**Government of the People's Republic of Bangladesh
Ministry of
Housing and Public Works Urban Development Directorate**

FLORA AND FAUNA SURVEY UNDER "PREPARATION OF DEVELOPMENT PLAN FOR MEHERPUR DISTRICT

Inception Report

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1. Introduction

1.1 Project Background

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

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

In developing countries, urbanization has now become a powerful force. Cities are important drivers of growth and development, providing jobs, infrastructure, and services. With the unplanned expansion, the growing number of people, assets, and economic activities increase the exposure of cities to the impacts of disasters and climate change. However, in low and lower-middle income countries, new urban development is increasingly more likely to occur on hazard-prone land, namely in floodplains and other low-lying areas, along fault lines, and on steep slopes. In addition to settling in hazard-prone areas, much of the building construction that occurs is unregulated and unplanned, placing vulnerable populations, who settle on hazard-prone land, at increased risk. Besides, poor urban governance, declining ecosystems, and vulnerable rural livelihoods are among the main underlying risk drivers, which need to be addressed to build safer cities. Bangladesh has been experiencing a rapid increase in its urban population ever since its independence in 1971.Urban population as a percentage of total population increased from around 8.8% to nearly 23% during the 1974-2011 periods. It is estimated that by the year 2021 nearly one-third or 33% of the population of Bangladesh will be living in urban areas. More than 60% of the national GDP is derived from non-agricultural sectors that are mainly based in urban areas. This phenomenon indicates the increasing role of urban areas being played in the national economy.

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

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

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

1.2 Description of the Study Area

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

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

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a) Gangni Upazila

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

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

b) Meherpur Sadar Upazila

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

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

c) Mujibnagar Upazila

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

Population Total 99143; male 49084, female 50059; Muslim 92970, Hindu 945, Buddhist 13, Christian 5200 and others 15. Water bodies Bhairab River, Sarashati Canal and Datpur Beel are notable. Administration Mujibnagar upazila was formed on 24 February 2000. Mujibnagar Upazila consist of 4 Unions, 29 Mouza and 33 Villages.
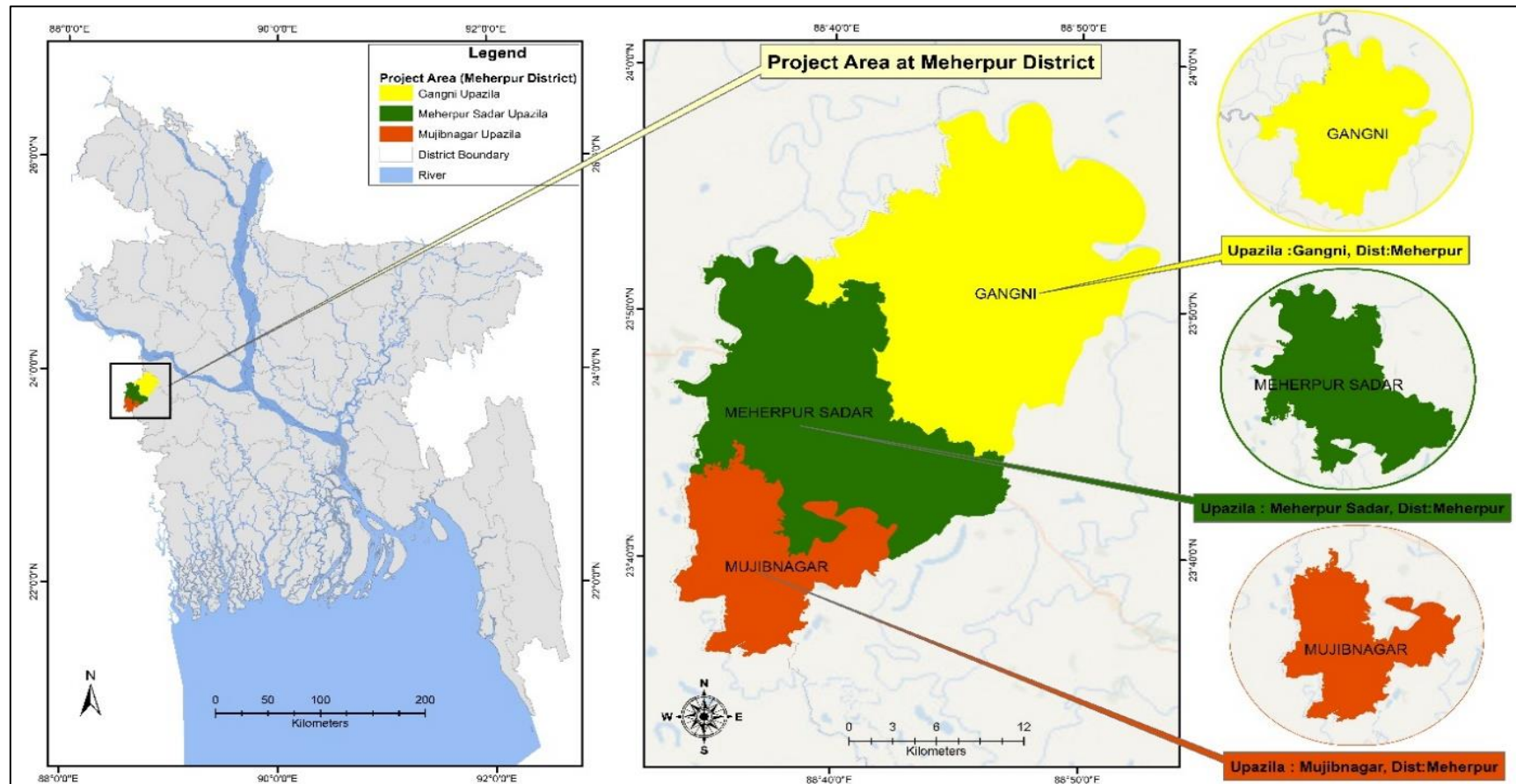
Figure 1-1: Location map of project area of Meherpur District.

1.3 Understanding of the assignment

a) An Inventory of the existing Flora and Fauna has to be carryout for two seasons (dry and wet season) in a year for single cycle data accumulation is required for a credible holistic base line survey of existing flora and fauna. ECAL will take sample from necessary locations of the project area for inventory of existing flora and fauna in consultation with PD. For this reason, ECAL has to classify the species distribution to communities for mapping the flora and fauna and identify abiotic factors that may be driving forces behind the species decline. To do so, the firm will stratify the landscape into different units. By comparing all relives over all representative sites of all landscape units, the firm will group relives with similar species distribution together to communities. From the comparison of the different communities with their aggregated species distribution, the firm will deduce which species are restricted to one community type and which species are frequent over a broad range of communities. The frequency and spatial extent of the communities and their sites, respectively will be considered from a map. Therefore, the firm also needs to produce a map of the vegetation cover.

b) Aggregation of individual samples of species to communities and community mapping has a long tradition with respect to the vegetation as plants are sessile and are therefore easily to be recognized. Community identification and mapping is much more difficult or even impossible with respect to the fauna. Animals are capable of moving through patches or landscapes. Their current distribution may be highly influenced by their ethology, e.g. territoriality, rivalry for occurrence of potential predators. They may belong to different trophic levels and their spatial home range may vary over several orders of magnitude. Keeping these difficulties in mind, the ECAL will advocate for a pragmatic concept to relate animal occurrences to biotopes. Samples of animal populations are mostly point samples. As long as the biotope physiognomy and the physical factors remain the same in the neighborhood of the point sample, the firm will infer that the point data are representative for this neighborhood. Its extent can then be delineated on a map.

c) Each of the field survey will be conducted by specific survey methods. Thus, the data will be comparable to see any seasonal variation. Trained wildlife biologists/ ecologists will be employed for the survey. Each of the field surveys will be focused on the common plants and wild animals from all the groups (amphibians, reptiles, birds and mammals; also, on common insects like butterfly, dragon and damsel fly), special emphasis will be put on a particular animal group wherever necessary.

d) The Comparative Assessment of the Plant and Animal Communities Present in the Study Area.

e) Prepare the significant species or community's habitat map. The firm will then develop criteria for rarity or restitution capacity. As communities change readily in species composition if soil conditions, climatic conditions or land use intensity vary at the sites where they live. This is the scale to identify some of the abiotic driving forces behind the species decline. Our conservation measures will aim to improve the abiotic conditions in the biotopes in a way that threatened species will naturally rise in population numbers.

f) Evaluation and Goal Development Based on "Target Species": It is obvious that remaining populations of a threatened species have to be considered with the highest priority. The management of lost habitats and home-ranges should be adjusted to the needs of these populations. The target species approach is usually more general. It is based upon the principle that it is never possible to focus on all species in any given planning area.

The various classes of species that shall be used to gather evidence on the habitat characteristics of a planning area are defined below:

- Indicator species: species which indicate special factors such as pH, humidity, temperature, trophic level, nutrient conditions.
- Umbrella species: species which prove that the habitat requirements for a broad range of other species are "covered".
- Flagship species: Particularly attractive or appealing species which leads public opinion towards nature conversation regardless of cost or restrictions.
- Target species (Goal species): species (groups) upon which politicians, nature conservation authorities, or other bodies have agreed to focus in any given area.

g) Identification of critical Species: During the survey any critical habitat (also why it is critical) and its significance needs to be identified, and protection status recorded in practice, a check of each individual species against the following will be required in order to be to determine its protection status:
- IUCN's threatened category (Red Data Book-both national and global threatened categories);
- Species protected under Wildlife (Protection and Security) Act 2012;
- Species protected under any protocol, conventions and any other agreement;
- Species considered as flagship species, keystone species or other significant species; and
- Endemicity of the species.

h) Indicator species monitoring: Species, which indicate the health of the environment by their presence, absence or any abnormalities of change in their population, health or behavior. Indicator species will be selected from all the groups based on the habitat or target of monitoring. Indicator species from amphibians, reptiles, birds and mammals will be selected. Population status of all the indicator species will be monitored. Indicator species will be selected from the literature and reconnaissance survey of the project area. Each of the indicator species will be finally selected after the initial field visit.

i) Integrated Evaluation of Species and Habitats: Particular habitats with a high species diversity, and remnants of representative ecosystems (climax ecosystem') which exist on sites which are now normally in economic use, represent the basic skeleton network of a species conservation concept. In this context, it should be identified and assign the rank to the very important habitats and the most heavily impacted sites; and then shall classify the areas according to their species and habitat diversity.

Identification of potential Impacts on Existing Ecosystem due to development plan as per their land use proposal: Following significant impacts or activities can be considered
- Lethal or sub lethal effects to biota
- Disturbances to animals
- Destruction of important vegetation habitat
- Disturbances/reduction to natural breeding and recruitment
- Permanent degradation of migration and migratory pattern
- Disturbance to resting and roosting sites for local area animals
- Hindrance of the natural generation process in the project area
- Reduce the aesthetic values of habitat/ecosystem

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

k) Characterizing Impacts (ElA) and Mitigation: The firm/NGO has to illustrate how significant impacts (adverse or beneficial) that might occur due to tourism development and establishment of project item as well as identify the mitigation and compensation measures, shall be quantified and characterized in the following way:
Determine the value of existing flora and fauna affected, through survey and study:
- Assess impacts affecting those flora and fauna, which meet or exceed a defined threshold value, with reference to ecological processes and functions as appropriate;
- Quantify' the extent, magnitude, duration, timing and frequency of the impacts;
- Assess impact reversibility;
- Explain the level of confidence in these predictions; and
- Identify likely significant impacts in the absence of any mitigation.

l) Evaluation of Project Design and Mitigation:
- Identify measures to avoid or reduce negative impacts;
- Identify opportunities for enhancement;
- Demonstrate likely success of mitigation measures; and
- Provide sufficient information for mitigation measures to be implemented effectively, e.g. through an Environmental Action Plan (EAP).

m) Identify Significant Residual Impacts and Their Legal, Policy and Development Control Consequences:
- Produce a clear summary of the significant residual impacts of the project incorporating mitigation and enhancement measures;
- Where significant impacts cannot be avoided/reduced, identify compensation measures to be implemented;
- Consider the consequences of significant residual impacts in the light of planning policies and legislation; and
- Include mitigation, compensatory actions and enhancements in the EAP or similar.

n) Mapping of the Site: The ECAL will then map the site of the flora and fauna in ARC GIS and present at a scale in consultation with PD.

o) Development of an Interactive Digital Model: The ECAL will develop an interactive digital model of existing habitat, decline of habitat and possible areas of conservation.

1.4 Objectives

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

Main objectives of the project:
The objective of the project is to optimize resources and activities for sustenance of marginal people. The urban and rural activities and resources are very important to the economy and life of the people of Bangladesh whose living conditions are inextricably linked to the productivity and sustainability of land

use. There is no long-term Holistic Development Plan for the rural and urban area but it needs to be integrated with the mainstream of development process of the country. So, an interdisciplinary development planning approach is urgent to optimize livelihood of the project area.

Specific objectives of present study as per scope of work:
Baseline survey of existing flora and fauna in different place of the study area will be conducted to attain the following objectives:

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

2. Methodology for the Assignment

2.1   An Inventory of the Flora and Fauna

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

2.2   The comparative assessment of plant and animal communities

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

2.3   Sampling Technique for Inventory

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

Table 1. Survey methods in brief

| Name of the Methods	Objectives to be fulfilled
Survey Methods for Flora	
1. **Literature Review** 2. **Transect survey** 3. **Quadrat survey** 4. **Point Quarter Method** 5. **Collection of plant parts**	• To understand the existing floral distribution scenario and their significances in the ecosystem of the project area based on available secondary information from any baseline studies which already been carried out previously. • To prepare an inventory list of the species of the existing flora, their spatial distribution, the species that are frequent and also which are rare. • To identify the ecological characteristics of every ecological unit and the communities they form. • To identify the characteristics and physical conditions of the habitats. • To determine underlying process of habitats dynamism-char formation, afforestation, forest clearing, settlements, growth centers, dykes, land reclamation, drainage system improvement, etc.
6. Questionnaire Survey	• To explore historical aspects of habitats and biodiversity in the area.
Survey Methods for Fauna	
Direct Survey Methods 1. Line Transect Sampling 2. Quadrat Sampling 3. Use of different types of traps 4. Counting at colonies and bat roosts	• To understand the existing faunal distribution scenario and their significances in the ecosystem of the project area based on available secondary information from any baseline studies which already been carried out previously. • To prepare an inventory list of the species of the existing fauna, their spatial distribution, the species that are frequent and also which are rare.

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Name of the Methods	Objectives to be fulfilled

5. Night survey
6. Camera trap survey
7. Questionnaire survey
8. FGD
9. Boat Survey through river system or lake for aquatic animals
10. Survey on fish
Indirect Survey Methods
  1. Pellet / scat / feces count
  2. Footprint / Pugmark count
  3. Other indices of presence
	• To identify the ecological characteristics of every ecological unit and the communities they form.
	• To identify the characteristics and physical conditions of their habitats.
	• To determine underlying process of habitats dynamism-char formation, afforestation, forest clearing, settlements, growth centers, dykes, land reclamation, drainage system improvement, etc.
	• To identify the flora and fauna reaching the threshold value which could be affected by the project.
	• To identify the threats to the endangered species (e.g., Fallowing, eutrophication, disturbance, intensification).
	• To determine the species including their habitat that might be threatened due to future development.
	• To set forth recommendations on preserving the species of the project area and ecology sensitive land use planning to keep the ecological system sustainable.
	• To develop an interactive digital model for the ecological system for the project area.

Detailed Survey Methods

i. Survey methods for flora

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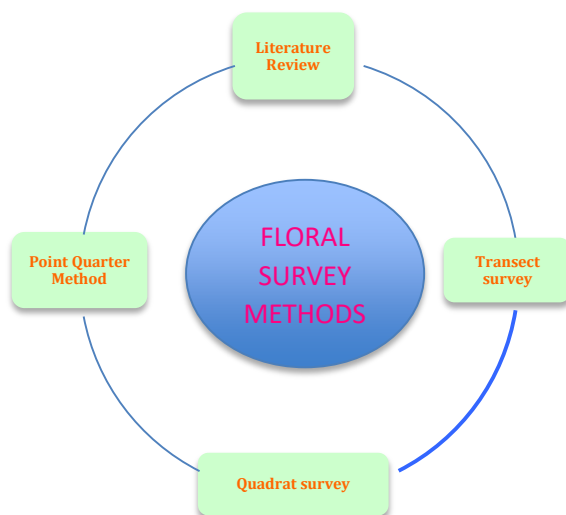
a) Transect survey

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

b) *Quadrat survey*

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

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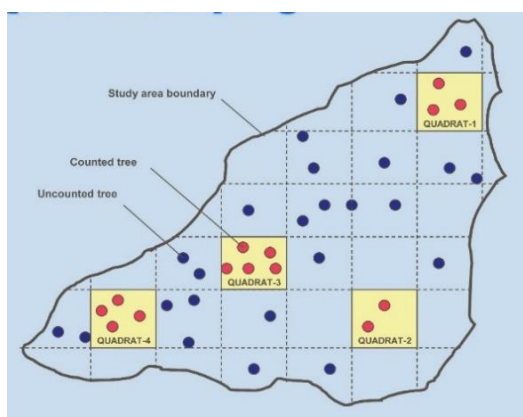
c) *Point Quarter Method*

The point quarter sampling method is a method that is quick and very useful to field biologist. The method relies on using a series of randomly determined points that may be distributed along a transect line or throughout a habitat to be described. Each point represents the center from which four compass directions north, south, east and west) divided the sampling point into four quarters. In each quarter the distance (d1 to d4) from the point to the center of the nearest plant with a predefined size (>10 cm dbh) is measured. So, the calculation is-

Mean distance from the point d=mean (d1 to d4)

So, density of plants per unit area $=A/d^2$,

Where A= total area.
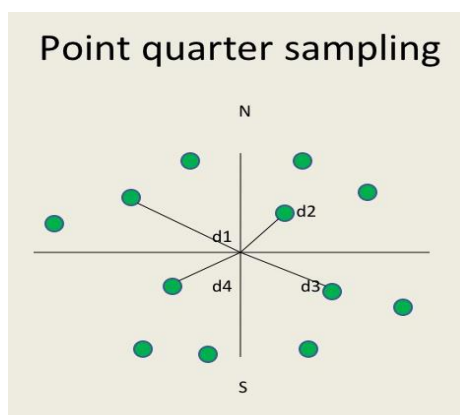
ii. Survey methods for fauna

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

<u>Direct Survey Methods</u>

i.   Line Transect Sampling

Both temporary and permanent transect line will be set randomly covering all types of habitats. Visual encounter survey will be conducted on foot both in day and night. All the wild animals will be recorded from the both side of transect. GPS coordination will be used to calculate the total transect area covered for survey. During river habitat survey, the river will be considered as a transect line. A total of 20 transect lines will be set up in different habitats.

i.   Use of different types of traps

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

ii. Counting at colonies and bat roosts

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

iii. Night survey

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

iv. Camera trap

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

v. Questionnaire survey

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

Questionnaire survey at different habitats in Meherpur district.

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

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

A view of Kajla Riverbed at Meherpur Sadar.

vii. Survey on fishes

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

<u>Indirect Survey Methods</u>

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

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

2.4 Identification of critical Species

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

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

2.5   Identification of critical ecosystem and wildlife habitats

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

2.6   Mapping of the Site

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

2.7   Development of an Interactive Digital Model

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

2.8   Submission of Report

The final report shall include clearly, information on existing flora and fauna necessary for decision making Key aspects which include:

- Description of baseline and trends of existing flora and fauna, if the project were not to go ahead;
- Explanation of the criteria used to evaluate existing flora and fauna, and assess the' significance of impacts of the project;
- Statement of methodology used:
- Presentation of analytical techniques used and the analysis itself; and interpretation from the analyses
- Identification of likely impacts on existing flora and fauna; and an explanation of their significance and the level of certainty with which this can. be stated; and
- Description of legal and policy consequences.

2.9   Deliverables and Timeframe

The outlines of the deliverables and the timeframe for their submission are given in the Table-3 below. The timeframe can be change as well.

Table 2: List of deliverables with their tentative outlines

Sl. No.	Deliverables	Outline of Deliverables
1	Mobilization Report	• Description of objectives and scope of sub-activities • Team formation and structure of survey team. • Actual work schedule for the work

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Sl. No.	Deliverables	Outline of Deliverables
		Immediate action taken after signing agreement
2	Inception Report	• Introduction • Description of sub-activities • Method and materials for each activity • Required resources allocation Revised work schedule for completion of the work
3	Report on an Inventory of Existing flora and Fauna	• Identified existing flora and fauna • Stating which species are rare and which species are endangered Identify the habitats of the flora and fauna • Identify the characteristics of the flora and fauna.
4	Report on Spatial Distribution of Habitat along with GIS Shape file and thematic maps	• Spatial Distribution of flora and fauna • Location map of flora and fauna • Location and Spatial Distribution of rare and endangered Species
5	Draft Report on Interactive Digital Model on Bio-Diversity and Human Intervention along with G1S Shape file and thematic maps	• Description of baseline and trends of existing flora and fauna, if the project were not to go ahead; • Explanation of the criteria used to evaluate existing flora and fauna; and assess the significance of impacts of the project • Statement of methodology used • Presentation of analytical techniques used and the analysis itself, and interpretation from the analysis
6	Final Report on Interactive Digital Model on Bio-Diversity and Human Intervention along with GIS Shape file and thematic maps; and Recommendation on Eco-Sensitive Land use Planning.	• An interactive digital model of existing habitat, decline of habitat and possible areas of conservation • Identification of likely impacts on existing flora and fauna; and an explanation of their significance and the level of certainty with which this can be stated • A digital map of the existing flora and fauna • Description of legal and policy consequences • Thematic map for providing planning guidelines

INCEPTION REPORT

ON BASELINE SURVEY OF EXISTING FLORA AND FAUNA UNDER "PREPARATION OF DEVELOPMENT PLAN FOR MEHERPUR ZILLA" PROJECT OF URBAN DEVELOPMENT DIRECTORATE (UDD).

3. Deliverables schedule & Work Plan for the survey of Existing Flora and Fauna

As per the consultation meeting with the project director, the work schedule and deliverables with the timeframe are re-scheduled and which are given in the Table below. The timeframe can be change as well as per field situation.

3.1 Deliverables schedule:

Table 3: Deliverables Schedule

Sl. No.	Deliverables	Activities	Time
1.	**Project singing**	**Contract singing in between ECAL and UDD**	**5 December, 2024**
1	Mobilization Report	Done	30 December,2024
2	Inception Report	Preparation under processes	28 February, 2025
3	Report on an Inventory of Existing flora and Fauna	Field survey plan has been prepared and field data acquisition will be started 18 February 2025 to 28 February 2025.	25 April 2025
4	Report on Spatial Distribution of Habitat along with GIS Shape file and thematic maps	Report will be prepared on spatial distribution of flora and fauna habitat map with GIS. Field survey will be 16 June, 2025 to 26 June 2025.	15 July 2025
5	Draft Report on Interactive Digital Model on Bio-Diversity and Human Intervention along with G1S Shape file and thematic maps	Draft report will be prepared based on integration of both season data.	30 July 2025
6	Final Report on Interactive Digital Model on Bio-Diversity and Human Intervention along with GIS Shape file and thematic maps; and Recommendation on Eco-Sensitive Land Use Planning.	Final report will be finalized after addressing the all kind of comments from TMC of project and from different stakeholder.	30 August 2025

3.2 work schedule and field activity

Table 4: Work Schedule and filed activity

Work/Activities	Months									
	Dec	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep
Contract signing	▓									
Team Mobilization	▓									
Literature Review	▓	▓								
Faunal Data Collection	░	░	▓	▓	▓	▓	▓	▓	▓	
Floral Data Collection			▓	▓			▓	▓		
Data collection ecological features			▓	▓	▓	▓	▓	▓	▓	
Data Analysis				▓	▓	▓	▓	▓	▓	
Mobilization Report	▓									
Inception Report			▓							
1st Interim Report					▓					
Report on Spatial Distribution								▓		
Draft Final Report									▓	
Final Report										▓

4. Team Composition and Task Assignment

4.1 Team Composition

As per TOR, we are assigning key person to execute the Baseline Survey of Existing Flora and Fauna, the positions are given bellow

1. Existing Flora and Fauna Baseline Survey Expert -1 Persons
2. GIS Expert-1 Person
3. Associate Baseline Survey of Existing flora and Fauna Expert-5 Persons

But the task of the project is vast and complex, that's why so multiple disciplines have to be involved in this science-based research work, for example terrestrial and aquatic flora and faunal assemblage study, fisheries (transitional and fresh water), forest ecology and wild life, natural hazard and anthropogenic activities impact on biodiversity, ecosystem-based resources management and ecotourism and wild animal etc.,

INCEPTION REPORT

ON BASELINE SURVEY OF EXISTING FLORA AND FAUNA UNDER "PREPARATION OF DEVELOPMENT PLAN FOR MEHERPUR ZILLA" PROJECT OF URBAN DEVELOPMENT DIRECTORATE (UDD).

As per TOR, expert diversity is limited but task is deserving some specialized expert in the particular sector. To overcome this limitation, we are included some specific consultant in our team composition to complete the task and prepare a holistic baseline survey report on existing flora and fauna and it will help us to get valuable recommendation regarding Comprehensive Plan. So, we are going to supplements following key personal in the team composition which are given bellow:

1. Flora and Fauna Expert-1 Person
2. GIS expert-1 person
3. Associate expert and research assistant are taking from various discipline (Ornithologist, Fisheries Expert, Floral Expert, Mammalogist & Herpetologist) related to study work for the better service. For example, Associate Existing Flora and Fauna Baseline Survey Expert-5.
4. To successfully official documentation and communication with client's office, a supporting team will work such as Office Manager-1 and Peon-1 will perform for this project.

Finally, a coordinator has to be assigned from the team who will be responsible to coordinate the job as well as team member and also providing the coordination services among the client and individual consultant. Finally, he will be the key person to mobilize the field survey program, communicate with concern authority and deliver the presentation and report in every step of the project execution.

Table 5: The Team Composition & Task Assignment

Sl. No.	Name of Staff & Organization	Area of Expertise	Proposition assigned	Task Assigned
1	**Dr. Md. Kamrul Hasan**	Ecology and wildlife	**Baseline Survey of Existing Flora and Fauna Expert / Team Leader**	(i) To make an inventory of all types existing flora and fauna in the project area including endanger species, (ii) to identify ihe potentiality of the natural resources (flora and fauna) for tourism development in the region. (iii) To identify environmental hazards that might de imparted on the flora and fauna. (iv) To prepare a map of habitat for existing flora and fauna of the project area indicating communities of various species of plants including the areas that would be disturbed by tourism development (v) To earmark the areas, which would not be disturbed by any kind of development; (vi) To make recommendations to protect the forest resources from environmental hazards and also to preserve the endangered species from depletion to attain sustainable development; (vii) To develop an interactive digital model for the whole ecological system with special reference to flora and fauna in the project area.(viii) To prepare report on assigned task under the scope of work of the

Sl. No.	Name of Staff & Organization	Area of Expertise	Proposition assigned	Task Assigned
				ToR; (ix) Any other related task as assigned by PD.
2	**Abdullah Al Tariq**	GIS and Urban planning	**GIS Expert**	To design transport surveys for the project, to conduct, coordinate and monitor traffic and transportation related surveys and studies; Ensure quality and accuracy of survey data; To compile all the survey data into digital form; To conduct database management and operation, To assist the GIS Expert in transferring survey data into GIS, To arrange survey trainings for UDD staff, Any other survey and studies related Jobs
3	**Ashis Kumar Datta**	Ornithologist (Birds)	**Associate Baseline Survey of Existing Flora and Fauna Expert**	To make an inventory of birds in the project area. To identify seasonality of avifauna. Identify critical habitats for bird community in the project area. Take all the GPS coordinates to generate and visualize maps.
Non-Key staff (Wildlife, Fisherest, Forest and EIA Expert)				
1	**Mohammod Abdur Rahim**	Floral Expert	**Associate Baseline Survey of Existing Flora and Fauna Expert**	To make an inventory of plant community in the project area. Identify critical habitats for plant community in the project area. To identify the presence of any threatened plant species. Take all the GPS coordinates to generate and visualize maps.
2	**Shilpi Sarkar**	Fisheries Expert	**Associate Baseline Survey of Existing Flora and Fauna Expert (Fisheries)**	To make an inventory of freshwater fishes in the project area. To identify seasonality and abundance of freshwater fishes. Identify critical habitats for freshwater fishes in the project area. Take all the GPS coordinates to generate and visualize maps.
3	**Anik Saha**	Mammalogist	**Associate Baseline Survey of Existing Flora and Fauna Expert**	To make an inventory of mammals in the project area. To identify habitats of mammals in the project area. Identify critical habitats for mammalian community in the project area. Conduct survey on aquatic mammals. Take all the GPS coordinates to generate and visualize maps.
4	**Amit Kumar**	Herpetologist	**Associate Baseline Survey of Existing Flora and Fauna Expert**	To make an inventory of herpetofauna in the project area. To identify seasonality of herpetofauna. Identify critical habitats for herpetofaunal community in the project area. To identify breeding sites for amphibians and reptiles. Take all the GPS coordinates to generate and visualize maps.
5	**Santosh Kumar Roy**	Office Management	**Office Manager**	Office Management for Implementation of Projects.

5. Work progress

5.1 Contract signing

After successful negotiation meeting, contract agreement has been singed among the both party (UDD and ECAL) in the presence of PEC committee members and the representatives of consulting firm on date 05th December 2024 (Contract agreement is given in the attachment -5)

5.2 Kickoff meeting with PD office of Urban Development Directorate (UDD):

A consultation meeting has been occurred in UDD with project director and project manager about the program schedule, field mobilization and work procedure. From discussion we are outlined a tentative broad schedule for field operation.

Mobilization report will be submitted by 31 December, 2024.

A reconnaissance field visit has been planned to conduct 12-13 January, 2025.

Inception report will be submitted 15 January, 2025.

Detail field survey schedule will be designed after reconnaissance field visit of the project area and which is included in the inception report.

Detail survey can be combated in two seasons, one is dry season (February to March, 2025) and another is wet season (July to August, 2025). Some specific survey can be happened one time in a particular season, like migratory bird and aquatic wild life.

6. Conclusion

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

FLORA AND FAUNA SURVEY UNDER "PREPARATION OF DEVELOPMENT PIAN FOR MEHERPUR DISTRICT

Annex 1: Questionnaire

Flora and Fauna Survey Under "Preparation of Development Plan for Meherpur District

Location:	Date & Time:
Respondent Name:	Address:
Age: Sex: Religion/Cast:	Education:

Livelihood status

1. How long have you been staying in this village / area?

2. Do you collect any resource (like fish, shell etc.) from the project area?

3. If yes then how frequent?

4. Do you or your family member go for hunting? Y   /   N

5. If yes, what are the species that you usually hunt for?

   How frequent do you go for hunting? Daily / weekly / monthly / seasonally / yearly / …………….

7. Does anyone in your village destroy bird nest / disturb / catch animals? If yes what kind of animals?

8. What do you do when you/ family members got sick? Use traditional medicine / go to K*abiraj or Boidda /* Buy medicine from shop / go to doctor.

9. Do you see following animals in your village / surrounding areas (show the color plate). If yes, how often you see or when did you see last time?

   Jungle cat…………….…………… Fishing Cat ……….…………….……. Civets ………………….…….

   Jackal …………………….. ………… Hog Badger………….……………. Porcupine ………………………..

   Monkey ……………………….. …. Deer ………………………. Others ……………………………………

10. Do you think biodiversity (forest, plants, animals) in your area decreasing? Y / N. if yes why?

11. Do you think proposed economic zone may harm biodiversity in your area? If yes how?

12. What should do to conserve biodiversity in your area?

13. Do you know about Wildlife Act / other law?   Y / N.

14. Miscellaneous Information (if any):

Name and signature of the Interviewer:

Annex 2: Field Activities Photo