SCOPE OF WORK
Environmental Sensitivity Index (ESI) of Ketapang Block, Offshore North of Madura and Muriah Block, Offshore Offshore North of Java.

1. BACKGROUND

PC Ketapang II Ltd. and PC Muriah Ltd. (hereinafter referred to as COMPANY) plans to develop their oil and gas field in Ketapang Block, Offshore North of Madura and Muriah Block, Offshore North of Java.

Coral reef near Ketapang Block is located in Tanjung Modung and Siring Kemuning coastline. Distance from pipeline to Tanjung Modung costline is about 12 km. While the distance from Bukit Tua platform to Siring Kemuning coastline is about 42 km. In both locations, mortality rate of coral reef is high (31.74-51.08%). The death of coral reef is caused by murky waters in the locations.

Ketapang Block is located in Java Sea Fisheries Management Area. The territory sea is part of Java Sea Fish Catchment area. The nearest land from Ketapang Block is north coast of Sampang and Bangkalan Residences and east and north of Gresik Residence. One of the main local economical activities in these areas is fishing. This leads to high levels of community dependence to the sea.

The area surrounding Muriah Block is the fish catchment area for fisherman from north coast of East Java, especially from Tuban Regency. The area is also the fisherman's ship trajectory sailed to Kalimantan or other islands.

Kasperson (2000) defined sensitivity as potential impact to a system from perturbations including shocks and stress. Issue of sensitivity is generally related with the topic of sustainable development. As Nijkamp and Vreeker (2000) has addressed that sensitivity concept is a part of sustainability constraints together with, for example, the concept of safe minimum standards, quality standards, carrying capacity, eco-capacity, maximum sustainable yield, critical loads, environmental utilization space, etc. All such concepts may be useful for a policy analysis. Moreover, Van Pelt et.al (1992) mentioned that a sustainability constraint has a least four attributes : (1) it is expressed in one or more measurable parameters; (2) these parameters are linked to sustainability targets; (3) the parameters have a proper geographical scale; (4) these parameters have also a relevant time dimension. It is also stated that ideally these parameters should be mapped out in quantitative factors, but in reality it is often confronted with qualitative, fuzzy and incomplete information (Nijkamp and Vreeker, 2000). In this context, it is then needed a better understanding of the habitat and ecosystem and their sensitivity of COMPANY's working areas environment through the development of environmental sensitivity area mapping.

The Environmental Sensitivity Index (ESI) maps have become an integral component of oil spill contingency planning, response and damage assessments as well as coastal resource management in many countries. The identification of vulnerable coastal locations based on environmental parameters such as shoreline characteristics, biological resources richness, exposure to wave and tidal energy, and socio-economic beneficial uses of coastal resources is required in the production of ESI maps. COMPANY will appoint a professional third party (hereinafter referred to as CONTRACTOR) to conduct the ESI mapping (hereinafter referred to as SERVICE).

ESI maps need to be produced before a hazardous substance releases or spill happens as availability of information pertaining to the vulnerability of the coastline will assist the combat team in determining the use of appropriate materials, chemicals and equipment during combat strategies especially in protecting the more vulnerable coastal locations.

ESI Maps also serve as quick references for Oil and Chemical Spill Responders and Coastal Zone Managers and assist them in decision-making, promptly and appropriately

2. OBJECTIVE

The objective of the SERVICE is to develop ESI maps to support COMPANY's oil spill preparedness and response program by incorporating detailed information on environmental and social sensitivities in COMPANY's working area in Ketapang Block, Offshore North of Madura and Muriah Block, Offshore North of Java. The ESI study area covers the oil spill affected areas based on Oil Spill Modeling Study including northern coast of Madura Island from Bangkalan Regency to Sumenep Regency.

CONTRACTOR shall provide the ESI maps reports for Ketapang Block and Muriah Block in English and Bahasa Indonesia.

3. SCOPE OF WORK

CONTRACTOR shall perform the work which include but not limited to the following activities:

A. Update Environmental Parameters

Collect, compile, synthesize and populate the following ESI spatial and attribute data for the designated study areas (from the shoreline to 5 km inland and 12 nm offshore):

(1) Geology
(2) Physical coastline characteristics and processes
(3) Coastal geomorphology
(4) Coastal vegetation / flora
(5) Fauna – epifauna and infauna
(6) Coastal land use including industrial facilities and activities, etc. It shall include coastal zoning and development projects that have been committed for implementation within two (2) years
(7) Wildlife sanctuaries
(8) Marine parks
(9) Socio-economy – coastal villages, hotels and resorts, recreational areas, tourism spots, etc.
(10) Environmentally sensitive areas such as mangroves and wetlands
(11) Fisheries – activities, fishing ground, breeding ground etc.
(12) Shoreline accessibility
(13) Near shore bathymetry
(14) Critical infrastructures – airports, army bases, ports, water intakes etc.

B. Develop ESI Environmental Databases

All spatial and attribute data collated shall be stored in the ESI Environmental Databases to be located within the department existing GIS package – ArcGIS®. The design of the databases must take into consideration the users' needs such as ease of data entry for updating attribute information, retrieval, query and spatial analysis.

The spatial layers of the ESI Environmental Databases shall consist of but not limited to the following:

(1) Basemap – administrative and coastline boundaries
(2) Roads networks - primary and secondary
(3) Rivers networks/Drainage system
(4) Land use/Land cover
(5) Topography Map
(6) Geological features – geology and geomorphology
(7) Nearshore Bathymetry
(8) Environmental sensitive areas - e.g. mangrove and wetlands
(9) Conservation and protected areas – e.g. sanctuaries and Marine Parks
(10) Shoreline types
(11) ESI Ranking map

(12) Spill response resources map
(13) Critical infrastructures
(14) Future committed development projects – Structure Plan, Local Plan, etc

C. Develop ESI Report & ESI Maps

(1) ESI maps that are ranked from 1–10 and color-coded are to be produced based on the details as described in the indexes of the ESI maps. All colors and symbols use in the ESI maps must conform to standard color scheme and symbolization as stipulated in IMO/IPEACA Report Series Volume 1 – Sensitivity Mapping For Oil Spill Response (latest edition).
(2) All maps, hardcopy or digital, must conform to the national mapping standard and in RSO map projection.
(3) Mapping scale shall be 1:50,000 or better. Mapping shall be assisted using satellite images of 25 m spatial resolution or better, or using recent aerial photographs/videos.
(4) Other Information such as photographs and videos shall be hyperlink to the related features in the databases so as to provide a better visualization and understanding of the environmental settings.

D. Presenting and Socializing the ESI study result to PC Ketapang II Ltd. and PC Muriah Ltd, the Ministry of Environment (MOE) and SKK MIGAS.

4. METHODOLOGY

To prepare for the Work, COMPANY will provide CONTRACTOR with the following documents, data and information:

1. Oil Spill Modeling Study for Ketapang Block
2. Oil Spill Modeling Study for Muriah Block

Upon receive of the documents and information, CONTRACTOR shall:

1. Perform preliminary review to confirm all information has been received and sufficient to perform the Work.
2. Coordinate with COMPANY to establish and confirm the work plan and methodology used in performing the Work/Services, within the requirements and timeframe as described in this Scope of Work.

All sampling methodology and samples analysis shall follow established international methods.
All primary and secondary data collated in the form of textual/attribute information or maps (hardcopy or digital) are to be used to develop the ESI Environmental Databases for the designated study areas.

5. MAPS OF PRELIMINARY STUDY AREA

CONTRACTOR shall determine the required area of interest in consultation with COMPANY

Figure 1. Map Area of Interest Environmental Sensitivity Index of Ketapang Block and Muriah Block.

6. TERMS OF AGREEMENT

This agreement will apply for one (1) time service with duration 6 (six) months/ 180 (one hundred eighty) days from start of the Work. Preliminary ESI Maps shall be submitted within 4 (four) months/ 120 days from start of the Work for Ketapang & Muriah.

7. WORK SCHEDULE

The SERVICE for PC Ketapang Ltd and PC Muriah Ltd will be carried out within 6 months as depicted in the **Table 1**

Table 1. Proposed Working Schedule

No	Activities	Month 1				Month 2				Month 3				Month 4				Month 5				Month 6			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	**- Kick off meeting**																								
2	**- Survey Preparation**																								
	Preparation for Personnel																								
	Preparation for Survey Equipment																								
	Purchasing Satelite Imagery																								
	Collection Secondary Data & Base Map																								
3	**- Field visit and/or measurement**																								
4	**- Data Analysis and mapping process**																								
	Satelite imageries analysis																								
5	**ESI Data Analysis**																								
	(Calculation of vulnerability index, ecological index, and socio-economic index)																								
6	**Develop Survey Report**																								
	- Submit Survey Report																								
7	**ESI Analysis**																								
8	**Develop Preliminary ESI REPORT and ESI Maps**																								
	- Submit Preliminary ESI REPORT and Presentation																								
9	**Discussion with PETRONAS**																								
10	**Developed Draft Final report & GIS Database**																								
	Submit Draft Final ESI REPORT and ESI Maps																								
11	**Report Revision**																								
	- Final Report and presentation																								

Reporting Schedule

To ensure the project deliverables is completed in timely manner, the progress reporting schedule of the study is conducted in monthly basis.

8. WORK DELIVERABLES

CONTRACTOR shall provide data as follow:

A. ESI Environmental Databases to be located within GIS package - ArcGIS®.

B. Provide 5 (five) hardcopies and softcopies of Final Report for Ketapang and 5 (five) hardcopies and softcopies of Final Report for Muriah in English and Bahasa Indonesia.

C. Provide 5 (five) hardcopies and softcopies of ESI Maps for Ketapang and 5 (five) hardcopies and softcopies of Final Report for Muriah. Mapping scale shall be 1:50,000 or better. Mapping shall be assisted using satellite images of 25 m spatial resolution or better, or using recent aerial photographs/videos.

9. RESPONSIBILITY AND QUALIFICATION

A. The CONTRACTOR shall have adequate human resources to perform the works and shall meet the following requirements:
   - Expertise and staffs are developed and their performance is continually reviewed.
   - Sufficient time is available to provide information, advising and counseling.
   - Sufficient expertise and staffs with the qualifications and experience is available.

- Sufficient time is allowed for administering the work.

B. Team leader should hold S-3 degree at minimum, majoring in Environment/Conservation /Coastal Zone Management Studies.
C. Team supervisor and Team Coordinator should hold S-2 degree at minimum, majoring in Fisheries/Coastal Zone Management/GIS studies.
D. The CONTRACTOR shall have adequate expertise and staffs with minimum qualifications criteria are as follow, but not limited to:
   - Have relevant background, knowledge as well as understand & familiar with the related project matters.
   - Have proven experience in a discipline that had special duties with respect to the related project matters.
   - Have necessary training skills.

10. MOBILIZATION/DEMOBILIZATION

CONTRACTOR will conduct field survey activity. For personnel mobilization/demobilization CONTRACTOR shall follow the following terms:

- CONTRACTOR shall be responsible to arrange transportation of its personnel and equipment mobilization/demobilization for the work, from CONTRACTOR office/facility to location of the study and vise versa.
- CONTRACTOR shall also be responsible for arranging necessary health and safety requirements for their personnel going to study area.

11. WORK ORDER

COMPANY will provide a Work Order to CONTRACTOR with at least 1 (one) day prior notice and also will inform CONTRACTOR by phone or fax with the work order signed by the COMPANY representatives as stated in the contract as the contact person or his/her alternate to start the services.

12. COST ESTIMATION

CONTRACTOR must submit the price estimation in **Appendix-1**. **"Price Estimation**".

13. IMPLEMENTATION OF COMPENSATION & PAYMENT PHASE AND TAX ARRANGEMENT

Compensation & Payment Phase

Total compensation of this Agreement is **IDR 708.800.000** and to be paid in three phases:

a) **Phase 1 Payment**: 40% (forty percent) that will be paid to CONTRACTOR after COMPANY received the Field Survey Report
b) **Phase 2 Payment**: 30% (thirty percent) that will be paid to CONTRACTOR after COMPANY received Draft Report of ESI
c) **Phase 3 Payment**: 30% (thirty percent) that will be paid to CONTRACTOR after COMPANY received Final Report

Tax Arrangement

The total compensation **excludes 10% VAT**, but includes other tax, retribution and other cost related to this service implementation.

APPENDIX – 1

PRICE ESTIMATION

PC KETAPANG LTD

No	DESCRIPTION	UNIT	Quantity	Month	Cost per Unit (RP)	Total Cost (RP)
I.	**REMUNERATION**					
a.	**Management**					
1	Project Manager	Person	1	3	2,000,000	6,000,000
b.	**Professional Staff (Expert)**					
1	Environmental Management Expert / Team Leader	Person	1	2.5	7,000,000	17,500,000
2	Conservation and Mangrove Expert	Person	1	2	6,000,000	12,000,000
3	Social-Economic and Culture Expert	Person	1	2	6,000,000	12,000,000
4	Fisheries Expert	Person	1	2	6,000,000	12,000,000
5	Coastal morphology	Person	1	2	6,000,000	12,000,000
6	Coral Reef Expert	Person	1	2	6,000,000	12,000,000
7	GIS Expert	Person	1	3	6,000,000	18,000,000
c	**Sub Professional Staff (Expert Assistant)**					
1	Conservation and Mangrove	Person	1	2	3,000,000	6,000,000
2	GIS	Person	1	3	3,000,000	9,000,000
3	Social-Economic and Culture	Person	1	2	3,000,000	6,000,000
	Total Cost I					**122,500,000**

II. DIRECT COST

No	DESCRIPTION	UNIT	Quantity	Day	Cost per Unit (RP)	Total Cost (RP)
2.1.	**Survey Cost**					
a	**Perdiem**					
1	Environmental Management Expert / Team Leader	Person	1	5	500,000	2,500,000
2	Conservation and Mangrove Expert	Person	1	5	500,000	2,500,000
3	Social-Economic and Culture Expert	Person	1	5	500,000	2,500,000
4	Fisheries Expert	Person	1	5	500,000	2,500,000
5	Coastal morphology	Person	1	5	500,000	2,500,000
6	Coral Reef Expert	Person	1	5	500,000	2,500,000
7	GIS Expert	Person	2	5	350,000	3,500,000
8	Social-Economic and Culture Expert Assistant	Person	1	5	350,000	1,750,000
9	Conservation and Mangrove Expert Assistant	Person	1	5	350,000	1,750,000
b	**Transportation**					
1	Bogor-Airport (2 Vehicle)	Per unit/day	2	1	600,000	1,200,000
2	Ticket Jkt-Sub	Person	10	1	1,500,000	15,000,000
3	Vehicle Rental (incl. Transport from Surabaya to the sites) (2 vehicles)	Per unit/day	2	5	1,750,000	17,500,000
4	Boat rental for sea survey (1 Unit Including Fuel and Crew boat consumption)	Per unit/day	1	5	10,000,000	50,000,000
c	**Accommodation**	Room	6	5	750,000	22,500,000
d	**Consumption**	Person	10	5	250,000	12,500,000
	Sub Total 2.1					**140,700,000**

No	DESCRIPTION	UNIT	Quantity	Month	Cost per Unit (RP)	Total Cost (RP)
2.2.	**Office Operational Cost**					
1	Communication	Per unit	1	3	500,000	1,500,000
2	Meeting with proponent (transport, meals of team)					
	- transport (1 car)	Per unit	1	3	500,000	1,500,000
	- meals (8 persons)	Person	8	3	100,000	2,400,000
	- lump sum (8 persons)	Person	8	3	200,000	4,800,000
3	Data analysis and team internal Meeting	Package	1	3	2,000,000	6,000,000
4	Report Finalization Meeting	Package	1	1	4,500,000	4,500,000
5	Office stationary	Month	1	3	1,000,000	3,000,000
6	Documentation	Lump Sum	1	-	500,000	500,000
	Sub Total 2.2					**24,200,000**
No	**DESCRIPTION**	**UNIT**	**Quantity**	**Month**	**Cost per Unit (RP)**	**Total Cost (RP)**
2.3.	**Equipment and Laboratory Analysis**					
1	**Map and Image**					
	- Image Landsat TM 8	Scene	2	-	5,000,000	10,000,000
	- Digital Map and printed map	Package	16	-	750,000	12,000,000
	Sub Total 2.3					**22,000,000**

No	DESCRIPTION	UNIT	Quantity	Month	Cost per Unit (RP)	Total Cost (RP)
2.4.	**Reporting Cost**					
1	Data Collection and Analyze	Month	1	2.5	2,000,000	5,000,000
2	GIS analysis works (environmental database in ArcGis)	Pack.	1	0.5	20,000,000	10,000,000
2	Progress Report (Including Maps)	Expl	1	1	1,000,000	1,000,000
3	Final Report (hardcopy & softcopy) in English and Bahasa Indonesia	Expl	5	1	2,000,000	10,000,000
4	Map Printing (scale 1:50,000 or better)	Expl	5	1	3,800,000	19,000,000
	Sub Total 2.4					**45,000,000**
	Total Cost II					**231,900,000**
	Grand Total (I + II)					**354,400,000**

PC MURIAH LTD

No	DESCRIPTION	UNIT	Quantity	Month	Cost per Unit (RP)	Total Cost (RP)
I.	**REMUNERATION**					
a.	**Management**					
1	Project Manager	Person	1	3	2,000,000	6,000,000
b.	**Professional Staff (Expert)**					
1	Environmental Management Expert / Team Leader	Person	1	2.5	7,000,000	17,500,000
2	Conservation and Mangrove Expert	Person	1	2	6,000,000	12,000,000
3	Social-Economic and Culture Expert	Person	1	2	6,000,000	12,000,000
4	Fisheries Expert	Person	1	2	6,000,000	12,000,000
5	Coastal morphology	Person	1	2	6,000,000	12,000,000
6	Coral Reef Expert	Person	1	2	6,000,000	12,000,000
7	GIS Expert	Person	1	3	6,000,000	18,000,000
c	**Sub Professional Staff (Expert Assistant)**					
1	Conservation and Mangrove	Person	1	2	3,000,000	6,000,000
2	GIS	Person	1	3	3,000,000	9,000,000
3	Social-Economic and Culture	Person	1	2	3,000,000	6,000,000
	Total Cost I					**22,500,000**
II.	**DIRECT COST**					
No	**DESCRIPTION**	**UNIT**	**Quantity**	**Day**	**Cost per Unit (RP)**	**Total Cost (RP)**
2.1.	**Survey Cost**					
a	**Perdiem**					
1	Environmental Management Expert / Team Leader	Person	1	5	500,000	2,500,000
2	Conservation and Mangrove Expert	Person	1	5	500,000	2,500,000
3	Social-Economic and Culture Expert	Person	1	5	500,000	2,500,000
4	Fisheries Expert	Person	1	5	500,000	2,500,000

No	DESCRIPTION	UNIT	Quantity	Day	Cost per Unit (RP)	Total Cost (RP)
5	Coastal morphology	Person	1	5	500,000	2,500,000
6	Coral Reef Expert	Person	1	5	500,000	2,500,000
7	GIS Expert	Person	2	5	350,000	3,500,000
8	Social-Economic and Culture Expert Assistant	Person	1	5	350,000	1,750,000
9	Conservation and Mangrove Expert Assistant	Person	1	5	350,000	1,750,000
b	**Transportation**					
1	Bogor-Airport (2 Vehicle)	Per unit/day	2	1	600,000	1,200,000
2	Ticket Jkt-Sub	Person	10	1	1,500,000	15,000,000
3	Vehicle Rental (incl. Transport from Surabaya to the sites) (2 vehicles)	Per unit/day	2	5	1,750,000	17,500,000
4	Boat rental for sea survey (1 Unit Including Fuel and Crew boat consumption)	Per unit/day	1	5	10,000,000	50,000,000
c	**Accommodation**	Person	6	5	750,000	22,500,000
d	**Consumption**	Person	10	5	250,000	12,500,000
	Sub Total 2.1					**140,700,000**
No	**DESCRIPTION**	**UNIT**	**Quantity**	**Month**	**Cost per Unit (RP)**	**Total Cost (RP)**
2.2.	**Office Operational Cost**					
1	Communication	Per unit	1	3	500,000	1,500,000
2	Meeting with proponent (transport, meals of team)					
	- transport (1 car)	Per unit	1	3	500,000	1,500,000
	- meals (8 persons)	Person	8	3	100,000	2,400,000
	- lump sum (8 persons)	Person	8	3	200,000	4,800,000
3	Data analysis and team internal meeting	Package	1	3	2,000,000	6,000,000
4	Report Finalization Meeting	Package	1	1	4,500,000	4,500,000
5	Office stationary	Month	1	3	1,000,000	3,000,000
6	Documentation	Lump Sum	1	-	500,000	500,000
	Sub Total 2.2					**24,200,000**

No	DESCRIPTION	UNIT	Quantity	Month	Cost per Unit (RP)	Total Cost (RP)
2.3.	**Equipment and Laboratory Analysis**					
1	**Map and Image**					
	- Image Landsat TM 8	Scene	2	-	5,000,000	10,000,000
	- Digital Map and printed map	Package	16	-	750,000	12,000,000
	Sub Total 2.3					**22,000,000**
No	**DESCRIPTION**	**UNIT**	**Quantity**	**Month**	**Cost per Unit (RP)**	**Total Cost (RP)**
2.4.	**Reporting Cost**					
1	Data Collection and Analyze	Month	1	2.5	2,000,000	5,000,000
2	GIS analysis works (environmental database in ArcGis)	Pack.	1	0.5	20,000,000	10,000,000
2	Progress Report (Including Maps)	Expl	1	1	1,000,000	1,000,000
3	Final Report (hardcopy & softcopy) in English and Bahasa Indonesia	Expl	5	1	2,000,000	10,000,000
4	Map Printing (scale 1:50,000 or better)	Expl	5	1	3,800,000	19,000,000
	Sub Total 2.4					**45,000,000**
	Total Cost II					**231,900,000**
	Grand Total (I + II)					**354,400,000**