbanization trends.

Strategic Rural Center Zone: This is not a zone, rather it is an indicative area demarcated to facilitate implementation of government's local level plan and policies to reach national goals. The major objectives are as follows:to encourage the growth of a wide range of commercial facilities and services, including major offices, retailing, and a mix of entertainment, recreation, and community facilities to meet the needs of the community; to facilitate the creation of employment within the center to reduce the need for travel and increase the level of self-sufficiency within the Upazila; to make it easier for the neighborhood's complementary housing development to take place in order to boost business viability, the Upazila's overall liveliness, and the range of housing options available; to encourage high levels of accessibility to and within the center for users of all available modes of transportation (available public service, bicycle, and by foot) and considering population the zone has been ranked as first order, second order and third order.

5.4.3 Structure Plan of Pathargahat Upazila

Agricultural lands constitute about 31.17 % of the total upazila area. Road network (2.22%) includes primary, secondary and tertiary roads. Conservation Zone covers 4.96 % of land of the Upazila. Rural settlement (21.31%) encompasses rural housing structures and surrounding vacant land and vegetations- which is the third highest land use. Potential Urban area covers 0.71% of the upazila which includes densely developed area named as Core Urban Area (0.48%) area within pourashava area. Foreshore and coastal afforestation cover 3.93 % area mainly proposed near river side. Agro-fishery Zone covers 0.11 % and water bodies cover 29.32 % area that include canals and ponds. This structure plan has proposed 0.98 % land as Potential economic zone. It is expected that this zone will assist and encourage government and private investors to invest. Investment for industrial development will help to achieve the objective of the structure plan to enhance the residents' socioeconomic position.

Table-23: Percentage of area of proposed zones

SL No.	Proposed Zone Category	Area (Acre)	%
1	Agriculture Zone	24888.80	31.64
2	Waterbody	21954.12	27.91
3	Rural Settlement	17159.86	21.81
4	Conservation Zone	5966.70	7.58
5	Coastal Afforestation and Foreshore Area	3182.03	4.04
6	Urban Fringe Area	1348.18	1.71
7	Circulation Network	1071.57	1.36
8	Economic Region	942.38	1.20
9	Potential Urban Area	556.32	0.71
10	Core Urban Area	378.69	0.48
11	Strategic Service Center 1st Order	597.72	0.76
12	Strategic Service Center 2nd Order	276.95	0.35
13	Strategic Service Center 3rd Order	228.93	0.29
14	Trade and Commerce Zone	121.26	0.15
Total		**78673.53**	**100.00**

Source: PKCP project, UDD, 2022

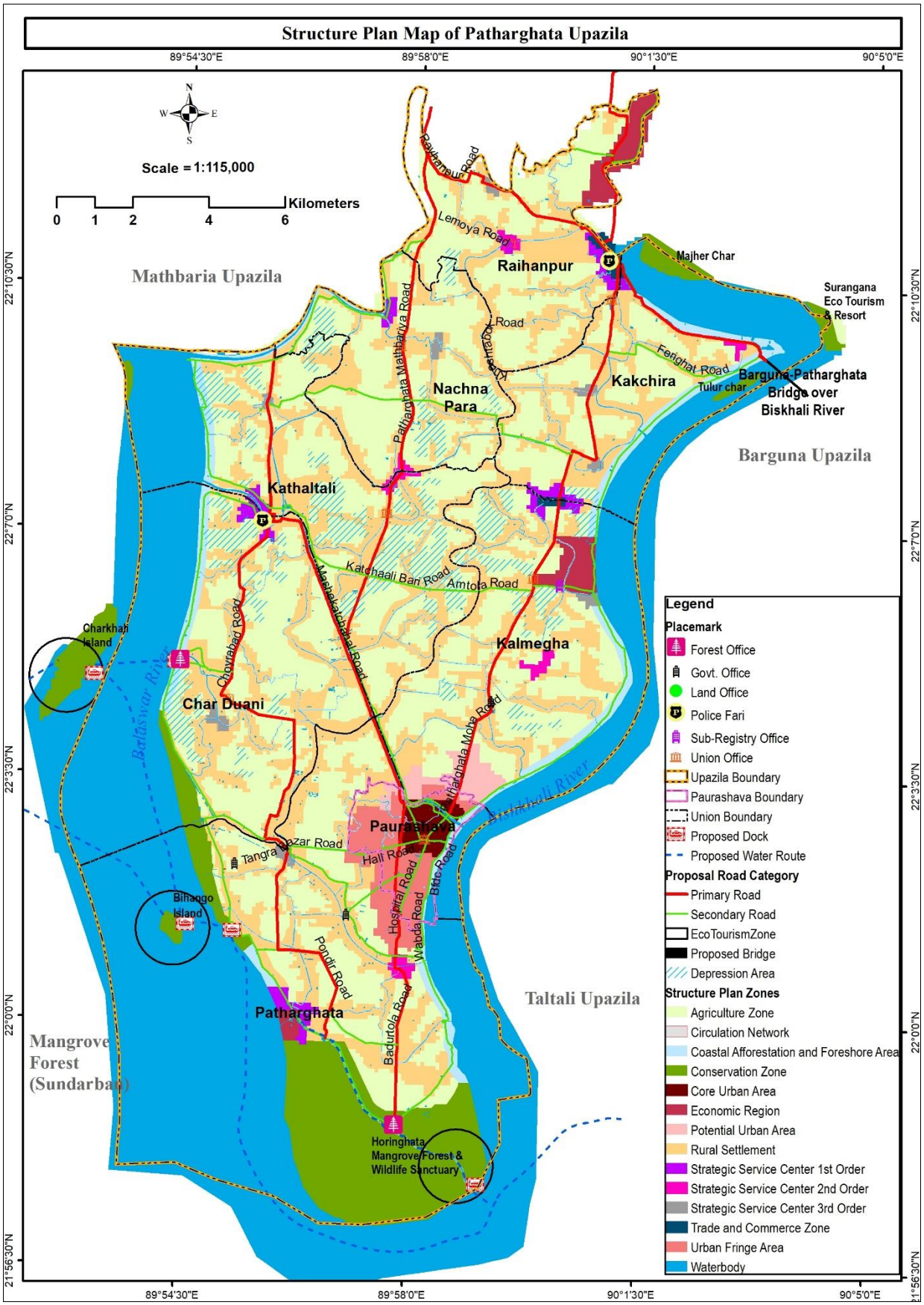


Figure-50: *Structure Plan Map of Patharghata Upazila*
Source: PKCP project, UDD, 2022

5.5 DEVLOPMENT PROPOSALS FOR STRUCTURE PLAN

The development proposals on the basis of planning standards are provided for land uses in different sectors for various phases of plan period in the project Upazila. Some major development projects with possible guidelines are proposed in this plan. The possible sources of funding the projects have also been identified in the Structure Plan.

Table-24: List of Development proposals for Structure Plan

Proposals Name	Quantity	Location
Strategic Zones	14	Overall Upazila
Water Dock	5	Horinghata, Rohita Sea Beach, Bihangho Island, Charkhali Island, Tafalbaria
Proposed Water Route	47.05 Km	Overall Upazila
Eco-Tourism Zones	3	Boleshowr Island, Horinghata Island, Bihango Island
Proposed Bridge	1	Barguna-Patharghata Road over Biskhali River
ECA	191.74 Square km	The Government of Bangladesh has declared this area as Ecologically Critical Area (ECA).
Primary Road	88.84 km	Connecting Growth Center
Secondary Road	121.23 km	Connecting Growth Center

Source: PKCP project, UDD, 2022

5.5.1 Proposed Road Network

From the existing data, it has been observed that, the condition of roads are very poor and narrow. Majority of the roads are katcha roads in Patharghata Upazila. In the perspective plan, road proposals have been given in ordet to connect growth centers from union to union and upazila to other upazilas.

Table-25: Proposed Road category of Patharghata Upazila

Proposed Class	Proposed Width (ft)	Planning Decision
Primary Road	80	Widening
Secondary Road	60	Widening
Tertiary Road	40	Widening
Access Road	20	Widening

Source: PKCP project, UDD, 2022

Figure-51: *Proposed Road Plan of Patharghata Upazila*
Source: PKCP project, UDD, 2022

5.6 Structure Plan 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:

5.6.1 Core Urban Area

As there is an existing paurashava in Patharghata Upazila. Core urban area has been proposed in paurashava. About 378.69 acre is proposed for core urban area.

5.6.2 Potential Urban Area

Patharghata pourashava is growing towards north day by day. The structure plan recommends the area as future potential urban area for the development. It comprises the area of 556.32 acres. 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.

5.6.3 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 Patharghata 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 Patharghata Upazila are 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 Patharghata upazila located on the bank of Macherkhal 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.

5.6.4 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 in spite of high flood risk and a paucity of infrastructure services and other social and community service provision. The hierarchy of growth centers 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 centers have spread their influence to outer areas like Kakchira, and Padma Bazar etc. so as to form a functional relationship with these areas.

Trade and Commerce center

It is the centre of activities in the established of Patharghata 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 Kakchira Hat and Kamarhat Bazar area of the Patharghata Upazila. The following facilities can be developed in the Trade and Commerce center.

a. Commerce and Shopping
b. Open Space and Recreation
c. Miscellaneous
d. Utilities
e. Transportation

Strategic Service center-1st Order

This type of growth centre 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 Charduania Bazar, Manik Khali Bazar, Charlathiamara Bazar, Kakchira Hat and Kamarhat Bazar. Following are the major facilities which have the potentiality for development.

a. Community Facilities
b. Government Services
c. Health
d. Education
e. Transportation
f. Open Space and Recreation
g. Residential
h. Miscellaneous
i. Utilities

Strategic Service center-2nd order

It is an economic activity 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 six place as second order like Patharghata Bazar, Lamua Hat, Keramotpur Bazar, Bainchutki Bazar, Patharghata Bazar and Chhanbania Bazar. The second order service center include the following facilities-

a. Community Facilities
b. Health
c. Education
d. Transportation
e. Open Space and Recreation
f. Residential
g. Miscellaneous
h. Utilities

Strategic Service center- 3rd order

Centre to support the convenience of residents; designated community centre with consideration of accessibility by transportation, adjacent to other centres. The rest of the hat and bazar are categorized as third order and include the following categories of services.

a. Health
b. Education
c. Community Facilities
d. Transportation
e. Open Space and Recreation
f. Residential
g. Miscellaneous
h. Utilities

Table-26: List of Probable facilities within Development Centers

Growth Center Hiararchy	Probable Facilities	Location Name
Trade and Commerce Center	• Shopping Complex, • Open space to take shelter in disaster event or fire hazard or earth quake, • Waste Disposal Ground	Kakchira Hat, Kamarhat Bazar
Strategic Rural Center Zone-First Order	• Retail sale/ Kitchen/ Neighborhood market • Eidgha/graveyard/ Community center/ religious places/ cremation ground • Police station/ Police box/ Post office/Fireservice • Maternity/ Child Care Center/Clinic • College/vocational training center/Nursery School/Primary School/ Kindergarten/Secondary / High School/ public library • Bus stand/truck stand/Rickshaw/ van/Baby taxi/tempo stand/ Fuel/ Filling Station	Charduania Bazar, Manik Khali Bazar, Charlathiamara Bazar, Kakchira Hat, Kamarhat Bazar

	• Neighborhood /Community Park/ Cinema Hall/ Town Hall/ Complex • water supply treatment plant/waste dumping ground/ water booth	
Strategic Rural Center Zone-Second Order	• Community center/religious places/cremation ground • Clinic • Nursery School/Primary School/ Kindergarten/Secondary / High School/ public library • Rickshaw/ van/Baby taxi/tempo stand/ Fuel/ Filling Station • small playgroung / Cinema Hall/ Town Hall/ Complex/ Club House • Waste disposal ground/Waste collection point/ water booth	Patharghata Bazar, Lamua Hat, Keramotpur Bazar, Bainchutki Bazar, Patharghata Bazar, Chhanbania Bazar
Strategic Rural Center Zone-Third Order	• Nursary school, primary school • Religious places • Mainly recreation facilities • Waste collection point/ water booth	Raihanpur Bazar, Kathaltoli Bazar, Rupdhan Bazar, Rupdon Bazar, Kalmegha Hat, Boro Tangra Bazar, Fakirhat Bazar, Khalpar Bazar

5.6.5 Beach Area

Patharghata Upazila is an attractive place for natural beauty with a sandy beach named Ruhita Beach. 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. Ruhita Beach Sea beach is a habitat for local birds, sea turtles and also serve as high tide roosting sites for the birds.

5.6.6 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. The proposed road has already discussed in the 5.5 section.

5.6.7 Water Route Network

The river network of Patharghata 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 *Haringhata Forest via Barguna Sadar via Fatrar Char to Kuakata* for the attraction of tourist as well as local people.

5.6.8 Bridge

Communication is time consuming and difficult in the Patharghata Upazila. To ease travelling and for better connection with Barguna and Barguna Paurashava one bridges have proposed over Bishkhali River.

5.6.9 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 250 m 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.

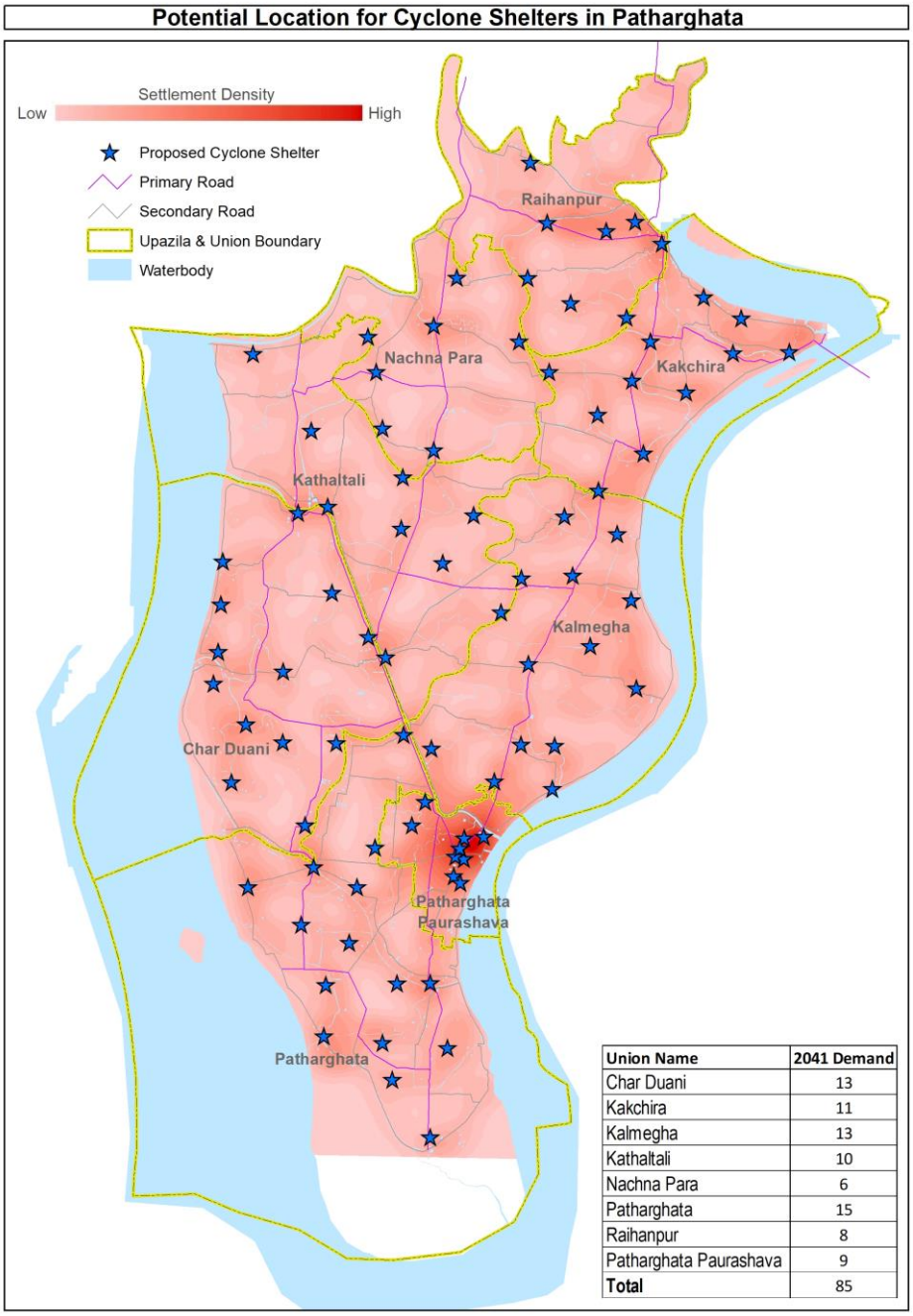
5.6.10 Island Tourism Points

Two island tourism points has been proposed on the Baleshwar 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.

5.6.11 Cyclone Shelter

Though Patharghata Upazila is a disaster prone area, 85 locations has been identified as potential cyclone shelters here. When specific warnings for cyclone and tidal surges are

announced by the appropriate authorities, the building would be open for safe shelters of local communities and cattle.



Union Name	2041 Demand
Char Duani	13
Kakchira	11
Kalmegha	13
Kathaltali	10
Nachna Para	6
Patharghata	15
Raihanpur	8
Patharghata Paurashava	9
Total	85

Figure-52: *Potential Locations for Cyclone Shelter in Patharghata Upazila*
Source: PKCP project, UDD, 2022

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 recommended that the urban sub-central area and rural sub-central area settlements areas in diverse places of the urban and rural sections of Patharghata Upazila be preserved in order to accommodate future population expansion. 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 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. Moreover, as there is ECA on the side, heavy construction requires checking whether it violates the ECA rules and guidelines.

Land use Control

Land use zoning is an inevitable element of development plan that regulates the haphazard land use and ensures enough space for proper uses and creates homogeneous land uses. Land use zoning have been practiced in local planning system since the beginning of the post-World War II in the form of physical planning approach. The aim of land use zoning is outlined below.

Land use control or regulation and land use development will ensure sustainable development of the environment and urban growth. It also enables issuance of land use clearance for development. The land use development proposals are prepared considering the permitted,

conditional and non- permitted uses of land in the Structure Plan Zones (SPZs). The matrix (Table 30) prepared in this respect will guide the development process in the Upazila in general. The projects that are required for major development interventions at the Upazila level are considered in the structure plan of the Upazila. The details of the priority projects are provided in the Action Area Plan of the Paurashava and the Urban Promotion Areas (UPAs) at union level of the Upazila.

Table-27: Permitted & conditional uses of different Land use category

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

Facilities	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Core Urban Area	Potential Urban Area	Urban Fringe 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	Waterbody
Agricultural Shelter & Gazing	P	C	N	N	C	C	C	P	C	C	P	P	P	N
Agri Business & Services	P	C	N	N	P	P	P	C	P	P	P	P	P	N
Aquaculture & Fisheries	C	C	N	N	N	P	C	P	P	C	P	P	P	C
Arboriculture	P	P	P	C	N	P	P	P	C	C	C	C	C	C
ATM Booth	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Auditorium Meeting Hall	N	N	N	N	P	C	C	N	P	C	N	N	N	N
Automobile Works	N	N	N	N	P	P	P	C	C	P	C	C	C	N
Autorickshaw Stand	N	N	N	N	P	P	P	P	P	N	P	P	P	N
Bank & Financial Institutions	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Billboard (Advertisement Structure)	N	N	N	N	C	C	C	C	C	P	P	N	N	N
Boitanical Garden	N	P	N	N	P	P	P	N	N	C	C	C	C	N
Boarding & Rooming House	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Brick Fields	N	N	N	N	N	N	N	C	N	N	C	C	C	N
Bus/Auto Passenger Shelter/Stops	N	N	N	N	P	P	P	C	P	C	C	P	P	N
Causeways: Road, Railways	N	N	N	P	R	R	R	R	R	R	R	R	R	N

Facilities	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Core Urban Area	Potential Urban Area	Urban Fringe 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	Waterbody
Cash Crop Cultivation	P	C	N	N	C	P	P	P	P	P	P	P	P	N
Carnival & Fair	N	N	N	N	C	C	C	C	C	C	C	C	C	N
Cemetaries/ Graveyard	N	N	N	N	P	P	P	P	N	N	N	N	N	N
Cinema Hall	N	N	N	N	C	C	C	N	N	N	N	N	N	N
Clinics/ Medical	N	N	N	N	P	P	P	P	P	P	P	P	N	N
Clubs, Private	N	N	N	N	N	N	N	N	C	P	C	C	N	N
Colleges/Universities	N	N	N	N	P	P	P	N	N	P	N	N	N	N
Convention Center	N	N	N	N	P	P	P	N	P	P	C	N	N	N
Communication Service Facilities	N	N	N	P	P	P	P	C	P	P	P	P	P	N
Communication Tower with Height	N	N	N	N	C	C	C	C	P	P	P	P	P	N
Community Center	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Cottage Industry	N	N	N	N	P	P	P	N	P	N	P	P	P	N
Cultural Exhibits & Library	N	N	N	N	C	C	C	C	C	C	C	C	C	N
Cyber Café/IT Center	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Dairy Farming	P	C	C	N	P	P	P	P	P	P	P	P	P	N
Deep Tubewell	C	N	N	N	P	P	P	P	P	N	P	P	P	N
Diagonistic Centres	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Docks & Jetties	C	N	N	N	P	P	P	N	P	P	C	C	C	P
Dormitory / NGO Rest House	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Bakery	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Dwellings, Farm	C	N	N	N	N	P	P	C	P	P	P	P	P	N
Dwellings,Minimal Housing	N	N	N	N	P	P	P	P	N	N	N	N	N	N
Dwellings,Single/ MultiFamily	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Educational Facilities	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Electric Sub Station	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Emergency Shelter	C	N	N	N	P	P	P	P	P	P	P	P	P	N
Explosive Manufacture & Storage	N	N	N	N	N	N	N	N	P	N	N	N	N	N

Facilities	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Core Urban Area	Potential Urban Area	Urban Fringe 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	Waterbody
Fire Station	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Food Kiosk	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Flood Management Structures	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Freight Transport Facilities	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Garages/ Workshops	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Garments & Kneeting Factory	N	N	N	N	C	P	P	N	P	P	P	P	P	N
Golf Courses & Golf Club	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Government Office / Guest House	N	N	N	N	P	C	C	N	P	P	P	P	P	N
Green Belt/ Green Space	N	P	P	P	P	P	P	P	C	C	C	C	C	N
Hatchery	P	N	N	N	N	P	P	P	P	P	P	P	P	N
Health Facilities	N	N	N	N	P	P	P	P	P	P	P	P	P	N
High School	N	N	N	N	P	P	P	N	N	P	P	P	P	N
Horticulture	P	N	N	N	N	P	P	P	P	P	P	P	P	N
Hospitals/ Health Centers	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Hotel Guest House	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Hotel International Class	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Husking/ Grinding(Rice, Wheat, Pulse)	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Industrial Class 1	N	N	N	N	P	P	P	N	P	N	N	N	N	N
Industrial Class 2	N	N	N	N	P	P	P	N	P	N	N	N	N	N
Institutions	N	N	N	N	C	C	C	N	N	P	P	P	P	N
Irrigation Facilities (Flood Wall/ Canal)	C	N	N	N	C	C	C	C	C	C	C	C	C	P
Livestock	C	C	N	N	P	P	P	P	P	P	P	P	P	N
Major Development	N	N	N	N	P	P	P	N	P	C	C	C	C	N
Multi stored Car park	N	N	N	N	C	C	C	N	C	C	C	C	C	N
Nursery School	N	N	N	N	C	C	C	N	N	N	P	P	P	N
Offices/ Services	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Open Theatre	N	N	N	N	C	C	C	N	P	P	P	P	P	N

Facilities	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Core Urban Area	Potential Urban Area	Urban Fringe 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	Waterbody
Orphanage	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Outdoor Religious Events	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Parking Facilities, Commercial	N	N	N	C	C	C	C	N	P	P	P	P	P	N
Parking Facilities	N	N	N	P	C	C	C	N	P	P	P	P	P	N
PC Culture	C	C	N	N	N	P	P	C	P	P	P	P	P	N
Petrol Stations	N	N	N	N	P	N	N	N	P	P	P	P	P	N
Plantations	N	P	P	P	P	P	P	C	N	N	N	N	N	N
Mosque/ Temple	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Places of Worship	N	N	N	N	P	C	C	N	N	N	N	N	N	N
Packaging & Processing	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Play Field	N	N	N	N	P	P	P	C	N	N	N	N	N	N
Police Box/ Barrak	N	N	N	N	P	C	C	N	P	P	P	P	P	N
Post Office	N	N	N	N	P	C	C	N	P	P	P	P	P	N
Postal Facilities/ Courier	N	N	N	N	P	C	C	N	P	P	P	P	P	N
Poultry	P	N	N	N	C	C	C	C	P	P	P	P	P	N
Primary School	N	N	N	N	P	C	C	N	N	N	N	N	N	N
Prisons	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Printing/ Publishing House	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Public Uses & Structures	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Public Transport Facilities	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Recreational Facilities, outdoor	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Religious Facilities & Structures	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Repair Shops, Major	N	N	N	N	P	P	P	N	P	N	N	N	N	N
Repair Shops, Minor	N	N	N	N	C	C	C	N	N	P	P	P	P	N
Retention Ponds	N	N	N	N	P	P	P	C	N	N	N	N	N	C
Rickshaw Stands	N	N	N	N	P	P	P	P	P	P	P	P	P	N
Salvage, Storage & Processing	N	N	N	N	P	P	P	N	P	P	P	P	P	N

Facilities	Agriculture Zone	Coastal Afforestation and Foreshore Area	Conservation Zone	Circulation Network	Core Urban Area	Potential Urban Area	Urban Fringe 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	Waterbody
Saw- Mill	N	N	N	N	C	C	C	N	P	C	C	C	C	N
Schools, Private	N	N	N	N	N	N	N	N	N	P	P	P	P	N
Scientific Research Establishment	N	N	N	N	P	P	P	N	P	C	C	C	C	N
Ship & Boat Servicing	N	N	N	N	P	P	P	N	P	P	P	N	N	N
Social Forestry	P	P	P	N	C	C	C	P	C	C	C	C	C	N
Special Function Tent	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Stadium Sports	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Swimming Court/ Pool	N	N	N	N	C	C	C	N	P	P	P	P	P	N
Tea Stall/ Coffee Shops	N	N	N	N	C	C	C	C	P	P	P	P	P	N
Tennis Court / Club	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Termminals, Train, Bus, Truck, Freight	N	N	N	C	P	P	P	N	P	P	P	P	P	N
Trade Centers	P	N	N	N	P	P	P	N	P	P	P	P	P	N
Transformer stations	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Transmission Lines	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Utility Installations/ Lines	N	N	N	N	P	P	P	C	P	P	P	P	P	N
Vegetable Cultivation	C	N	N	N	P	P	P	P	N	N	N	N	N	N
Ware Housing & Distribution	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Water pump, Reservoir	C	N	N	N	P	P	P	C	P	P	P	P	P	N
Waste Disposal & Processing / Minarator	N	N	N	N	C	C	C	C	C	C	C	C	C	N
Water Based Recreational Park	N	N	N	N	C	C	C	N	C	C	C	C	C	P
Water Treatment / Purification Plant	N	N	N	N	P	P	P	C	C	C	C	C	C	C
Wood / Iron Furniture Production	N	N	N	N	P	P	P	N	P	P	P	P	P	N
Zoo	N	N	N	N	C	C	C	N	C	N	N	N	N	N
Eco Tourism	C	p	p	N	C	C	C	P	P	C	C	C	C	N

Source: PKCP project, UDD, 2022

CHAPTER SEVEN: IMPLEMENTATION PHASING OF PROPOSALS, RESPONSIBLE AGENCIES AND RELEVANT ISSUES

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.

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

The Urban Development Directorate (UDD) under the Ministry of Housing and Public Works 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. Patharghata Upazila 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 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 Urban Development Directorate (UDD) is to assist this implementation process and provide No Objection Certificate (NOC) for governmental projects.

The Patharghata Plan implementation 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

A Plan Review Committee would be required for reviewing the cases of demand for change the plan special plan requirements. A Plan Review Committee can serve this purpose following the recommending made by UDD 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 fulfill 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 EIGHT: 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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Water Quality of Major Rivers

Table-A1: Status of Physical and Aggregate Properties

Parameters	Unit	Baleswar	Bishkhali	BD Standards	Remarks
Temp.	^{0}C	31	31	20-30	Within the range
pH	Value	7.5	7.2	6.5-8.5	Within the range
TDS	mg/l	2000	86	1000	Complied the standard except Andarmanik
EC	µS/cm	4000	173	1200	Complied the standard except Andarmanik
Salinity	ppt	5	0.1	0	Complied the standard except Andarmanik
TSS	mg/l	50	4	50-150	Within the range
Turbidity	NTU	60	49	50	Higher than the standard
Alkalinity	mg/l	25	30	20-120	Within the range
Hardness	mg/l	300	145	200-500	Within the range

Source: CEGIS Survey, May 2022

Table-A2: Status of Inorganic Non-metallic Constituents

Parameters	Unit	Baleswar	Bishkhali	BD Standards/WHO*	Remarks
Chloride	mg/l	-	20	250	Complied the standard except Andarmanik and Donmanick
Sodium	mg/l	50	6	200*	Complied the standard except Andarmanik
Potassium	mg/l	-	3	12*	Complied the standard except Andarmanik
Nitrate	mg/l	2.0	8.5	2.5	Higher than the standard
Phosphate	mg/l	0.1	0.2	0.5	Complied the standard except Donmanick
Sulphate	mg/l	-	13	400	Complied the standard

Source: CEGIS Survey, May 2022

Table-A3: Status of Aggregate Organic Constituents

Parameters	Unit	Baleswar	Bishkhali	BD Standards	Remarks
DO	mg/l	5.0	5	5 or more	Within the standard except Andarmanik
BOD	mg/l	3	2	Less than 10	Complied the standard
COD	mg/l	15	8	Less than 25	Complied the standard

Source: CEGIS Survey, May 2022

Table-A4: Status of Metal Constituents

Parameters	Unit	Baleswar	Bishkhali	EPR'86, India	Remarks
Iron	mg/l	-	0.5	0.1	Higher than the standard
Zinc	mg/l	-	0.03	2	Complied the standard
Manganese	mg/l	-	0.05	3	Complied the standard
Lead	mg/l	-	0.005	2	Complied the standard

Chromium	mg/l	-	0.011	0.05 (BD, Drinking)	Complied the standard
Nickel	mg/l	-	0.030	5	Complied the standard
Copper	mg/l	-	0.030	1 (BD, Drinking)	Complied the standard
Cadmium	mg/l	-	0.00015	0.005 (BD, Drinking)	Complied the standard except Tetulia

Source: CEGIS Survey, May 2022

Table-A5: Status of Oil & Grease and Phenol

Parameters	Unit	Baleswar	Bishkhali	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: CEGIS Survey, May 2022

Table-A6: 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: CEGIS field visit, May 2022

Table-A7: Air Quality of the Study Area

Unit	PM_{10} $\mu g/m^3$	$PM_{2.2}$ $\mu g/m^3$	SO_2 $\mu g/m^3$	NO_x $\mu g/m^3$	CO mg/m^3	VOC $\mu g/m^3$
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)	-	-

Table-A8: Noise Quality of Different Land Use Types in the Study Area

Patharghata					
Location ID	**Zone**	**Morning (dB)**	**Std. (Noise control rules, 2006) (dB)**	**Evening (dB)**	**Std. (Noise control rules, 2006) (dB)**
NL-1	Commercial	62	70	62	60
NL-2	Commercial	98	70	63	60
NL-3	Commercial	64	70	94	60
NL-4	Commercial	92	70	91	60
NL-5	mixed	52	60	58	50
NL-6	Residential Area	74	55	67	45

Source: CEGIS Survey, August - September, 2022

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.

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	None 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 good[1]	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 areas	Hectare	Reserve forests 43,453	2022	BDF 2022	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	
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 poor[2]	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	
	3	Reduce all forms of pollution (air, , water, noise etc	6	Dry season water quality (nitrate) in the Galachipa river (Horidebpur Bazar near Ferry ghat)	mg/litre	2.0-3.0	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, NRM, DoE, email: dirnrm@doe.gov.bd, Cell: 01718114188 2. Director, Barishal Divisional Office, DoE,	Annually	

[1].**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.

[2]**Very 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.

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…)
			7	Dry season water quality (phosphate) in the Galachipa river (Horidebpur Bazar near Ferry ghat)	mg/litre	0.5-1.0	2022	CEGIS 2022	Same as above	Same as above	Same as above	Annually	
			8	Dry season water quality (BOD) in the Galachipa river (Horidebpur Bazar near Ferry ghat)	mg/litre	1.0	2022	CEGIS 2022	Same as above	Same as above	Same as above	Annually	
			16	Dry season water quality (phosphate) at Tetulia river (Bonnatoli Kheya Ghat)	mg/litre	0.5	2022	CEGIS 2022	Same as above	Same as above	Same as above	Annually	
			17	Dry season water quality (BOD) at Tetulia river (Bonnatoli Kheya Ghat)	mg/litre	3-4	2022	CEGIS 2022	Same as above	Same as above	Same as above	Annually	
			18	No hrs. in which noise exceeds 45dBA in the 'Silent Zone' in the reserve forests)[3]	Hrs./day	0 [4]	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, Cell: 01712125880 2. Director, Air Quality Management, Department of Environment. Mail: nazmul@doe.gov.bd, Cell: 01819427358	Methodology, duration and coverage to be revised	Survey needed
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: 8835495	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@dphe.gov.bd, Phone: 02-9342485	Continuous	Measure this in wells. There are a number of monitoring wells. The monitoring is already in place
			27 (b)	As above	% of Region: 5PPT in SW	52.5	As above	As above	As above	As above	As above	As above	As above

[3]Bangladesh standard (Environmental Conservation Rule-ECR-1997) for Silent zone (45 dBA)
[4]Discontinuously when Cargo and ships move and honk

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…)
			28	Number of Households severely affected5 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)	PPP[6] 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.bdPhone (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 Region as share of national GDP	%	14	2018-19	Est.	same as above	same as above	same as above	Annually	
			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.bablu@gmail.com, phone: 02-55007331	Annually	
			35	Life expectancy	Yrs	72.10	2018	BBS, 2019	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 & National Institute of Population Research and Training (NIPORT) Director General, NIPORT, email: dg.niport1977@gmail.com, phone: 9662495	RPTI 1. Regional Population Training Institute (RPTI), Barishal 2. Director, Census/computer Wing, Bangladesh Bureau of Statistics (BBS), email: mahfuz.bablu@gmail.com, phone: 02-55007331	Annually	

5Severely 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.

[6] 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…)
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) Additional Secretary, Informatics Wing, SID email: addlsecy@sid.gov.bd, Phone: 55007377	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 Movements Research Unit (RMMRU), University of Dhaka E-mail: info@rmmru.org, Tel: + 880-2-9360338	Annually	Rate of migration to urban areas in PK Region
Conflicts and security	10	Reduce conflicts over use of land	38	No of fisher-farmer land-related disputes / clashes	No.	None yet	None 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 good[7]	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 Controller of Food Regional Food Department, Barishal Division	annual	
		Improve food security	39 (b)	quality	Good	Moderate	As above	As above	As above	As above	As above	As above	
		Improve food security	39 (c)	safety food to all people at all time	moderate	Moderate	As above	As above	As above	As above	As above	As above	

[7]Very 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

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…)
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, Email: dev-5@pd.gov.bd	26	
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 institutes)	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: scy@mopme.gov.bd Phone: +88-02-55100484 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		Standing figure until new railway is built Update figure	

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…)
			45	Density of roads in PK Region	Km roads per 100 Km^2	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[8]	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 at Payra Port	Metric Ton	210,387	2022	PPA website	MoS	Traffic Department, Payra Port Authority			
			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 MT	2021-22	DAE field report and CEGIS calculation based on field survey, 2022	Ministry of Agriculture (MoA) Secretary, MoA, email: secretary@moa.gov.bd, phone: 9540100	Department of Agriculture Extension (DAE) Director General, DAE email: dg@dae.gov.bd,	Deputy Director of Department of Agricultural Extension (DDDAE) of Barguna and Patuakhali District email: dg@dae.gov.bd, Phone: 55028369 Upazila Agriculture Officer (UAO) of the respective upazila	Annually	

[8] Data available up to December 31, 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…)
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 1. 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 season	60	Average daily monsoon (Jul-Aug-Sept) WL in Tetulia Channel	mPWD	2.75	1989-2002	BIWTA	MoWR	Bangladesh Water Development Board 1. Director General dg@bwdb.gov.bd, dg.bwdb.bd@gmail.com Phone: 01318234567	Bangladesh Water Development Board (relevant district office)	Daily	

APPENDIX C: COMMENTS AND RESPONSE MATRIX

National Consultation Meeting on the SEMP Report
Strategic Environmental Assessment
Preparation of the Payra-Kuakata Comprehensive Plan Focusing on Eco-tourism
24th May 2023, CIRDAP Conference Room, Top Khana Road, Dhaka

SL	Comments	Response
1	**Md. Shahed Ali, Department of Fisheries** • Providing scientific interventions for fish culture in the region; • The master plan should contain interventions for the fishing community and their livelihoods improvement; • Need to suggest measures to minimize plastic usage and plastic pollution to protect the ecosystem;	• In the PKCP plan, no interventions for scientific fish culture were considered. The Department of Fisheries has sole responsibility for this. • The PKCP plan considers fish processing industries to improve fishermen's livelihoods. • Plastic pollution management strategies are suggested (SEMP Report: Table 4.2: Tourism and Exclusive Tourism Area: Waste management/ Visual impact).
2	**A K M Arif Uddin, Director, Bangladesh Inland Water Transport Authority** Rivers are the largest environmental resource. There are many seaports and boat stations on the river bank. All kinds of building infrastructure near river banks and sea beaches should be monitored according to policy, plans, and programs.	The SEA also recommends following the rules and regulations of the department of environment and other relevant legislations for implementing the PKCP plans.
3	Address environmental pollution and its mitigation measures during the construction process.	Rigorous suggestions have been made to save and protect the environment and address social issues for the PKCP plan implementation (SEMP Report: Table 4.2).
4	**A.K.M. Saiful Islam, IWRM, BUET** • There should be a comprehensive mitigation plan. Also recommendations and strategic measures should be suggested for each upazilla (total 7 upazilla) in this strategic plan; • Urban heat wave, urban flood and solid waste management issues need to be addressed here;	• Comprehensive mitigation measures are applied strategically to all sectors considered. SEA doesn't separate impacts based on individual plans. SEA assesses the cumulative impacts and provides strategic recommendations and suggestions (SEMP Report: Table 4.2). • Urban floods and heat will not generate from the proposed PKCP plan (see linkage diagrams in chapter 8). Solid wastes are recommended as part of the SEMP Report (Table 4.2).
5	According to national policy and strategy, measures to reduce water pollution and increase water security must be included.	The SEMP Report (Table 4.2) makes suggestions for addressing the impacts.
6	**Md. Nizam Uddin, Assistant Director, Bangladesh Tourism Board** In the SEMP Advisory Council (SAC), the BTB should be included.	As per BPC's vision and mission, the given responsibility fits them quite well.

ANNEXURE-D: PROJECT TEAM

Team Formation

Prepared by:

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Junior GIS Expert
Payra Kuakata Comprehensive Plan Focusing on Eco-Tourism

Guided by:

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Professor (Rtd), Department of Urban & Regional Planning and
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Payra Kuakata Comprehensive Plan Focusing on Eco-Tourism

Khandakar Masudur Rahman
Urban Planner
Payra Kuakata Comprehensive Plan Focusing on Eco-Tourism

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