Terms of Reference
For
Site Inspection & Services towards Marine EIA and Modelling Studies for Opening of Sea Mouth of Pullicat Lake at Rayadoruvu Village, Vakadu Mandal, SPSR Nellore district, Andhra Pradesh – Study for CRZ & EC clearance under the AP Fisheries Department

I. Introduction

Department of Fisheries, A.P has entrusted Andhra Pradesh Urban Infrastructure Asset Management Limited (APUIAML) for carrying out Technical Advisory services towards Site Inspection & Services towards Marine EIA and Modelling Studies for Opening of Sea Mouth of Pullicat Lake at Rayadoruvu Village, Vakadu Mandal, SPSR Nellore district, Andhra Pradesh – Study for CRZ & EC clearance under the AP Fisheries Department vide Work Order Lr.No.06-A-2022; Dated 24-05-2022.

II. Solicitation:

In this context it is solicited to receive sealed price quotes for the scope of work as laid down in this document from agencies at the following address on or before **12:30 HRS, 10.06.2022**. The price quote is to be provided as per the format given in "ANNEXURE -1". The price quotes shall be in force and be valid for a period of 6 months. The bidders shall also submit the detailed action plan and way forward so as to execute the assignment within the given time frame as mentioned in the work order from time to time and relevant engineering qualifications for consideration.

To
The CEO,
Andhra Pradesh Urban Infrastructure Asset Management Limited (APUIAML),
4thFloor, RTC House, Pandit Nehru Bus Station,
Vijayawada-520013, Andhra Pradesh

The selection of Agency(s) shall be on the basis of Least Quote (L1) subject to the availability & qualification of man power (Team) as mentioned in clause VI.

III. Study Area & Scope of Services

The broad scope of services to be provided by selected agency under the subject assignment are as below:

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To carry out Environmental Impact Assessment (EIA) Study
- Marine EIA study
- Impact Assessment
- Mitigation Measures
- Environmental Management Plan
- Preparation of EIA

a. To carry out Modelling Studies
b. To carry out CRZ Mapping - HTL/LTL/CRZ Demarcation Survey
c. To assist clients in obtaining statutory clearances

The detailed scope of work is as below:

1) Environmental Impact Assessment (EIA) Study

Marine EIA study will be carried out covering 10 km radius around the proposed sea mouth at Rayadoruvu Village of Vakadu Mandal, SPSR Nellore District, Andhra Pradesh. The marine aspects will be covered as required by MoEF&CC - EIA 2006 Notification. One season study will be conducted.

1.1 Marine EIA study:

- to compile the available data on physical parameters on wave, wind, temperature, salinity, etc.,
- to collect seawater samples at 10 locations and analyze for water quality parameters on salinity, temperature, pH, dissolved oxygen, bio-chemical oxygen demand, nitrate, nitrite, ammonia, phosphate, total phosphorus, total nitrogen, cadmium, lead, mercury, chromium, petroleum hydrocarbons and phenols,
- to evaluate seabed sediment quality parameters at 10 locations on texture, total phosphorous, total nitrogen, total organic carbon, calcium carbonate, phenolic compounds, cadmium, chromium, lead and mercury,
- to evaluate on biological quality parameters at 10 locations on:
  - ➢ – Phytoplankton biomass, population, and group diversity,
  - ➢ – Zooplankton biomass, population, and group diversity,
  - ➢ – Benthic biomass, population, and group diversity,
  - ➢ – Distribution of Coastal vegetation,
  - ➢ – Distribution of Sea grasses and Seaweeds,
  - ➢ – Corals,
  - ➢ – Marine protected area – Marine National Park and Marine Sanctuary,
  - ➢ – Marine mammals if any,
  - ➢ – Sea Turtles,
  - ➢ – Other Endangered species, and
  - ➢ – Fisheries data

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- to study on microbial population in water,
- to study the species and area of mangroves, its impact on the proposed activity, and
- to study fish-catch based on experimental trawling and available statistics.

1.2 Impact assessment:

- The various impacts on the process of opening of sea mouth of Pulicat lake will be analyzed. Exercise will be done for the prediction of the Impact which may alter the marine environment.

1.3 Mitigation measures:

- In order to minimize or nullify the impacts in environment the possible mitigation measures will be worked out. In case of any negative impacts the possible way of reducing the impacts, available alternatives and suitable mitigation measures will be formulated and presented.

1.4 Environmental Management Plan:

- EMP including Biodiversity Management Plan will be prepared for the project location. Post project monitoring will be enlisted in order to ensure that the environmental quality is maintained within the prescribed standards. A detailed schedule of post project monitoring including the locations and time schedule will be presented.

1.5 Preparation of EIA:
- The entire report will be prepared in accordance with the generic structure of the EIA report as per Appendix III of EIA Notification 2006.
- The structure of EIA report is indicated below:

  Chapter 1 : Introduction

  Chapter 2 : Project Description

  Chapter 3 : Description of the Environment

  Chapter 4 : Anticipated Environmental Impacts & Mitigation Measures

  Chapter 5 : Analysis of Alternatives (Technology & site)

  Chapter 6 : Environmental Monitoring Program

  Chapter 7 : Additional Studies (Like mathematical modeling etc.)

  Chapter 8 : Project Benefits

  Chapter 9 : Environmental Cost Benefit Analysis

  Chapter 10: EMP / CER

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Chapter 11 : Summary & Conclusion

Chapter 12 : Disclosure of Consultants engaged

- To prepare the EIA report as per the requirements of PCB, CZMA and MoEF & CC-CRZ committees.

2) Modelling Studies
    i)   to understand the change in shoreline due to construction of groynes on either side of the channel using MIKE LITLINE model,
    ii)   to understand the erosion on the shoreline using MIKE LITDRIFT model,
    iii)   to study the siltation on the channel using MIKE 21 – ST model,
    iv)   to assess the dredge disposal during the free flow of sea water using MIKE 21 – PA model

3) CRZ Mapping - HTL/LTL/CRZ Demarcation Survey (Handholding & Coordination with Anna University)
    i)   to carry out physical survey for demarcation of HTL and LTL lines along the coast
    ii)   to prepare the CRZ maps demarcating HTL, LTL and setback lines covering 7 km radius in 1:4000 and 1:25000 scale. The CRZ classification like CRZ I, II, III and IV as per CRZ Notification 2011 will be demarcated on the map based on the environmental setting around the project site, and
    iii)   to prepare the CRZ report containing the CRZ demarcation methodology, CRZ maps (Sl. No. ii above), satellite imagery map, permissibility of proposed project as per the CRZ classification and the distance of proposed project facility from CRZ – I areas.

4) Statutory Clearances
    i)   to assist in preparation and submission of PARIVESH (MoEF & CC Online Portal – Form 1),
    ii)   to prepare and make presentation for APCZMA and MoEF & CC-CRZ committee, and
    iii)   to assist clients in other meetings and presentations.

5) Requirements from the department
    i)   Permission from AP Port Department, Marine Police for conducting the Marine surveys.
    ii)   Local Cadastral village maps for CRZ Mapping purpose.
    iii)   To provide NIOT report and other relevant reports like Feasibility reports, Bathymetry reports, CRZ reports

6) METHODOLOGY

Environmental Impact Assessment

Marine EIA Study

Seawater, seabed sediment and biological sampling will be carried out at 10 locations covering 10 km radius around the project location

Physical Parameters

Currents: Current data will be compiled from the available data.

Tides: Tide data will be compiled from the available data.

Waves: Wave data will be compiled from the available data.

Wind: Meteorological climate and wind off this region will be compiled from available sources.

Chemical Parameters

Water quality: The water samples will be collected at 10 locations and at surface, mid depth and bottom. Van Dorn water samplers will be used for sample collection and the collected samples will be properly sealed and labeled for further chemical analysis. The surface, bottom and mid depth samples will be analyzed for Salinity, Temperature, pH, Dissolved oxygen, Bio-chemical oxygen demand, Nitrate, Nitrite, Ammonia, Phosphate, Total phosphorus and Total nitrogen. Cadmium, Lead, Mercury, Chromium, Petroleum hydrocarbons and Phenols will be analyzed for mid depth samples alone.

Seabed sediment quality: Seabed sediment samples will be collected at the same locations using Van Veen Grab. These sediment samples will be analyzed to determine: Texture, Total phosphorous, Total nitrogen, Total organic carbon, Calcium carbonate, Phenolic compounds, Cadmium, Chromium, Lead and Mercury.

Biological parameters

Biological samples will be collected at 10 locations. The following parameters will be undertaken for the study:

i) Phytoplankton biomass, population and group diversity,

ii) Zooplankton biomass, population and group diversity,

iii) Intertidal & sub tidal benthos, their biomass, population and group diversity,

iv) Microbiological population,

v) Marine ecology on mangroves, sea grass, sea weeds, corals, other floral distribution, and

vi) Marine mammals, sea turtles, fisheries and other endangered species.

Modelling study

3.2.1. Littoral Drift

The littoral drift in the study region is estimated using the MIKE 21 LITDRIFT model. MIKE 21 LITDRIFT is a comprehensive deterministic numerical model which consists of two major parts, viz. i) a hydrodynamic model and ii) a sediment transport model (STP).

The hydrodynamic model includes propagation, shoaling and breaking of waves, calculation of the driving forces due to radiation stress gradients, momentum balance for the cross-shore and longshore direction giving the wave setup and the

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longshore current velocities. The model can be applied on complex coastal profiles with longshore bars.

The annual drift is evaluated by the contribution of transport from each of the incident wave occurring over the year. When calculating the annual drift, the wave climate in LITDRIFT is described at 6-hour interval in a time series file where each set of items describes the characteristics of incident waves. In addition, the duration of the wave incident is given as a fraction of a year. Then the total annual drift Qannual is calculated as the sum of the contributions from all incident waves, where NSETS is the total number of incident waves.

Shoreline changes

The coastal morphology is solely described by the coastline position (cross-shore direction) and the coastal profile at a given long-shore position. The calculations are based on a coordinate system in which the x axis is a baseline that runs parallel to the primary coastline orientation, while the y-axis runs from the baseline in offshore direction. "Coastal or coastline profile" is used to denote the variation of yc in the longshore (x) direction, while the cross-shore profile denotes the water depth as a function of the cross- shore position relative to the coastline position yc.

Boundary conditions

The coarse resolution model is forced by the tidal water level variations along the open sea boundaries. For the generation of these boundary conditions, the MIKE 21 C-Map tide data base is used. These boundary conditions for the coarse resolution model are prescribed as time series of tidal water level variations along the open boundaries of the model. If the tidal constituents along the boundaries of the coarse resolution model are available.

Model Input:

1. Bathymetry

2. Tidal constituents along the open boundaries

3. Tides covering one lunar cycle

4. Measured currents covering one lunar cycle

5. Creek bank configuration

6. Creek bed characteristics

Siltation Study

MIKE 21 ST is a module in the MIKE 21 application suite for calculating combined current and wave induced non-cohesive sediment transport rate at offshore beyond the wave breaking zone. The MIKE 21 ST module can simulate sand transport rates in a wide array of settings, including natural environments like tidal inlets, estuaries and coastlines, and manmade constructions like harbours and bridges. It calculates the sand transport rate based on pure current information, or combined current and waves. In addition to sand transport rates, the simulation will give the initial rates of bed level changes, which will identify the potential areas of erosion or deposition and the volume of fill in channels.

Dredge Disposal Modelling Studies

The MIKE 21-PA (Particle Analysis) module will be used to identify a suitable location for dumping the dredge spoil and to understand the dispersion pattern of disposed material after dumping.

Model description

MIKE 21 Particle Analysis (PA) module is based on the Lagrangian discrete parcels method in which an ensemble of particles is followed instead of solving the Eulerian advection-diffusion equation. The Lagrangian discrete parcel scheme calculates the displacement of each particle as the sum of an advective deterministic component and an independent, random Markovian component, which statistically approximates the random and/or chaotic nature of time-averaged tidal mixing.

In MIKE 21 PA module, which is designed to simulate the surface and subsurface transport, the spoil/waste/pollutant released into the water bodies are divided into discrete parcels, and sets of spatial coordinates are assigned to each parcel. It is assumed that these parcels advect with the surrounding water body and diffuse as a result of random processes. These flow processes occur simultaneously at different spatial and temporal scales with continuous spectrum ranging from molecular agitation to tidal, baroclinic residual flows. The advective velocities are (usually) obtained from hydrodynamic simulations (MIKE 21 HD), whereas the turbulent contributions are controlled by the dispersion coefficients. In this PA module, the discrete path of the pollutant parcels released in the water body are followed and recorded as a function of time relative to the reference grid system fixed in space. Then the density distributions of the ensemble are interpreted as the concentration of the spoil/waste/pollutant.

The properties of the released particles are described by distribution of grain sizes or settling velocities. It is possible to specify the number of particles released per time step. The sediment is released at a specified depth, and the particles settle with a constant or randomly generated settling velocity. The particles are deposited when they reach the bottom. The mass of the particle cloud can also change due to re-suspension and furthermore due to a linear decay.

This simulation method gives the possibilities of calculating the concentration of suspended material at different depths. The particles can be advected by a three-dimensional velocity field or by logarithmic velocity profiles established from the depth-integrated velocities specified in the Hydrodynamic model. The velocity profiles can be superimposed with a wind induced current profile if wind is applied to the model. The model calculates the frequency function for settling velocity by using Stokes law. A settling velocity chosen at random from this distribution is assigned to each particle when it is released.

The PA module gives the following outputs,

• Instantaneous concentration of suspended material (kg/m3)

 • Averaged concentration of suspended material (kg/m3)

 • Instantaneous total cohesive erosion and deposition (kg/m3)

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• Accumulated total cohesive erosion and deposition (kg/m3)

 • Accumulated net cohesive sedimentation (kg/m3)

Input

The simulated flow field over the project region using the MIKE 21 HD module will be used as input for MIKE21 PA module. The other necessary inputs on dispersion parameters and sediment characteristics will be specified in the model

IV.   Time Frame & Deliverables

This assignment shall be valid for a period of Six (6) months. Total time period for completion of the site visits and submission of report(s) under this assignment shall be Three (03) months from the date of issue of this Work Order.
The Scope of Work shall be as per S.No. III provided above.

The comments / suggestions made on review of the report will be incorporated and submitted within three days. The agency or its representatives are to be available to APUIAML or respective authorities whenever required upon prior notice.

V.   Payment Schedule:

Under this assignment the consultant shall quote the professional fee as mentioned Financial Quote for each project under the given scope. The L1 quote shall be the selected consultant for the same.

a. The professional fee for the assignment shall be in terms of INR and the same shall be payable upon satisfactory submission of reports for the same to APUIAML and accepted by the Client. The fee shall be based in the form and format as mentioned below:

b.   Terms of Payment

Sl. No.	Payment schedule	Percentage
1	Upon initiation of Field Survey	20
2	On completion of field survey	30
3	On submission of draft report	40
4	On obtaining the MoEF&CC clearances or within 6 months on submission of Final report whichever is earlier	10

Note: The payment to the selected consultant shall be made on back-to-back basis subject to realization of payments by APUIAML from the Client.

VI.   Required Team Composition

Sl. No.	Position	Educational Qualification	Experience
1	EIA Coordinator	Ph. D. (Ocean Engineering)	10 years
2	EIA Mentor & Overall, Planer	Ph. D. (Chemical Engineering)	10 years
3	Risk & Hazardous and Noise and vibration	B.E (Marine Engineering)	8 years
4	Risk & Hazardous Management.	M.Sc. (Ecology & Environment), M. Phil. (Disaster Management)	8 years
5	Ecology & Biodiversity	Ph.D. (Marine Biology)	8 years
6	Ecology & Biodiversity	Ph. D. (Marine Biology or Marine Pollution)	8 years
7	Modelling and Design	Ph. D. (Marine Science)	8 years
8	Marine Flora and Fauna	Ph. D. (Botany)	8 years
9	Water pollution and Water quality	Ph. D (Organic Chemistry)	8 years
10	Report Preparation	M. Tech. or M.E. (Coastal Management / Environmental Engineering)	6 years

*The CVs of the team as mentioned above shall be submitted during proposal submission.

Annexure -1

Format for

FINANCIAL PROPOSAL
[On the Letter head of the Firm]

Date:

The CEO,
Andhra Pradesh Urban Infrastructure Asset Management Limited (APUIAML),
4thFloor, RTC House, Pandit Nehru Bus Station,
Vijayawada-520013, Andhra Pradesh

Sub: FINANCIAL PROPOSAL FOR PROVIDING CONSULTANCY SERVICES FOR *"Site inspection & Services towards Marine EIA and Modelling Studies for Opening of Sea Mouth of Pulicat Lake at Rayadoruvu Village, Vakadu Mandal, SPSR Nellore district, Andhra Pradesh – Study for CRZ & EC clearance"*
Sir:

For providing consultancy services for the subject assignment, we hereby submit the following Professional Fee quotation to the APUIAML.

We quote our proposal in terms of INR for whole of the assignment execution as per T&C of clause V above as per the Schedule of Payment:

Project Name	Professional Fee	
	Rs.	INR (In words)
	Rs.	INR (In Figures)

And this is inclusive of transport, printing and stationery and all other expenses except GST towards our Professional fee for the subject assignment to be paid as per payment schedule specified in this TOR.

We shall abide by the above quote, terms and conditions of this TOR, if APUIAML selects us as the Consultant for this particular assignment.

We also understand that, in case any difference between the quoted amount in words and figures, the quote in words will be taken as final.

We agree that this offer shall remain valid for a period of one hundred and eighty (180 days) from the Proposal Due Date or such further period as may be mutually agreed upon.

Yours faithfully,

_____
(Signature of Authorized Signatory)
(Name, Title, Address, Date)
Note: The financial proposal to be submitted strictly as per the above format. Noncompliance to the above format shall disqualify the firm's proposal