Invitation for Initial Selection
Information Systems
(Design, Supply, and Installation)

Purchaser: *Ministry of Marine Affairs and Fisheries Republic of Indonesia*
Project: *Ocean Prosperity Project – LAUTRA*
Contract title: *Ocean Monitoring System (OMS)*
Country: *Indonesia*
Loan No: *IBRD 9498-ID*
ISD No: ***ID-MMAF-522643-GO-RFP***
Issued on: ***17 November 2025***

1. The Ministry of Marine Affairs and fisheries Republic of Indonesia (MMAF) has received financing from the World Bank toward the cost of the Ocean Prosperity Project - LAUTRA and intends to apply part of the proceeds toward payments under the contract for Ocean Monitoring System (OMS).

2. The Directorate General of Marine Management (DGMM), MMAF intends to initially select Applicants for providing Information System Design, Supply, and Installation including training in the Ocean Monitoring Systems project (OMS), which includes the following components:
    a) Enterprise Geospatial Visualization Platform and Digital Twin
    b) State-of-of-the-art Toos for Ocean Data Collection
    c) On-Premises Hyper Converged Infrastructure

    It is expected that the Request for Proposals will be made on 15 January 2026.

3. Initial Selection will be conducted through the procedures as specified in the World Bank's Procurement Regulations for Borrowers- Procurement in Investment Projects Financing", of November 2020 ("Procurement Regulations"), and is open to all eligible Applicants as defined in the Procurement Regulations.

4. Interested eligible Applicants may obtain further information from the Procurement Service Unit, MMAF at the address below Gedung Mina Bahari I, 3rd Floor, Jalan Medan Merdeka Timur No 16, Jakarta Pusat, Indonesia during office hours 08.30 a.m to 03.00 p.m (GMT+7). A complete set of **Initial Selection** documents in English Language will be available and can be downloaded at www.kkp.go.id/events/lautra-project.

5. Applications for Initial Selection should be submitted in clearly marked envelopes and delivered to the address below by 1.00 PM (GMT+7) on 31 December 2025. Late applications may be rejected.

Procurement Service Unit, MMAF
Selection Working Committee Ocean Monitoring System (OMS)
Gedung Mina Bahari I, 3rd Floor, Jalan Medan Merdeka Timur No 16, Jakarta Pusat, Indonesia
lautra-pbj@kkp.go.id
www.kkp.go.id/events/lautra-project

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(This Initial Selection Document is for use with a Request for Proposals process)

Standard Procurement Document

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PART 1 – Initial Selection Procedures

Section I - Instructions to Applicants

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Section I - Instructions to Applicants

A. General

1. Scope of Application

1.1 In connection with the invitation for Initial Selection indicated in Section II, Initial Selection Data Sheet (**ISDS**), the Purchaser, as defined **in the ISDS,** issues this Initial Selection Document ("Initial Selection Document") to prospective applicants ("Applicants") interested in submitting applications ("Applications") for Initial Selection to submit Proposals for the Information Systems Design, Supply and Installation described in Section VII, Scope of Purchaser's Requirement. In case proposals for the Information Systems Design, Supply and Installation are to be invited as individual contracts (i.e., the slice and package procedure), these are listed **in the ISDS**. The Request for Proposals (RFP) number corresponding to this Initial Selection is also provided **in the ISDS.**

1.2 For the purposes of this Initial Selection Document, the term "Information System" means all:

(a) the required information technologies, including all information processing and communications-related hardware, software, supplies, and consumable items that the Supplier is required to supply and install under the Contract, plus all associated documentation, and all other materials and goods to be supplied, installed, integrated, and made operational; and

(b) the related software development, transportation, insurance, installation, customization, integration, commissioning, training, technical support, maintenance, repair, and other services necessary for proper operation of the Information System to be provided by the selected Proposer as specified in Section VII Purchaser's Requirement.

2. Source of Funds

2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated **in the ISDS** has applied for or received financing (hereinafter called "funds") from the International Bank for Reconstruction and Development or the International Development Association (hereinafter called "the Bank") in an amount specified **in**

the ISDS, towards the cost of the project named **in the ISDS**. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) resulting from the Request for Proposals (RFP) process for which this Initial Selection is conducted.

2.2 Payment by the Bank will be made only at the request of the Borrower and upon approval by the Bank, and will be subject, in all respects, to the terms and conditions of the Loan (or other financing) Agreement. The Loan (or other financing) Agreement prohibits a withdrawal from the loan (or credit) account for the purpose of any payment to persons or entities, or for any import of goods, equipment, plant or materials, or services if such payment or import, to the knowledge of the Bank, is prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations. No party other than the Borrower shall derive any rights from the Loan (or other financing) Agreement or have any claim to the proceeds of the loan (or credit).

3. Fraud and Corruption

3.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Section VI, Fraud and Corruption.

3.2 In further pursuance of this policy, Applicants shall permit and shall cause their agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and personnel, to permit the Bank to inspect all accounts, records and other documents relating to any Prequalification process, Initial Selection process, Bid submission (in case prequalified), Proposal submission, (in case initially selected), and contract performance (in the case of award), and to have them audited by auditors appointed by the Bank.

4. Eligible Applicants

4.1 Applicants shall meet the eligibility criteria as per this Instruction and ITA 5.1.

4.2 An Applicant may be a firm that is a private entity, a state-owned enterprise or institution subject to ITA 4.9 - or any combination of such entities in the form of a joint venture ("JV") under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the entire

Contract in accordance with the Contract terms. The JV shall nominate an authorized representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the Initial Selection process, RFP process (in the event the JV submits a Proposal) and during contract execution (in the event the JV is awarded the Contract). Unless specified **in the ISDS**, there is no limit on the number of members in a JV.

4.3 A firm is not permitted to participate for initial selection for the same contract both as an individual firm and as a part of a joint venture or as a subcontractor. However, a firm may participate as a subcontractor in more than one Application but only in the capacity of a subcontractor. Applications submitted in violation of this procedure will be rejected.

4.4 A firm and any of its affiliates (that directly or indirectly control, are controlled by or are under common control with that firm) are not permitted to submit more than one application for initial selection for the same contract, either individually, as joint venture or as a subcontractor among them. Applications submitted in violation of this procedure will be rejected.

4.5 An Applicant may have the nationality of any country, subject to the restrictions pursuant to ITA 5.1. An Applicant shall be deemed to have the nationality of a country if the Applicant is constituted, incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed specialized sub-contractors or suppliers for any part of the Contract including related Services.

4.6 Applicants and proposed specialized sub-contractors or suppliers for any part of the Contract including related services (for the purpose of this ITA 4.6 referred to as "Applicants") shall not have a conflict of interest. Applicants shall be considered to have a conflict of interest, if they, or any of their affiliates, participated as a consultant in the preparation of the Purchaser's Requirement (other than design to be carried out as part of this Information System Design, Supply and Installation contract) or have been hired or proposed to

be hired by the Purchaser or Borrower as Project Manager for contract implementation of the Information Systems Design, Supply and Installation that are the subject of this Initial Selection. In addition, Applicants may be considered to have a conflict of interest if they have a close business or family relationship with a professional staff of the Borrower (or of the project implementing agency, or of a recipient of a part of the loan) who: (i) are directly or indirectly involved in the preparation of the Initial Selection Document or Request for Proposals (RFP) Document or specifications of the Contract, and/or the Proposal evaluation process of such Contract; or (ii) would be involved in the implementation or supervision of such Contract, unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Bank throughout the procurement process and execution of the Contract.

4.7 An Applicant that has been sanctioned by the Bank, pursuant to the Bank's Anti-Corruption Guidelines, and in accordance with its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as described in Section VI, paragraph 2.2 d. shall be ineligible to be prequalified for, initially selected for, bid for, propose for, or be awarded a Bank-financed contract or benefit from a Bank-financed contract, financially or otherwise, during such period of time as the Bank shall have determined.

4.8 The list of debarred firms and individuals is available as specified **in the ISDS.**

4.9 Applicants that are state-owned enterprise or institutions in the Purchaser's Country may be eligible to be initially selected, compete and be awarded a Contract(s) only if they can establish, in a manner acceptable to the Bank, that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not under supervision of the Purchaser.

4.10 An Applicant shall not be under suspension from bidding or submitting proposals by the Purchaser as the result of the execution of a Bid or Proposal–Securing Declaration.

4.11 An Applicant shall provide such documentary evidence of eligibility satisfactory to the Purchaser, as the Purchaser shall reasonably request.

4.12 A firm that is under a sanction of debarment by the Borrower from being awarded a contract is eligible to participate in this procurement, unless the Bank, at the Borrower's request, is satisfied that the debarment:

(a) relates to fraud or corruption; and

(b) followed a judicial or administrative proceeding that afforded the firm adequate due process.

5. Eligibility

5.1 Firms and individuals may be ineligible if they are nationals of ineligible countries as indicated in Section V. The countries, persons or entities are ineligible if (a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country, provided that the Bank is satisfied that such exclusion does not preclude effective competition for the supply of goods or the contracting of works or services required; or (b) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country, or any payments to any country, person, or entity in that country. When the Information Systems Design, Supply and Installation is implemented across jurisdictional boundaries (and more than one country is a Borrower, and is involved in the procurement), then exclusion of a firm or individual on the basis of ITA 5.1(a) above by any country may be applied to that procurement across other countries involved, if the Bank and the Borrowers involved in the procurement agree.

B. Contents of the Initial Selection Document

6. Sections of Initial Selection Document

6.1 This Initial Selection Document consists of parts 1 and 2 which comprise all the sections indicated below, and which should be read in conjunction with any Addendum issued in accordance with ITA 8.

PART 1 Initial Selection Procedures

- Section I - Instructions to Applicants (ITA)
- Section II - Initial Selection Data Sheet (ISDS)
- Section III - Initial Selection Criteria and Requirements

- Section IV - Application Forms
- Section V – Eligible Countries
- Section VI – Fraud and Corruption

PART 2 Purchaser's Requirements

- Section VII - Scope of Purchaser's Requirement

6.2 Unless obtained directly from the Purchaser, the Purchaser accepts no responsibility for the completeness of the document, responses to requests for clarification, the minutes of the pre-Application meeting (if any), or Addenda to the Initial Selection Document in accordance with ITA 8. In case of any discrepancies, documents issued directly by the Purchaser shall prevail.

6.3 The Applicant is expected to examine all instructions, forms, and terms in the Initial Selection Document and to furnish with its Application all information or documentation as is required by the Initial Selection Document.

7. Clarification of Initial Selection Document and Pre-Application Meeting

7.1 An Applicant requiring any clarification of the Initial Selection Document shall contact the Purchaser in writing at the Purchaser's address indicated **in the ISDS.** The Purchaser will respond in writing to any request for clarification provided that such request is received no later than fourteen (14) days prior to the deadline for submission of the applications. The Purchaser shall forward a copy of its response to all prospective Applicants who have obtained the Initial Selection Document directly from the Purchaser, including a description of the inquiry but without identifying its source. If so indicated **in the ISDS**, the Purchaser shall also promptly publish its response at the web page identified **in the ISDS**. Should the Purchaser deem it necessary to amend the Initial Selection Document as a result of a clarification, it shall do so following the procedure under ITA 8 and in accordance with the provisions of ITA 17.2.

7.2 If indicated **in the ISDS**, the Applicant's designated representative is invited at the Applicant's cost to attend a pre-Application meeting at the place, date and time mentioned **in the ISDS**. During this pre-Application meeting, prospective Applicants may request

clarification of the project requirement, the criteria for qualifications or any other aspects of the Initial Selection Document.

7.3 Minutes of the pre-Application meeting, if applicable, including the text of the questions asked by Applicants, including those during the meeting (without identifying the source) and the responses given, together with any responses prepared after the meeting will be transmitted promptly to all prospective Applicants who have obtained the Initial Selection Document. Any modification to the Initial Selection Document that may become necessary as a result of the pre-Application meeting shall be made by the Purchaser exclusively through the use of an Addendum pursuant to ITA 8. Non-attendance at the pre-Application meeting will not be a cause for disqualification of an Applicant.

8. Amendment of Initial Selection Document

8.1 At any time prior to the deadline for submission of Applications, the Purchaser may amend the Initial Selection Document by issuing an Addendum.

8.2 Any Addendum issued shall be part of the Initial Selection Document and shall be communicated in writing to all Applicants who have obtained the Initial Selection Document from the Purchaser. The Purchaser shall promptly publish the Addendum at the Purchaser's web page identified **in the ISDS**.

8.3 To give Applicants reasonable time to take an Addendum into account in preparing their Applications, the Purchaser may, at its discretion, extend the deadline for the submission of Applications in accordance with ITA 17.2.

C. Preparation of Applications

9. Cost of Applications

9.1 The Applicant shall bear all costs associated with the preparation and submission of its Application. The Purchaser will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Initial Selection process.

10. Language of Application

10.1 The Application as well as all correspondence and documents relating to the Initial Selection exchanged by the Applicant and the Purchaser, shall be written in the language specified **in the ISDS.** Supporting documents and printed literature that are part of the Application may

be in another language, provided they are accompanied by an accurate translation of the relevant passages in the language specified **in the ISDS,** in which case, for purposes of interpretation of the Application, the translation shall govern.

11. Documents Comprising the Application

11.1 The Application shall comprise the following:

(a) **Application Submission Letter**, in accordance with ITA 12.1;

(b) **Eligibility:** documentary evidence establishing the Applicant's eligibility, in accordance with ITA 13.1;

(c) **Qualifications:** documentary evidence establishing the Applicant's qualifications, in accordance with ITA 14; and

(d) any other document required as specified **in the ISDS**.

11.2 The Applicant shall furnish information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Application

12. Application Submission Letter

12.1 The Applicant shall complete an Application Submission Letter as provided in Section IV, Application Forms. This Letter must be completed without any alteration to its format.

13. Documents Establishing the Eligibility of the Applicant

13.1 To establish its eligibility in accordance with ITA 4, the Applicant shall complete the eligibility declarations in the Application Submission Letter and Forms ELI (eligibility) 1.1 and 1.2, included in Section IV, Application Forms.

14. Documents Establishing the Qualifications of the Applicant

14.1 To establish its qualifications to perform the contract(s) in accordance with Section III - Initial Selection Criteria and Requirements, the Applicant shall provide the information requested in the corresponding Information Sheets included in Section IV, Application Forms.

14.2 Wherever an Application Form requires an Applicant to state a monetary amount, Applicants should indicate the USD equivalent using the rate of exchange determined as follows:

(a) For turnover or financial data required for each

year - Exchange rate prevailing on the last day of the respective calendar year (in which the amounts for that year are to be converted).

(b) Value of single contract - Exchange rate prevailing on the date of the contract.

Exchange rates shall be taken from the publicly available source identified **in the ISDS**. Any error in determining the exchange rates in the Application may be corrected by the Purchaser.

15. Signing of the Application and Number of Copies

15.1 The Applicant shall prepare one original of the documents comprising the Application as described in ITA 11 and clearly mark it "ORIGINAL". The original of the Application shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Applicant. In case the Applicant is a JV, the Application shall be signed by an authorized representative of the JV on behalf of the JV and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized signatories.

15.2 The Applicant shall submit copies of the signed original Application, in the number specified **in the ISDS,** and clearly mark them "COPY". In the event of any discrepancy between the original and the copies, the original shall prevail.

D. Submission of Applications

16. Sealing and Marking of Applications

16.1 The Applicant shall enclose the original and the copies of the Application in a sealed envelope that shall:

(a) bear the name and address of the Applicant;

(b) be addressed to the Purchaser, in accordance with ITA 17.1; and

(c) bear the specific identification of this Initial Selection process indicated **in the ISDS** 1.1.

16.2 The Purchaser will accept no responsibility for not processing any envelope that was not identified as required in ITA 16.1 above.

17. Deadline for Submission of Applications

17.1 Applicants may either submit their Applications by mail or by hand. Applications shall be received by the Purchaser at the address and no later than the deadline indicated **in the ISDS.** When so specified **in the ISDS,** Applicants have the option of submitting their Applications electronically, in accordance with electronic Application submission procedures specified **in the ISDS.**

17.2 The Purchaser may, at its discretion, extend the deadline for the submission of Applications by amending the Initial Selection Document in accordance with ITA 8, in which case all rights and obligations of the Purchaser and the Applicants subject to the previous deadline shall thereafter be subject to the deadline as extended.

18. Late Applications

18.1 The Purchaser reserves the right to accept applications received after the deadline for submission of applications, unless otherwise specified **in the ISDS**.

19. Opening of Applications

19.1 The Purchaser shall open all Applications at the date, time and place specified **in the ISDS**. Late Applications shall be treated in accordance with ITA 18.1.

19.2 Applications submitted electronically (if permitted pursuant to ITA 17.1) shall be opened in accordance with the procedures specified in the **ISDS.**

19.3 The Purchaser shall prepare a record of the opening of Applications to include, as a minimum, the name of the Applicants. A copy of the record shall be distributed to all Applicants.

E. Procedures for Evaluation of Applications

20. Confidentiality

20.1 Information relating to the Applications, their evaluation and results of the Initial Selection shall not be disclosed to Applicants or any other persons not officially concerned with the Initial Selection process until the notification of Initial Selection results is made to all Applicants in accordance with ITA 28.

20.2 From the deadline for submission of Applications to the time of notification of the results of the Initial Selection in accordance with ITA 28, any Applicant that wishes to contact the Purchaser on any matter related to the Initial Selection process may do so only in writing.

21. Clarification of Applications

21.1 To assist in the evaluation of Applications, the Purchaser may, at its discretion, ask an Applicant for a clarification (including missing documents) of its Application, to be submitted within a stated reasonable period of time. Any request for clarification from the Purchaser and all clarifications from the Applicant shall be in writing.

21.2 If an Applicant does not provide clarifications and/or documents requested by the date and time set in the Purchaser's request for clarification, its Application shall be evaluated based on the information and documents available at the time of evaluation of the Application.

22. Responsiveness of Applications

22.1 The Purchaser may reject any Application which is not responsive to the requirements of the Initial Selection Document. In case the information furnished by the Applicant is incomplete or otherwise requires clarification as per ITA 21.1, and the Applicant fails to provide satisfactory clarification and/or missing information, it may result in disqualification of the Applicant.

23. Margin of Preference

23.1 Margin of preference for domestic Proposers shall not apply in the RFP process resulting from this Initial Selection.

24. Subcontractors

24.1 Unless otherwise stated **in the ISDS,** the Purchaser does not intend to execute any specific elements of the Information Systems Design, Supply and Installation by sub-contractors selected in advance by the Purchaser (so-called "Nominated Subcontractors")**.**

24.2 The Applicant shall not propose to subcontract the whole of the contract. The Applicant may propose subcontractors for certain specialized parts of the contract. Applicants planning to use such specialized **subcontractors** shall specify, in the Application Submission Letter, the parts of the contract proposed to be subcontracted along with details of the proposed **subcontractors** including their qualification and experience.

F. Evaluation of Applications and Initial Selection of Applicants

25. Evaluation of Applications

25.1 The Purchaser shall use the factors, methods, criteria, and requirements defined in Section III, Initial Selection Criteria and Requirements and the ISDS, to evaluate the qualifications of the Applicants, and no other factors,

methods, criteria, or requirements shall be used. The Purchaser reserves the right to waive minor deviations from the qualification criteria if they do not materially affect the technical capability and financial resources of an Applicant to perform the Contract.

25.2 Subcontractors proposed by the Applicant shall be fully qualified for their parts of the contract. The subcontractor's qualifications shall not be used by the Applicant to qualify for the contract unless the applicant designates them as Specialized Subcontractors, in which case, the qualifications of the Specialized Subcontractor proposed by the Applicant may be added to the qualifications of the Applicant for the purpose of the evaluation, if specified in ISDS.

25.3 In case of multiple contracts, Applicants should indicate in their Applications the individual contract or combination of contracts in which they are interested. The Purchaser shall initially select each Applicant for the maximum combination of contracts for which the Applicant has thereby indicated its interest and for which the Applicant meets the appropriate aggregate requirements specified in Section III - Initial Selection Criteria and Requirements.

25.4 Only the qualifications of the Applicant shall be considered. The qualifications of other firms, including the Applicant's subsidiaries, parent entities, affiliates, subcontractors (other than specialized subcontractors in accordance with ITA 25.2 above) or any other firm(s) different from the Applicant shall not be considered.

26. Purchaser's Right to Accept or Reject Applicants

26.1 The Purchaser reserves the right to accept or reject any Application, and to annul the Initial Selection process and reject all Applicants at any time, without thereby incurring any liability to the Applicants.

27. Initial Selection of Applicants

27.1 The range of Applicants that the Purchaser may Initially Select (x = minimum number, y = maximum number) is specified in the ISDS.

27.2 The Selection of Applicants involves several steps, as follows:

(a) **Step 1 - Table 1 Evaluation:** The first step of Initial Selection involves evaluation against the methods, criteria and requirements described in

Section III, Table 1: Qualification Criteria and Requirements;

(b) **Step 2 - Rejection:** Applicants that do not substantially meet the qualification criteria and requirements in Table 1: Qualification Criteria and Requirements will not be evaluated further, and will be eliminated from the Initial Selection process;

(c) **Step 3 - Long List**: Applicants that substantially meet the qualification criteria and requirements in Table 1: Qualification Criteria and Requirements are long listed, and will be evaluated further;

(d) **Step 4 -** Depending on the number of Applicants that are long listed, one of the following options will apply:

Option 1: All are Initially Selected: Where the number of long listed Applicants is **≤x**, all long listed Applicants are Initially Selected. In this scenario, there is no requirement to evaluate these long listed Applicants against Table 2: Rated Criteria and Requirements;

Option 2: Applicants are evaluated using Table 2 Evaluation: Where the number of long listed Applicants is **>x**, the Purchaser shall evaluate all long listed Applicants against Table 2: Rated Criteria and Requirements. This evaluation method involves scoring each Application against rated criteria using the scoring methodology described;

(e) **Step 5 - Rank Applicants**: The total scores, from this step of the Initial Selection evaluation, for each long-listed Applicant are compared, and the Applicants are ranked from the highest to the lowest total score;

(f) **Step 6 - Initial Selection up to x**: In accordance with the values selected by the Purchaser for **x** and **y**, the Purchaser Initially Selects the Applicants that are ranked from the highest score, to the Application ranked as **x**.;

(g) **Step 7 - Reject y+1 Applicants**: Where the number of long listed Applicants is **>y**, the Purchaser rejects all Applicants that are ranked greater than **y**, i.e. ranked as **y+1**, **y+2**, **y+3**, etc.;

(h) **Step 8 - Optional, at the Purchaser's Discretion**: Ranked Applicants which are greater than **x,** up to, and including **y**, are not normally Initially Selected. However, the Purchaser may, at its sole discretion, if justified, Initially Selected or more additional Applicants(s) from those that are ranked **x+1**, up to and including **y**. This Initial Selection will follow the order of ranking (i.e. the Purchaser cannot Initially Select **x+2**, without Initially Selecting **x+1**).

28. Notification of Initial Selection

28.1 The Purchaser shall notify all Applicants in writing of the names of those Applicants who have been initially selected. In addition, those Applicants who have been disqualified will be informed separately.

28.2 Applicants that have not been initially selected may write to the Purchaser to request, in writing, the grounds on which they were disqualified.

29. Request for Proposals

29.1 Promptly after the notification of the results of the Initial Selection, the Purchaser shall invite Proposals from all the Applicants that have been initially selected.

29.2 Proposers may be required to provide a Proposal Security or a Proposal-Securing Declaration acceptable to the Purchaser in the form and an amount to be specified in the RFP Document, and the successful Proposer shall be required to provide Performance Security as specified in the RFP Document.

29.3 Proposers shall be required to provide a Code of Conduct which will apply to their and sub-contractors' personnel that includes the minimum requirements specified in the RFP Document.

29.4 If required in the RFP documents, the successful Proposer shall provide additional information about its beneficial ownership using the Beneficial Ownership Disclosure Form included in the RFP document.

29.5 Prior to Contract award, the Purchaser will verify that the successful Proposer (including each member of a JV)

is not disqualified by the Bank due to noncompliance with contractual SEA/SH prevention and response obligations. The Purchaser will conduct the same verification for each subcontractor proposed by the successful Proposer. If any proposed subcontractor does not meet the requirement, the Purchaser will require the Proposer to propose a replacement subcontractor

30. Changes in Qualifications of Applicants

30.1 Any change in the structure or formation of an Applicant after being initially selected in accordance with ITA 27 and invited to submit Proposal (including, in the case of a JV, any change in the structure or formation of any member and also including any change in any specialized subcontractor) shall be subject to the written approval of the Purchaser prior to the deadline for submission of Proposals. Such approval shall be denied if (i) an initially selected applicant proposes to associate with a disqualified applicant or in case of a disqualified joint venture, any of its members; (ii) as a consequence of the change, the Applicant no longer substantially meets the qualification criteria set forth in Section III - Initial Selection Criteria and Requirements Table 1- Qualification Criteria, and Requirements; or (iii) no longer continues to be in the list of Initially Selected Applicants as a result of the Purchaser's re-evaluation of the Application in accordance with ITA 27; or (iv) in the opinion of the Purchaser, the change may result in a substantial reduction in competition. Any such change should be submitted to the Purchaser not later than fourteen (14) days after the date of the Request for Proposals.

31. Procurement Related Complaint

31.1 The procedures for making a Procurement-related Complaint are as specified in the ISDS.

Section II - Initial Selection Data Sheet (ISDS)

A. General	
ITA 1.1	The identification of the Invitation for Initial Selection is: ***ID-MMAF-522643-GO-RFP*** The Purchaser is: The Ministry of Marine Affairs and Fisheries Republic of Indonesia (MMAF) The list of contract/s is: One (1) - Ocean Monitoring System (OMS) RFP name and number are: ***ID-MMAF-522643-GO-RFP***
ITA 2.1	The Borrower is: The Ministry of Marine Affairs and Fisheries Republic of Indonesia Loan or Financing Agreement amount: US$210 million The name of the Project is: Ocean for Prosperity - LAUTRA
ITA 4.2	Maximum number of members in the JV shall be: *Two (2).*
ITA 4.8	A list of debarred firms and individuals is available on the Bank's external website: http://www.worldbank.org/debarr.
B. Contents of the Initial Selection Document	
ITA 7.1	For **clarification purposes,** is throughout: Electronic mail address: lautra-pbj@kkp.go.id **All clarifications should be requested between 18 November 2025 to 5 December 2025.** Clarification submitted to other email addresses will not be considered or replied to.
ITA 7.1 & 8.2	www.kkp.go.id/events/lautra-project
ITA 7.2	Pre-Application Meeting will be held: Yes, and will be held virtually on 28 November 2025. The Meeting will be conducted in two seperate sessions, from which the Applicant may choose one to attend : 1. 09:00 AM (GMT +7) Link Zoom ID https://us02web.zoom.us/j/89384621163?pwd=2zJd3o8VDfU2xG8aZWhBIbNj174dwM.1 Meeting ID: 893 8462 1163 Password: LAUTRA

	2. 16:00 PM (GMT +7) Link Zoom ID https://us02web.zoom.us/j/89384621163?pwd=2zJd3o8VDfU2xG8aZWhBIbNj174dwM.1 Meeting ID: 893 8462 1163 Password: LAUTRA
C. Preparation of Applications	
ITA 10.1	This Initial Selection document has been issued in the **English** language. All correspondence exchange shall be in **English** language. The Application as well as all correspondence shall be submitted in **English** Language. If translation of a supporting document is prohibited under the laws of the issuing country, the original version may be submitted as is.
ITA 11.1 (d)	The Applicant shall submit with its Application the following additional documents: a) System integrator certification or any other applicable license or credential related to ocean or marine monitoring data, if available b) Documentation pertaining to the project or credentials associated with a comparable initiative
ITA 14.2	The source for determining exchange rates is the Bank Indonesia selling rate as prevailing at contract signing. The applicable date for the exchange rate shall be 31 December 2025.
ITA 15.2	In addition to the original, the number of copies to be submitted with the Application is: one (1) copy Applicants should also submit soft copies of the Application using USB type-C, which shall be unprotected and converted into readable format. In case any inconsistency between soft files and hard copies, the hard copy shall prevail. If the soft files are not available at the opening of the Application, the Purchaser may request submission of the soft files (only on USB type-c) immediately during the opening of the Applications, in the presence of other Bidders' representatives and Internal MMAF Probity Auditor.
D. Submission of Applications	
ITA 17.1	**The deadline for Application submission is:** Date: 31 December 2025 Time: 1.00 p.m. (GMT +7)

	For **Application submission purposes only,** the Purchaser's address is: Attention: Selection Working Committee Ocean Monitoring System (OMS) Address: Procurement Service Unit, MMAF, Gedung Mina Bahari I, 3rd Floor, Jalan Medan Merdeka Timur No 16, Jakarta Pusat, Indonesia Email address: lautra-pbj@kkp.go.id The electronic Application submission procedures shall be: Not Applicable
ITA 18.1	The Purchaser reserves the right to reject late Applications.
ITA 19.1	The opening of the Applications shall be at 1.00 pm (GMT+7) on 6 January 2026 at Procurement Service Unit
ITA 19.2	Electronic procurement submission does not apply
E. Procedures for Evaluation of Applications	
ITA 24.1	At this time the Purchaser intends to execute certain specific parts of the contract by sub-contractors selected in advance. These specific parts include the following: a) The name of the subcontractors selected for each part b) The responsibility of sub-contractors
F. Evaluation of Applications and Initial Selection of Applicants	
ITA 25.2	The relevant qualifications of the proposed Specialized Subcontractors will added to the qualifications of the Applicant for the purpose of evaluation as indicated in Section III - Initial Selection Criteria and Requirements.
ITA 27.1	**Initial Selection – minimum number (x)** The Purchaser intends to Initially Select the following number of long listed Applications: **3**. This number is referred to as ***x***, and is the minimum number to be Initially Selected. **Initial Selection – maximum number (y)** The Purchaser may, at its sole discretion, Initially Select more than the minimum number of long listed Applications. The maximum number that may be Initially Selected is **6**. This number is referred to as ***y***.
ITA 31.1	The procedures for making a Procurement-related Complaint are detailed in the "Procurement Regulations for IPF Borrowers (Annex III)." If an Applicant wishes to make a Procurement-related Complaint, the Applicant should submit its complaint following these procedures, in writing (by the quickest means available, that is either by email or fax), to: **For the attention**: Selection Working Committee Ocean Monitoring System

	(OMS) **Title/position**: Head Selection Working Committee Ocean Monitoring System (OMS) **Purchaser:** The Ministry of Marine Affairs and Fisheries Republic of Indonesia **Email address**: lautra-pbj@kkp.go.id In summary, at this stage, a Procurement-related Complaint may challenge any of the following: **1.** the terms of the Initial Selection Document; and **2.** the **Purchaser**'s decision not to initially select an Applicant. A copy of the complaint can be sent for the Bank's information and monitoring to: **pprocurementcomplaints@worldbank.org**

Section III - Initial Selection Criteria and Requirements

This section contains all the methods, criteria, and requirements that the Purchaser shall use to evaluate Applications. The information to be provided in relation to each requirement and the definitions of the corresponding terms are included in the respective Application Forms.

Contents

Table 1 – Qualification Criteria and Requirements

[*Note to Purchaser: Only applications that are substantially responsive to the qualification criteria and requirements in Table 1 are to be assessed against Table 2, Rated Criteria and Requirements.*]

1. Eligibility

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
1.1	**Nationality**	Nationality in accordance with ITA 4.5	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.2	**Conflict of Interest**	No conflicts of interest in accordance with ITA 4.6	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Application Submission Letter
1.3	**Bank Eligibility**	Not having been declared ineligible by the Bank, as described in ITA 4.7 and 5.1	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Application Submission Letter
1.4	**United Nations resolution or Borrower's country law**	Not having been excluded as a result of prohibition in the Borrower's country laws or official regulations against commercial relations with the Applicant's country, or by an act of compliance with UN Security Council resolution, both in accordance with ITA 5.1 and Section V.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments

2. Historical Contract Non-Performance

Criteria			Single Entity Requirements	Joint Venture			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
2.1	**History of Non-Performing Contracts**	Non-performance of a contract[1] did not occur as a result of Supplier's default since 1st January 2020 until one month prior to application submission deadline	Must meet requirement[1]	Must meet requirements	Must meet requirement[2]	N/A	Form CON-2
2.2	**Suspension Based on Execution of a Bid or Proposal Securing Declaration by the Purchaser**	Not under suspension based on execution of Bid or Proposal Securing Declaration pursuant to ITA 4.10.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Application Submission Letter
2.3	**Pending Litigation**	Applicant's financial position and prospective long term profitability still sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Applicant	Must meet requirement	N/A	Must meet requirement	N/A	Form CON – 2
2.4	**Litigation History**	No consistent history of court/arbitral award decisions against the Applicant[3] since 1st January 2020 until one month	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2

[1] Nonperformance, as decided by the Purchaser, shall include all contracts where (a) nonperformance was not challenged by the Supplier, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the Supplier. Nonperformance shall not include contracts where Purchasers decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the applicant have been exhausted.

[2] This requirement also applies to contracts executed by the Applicant as JV member.

[3] The Applicant shall provide accurate information on the related Application Form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of awards against the Applicant or any member of a joint venture may result in rejection of the Application.

		prior to application submission deadline					
2.6	**Bank's SEA and/or SH Disqualification**	At the time of Contract Award, not subject to disqualification by the Bank for non-compliance with SEA/ SH obligations	Must meet requirement (including each subcontractor)	N/A	Must meet requirement (including each subcontractor proposed by the Applicant)	N/A	Application Submission Letter, Form CON-3

3. Financial Situation and Performance

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
3.1	**Financial Capabilities**	(i) The Applicant shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the cash flow requirements estimated as US$ 7 million for the subject contract(s) net of the Applicants' other commitments. for the subject contract(s) net of the Applicants other commitments. (ii) The Applicant shall also demonstrate, to the satisfaction of the Purchaser, that it has adequate sources of finance to meet the cash flow	Must meet requirement	Must meet requirement	N/A	N/A	Form FIN – 3.1, with attachments

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
		requirements on contracts currently in progress and for future contract commitments. (iii) The audited balance sheets or, if not required by the laws of the Applicant's country, other financial statements acceptable to the Purchaser, for the last three (3) years shall be submitted and must demonstrate the current soundness of the Applicant's financial position and indicate its prospective long-term profitability.	Must meet requirement Must meet requirement	Must meet requirement N/A	N/A Must meet requirement	N/A N/A	
3.2	**Average Annual Turnover**	Minimum average annual turnover in Information Systems Design, and/or Supply and/or Installation of US$ 32.5 million calculated as total certified payments received for contracts in progress and/or completed within the last five (5) years, divided by five (5) years.	Must meet requirement	Must meet requirement	Must meet *25* %, *[twenty five percents]* of the requirement	Must meet *40* %, *[fourty percents]* of the requirement	Form FIN – 3.2

4. Experience

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
4.1	**General Experience**	Experience in Information Systems Design, and/or Supply and/or Installation contracts in the role of prime contractor, JV member, subcontractor, or management contractor for at least the last 5 years, starting 1st January 2020 until one month prior to application submission deadline	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1
4.2 (a)	**Specific Experience**	A minimum number of 1 (one) similar contract has[4], and [5], management contractor or subcontractor between 1st January 2020 and until one month prior to application submission deadline. To be considered a "similar contract", the bidder or JV must provide verifiable evidence of contract(s) that covers work from at least one	Must meet requirement	Must meet requirement[6]	N/A	N/A	Form EXP 4.2

[4] Substantial completion shall be based on 80% or more of the contracts completed.

[5] For contracts under which the Applicant participated as a joint venture member or sub-contractor, only the Applicant's role and responsibilities shall be considered to meet this requirement.

[6] In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated.

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
		of the three core component categories specified below that have been satisfactorily and substantially completed as a prime contractor, joint venture member" between a minimum number of 1 (one) similar contract and management contractor. **Core Component Category 1: Enterprise Geospatial & Data Platform** Demonstrated experience in delivering large-scale software platforms for data analysis and visualization. This includes projects described as: • Enterprise Geospatial Visualization Platform and Digital Twin Project OR • Geospatial Developer/Provider OR • Digital Government Project (where the core was a data integration and					

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
		analytics platform) OR • System Integrator Project (where the focus was integrating diverse data sources into a central software platform) **Core Component Category 2: Advanced Autonomous Data Collection** Demonstrated experience in the deployment and operational integration of advanced autonomous tools for large-scale monitoring. A qualifying project must meet at least one of the following scale criteria: • Involved a minimum fleet size of 5+ autonomous vehicles (AUVs or UAVs); OR • Covered a marine or coastal survey area exceeding 10,000 hectares; OR • Included multi-year (2+ years)					

Criteria			Single Entity Requirements	Joint Venture Requirements			Documentation
No.	Subject	Requirement		All Members Combined	Each Member	One Member	Submission Requirements
		operational deployment and management of the autonomous systems. **Core Component Category 3: On-Premise Critical Data Infrastructure** Demonstrated experience in designing and deploying the secure, high-performance hardware backbone for data-intensive national systems. This includes projects focused on: • On-premise Hyper-Converged Infrastructure (HCI) design and deployment, including all supporting network and security infrastructure for a national-level system.					

Table 2 – Rated Criteria and Requirements

[*Note to Purchaser: The criteria, requirements, maximum scores, weightings and scoring methodology contained in the tables below are examples only and may be modified to suit the nature and complexity of the contract. Only applications that are substantially responsive to the qualification criteria and requirements in Table 1 are to be assessed against Table 2, Rated Criteria and Requirements*]

5. Past Performance

<table>
<tr><th rowspan="2">Requirement</th><th colspan="2">Scoring</th><th>Documentation</th></tr>
<tr><th>Maximum score</th><th>Remark</th><th>Submission Requirement</th></tr>
<tr><td>

1.1 Number of similar contracts

Number of satisfactorily and substantially completed Information System contracts that exceed the number specified in Table 1, Sub-Factor 4.2(where this number is **x = 1**) that are:

1. similar to the Requirements (Reference Table 1, 4.2); and
2. similar to the Requirements (Reference Table 1, 4.2) completed during the past five (5) years.

Scoring methodology:

<table>
<tr><td>Number of contracts
Number of satisfactorily and substantially completed similar contracts.</td><td>>= x+4 contracts</td><td>x+3 contracts</td><td>x+2 contracts</td><td>x+1 contracts</td><td>x contracts</td></tr>
<tr><td>Weighting</td><td>100</td><td>80</td><td>60</td><td>40</td><td>20</td></tr>
</table>

</td><td>30</td><td>In case of JV, all members combined will be evaluated.</td><td>Form EXP 4.2</td></tr>
</table>

6. Contract/Project Management Capability

<table>
<tr><th colspan="2">Criteria</th><th>Scoring</th><th>Documentation</th></tr>
<tr><th colspan="2">Requirement</th><th>Maximum score</th><th>Remark</th><th>Submission Requirement</th></tr>
<tr><td colspan="2">Contract/project management capability is demonstrated in the following key areas:
1. Description of contract/project management system/s and how they will be applied (including status of accreditation with recognized international standards applicable to the industry, in particular the similar areas specified in Table 1.4.2.) - maximum 5 pages
2. Health and safety management practice – maximum 5 pages, and
3. Use of value Engineering, innovation and continuous improvement, this includes any AI-Driven Analytics and IoT integrated systems – maximum 5 pages
4. Ability to meet functional requirements – maximum 5 pages
Scoring methodology:
<table>
<tr><td>Key areas: [Number and extent of key areas demonstrated.]</td><td>all 4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>Initial score</td><td>30</td><td>15</td><td>10</td><td>5</td><td>0</td></tr>
</table></td><td>30</td><td>In case of JV, the capability of the lead member will be evaluated</td><td>Table 2-PM</td></tr>
</table>

7. Purchaser's Requirements

Criteria	Scoring		Documentation
Requirement	**Maximum score**	**Remark**	**Submission Requirement**
Demonstrate an understanding of the Purchaser's Requirements. *Key aspects to be addressed are:* 1. *approach to the contract* 2. *offered solution's ability to deliver functional requirements and system integration* 3. *preliminary timeline/delivery schedule,* 4. *disbursement plan/phased financing arrangement and* 5. *risk identification.* **Scoring methodology:**	**30**		Table 2-ER

Key aspects: [*Number and extent of key areas demonstrated.*]	***all 5***	***4***	***3***	***2***	***1***	***0***
Initial score	***30***	***24***	***18***	***12***	***6***	***0***

8. Cyber Security

[Include for contracts that have been assessed to present potential or actual cyber security risks]

Criteria	Scoring		Documentation
Requirement	**Maximum score**	**Remark**	**Submission Requirement**
Cyber Security practice and track record shall be demonstrated through: 1. Cyber Security risk management practice and track record relevant to the similar areas specified in Table 1.4.2. 2. Relevant Cyber security accreditation such as ISO 37001 or equivalent **Scoring methodology:**	**10**	In case of JV, at least one member will be evaluated.	Table 2-CS

Key aspects: *[Number and extent of key areas demonstrated.]*	***all 2***	***1***	***0***			
Initial score	***10***	***5***	***0***			

Section IV - Application Forms

Table of Forms

Application Submission Letter

Date: *[insert day, month, and year]*
ISD No. and title: *[insert ISD number and title]*

To: Ministry of Marine and Fisheries Republic of Indonesia, Ocean for Prosperity Project - LAUTRA

We, the undersigned, apply to be initially selected for the referenced Request for Proposal (RFP) and declare that:

(a) **No reservations:** We have examined and have no reservations to the Initial Selection **Document**, including Addendum(s) No(s), issued in accordance with ITA 8: *[insert the number and issuing date of each addendum]*.

(b) **No conflict of interest:** *We* have no conflict of interest in accordance with ITA 4.6;

(c) **Eligibility:** We (and our subcontractors) meet the eligibility requirements as stated in ITA 4, we have not been suspended by the Purchaser based on execution of a Bid-Securing Declaration or Proposal-Securing Declaration in accordance with ITA 4.10;

(d) **Suspension and Debarment**: We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by *any* entity or individual that is subject to, a temporary suspension or a debarment imposed by the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Purchaser's country laws or official regulations or pursuant to a decision of the United Nations Security Council;

(e) **Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment (SH):** [*select the appropriate option from (i) to (iii) below and delete the others*].

We *[where JV, insert:* "including any of our JV members"*]*, and any of our subcontractors:

(i) [have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.]

(ii) [are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.]

(iii) [had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor.]

(f) **State-owned enterprise or institution:** [*select the appropriate option and delete the other*] [*We are not a state-owned enterprise or institution*] / [*We are a state-owned enterprise or institution but meet the requirements of ITA 4.9*];

(g) (f)**Subcontractors and Specialized Subcontractors:** We, in accordance with ITA 24.2 and 25.2, *plan* to subcontract the following parts of the contract:

[Insert any part of the contract which the Applicant intends to subcontract along with complete details of the Specialized Subcontractors, their qualification and experience]

(h) (g)**Commissions, gratuities, fees:** We declare that the following commissions, gratuities, or fees have been paid or are to be paid with respect to the Initial Selection process, the corresponding RFP process or execution of the Contract:

Name of Recipient	Address	Reason	Amount
[insert full name for each occurrence]	*[insert street/ number/city/country]*	*[indicate reason]*	*[specify amount currency, value, exchange rate and US$ equivalent]*
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

[If no payments are made or promised, add the following statement: "No commissions or gratuities have been or are to be paid by us to agents or any third party relating to this Application]

(i) **Not bound to accept:** We understand that you may cancel the Initial Selection process at any time and that you are neither bound to accept any Application that you may receive nor to invite the initially *selected* Applicants to submit Proposal for the contract subject of this Initial selection process, without incurring any liability to the Applicants, in accordance with ITA 26.1.

(j) **True and correct:** All information, statements and descriptions contained in the Application are in all respect true, correct *and* complete to the best of our knowledge and belief.

Signed *[insert signature(s) of an authorized representative(s) of the Applicant]*

Name [insert full name of person signing the Application]

In the capacity of *[insert capacity of person signing the Application]*

Duly authorized to sign the Application for and on behalf of:

Applicant's Name *[insert full name of Applicant or the name of*

the JV]

Address *[insert street number/town or city/country*

address]

Dated on *[insert day number]* day of *[insert month], [insert year]*

[For a joint venture, either all members shall sign or only the authorized representative, in which case the power of attorney to sign on behalf of all members shall be attached]

Form ELI -1.1
Applicant Information Form

Date: *[insert day, month, year*]
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

Applicant's name *[insert full name]*
In case of Joint Venture (JV), name of each member: *[insert full name of each member in JV]*
Applicant's actual or intended country of registration: *[indicate country of Constitution]*
Applicant's actual or intended year of incorporation: *[indicate year of Constitution]*
Applicant's legal address [in country of registration]: *[insert street/ number/ town or city/ country]*
Applicant's authorized representative information Name: *[insert full name]* Address: *[insert street/ number/ town or city/ country]* Telephone/Fax numbers: *[insert telephone/fax numbers, including country and city codes]* E-mail address: *[indicate e-mail address]*
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITA 4.5. ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITA 4.2. ☐ In case of state-owned enterprise or institution, in accordance with ITA 4.9 documents establishing: • Legal and financial autonomy • Operation under commercial law • Establishing that the Applicant is not under supervision of the Purchaser 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Form ELI -1.2
Applicant's JV Information Form

[The following form is additional to Form ELI – 1.1., and shall be completed to provide information relating to each JV member (in case the Applicant is a JV) as well as any Specialized Subcontractor proposed to be used by the Applicant for any part of the Contract resulting from this Initial Selection]

Date: *[insert day, month, year]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

Applicant name: *[insert full name]*
Applicant's JV Member's name: *[insert full name of Applicant's JV Member]*
Applicant's JV Member's country of registration: *[indicate country of registration]*
Applicant JV Member's year of constitution: *[indicate year of constitution]*
Applicant JV Member's legal address in country of constitution: *[insert street/ number/ town or city/ country]*
Applicant JV Member's authorized representative information Name: *[insert full name]* Address: *[insert street/ number/ town or city/ country]* Telephone/Fax numbers: *[insert telephone/fax numbers, including country and city codes]* E-mail address: *[indicate e-mail address]*
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITA 4.5. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and they are not under the supervision of the Purchaser, in accordance with ITA 4.9. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Form CON – 2
Historical Contract Non-Performance, Pending Litigation and Litigation History

[The following table shall be filled in for the Applicant and for each member of a Joint Venture]

Applicant's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member's Name:*[insert full name]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

Non-Performed Contracts in accordance with Section III, Table 1 Qualification Criteria and Requirements			
☐ Contract non-performance did not occur since 1st January *[insert year]* ☐ Contract(s) not performed since 1st January *[insert year]*.			
Year	**Non-performed portion of contract**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and US$ equivalent)**
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Purchaser: *[insert full name]* Address of Purchaser: *[insert street/city/country]* Reason(s) for nonperformance: *[indicate main reason(s)]*	*[insert amount]*
Pending Litigation, in accordance with Section III, Table 1 Qualification Criteria and Requirements			
☐ No pending litigation ☐ Pending litigation			

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)
[insert year]	*[insert amount]*	Contract Identification: [indicate complete contract name, number, and any other identification] Name of Purchaser: *[insert full name]* Address of Purchaser: *[insert street/city/country]* Matter in dispute: *[indicate main issues in dispute]* Party who initiated the dispute: *[indicate "Purchaser" or "Contractor"]* Status of dispute:	*[insert amount]*
Litigation History in accordance with Section III, Table 1 Qualification Criteria and Requirements			
☐ No Litigation History ☐ Litigation History			
Year of award	**Outcome as percentage of Net Worth**	**Contract Identification**	**Total Contract Amount (currency), USD Equivalent (exchange rate)**
[insert year]	*[insert percentage]*	Contract Identification: [indicate complete contract name, number, and any other identification] Name of Purchaser: *[insert full name]* Address of Purchaser: *[insert street/city/country]* Matter in dispute: *[indicate main issues in dispute]* Party who initiated the dispute: *[indicate "Purchaser" or "Contractor"]* Reason(s) for Litigation and award decision *[indicate main reason(s)]*	*[insert amount]*

Form CON – 3
Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment Performance Declaration

[The following table shall be filled in by the Applicant, each member of a Joint Venture and each subcontractor proposed by the Applicant]

Applicant's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member's or Subcontractor's Name: *[insert full name]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

SEA and/or SH Declaration **in accordance with Section III, Qualification Criteria, and Requirements**
We: ☐ (a) have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations ☐ (b) are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations ☐ (c) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor.
[*If (c) above is applicable, attach evidence of an arbitral award reversing the findings on the issues underlying the disqualification.]*
Period of disqualification: From: _____ To: _____

Form FIN – 3.1
Financial Situation and Performance

[The following table shall be filled in for the Applicant and for each member of a Joint Venture]

Applicant's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member Name:*[insert full name]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

1. Financial data

Type of Financial information in (currency)	**Historic information for previous** *[insert number] years, [insert in words]* **(amount in currency, currency, exchange rate*, USD equivalent)**				
	Year 1	Year 2	Year 3	Year4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Total Equity/Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (WC)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Cash Flow Information					

Cash Flow from Operating Activities					

* Refer ITA 14 for the exchange rate

2. Sources of Finance

[The following table shall be filled in for the Applicant and all parties combined in case of a Joint Venture]

Specify sources of finance to meet the cash flow requirements on contracts currently in progress and for future contract commitments.

No.	Source of finance	Amount (US$ equivalent)
1		
2		
3		

3. Financial documents

The Applicant and its parties shall provide copies of financial statements for *[number]* years pursuant Section III, Table 1 –Qualification Criteria, and Requirements Sub-factor 3.1. The financial statements shall:

(a) reflect the financial situation of the Applicant or in case of JV member , and not an affiliated entity (such as parent company or group member).

(b) be independently audited or certified in accordance with local legislation.

(c) be complete, including all notes to the financial statements.

(d) correspond to accounting periods already completed and audited.

☐ Attached are copies of financial statements[1] for the *[number]* years required above; and complying with the requirements

[1] If the most recent set of financial statements is for a period earlier than 12 months from the date of Application, the reason for this should be justified.

Form FIN - 3.2
Average Annual Turnover in Information Systems Design and/or Supply and/or Installation

[The following table shall be filled in for the Applicant and for each member of a Joint Venture]

Applicant's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member Name:*[insert full name]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

Annual turnover data			
Year	**Amount** **Currency**	**Exchange rate***	**USD equivalent**
[indicate calendar year]	*[insert amount and indicate currency]*		
		Average Annual Turnover **	

* Refer ITA 14 for date and source of exchange rate.

** Total USD equivalent for all years divided by the total number of years. See Section III, Table 1 Qualification Criteria, and Requirements, 3.2.

Form EXP - 4.1
General Experience in Information Systems Design and/or Supply and/or Installation

[The following table shall be filled in for the Applicant and in the case of a JV Applicant, each Member]

Applicant's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member Name:*[insert full name]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

[As per Section III, Table 1 Qualification Criteria, and Requirements, Sub-Factor 4.1. list contracts chronologically, according to their commencement (starting) dates.]

Starting Year	Ending Year	Contract Identification	Role of Applicant
[indicate year]	*[indicate year]*	Contract name: *[insert full name]* Brief Description of the Contracts performed by the Applicant: *[describe contracts performed briefly]* Amount of contract: *[insert amount in currency, mention currency used, exchange rate and US$ equivalent*]* Name of Purchaser: *[indicate full name]* Address: *[indicate street/number/town or city/country]*	*[insert "Prime Contractor" or "JV Member" or "Sub-contractor" or "Management Contractor"]*
		Contract name: *[insert full name]* Brief Description of the Contracts performed by the Applicant: *[describe contracts performed briefly]* Amount of contract: *[insert amount in currency, mention currency used, exchange rate and US$ equivalent*]* Name of Purchaser: *[indicate full name]* Address: *[indicate street/number/town or city/country]*	*[insert "Prime Contractor" or "JV Member" or "Sub-contractor" or "Management Contractor"]*
		Contract name: *[insert full name]* Brief Description of the Contracts performed by the Applicant: *[describe contracts performed briefly]* Amount of contract: *[insert amount in currency, mention currency used, exchange rate and US$ equivalent*]* Name of Purchaser: *[indicate full name]* Address: *[indicate street/number/town or city/country]*	*[insert "Prime Contractor" or "JV Member" or "Sub-contractor" or "Management Contractor"]*

* Refer ITA 14 for date and source of exchange rate.

Form EXP - 4.2 (a)
Specific Experience

(Table 1, 4.2 and Table 2)

[The following table shall be filled in for contracts performed by the Applicant, each member of a Joint Venture, and Specialized Sub-contractors]

Applicant's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member Name:*[insert full name]*
ISD No. and title: *[insert ISD number and title]*
Page *[insert page number]* of *[insert total number]* pages

Similar Contract No. *[insert number]* of *[insert number of similar contracts required]*	**Information**			
Contract Identification	*[insert contract name and number, if applicable]*			
Award date	*[insert day, month, year, i.e., 15 June, 2015]*			
Completion date	*[insert day, month, year, i.e., 03 October, 2017]*			
Role in Contract *[check the appropriate box]*	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount	*[insert total contract amount in local currency]*		US$ *[insert Exchange rate and total contract amount in US$ equivalent]**	
If member in a JV or sub-contractor, specify share in value in total Contract amount and roles and responsibilities	*[insert a percentage amount]*	*[insert total contract amount in local currency]*	*[insert exchange rate and total contract amount in US$ equivalent]**	
	[insert roles and responsibilities]			
Description of the similarity in accordance with Section III Table 1, 4.2				
Complexity	*[insert description of complexity]*			
Methods/Technology	*[insert specific aspects of the methods/technology involved in the contract]*			

Other Characteristics	*[insert other characteristics as described in Section VII, Scope of Purchaser's Requirements]*
Purchaser's Name:	*[insert full name]*
Address: Telephone/fax number E-mail:	*[indicate street / number / town or city / country]* *[insert telephone/fax numbers, including country and city area codes]* *[insert e-mail address, if available]*

* Refer ITA 14 for date and source of exchange rate.

Table 2-PM
Contract / Project Management Capability

The applicant shall demonstrate Contract / Project Management Capability in accordance with Table 2

Table 2-ER
Understanding of the Purchaser's Requirement

The applicant shall demonstrate an Understanding of the Purchaser's Requirement in accordance with Table 2

Table 2-SP
Sustainable Procurement

The applicant shall demonstrate capability in Sustainable Procurement in accordance with Table 2

Table 2-CS
Cyber Security Requirement

The Applicant shall demonstrate capability in managing Cyber security risks in accordance with Table 2.

Section V - Eligible Countries

Eligibility for the Provision of Goods, Works and Services in Bank-Financed Procurement

In reference to ITA 5.1, for the information of the Applicants, at the present time firms and individuals, supply of goods, or contracting of works or services, from the following countries are excluded from this Initial Selection process:

Under ITA 5.1 (a) *[insert a list of the countries following approval by the Bank to apply the restriction or state "none"]*

Under ITA 5.1 (b) *[list the countries or state "none"]*

Section VI – Fraud and Corruption

(The text in this Section VI shall not be modified)

1. Purpose

1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders (applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.2 To this end, the Bank:

a. Defines, for the purposes of this provision, the terms set forth below as follows:

i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;

iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

iv. "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

v. "obstructive practice" is:

(a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or

(b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.

b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;

c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;

d. Pursuant to the Bank's Anti-Corruption Guidelines, and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such a firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;[1] (ii) to be a nominated[2] sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;

e. Requires that a clause be included in request for bid/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents, personnel, permit the Bank to inspect[3] all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

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1 For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

2 A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification Application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

3 Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

PART 2 – Purchaser's Requirements

Section VII - Scope of Purchaser's Requirements

Contents

1. Description of the Information Systems Design, Supply and Installation

The Ocean Monitoring System (OMS) is a strategic national investment to enhance the management effectiveness of Indonesia's Marine Protected Areas (MPAs). The primary goal is to transform MPA management from a reactive, high-cost model to a proactive, data-driven, and cost-effective one. The system will provide the real-time, high-quality data necessary to elevate MPA effectiveness scores (EVIKA rating) and establish the verifiable scientific baseline required for future Blue Economy opportunities, such as carbon and biodiversity credits, in alignment with the UN System of Environmental-Economic Accounting (SEEA-EA).

System Architecture and Philosophy:

The OMS is an integrated, self-contained "system of systems" designed to function as a complete "data factory". It will implement a federated architecture that integrates autonomous data collection platforms, real-time processing, and decision support tools. This architecture follows proven international models, particularly Australia's Integrated Marine Observing System (IMOS), while being specifically tailored to Indonesia's tropical marine environment, multi-stakeholder governance, and community engagement protocols.

Summary of Core Technical Components and Tasks:

The procurement covers the design, supply, installation, integration, and long-term support of turnkey system comprising the following six core tasks:

- **Task 1: Enterprise Geospatial Visualization Platform:** The software core for data visualization, including a "Digital Twin" for 2D/3D/4D simulation, advanced analytics, and decision support.

a) Core Functional Requirements:

1) Centralized Marine Spatial Data Platform
    a. A centralized enterprise-grade solution for acquisition, management, and analysis of marine spatial data across conservation areas.
    b. Must be compatible with national marine data governance structures and allow inter-operability with KKP's Ocean Big Data and Ocean Accounting systems.
2) Advanced 2D–3D Spatial Modeling and Digital Twin Capabilities
    a. Enable transition from 2D mapping to immersive 3D/4D simulations of coastal and marine environments, including bathymetry, habitat layers, infrastructure, and human use patterns.
    b. Incorporate dynamic data streams (e.g., sensor, satellite, drone inputs) for real-time and predictive modelling of ecosystem dynamics.
3) Integration of Monitoring Data Streams
    a. Ingest data from deployed tools under Task 2, including subsurface sensors, ROVs, AUVs, drones, and satellite systems.
    b. Visualize and overlay habitat data (e.g., coral reefs, mangroves, seagrasses)

and marine biodiversity with human use data.

4) Carbon Monitoring and Valuation Module
    a. Provide geospatial carbon stock visualization and monitoring capabilities.
    b. Include algorithms and analytics for tracking blue carbon ecosystems and supporting eligibility for carbon financing and trading schemes.
5) High-Resolution Marine Data Layers
    a. Display integrated 3D bathymetry, coastline evolution, seabed composition, and key habitat zones.
    b. Incorporate time-series analytics for habitat change detection and predictive modelling of climate or anthropogenic impacts.

b) System Architecture and Visualization Stack

1) Architecture:
    a. Implement a Service-Oriented Architecture (SOA) framework to support secure, scalable, and interoperable dissemination of geospatial services.
    b. Ensure data services are accessible by multiple client types, including web and mobile applications.
2) Visualization Technology Stack:
    a. Use lightweight, high-performance technologies (WebGL, HTML5, JavaScript) to support 2D/3D visualization in web environments.
3) Visualization Features:
    a. Satellite imagery and dynamic drone-captured visualizations.
    b. Drag-and-drop upload functionality for standard file types (SHP, GeoTIFF, 3DTiles).
    c. Layered map views with vertical intersections and habitat overlays.

c) Data Processing and Interoperability

1. Supported Data Formats:
    a. Bathymetry & Seabed Mapping: TIFF and GeoTIFF
    b. Ecosystem Layers: SHP (mangroves, corals, coastlines)
    c. AUV/ROV Data: 3DTiles, JPEG/TIFF images, MKV video (2K–4K, 30/60 FPS), LIDAR LAS
    d. Metadata & Logs: CSV for logs; JSON for mission plans
2. Processing Capabilities:
    a. Automated conversion, filtering, QA/QC, and indexing for all supported data types.
    b. Near/Real-time processing of incoming sensor/AUV streams for dynamic integration into dashboards and digital twin environments.

d) Data Management and System Serving

1. Deployment Options:
    a. On-premise deployment tailored to MMAF and PUSDATIN architecture.
2. Platform Features:
    a. Browser-based UI with user authentication and permission management.
    b. Integration with PostgreSQL/PostGIS databases.
    c. Full support for OGC-compliant services (WMS, WFS, WCS) with dynamic updates and downtime-free refresh.
    d. REST API for downstream integration (e.g., with OMS mobile tools or decision-support systems).

e) Web-Based Visualization and Decision Support Application

1. Core Features:
    a. Unified 2D/3D views for MPA stakeholders via secure web interface.
    b. GPU-accelerated rendering for high-resolution visual analytics.
    c. Interactive tools for spatial analysis (distance, area), alert visualization, patrol planning, and impact assessments.
2. Customizability and Extensibility:
    a. User-configurable layers, thematic maps, styling rules.
    b. Low-code support for rapid interface customizations and workflow adaptations.
    c. This enterprise platform will serve as the central interface for OMS users—including KKP staff, UPT/SOP field managers, and community partners—enabling high-confidence, data-driven management and policy decisions across the LAUTRA MPA portfolio.

- **Task 2: Advanced Data Collection Suite (UAV/AUV/Fixed Sensors):** A fleet of civilian-grade, long-endurance Unmanned Aerial Vehicles (UAVs) equipped with EO/IR and LiDAR sensors for coastal mapping and surveillance. A fleet of civilian-grade, long-endurance Unmanned Aerial Vehicles (UAVs) equipped with EO/IR and LiDAR sensors for coastal mapping and surveillance. The requisition is also open to vendor recommendations of additional or alternative suite of MPA site level sensors, data platforms, and devices to accelerate progress towards EVIKA measured MPA management effectiveness scores.

Specifications	Total
Autonomous Underwater Vehicle Navigation System • Range : 1000m+ • Position Accuracy (5m range) : 0.1m • Position Accuracy (100m range) : 0.5m • Position Accuracy (1000m range) : 5.0mHCC • Velocity Accuracy : 0.01 m/s • Roll and Pitch Accuracy : 0.1° • Heading Accuracy : 0.3° • Integrated GNSS/INS : Yes • Integrated GNSS Antenna : In top of hydrophone array • Pressure Sensor Range : 1000m • Pressure Sensor Accuracy : 1.5m **Include License Software Photogrammetry :** • Software for photogrammetric processing of digital images. • Converts data inputs into 3D spatial data essential for various applications such as GIS, cultural heritage preservation, and visual effects production.	**3 Unit**

• Supports wide range of cameras and laser scanners, allowing to create point clouds, textured models, orthomosaics, and digital surface models. • Advanced features include shadow and texture artifact removal, vegetation index calculation, and point cloud classification. • Has distributed processing capability enables handling of large datasets, either locally across a cluster or in the cloud, offering flexibility and scalability. • Combines digital photogrammetry techniques with computer vision methods, resulting in an automated processing system. • Detailed reports generated after processing provide insights into the quality and integrity of the generated data **Includes services:** • Configuration, test and commissioning • Includes warranty & support for a period of 2 years • Manufacturing limited warranty for 2 years • Onsite Training	

AUV (Autonomous Underwater Vehicle) • Speed : 1.5knots • Max Range : 1.3 km • Max Endurance : 2 hrs • Depth Rating : 300m • Approximate dimensions : 520 x 264 x 235 mm • Weight : 7.1 kg • Video Resolution : 4K @ 60 FPS • Lighting : 20,000 Lumen *Features:* • Depth & Time: Capable of operating at 300m for ~30 mins • Speed: Capable of capturing survey data at up to 1.5 knots (0.77m/s) Orientation: camera facing down, 10 degree pitch • Capable of transiting at speeds of 2 knots (1m per second) Oreantation: Camera facing down, typical vertical speed: 0.7m/s • Range: Capable of propelling itself 1500m while conducting survey operations • Endurance: Capable of station-keeping for 2.5 hours; and capable of surveying for ~2 hours • Capacity: Capable of Storing more than 2 hours of survey data onboard	**15 Unit**

• Recharge time: Capable of fully charging its battery in less than 3.5 hours Imaging System: Able to capture images with sufficient resolution and illumination to determine heads/tails on a 10 cent coint, from altitude, with no natural light **Includes services:** • Configuration, test and commissioning • Includes warranty & support for a period of 2 years • Manufacturing limited warranty for 2 years • Onsite Training	
AUV (Autonomous Underwater Vehicle) with Sensors • Have a maximum dimension of φ250 mm × 2300 mm. • Capable of operating at a maximum depth of 300 m. • Have an endurance of minimum 12 hours at 3 knots. • Have a maximum speed of 10 knots. • Have a maximum weight of 100 kg. • Use a 3.5 kWh rechargeable battery. • Support a communication range of minimum 2 km using LoRa protocol. • Equipped with a navigation system including GPS, INS, and DVL. **Shore-Based Control System** • The control system shall integrate navigation with GPS, INS, and DVL. • The navigation system shall provide accuracy of up to 2% of traveled distance. • The DVL shall have a maximum effective range of 80 m. **Side-Scan Sonar** • The sonar shall operate at a frequency of 900 kHz. • The sonar shall have a maximum slant range of 75 m at 900 kHz. **Camera** • The system shall include a camera with a resolution of minimum 1920 × 1080 pixels. • Acoustic Beacon • The acoustic beacon shall provide a coverage range of minimum 2 km. **Environmental Sensors** • Include a Dissolved Oxygen sensor. • Include a pH sensor. **Include a CTD sensor:**	**4 Unit**

• Include Conductivity: 0–70 mS/cm • Include Temperature: –2℃ to +35℃ Includes services: • Installation, configuration, test and commissioning • Manufacturing limited warranty for 2 years • Training	

- **Task 3: Advanced Data Collection Suite (UAV):** A fleet of civilian-grade, long-endurance Unmanned Aerial Vehicles (UAVs) equipped with EO/IR and LiDAR sensors for coastal mapping and surveillance.

Specifications	Total
UAV (Unmanned Aerial Vehicle) **Airframe & Propulsion** • Have approximate length of 2000 mm, height of 696 mm. and wingspan of 3744 mm (rear wing) and 2820 mm (front wing). • Made of aviation-grade carbon fiber composites. • The propulsion system shall use a gasoline engine. • The payload capacity shall be a minimum of 18 kg (including payload & gasoline). • The maximum take-off weight shall not exceed 40 kg. • The cruising speed shall be within 22–40 m/s, with a nominal cruising speed of at least 25 m/s. • The fuel consumption shall not exceed 0.96 L/h. • The flight endurance shall be a minimum of 12 hours. • The maximum altitude shall be a minimum of 5000 m. • The operating temperature range shall be -20℃ to +55℃. • The system shall withstand wind resistance of at least level 5 during take-off and level 6 during cruising. • The system shall include the following: • Triple frequency DGPS RTK (L1+L2+B1/B2) with ±2 cm post-processed accuracy • ADS-B (input/output), dual IMUs, redundant autopilot • 24GHz obstacle avoidance micro radar • ASTM F3389-22 parachute with auto-return (low fuel/signal lost) • Real-time DGPS RTK precision landing **EO & IR Camera** • Operate with 12V working voltage. • Support input voltage 3S–6S and output 5V (PWM). • Consume maximum 1600 mA @12V.	**8 Unit**

• Operate in the temperature range of -20℃ to +60℃. • Provide output via Micro-HDMI (1080p30/60fps) and IP (1080p/720p 30/60fps). • Shall support local storage with SD card up to 128GB. • Shall support control by PWM / SBUS / TTL / TCP (IP version). **Gimbal Specs** • Mechanical pitch/tilt: -55° to +130° • Mechanical roll: ±45° • Mechanical yaw/pan: ±300° / ±360°*N (IP/SDI version) • Controllable pitch/tilt: -45° to +90° • Controllable yaw/pan: ±290° / ±360°*N • Stabilization accuracy: ±0.02° (pitch/roll/yaw) • Shall support one-key centering **Camera Sensor** • Sensor: 1/2.8" Sony IMX462LQR CMOS • Resolution: Full HD 1920×1080 • Effective pixels: minimum 2.13 MP • Optical zoom: minimum 40x (F=4.25–170mm) • Digital zoom: up to 32x • Minimum illumination: 0.01 lux (color) • S/N ratio: ≥50 dB **IR Camera** • Type: Uncooled LWIR thermal imager (8–14 μm) • Resolution: minimum 640×512 • Pixel size: 12 μm • NETD: ≤50 mK (@25℃) • Digital zoom: up to 8x • Frame rate: 30 Hz • Detection capability: ≥10 simultaneous targets (car/human) • Detection rate: ≥85%, false alarm ≤10% • Physical • Net weight: maximum 1.04 kg • Dimensions: approx. 118×137×213 mm • Shall include gimbal, mounting hardware, and damping components **LiDAR** • Use Class 1 laser with wavelength 1535 nm. • Have detection range of minimum 10–1000 m @ 80% reflectivity. • Support up to 7 multiple returns. • Have repeatability of 3 mm @100 m. • Provide angular resolution of minimum 0.001°. • Have horizontal accuracy 0.01 m and vertical accuracy 0.02 m after post-processing.	

• Weight shall not exceed 2.3 kg (including IMU, GNSS, storage, camera). • Dimensions shall not exceed 235×110×131 mm. **Dual Screen Ground Control System** • Shall run on Windows 10/Linux with Intel i7-11 processor, 256 GB SSD, and minimum 8 GB RAM. • Provide dual displays: 15.6" main (1920×1080) and 12.1" secondary (1280×800). • Displays support 10-point multi-touch and brightness of minimum 1000 nits. • Include interfaces: USB 3.0, HDMI, LAN, Audio I/O. • Operate on 177 Wh battery, with operation time of minimum 4 hours. • Weight shall not exceed 8 kg. • Operate in temperature range -10°C to +60°C. • Provide 18 control channels, dual joysticks, rocker, switches, and knobs. • Shall include expansion space (140×70×27 mm) with multiple ports (RS232, USB, RJ45). Includes services: • Installation, configuration, test and commissioning • Manufacturing limited warranty for 2 years • Training	

Task 4: On-Premise Hyper-Converged Infrastructure (HCI): A secure, high-performance computing and storage cluster to be hosted in KKP's data centers, ensuring national data sovereignty and compliance with national cybersecurity (BSSN) mandates.

Specifications	Total
Hyperconverged Infrastructure – Storage Node **Minimum Technical Requirements per Unit:** • Hyperconverged storage node with minimum raw capacity of 245 TB, using mirroring, RAID 1, or equivalent data protection mechanisms. • Dual high-performance server-grade processors (e.g., x86_64 architecture), each with minimum 16 physical cores, clock speed ≥ 2.8 GHz. • Minimum 256 GB RAM per node. • Minimum 2 x 960 GB NVMe SSDs, configured in RAID 1 or equivalent.	**4 Unit**

• Minimum 8 x 7.68 TB SSDs for primary storage.
• Minimum 4 x 10/25GbE ports, with transceivers included.
• Minimum 1 x 1GbE management port.
• Redundant power supply units (PSUs) for high availability.
• Support for the following storage features:
  o Thin provisioning
  o Inline compression
  o Snapshot capability
  o Native replication
  o Container Storage Interface (CSI) compatibility
• Includes all necessary software licenses to enable the above features and ensure full functionality of the HCI platform.
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer	

Hyperconverged Infrastructure – Compute Node Type 1 **Minimum Technical Requirements per Unit:** • Dual high-performance server-grade processors (e.g., x86_64 architecture), each with minimum 32 physical cores, clock speed ≥ 2.8 GHz. • Minimum 1024 GB RAM per node. • Minimum 2 x 960 GB NVMe SSDs, configured in RAID 1 or equivalent fault-tolerant setup. • Minimum 4 x 10/25GbE ports, with transceivers included. • Minimum 2 x 32Gb Fibre Channel (FC) ports for SAN connectivity. • Minimum 1 x 1GbE management port. • Redundant power supply units (PSUs) for high availability. • Support for non-disruptive node expansion (scale-out architecture). • Includes all necessary software licenses to enable the above features and ensure full functionality of the HCI platform. **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**12 Unit**

Hyperconverged Infrastructure – Compute Node Type 2 • Hyperconverged Compute Nodes for Compute Server Management • Each unit has 2 x Intel Xeon Gold 2.8 GHz, 16C processors • Each unit has 256 GB Memory per Node • Each unit has 2 x 960 GB NVMe (RAID 1) Hot-Plug drives • Each unit has 2 x 2 ports 10/25GbE with transceivers included • Each unit has 1 x 2 ports 32Gb FC HBA • Each unit has 1 x 1 GbE management port • Each unit has Redundant power supply • Supports non-disruptive expansion of one or more nodes without affecting operations. • Includes all necessary software licenses to enable the above features and ensure full functionality of the HCI platform. Includes services: • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**4 Unit**
Hyperconverged Infrastructure – Management Cluster **Minimum Technical Requirements per Unit:** • Dual high-performance server-grade processors (e.g., x86_64 architecture), each with minimum 16 physical cores, clock speed ≥ 2.8 GHz. • Minimum 512 GB RAM per node. • Minimum 5 x 1.92 TB SSDs per node for primary storage. • Minimum 2 x 960 GB NVMe SSDs, configured in RAID 1 or equivalent fault-tolerant setup. • Minimum 6 x 10/25GbE ports, with transceivers included. • Minimum 1 x 1GbE management port. • Redundant power supply units (PSUs) for high availability. Support for centralized monitoring, alerting, and health status reporting of system components. • Includes all necessary software licenses to enable full functionality of the HCI platform. Includes services: • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**3 Unit**

Enterprise NAS Storage
 	
Minimum Technical Requirements per Unit:
• Scale-out NAS architecture with **minimum usable capacity** of:
  o 135 TiB NVMe SSD storage (post-redundancy/overhead)
  o 485 TiB HDD storage (post-redundancy/overhead)
• Minimum 2 x 25GbE SFP28 ports per unit
• Minimum 2 x 100GbE QSFP28 ports per unit
• Support for standard storage protocols:
  o NFS (v3/v4)
  o SMB (v2/v3)
  o S3-compatible object storage
  o HDFS
• Redundant network connectivity using 100GbE QSFP28 interfaces
• Disk protection mechanisms capable of tolerating:
  o At least 3 disk failures, or
  o 1 full node failure, without data loss
• Support for non-disruptive node expansion (scale-out growth)
• Support for advanced storage features:
  o **Data deduplication**
  o Snapshot capability
  o Multi-tier storage management
  o Quota management for users and groups
  o Security features, including:
  ▪ Write Once Read Many (WORM)
  ▪ External Key Manager (EKM) integration
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer
	2 Unit

Core Switch
 	
Minimum Technical Requirements per Unit:
• **Form Factor**: 1U rack-mountable chassis.
• **Port Configuration**:
  o Minimum **32 x 400GbE QSFP-56DD ports**.
  o Minimum **24 x 100GbE QSFP28 transceivers**.
  o Minimum **4 x 40GbE QSFP+ transceivers**.
  o Minimum **2 x 400GbE QSFP-56DD transceivers**.
  o Minimum **1 x 400GbE cable** for high-availability inter-switch connection.
• **Management Interface**:
  o Minimum **1 x 1GbE management port**.
• **Power Supply**:
  o Redundant power supply units (PSUs) for high availability.
• **Network Features**:
  o Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management.
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer
	2 Unit

Internet Switch
Minimum Technical Requirements per Unit:
• **Form Factor**: 1U rack-mountable chassis.
• **Port Configuration**:
  o Minimum **48 x 25GbE SFP28 ports**
  o Minimum **4 x 100GbE QSFP28 ports**
  o Minimum **2 x QSFP28-DD ports**
• **Transceiver Requirements**:
  o Minimum **12 x 25GbE SFP28 transceivers**
  o Minimum **12 x 10GbE SFP+ transceivers**
  o Minimum **12 x 10GBase-T transceivers**
  o Minimum **12 x 1GBase-T transceivers**
• **High Availability**:
  o Minimum **1 x 100GbE cable** for inter-switch high availability connection
• **Management Interface**:
  o Minimum **1 x 1GbE management port**
• **Power Supply**:
  o Redundant power supply units (PSUs) for high availability
	4 Unit

• **Network Features**: o Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	

WAN Switch
Minimum Technical Requirements per Unit:
• **Form Factor**: 1U rack-mountable chassis.
• **Port Configuration**:
  o Minimum **48 x 25GbE SFP28 ports**
  o Minimum **4 x 100GbE QSFP28 ports**
  o Minimum **2 x QSFP28-DD ports**
• **Transceiver Requirements**:
  o Minimum **12 x 25GbE SFP28 transceivers**
  o Minimum **12 x 10GbE SFP+ transceivers**
  o Minimum **12 x 10GBase-T transceivers**
  o Minimum **12 x 1GBase-T transceivers**
• **High Availability**:
  o Minimum **1 x 100GbE cable** for inter-switch high availability connection
• **Management Interface**:
  o Minimum **1 x 1GbE management port**
• **Power Supply**:
  o Redundant power supply units (PSUs) for high availability
• **Network Features**:
Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer
	4 Unit

Management Switch
Minimum Technical Requirements per Unit:
• **Form Factor**: 1U rack-mountable chassis.
• **Port Configuration**:
  o Minimum **48 x 1GbE Base-T ports**
  o Minimum **4 x 10GbE SFP+ ports**
  o Minimum **2 x 100GbE QSFP28 ports**
• **Transceiver Requirements**:
  o Minimum **2 x 10GbE SFP+ transceivers**
• **Management Interface**:
  o Minimum **1 x 1GbE management port**
• **Power Supply**:
  o Redundant power supply units (PSUs) for high availability
• **Network Features**:
  o Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer
	2 Unit

Border Switch
Minimum Technical Requirements per Unit:
• **Form Factor**: 1U rack-mountable chassis.
• **Port Configuration**:
  o Minimum **24 x 25GbE SFP28 ports**
  o Minimum **4 x 100GbE QSFP28 ports**
• **Transceiver Requirements**:
  o Minimum **16 x 25GbE SFP28 transceivers**
  o Minimum **8 x 10GbE SFP+ transceivers**
• **High Availability**:
  o Minimum **1 x 100GbE cable** for inter-switch high availability connection
• **Management Interface**:
  o Minimum **1 x 1GbE management port**
• **Power Supply**:
  o Redundant power supply units (PSUs) for high availability
• **Network Features**:
  o Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management
	2 Unit

Includes services: • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	
Spine Switch **Minimum Technical Requirements per Unit**: • **Form Factor**: 1U rack-mountable chassis. • **Port Configuration**: o Minimum **32 x 100GbE QSFP28 ports** • **Transceiver Requirements**: o Minimum **24 x 100GbE QSFP28 transceivers** • **High Availability**: o Minimum **1 x 100GbE cable** for inter-switch high availability connection • **Management Interface**: o Minimum **1 x 1GbE management port** • **Power Supply**: o Redundant power supply units (PSUs) for high availability • **Network Features**: o Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**2 Unit**
Leaf Switch **Minimum Technical Requirements per Unit**: • **Form Factor**: 1U rack-mountable chassis. • **Port Configuration**: o Minimum **48 x 25GbE SFP28 ports** o Minimum **4 x 100GbE QSFP28 ports** o Minimum **2 x QSFP28-DD ports** • **Transceiver Requirements**: o Minimum **40 x 25GbE SFP28 transceivers** o Minimum **8 x 10GbE SFP+ transceivers** • **High Availability**: o Minimum **1 x 100GbE cable** for inter-switch high	**4 Unit**

availability connection • **Management Interface**: o Minimum **1 x 1GbE management port** • **Power Supply**: o Redundant power supply units (PSUs) for high availability • **Network Features**: o Support for **Layer 2 and Layer 3 switching capabilities**, including VLAN, routing protocols, and traffic management **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	
Object Storage **Minimum Technical Requirements per Unit**: • **Architecture**: o Scale-out object storage system supporting horizontal expansion and high availability. • **Capacity**: o Minimum **usable capacity of 1,040 TiB**, verifiable through sizing tools or vendor documentation. • **Redundancy and High Availability**: o Includes **dedicated high-availability (HA) front-end and back-end switches**. o Supports **disk protection mechanisms** capable of tolerating: ▪ At least **4 disk failures**, or ▪ **1 full node failure**, without data loss. • **Hardware Configuration**: o Each device unit includes a **server-grade processor** (e.g., x86_64 architecture). o Each unit includes **metadata read/write cache** for performance optimization. o Minimum **4 x 25GbE SFP28 ports** per device unit. • **Protocol Support**: o Supports **multi-protocol access**, including: ▪ **Object storage (S3-compatible)** ▪ **File storage (NFSv3)** **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years	**1 Unit**

• Knowledge transfer	

Backup Server
 	
Minimum Technical Requirements per Unit:
• **Form Factor**: Minimum 2U rack-mountable chassis.
• **Processor**: Dual high-performance server-grade processors (e.g., x86_64 architecture), each with **minimum 24 physical cores**, clock speed **≥ 2.9 GHz**.
• **Memory**: Minimum **256 GB RAM**.
• **Primary Storage**:
  o Minimum **2 x 960 GB NVMe SSDs**, configured in RAID 1 or equivalent fault-tolerant setup.
  o Minimum **4 x 7.68 TB SSDs** for backup data storage.
• **RAID Controller**:
  o Minimum **12Gb SAS RAID controller** with **8GB cache** or equivalent.
• **Networking**:
  o Minimum **4 x 25GbE ports**, with **2 NICs for redundancy**, including transceivers.
• **Power Supply**:
  o Redundant power supply units (minimum 1+1 configuration), with sufficient wattage to support full system load and high availability (e.g. up to 1400W or equivalent based on system design)
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer
	1 Unit

Backup Storage
 	
Minimum Technical Requirements per Unit:
• **Architecture**:
  o Scale-out backup storage appliance supporting disk-based and cloud-integrated backup workflows.
• **Capacity**:
  o Minimum **usable capacity of 120 TB**, with capability to **offload to S3-compatible object storage** up to **360 TB**.
• **Connectivity**:
  o Minimum **1 x 1GbE management port**
  o Minimum **4 x 10GbE SFP+ ports**
• **Protocol Support**:
  o Supports **NFS**, **CIFS**, **VTL**, and **NDMP** protocols for
	1 Unit

flexible integration with backup software and legacy systems.
• **Backup Features**:
  o Support for **multiple backup modes**, including:
  ▪ Disk-based backup
  ▪ Source-side deduplication
  ▪ Virtual Tape Library (VTL)
  o Support for **deduplication** features (native or integrated)
• **Software**:
  o Includes all necessary **backup software licenses** to enable full functionality of the appliance.
 	
Includes services:
• Installation, configuration, test and commissioning
• Onsite support for a period of 2 years with 24/7 assistance
• Manufacturing limited warranty for 2 years
• Knowledge transfer	

AI Server
Minimum Technical Requirements per Unit:
• **Form Factor**: Minimum 6U rack-mountable chassis.
• **Processor**: Dual high-performance server-grade processors (e.g., x86_64 architecture), each with **minimum 64 physical cores**, clock speed **≥ 1.9 GHz**.
• **Memory**: Minimum **2,048 GB RAM**.
• **Primary Storage**:
  o Minimum **2 x 960 GB NVMe SSDs**, configured in RAID 1 or equivalent fault-tolerant setup.
  o Minimum **8 x 7.68 TB NVMe SSDs** for high-speed data access.
• **Networking**:
  o Minimum **8 x 400GbE ports**, with corresponding NIC cards.
  o Minimum **6 x 25GbE ports**, complete with transceivers.
• **AI Acceleration**:
  o Minimum **8 AI accelerator units**, compatible with modern deep learning frameworks (e.g., NVIDIA HGX H200 8-GPU SXM or equivalent), each with **minimum 141 GB memory** and **700W power rating**.
• **Power Supply**:
  o Redundant power supply units (e.g., 3+3 configuration), with **sufficient wattage to support full system load and high availability** (e.g., up to 2800W or equivalent based on system design).
	1 Unit

Includes services: • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	
Workstation • **Minimum Technical Requirements per Unit**: • **Processor**: o Equipped with a high-performance mobile processor (e.g., x86_64 architecture), with performance equivalent to or exceeding **Intel® Core™ i9-13950HX**. • **Memory**: o Minimum **64 GB RAM**. • **Graphics**: o Equipped with a professional-grade GPU, with performance equivalent to or exceeding **NVIDIA RTX™ 5000 Ada series**, and **minimum 16 GB GDDR6** memory. • **Storage**: o Minimum **512 GB M.2 2280 Gen 4 PCIe NVMe SSD** (primary drive). o Minimum **1 TB M.2 PCIe NVMe Gen 4 SSD** (secondary drive). • **Battery**: o Equipped with a **6-cell Lithium Ion Polymer battery**, with minimum **93 Wh capacity**. • **Operating System**: Pre-installed with a **64-bit professional-grade operating system**, such as **Windows 11 Professional** or equivalent.	**6 Unit**
Internet Router **Minimum Technical Requirements per Unit**: • **Form Factor**: o Minimum **1U rack-mountable chassis** • **Security & Performance Features**: o Supports **inline hardware-accelerated encryption** for high-throughput **IPsec** and **MACsec** traffic o Supports **high-performance routing** and **SD-WAN services** o Capable of operating with **1G and flexible 1G/10G interfaces** o Supports **dynamic allocation of processing resources** to optimize I/O and service plane operations based on	**2 Unit**

workload demands • **Power Supply**: o Equipped with **high-efficiency redundant power supply units** • **Transceiver Requirements**: o Includes minimum: ▪ **12 x 1000BASE-T SFP transceiver modules** ▪ **12 x 10GBASE-SR SFP modules** **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	
WAN Router **Minimum Technical Requirements per Unit**: • **Form Factor**: o Minimum **1U rack-mountable chassis** • **Security & Performance Features**: o Supports **inline hardware-accelerated encryption** for high-throughput **IPsec** and **MACsec** traffic o Supports **high-performance routing** and **SD-WAN services** o Capable of operating with **1G and flexible 1G/10G interfaces** o Supports **dynamic core allocation architecture**, enabling flexible use of data plane cores for I/O and service plane operations based on workload demands • **Power Supply**: o Equipped with **high-efficiency redundant power supply units** • **Transceiver Requirements**: o Includes minimum: ▪ **12 x 1000BASE-T SFP transceiver modules** ▪ **12 x 10GBASE-SR SFP modules** **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**2 Unit**

Load Balancer WAF **Minimum Technical Requirements per Unit**: • **Performance Capabilities**: o Minimum **Layer 4 throughput**: 100 Gbps o Minimum **Layer 7 throughput**: 80 Gbps o Minimum **SSL bulk encryption throughput**: 50 Gbps o Minimum **compression throughput**: 45 Gbps • **Security Features**: o Integrated **Web Application Firewall (WAF)** with protection against **OWASP Top 10 vulnerabilities** o **DDoS protection** o **Antivirus and bot mitigation** capabilities • **Compatibility**: o Compatible with **major enterprise applications** (e.g., SAP) o Supports integration with **public cloud platforms** (e.g., AWS, Azure) o Compatible with **container orchestration platforms** (e.g., Kubernetes, OpenShift) • **Hardware Interfaces**: o Minimum **4 x 40GbE QSFP+ slots** o Minimum **8 x 10GbE QSFP+ slots** o Minimum **2 x 1GbE Base-T ports** **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**2 Unit**

NGFW Server Farm **Minimum Technical Requirements per Unit:** • High-performance next-generation firewall (NGFW) • Throughput capabilities, handling up to 400 Gbps • NGFW throughput up to 33 Gbps, • Threat protection up to 31 Gbps • VPN throughput up to 110 Gbps. • 6 x 100 GE QSFP28 slots • 16 x 10 GE SFP+/25 GE SFP28 slots • 18 x 10G Base-T ports **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**2 Unit**
NGFW Perimeter **Minimum Technical Requirements per Unit:** • High-Performance Next-Generation Firewall (NGFW) • Throughput Support: Up to 198 Gbps for IPv4 traffic with 1518-byte UDP packets • Throughput 19 Gbps for Intrusion Prevention System (IPS) operations • Throughput 15 Gbps for NGFW functionalities, including application control and user identity management • Throughput 13 Gbps for comprehensive threat protection • Throughput 55 Gbps for IPsec Virtual Private Network (VPN) and 5.3 Gbps for SSL VPN, ensuring secure remote access and site-to-site connectivity • Multiple 10 GE RJ45 ports • 100 GE QSFP28, 40 GE QSFP+, 25 GE SFP28, and 10 GE SFP+ ports, providing flexible and high-speed connectivity solutions **Includes services:** • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	**2 Unit**
NGFW Management **Minimum Technical Requirements per Unit:** • Centralized Management: Provides a single-pane-of-glass interface or equivalent for managing network security devices,	**2 Unit**

streamlining policy and object management, and enhancing role-based access control (RBAC). • Security Automation: Simplifies Zero-Touch Provisioning (ZTP) for SD-Branch deployments using powerful templates with meta-variables, enabling scalable provisioning across multiple sites. • High Availability and Integration: Offers automated backups to multiple nodes and streamlines software and security updates for all managed devices, ensuring network reliability and operational efficiency. • Extensibility: Should allow integration with containerized applications or modules that enhance network visibility and management (e.g., SD-WAN orchestration, portal access, wireless LAN management, signature conversion tools). Equivalent solutions are acceptable. • High Log Processing Capacity: Capable of handling a minimum of 200 GB of logs per day, ensuring efficient data management for large-scale networks. • Secure and Ample Storage: Equipped with a minimum of 16 TB of self-encrypting storage, providing both security and sufficient capacity for extensive log data. • Flexible Connectivity: Offers minimum of 4 Gigabit Ethernet (RJ-45) ports and 2 SFP ports, facilitating versatile integration into diverse network infrastructures. Includes services: • Installation, configuration, test and commissioning • Onsite support for a period of 2 years with 24/7 assistance • Manufacturing limited warranty for 2 years • Knowledge transfer	
Platform for Containerized Applications **Minimum Technical Requirements per Unit:** • Support: Include Premium 24x7 support SLAs. • Subscription Scope: This subscription applies to self-managed OpenShift editions and is mandatory for utilizing OpenShift Virtualization Engine. • Operating System Compatibility: The platform should be deployable on bare-metal servers using x86 or ARM architecture, without requiring third-party hypervisors. o Preferred: Red Hat Enterprise Linux (RHEL), due to its proven compatibility and integration with OpenShift. o Alternative Linux distributions may be considered if they demonstrate full compatibility with OpenShift	**12 Unit**

Virtualization and meet all functional, support, and security requirements. • Subscription Scalability: Licensing or subscription models should allow stacking to cover servers with more than 2 CPU sockets or over 128 cores. A single subscription must not be used to cover multiple servers. • Virtualization Coverage: If virtualization of operating systems (e.g., Linux-based VMs) is required within the container platform, the solution must specify whether additional licenses are needed or if such functionality is included. •	
Platform for Managing AI and Machine Learning **Minimum Technical Requirements:** • Support: Must include premium-level technical support with 24/7 availability to ensure operational continuity and rapid issue resolution. • Subscription Scope: The platform must support self-managed OpenShift editions and be compatible with OpenShift Virtualization Engine. • Operating System Compatibility: The platform should be deployable on x86 and ARM bare-metal servers without requiring third-party hypervisors. o Preferred: Red Hat Enterprise Linux (RHEL), due to its proven compatibility and integration with OpenShift environments. o Alternative Linux distributions may be considered if they demonstrate full compatibility with OpenShift Virtualization and meet all functional, support, and security requirements. • Subscription Scalability: Licensing or subscription models should allow stacking to cover servers with more than 2 CPU sockets or over 128 cores. A single subscription must not be used to cover multiple servers. • Virtualization Coverage: If virtualization of operating systems (e.g., Linux-based VMs) is required within the container platform, the solution must specify whether additional licenses are needed or if such functionality is included. •	**1 Unit**
AI Accelerator **Minimum Technical Requirements:** • Support: Must include premium 24/7 technical support service-level agreements (SLAs).	**1 Unit**

• Hardware Requirements: The solution must include computing devices such as GPUs or ASICs that are specifically engineered to enhance and accelerate artificial intelligence (AI) workloads. These devices should provide optimized processing capabilities for tasks such as machine learning, model training, and inference. • Architecture: The AI accelerator must function as a separate processing unit, even if physically integrated within the same package or module as the CPU. To qualify as an AI accelerator, the device must: o Operate independently of the CPU cores; and o Be designed specifically to enhance AI computations. • Preferred Technologies: Devices based on modern architecture such as NVIDIA Hopper or newer are preferred, particularly for advanced AI tasks including deep learning model training and inference. Equivalent or superior technologies may also be considered.	
Operating System to Manage Physical and Virtual Servers **Minimum Technical Requirements:** • Must be an enterprise-grade Linux operating system that provides a stable and secure platform suitable for diverse workloads across physical, virtual, and cloud environments. • Must include capabilities for centralized management, including automation of provisioning, configuration, patching, and compliance across infrastructure. • Must offer premium 24/7 support services, ensuring timely assistance and resolution of critical operational issues. • Must support flexible deployment options, including installation on both physical hardware and virtualized environments. • Preferred: Red Hat Enterprise Linux (RHEL), due to its proven compatibility with OpenShift and alignment with existing infrastructure. • Alternative Linux distributions may be considered if they demonstrate full compatibility with OpenShift environments and meet all functional, support, and security requirements. • Subscription Details: Should typically include entitlements for 2 CPU sockets, covering either 1 physical node or 2 virtual nodes, with scalability options available.	**1 Unit**

- **Task 5: Historical Data Integration and Baseline Enhancement:** Services for data archaeology, digitization, and integration of historical marine datasets to establish a robust scientific baseline.

- **Task 6: Intelligent EVIKA Automation and SEE-EA Compliance Platform:** An intelligent software platform to automate the calculation and reporting of MPA management effectiveness (EVIKA) and support natural capital accounting under the SEE-EA framework.

Legal and Regulatory Requirements Business Function Requirements

Legal and Regulatory Compliance Requirements (World Bank OP 7.50 and 7.60)*:* The deployment of the OMS shall fully comply with World Bank Operational Policy 7.50 regarding projects on international waterways through the following measures:

Equipment Category	**Compliance Requirement**	**Verification Method**
UAV Systems	Civilian-grade specifications only; operational range ≤50km; altitude ≤3,500m AGL	Technical specification review; vendor certification; flight testing verification
AUV Systems	Scientific research classification; depth limitations appropriate for civilian use; commercial navigation systems only	Pressure testing certification; navigation system verification; civilian-grade component documentation
Sensor Systems	Environmental monitoring applications only; commercial-grade specifications; no military sensing capabilities	Sensor calibration certificates; application-specific testing; frequency limitation verification
Communication Systems	Commercial encryption standards; scientific research frequencies; no military communication protocols	Frequency allocation documentation; encryption standard verification; communication protocol testing

In accordance with OP 7.60, all equipment procurement avoids any specifications that could be classified as military or dual-use technology through:

Technical Specification Limitations	Explicit restrictions on capabilities that could trigger dual-use classification
Vendor Pre-Qualification	Requirements for civilian-grade certification and export control compliance. Please see section E.2.1 of the Technical Specifications document for further detail.
Documentation Requirements	Comprehensive compliance documentation for all advanced equipment. Please see section E.2.2 for further detail
Regulatory Approval	Pre-approval from relevant Indonesian authorities for advanced monitoring systems

Governance and Institutional Arrangement

Lead Executing Agency: Directorate General of Marine Spatial Planning (DG MSP) - Program oversight, technical leadership, alignment with national goals.

Technical Implementation Unit: PUSDATIN (Center for Data and Information) - Hosts infrastructure, ensures data standardization, security, and integration.

Site-Level Partners: UPT Kawasan Konservasi (MPA Field Units) - Responsible for field deployment, ground-truthing, and use of OMS for site-level management.

Coordination Mechanism: OMS Project Steering Committee - To review milestones, coordinate across directorates, and oversee risk management.

Functional and/or Performance Requirements

Detailed technical requirements of the functional and performance of the OMS is included in Appendix A of the Technical Specifications and Terms of Reference Sectio. In addition to the vendor certification requirements, vendors will also be assessed based on certification of key components to mitigate cyber security risk of Data Collection Suites such as AUVs. In addition, certain functional criteria will be rated in later stages of the procurement as documented in the technical specifications document.

Testing and Quality Assurance Requirements

User Acceptance Tests will be linked to milestone performance-based payment as described in Section 4.3 of the Technical Specifications. Briefly, the key UAT shall evaluate whether the system developed for the pilot is fully integrated and functionally operational. The pilot shall be certified success and ready to scale up when the pilot meets all operational KPIs and formally signed off by the Purchaser (MMAF). Refer to the Technical Specifications for the clearly defined KPIs.

Warranty or Post Warranty Services

The purchaser proposes a warranty period of two years. The purchaser also welcomes additional warranty and post warranty services.

2. Implementation Period

The OMS is expected to be completed in two phases. Phase 1 and Phase 2. Phase 1 is divided into Phase 1A and Phase 1B and shall be completed in 6 months. Phase 1B is expected to run for 1 year. In total phase 1 shall be completed within 18 months of contract signing. Phase 2 shall be completed following month 19 until scale up is completed across all sites. See section 3.0 of the technical specifications document for more details.

3. Site and Other Data

The Project shall commence with a Pilot in 2 Locations: The Gili Matra MPA and the Sawu Sea MPA.

- **Gili Matra MPA:** chosen as a "low-complexity, high-visibility" site. Its small size (2,274 ha), high accessibility, and reliable connectivity offer an ideal environment for initial deployment, equipment calibration, and user training.
- **Sawu Sea MPA:** chosen as a "high-impact, high-challenge" site. Its massive size (3.5 million ha) and remote, multi-district geography provide a robust testbed for system scalability, satellite data links, and complex operational logistics.

Following the pilot, the OMS will be scaled up in 10 additional LAUTRA project MPAs to be determined subsequently based on implementation practicalities, risk-based prioritization and lessons learned from the pilot.

4. Environmental and Social (ES) Requirement

As applicable, based on the ES assessment, the Employer shall provide key ES risks and impacts, (including on Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) risks and impacts, as appropriate) and expectations on contractors to manage the risks and impacts.

The Project will comply with the World Bank Environmental and Social Safeguards (ESS) Standards. The implementation of the OMS will follow additional World Bank guidance note on Protected Areas, including the risk and mitigation measures identified as part of the Due diligence for the procurement and deployment of the OMS. Furthermore, a summarized Environmental and Social Management Framework for OMS Deployment is described in Appendix E: Enhanced Environmental & Social Management Framework (ESMF) of the Technical Specifications. The Table below summarizes key ESS policies, risks and mitigation measures as relevant for the OMS.

World Bank ESS	**OMS Implementation Measures**
ESS1: Assessment	Comprehensive ESIA completed for all sites.
ESS2: Labor	Service Provider compliance with Indonesian labor laws and worker safety protocols.
ESS3: Resource Efficiency	Low-impact deployment methods; battery recycling programs (Basel Convention compliant).
ESS4: Community Safety	Navigation safety protocols; drone safety management plan; privacy protection framework.
ESS6: Biodiversity	System designed to support conservation; AUV acoustic output < 140 dB; lighting IEC 62471 G1; drone wildlife "dark-zone" logic.
ESS7: Indigenous Peoples	Free, prior, and informed consent (FPIC) processes; integration of traditional knowledge.
ESS8: Cultural Heritage	Cultural heritage screening; protection of traditional use areas.
World Bank OP 7.50/7.60 Compliance	Comprehensive pre-procurement compliance assessment; civilian-grade equipment specifications only; formal coordination with Indonesian Ministry of Defense; vendor certification for civilian use only; ongoing compliance monitoring and reporting
Dual-Use Technology Risk Management	Technical specification limitations to ensure civilian-grade classification; export control compliance documentation; end-user agreements excluding military applications; regular equipment performance verification against civilian parameters.

5. Full Terms of Reference and Detailed Technical Specifications for the Proposed Ocean Monitoring System

TERMS OF REFERENCE
Ocean Monitoring System

Version 6.0, 9th September 2025

MINISTRY OF MARINE AFFAIRS AND FISHERIES REPUBLIC OF INDONESIA

LIST OF ACRONYMS

Acronym	Full Description
AUV	Autonomous Underwater Vehicle
BCD	Blue Carbon Development
DG MSP	Directorate General of Marine Spatial Planning
EVIKA	Evaluasi Kawasan Konservasi Indonesia (Indonesia MPA Effectiveness Evaluation)
HCI	Hyper-Converged Infrastructure
INS	Inertial Navigation System
KKP	Kementerian Kelautan dan Perikanan (Ministry of Marine Affairs and Fisheries)
LAUTRA	Laut yang Terjaga dan Sejahtera (Ocean Prosperity Project)
MPA	Marine Protected Area
OMS	Ocean Monitoring System
PUSDATIN	Pusat Data, Statistik dan Informasi (Center for Data, Statistics and Information)
ROV	Remotely Operated Vehicle
SOA	Service-Oriented Architecture
SSO	Single Sign-On
USBL	Ultra-Short Baseline Positioning
UAV	Unmanned Aerial Vehicle
VMS	Vessel Monitoring System

Term of Reference: Ocean Monitoring System (OMS)

MINISTRY OF MARINE AFFAIRS AND FISHERIES (KKP) REPUBLIC OF INDONESIA

Executive Summary: A Strategic National Investment in Marine Governance

The Government of Indonesia, through the Ministry of Marine Affairs and Fisheries (KKP), proposes a strategic investment in an Ocean Monitoring System (OMS). This is a specialized, foundational system dedicated to solving the critical operational challenges of managing Indonesia's Marine Protected Areas (MPAs). By providing real-time data from advanced sensors and autonomous platforms, the OMS will transform MPA management from a reactive, high-cost model to a proactive, data-driven, and cost-effective one. This investment is structured as a single, multi-year procurement package.

To be clear, this is one single multi-year procurement activity procured under one contract. The division into "Phase 1" and "Phase 2" refers to the sequential stages of work within that single contract. This phased approach is a risk management strategy to ensure the system is fully proven in a pilot setting before the national scale-up commences, with formal governance gates controlling the progression between phases.

The OMS will transform Indonesia's marine management from a reactive, high-cost model to a proactive, data-driven, and cost-effective one. It will provide the tools to dramatically improve management efficiency—for example, by using autonomous drones for surveillance to reduce costly boat patrols and focus enforcement on targeted interceptions, or to monitor tourism carrying capacity in high-use areas like Gili Matra. This aligns directly with the LAUTRA Project's core objective of enhancing the management effectiveness of Indonesia's Marine Protected Areas (MPAs) **and elevating their EVIKA rating by providing the high-quality, real-time data needed for improved management.**

Analysis projects a **lifecycle cost saving of 58-66%** compared to traditional methods and a conservative **7:1 return on investment (ROI).** Beyond immediate benefits, the OMS provides the verifiable, scientific baseline required to unlock future high-value opportunities aligned with **Bappenas's Blue Economy plan**, such as carbon and biodiversity credits, projecting a potential economic impact exceeding **USD 455 million** within the first decade. This is underpinned by a system fully compliant with the **UN System of Environmental-Economic Accounting (SEEA-EA).**

The OMS is designed as a self-contained "data factory"—fully functional from day one with its own on-premise data infrastructure, independent of the future national **Ocean Big Data (OBD)** system but built to seamlessly connect to it. To address all stakeholder concerns, the **"Hybrid Phasing Model"** within Phase 1 enables a quick and visible start on procurement within the first 4-6 months, while ensuring major financial commitments for systems integration are firewalled behind a rigorous, 18-month performance-based pilot validation. A world-class National Management Consultant (NMC) team will ensure expert delivery and knowledge transfer to KKP. With payments strictly tied to performance milestones and KKP in full control via formal No-Objection Letter (NOL) governance gates, this project will establish sovereign national capability in 21st-century marine governance. This document presents the definitive, unified plan for the OMS project.

Project at a Glance

- **Core Goal:** To enhance the management effectiveness of MPAs by providing a data-driven, real-time monitoring and decision-support system.

- **Core Technology:** An integrated system combining an Enterprise Geospatial Platform, a fleet of autonomous monitoring tools (AUVs/UAVs), a secure on-premise data center, and an intelligent EVIKA automation platform.
- **Implementation Strategy:** A single procurement with two phases: Phase 1 for procurement and pilot validation in two key MPAs; Phase 2 for national scale-up.
- **Risk Mitigation:** Payments are strictly tied to performance milestones, with the majority of funding withheld until after successful pilot validation.
- **Hosting:** On-Premise Hyper-Converged Infrastructure (HCI) to ensure national data sovereignty and align with BSSN cybersecurity mandates.

1.0 Strategic Context and Value for Money Justification

1.1 The Strategic Imperative: From High-Cost BAU to a High-Impact Platform

The current "Business-as-Usual" (BAU) approach to marine monitoring relies on costly and intermittent patrols and manual surveys. Indonesia's current marine monitoring approach relies on vessel-based patrols covering less than 5% of marine protected area waters annually at costs exceeding USD 15,000 per square kilometer surveyed. Traditional methods detect fewer than 20% of illegal fishing incidents and provide data updates only every 3-6 months, creating critical gaps in ecosystem health monitoring and enforcement capability. This model is fiscally inefficient, provides limited and fragmented data, and cannot support the proactive management required to protect Indonesia's marine assets. The fiscal inefficiency and conservation inadequacy of current approaches necessitate transformation to technology-enabled, continuous monitoring systems that provide real-time data for proactive marine management. The strategic risks of inaction include:

- **Failure to Meet National Targets:** Inability to achieve the LAUTRA MPA effectiveness goals.
- **Inefficient Use of Public Funds:** Continued high recurrent spending with diminishing returns.
- **Irreversible Degradation of Natural Capital:** Endangering the multi-billion-dollar tourism and fishing industries.

The OMS represents a strategic shift to a modern, integrated infrastructure that leverages autonomous tools, advanced sensors, and a central AI-powered data platform to provide a continuous, comprehensive, and actionable understanding of the marine environment.

1.2 Strategic Justification

The OMS is a strategic investment in sovereign capability. It provides the essential infrastructure required to deliver on the LAUTRA Project's core commitments and secure Indonesia's position as a global leader in marine management. By shifting from high-cost, intermittent manual methods to continuous, automated monitoring, the OMS will significantly improve the efficiency and effectiveness of MPA management. The system provides the verifiable, scientific baseline required to support robust conservation outcomes and enhance the stewardship of Indonesia's vital marine natural capital.

2.0 OMS Scope of Works and System Architecture

The OMS is an integrated "system of systems" designed to transform raw data into strategic intelligence. The OMS implements a federated "system of systems" architecture that integrates autonomous data collection platforms, real-time processing capabilities, and decision support tools to transform continuous environmental monitoring into actionable marine management intelligence. This architecture follows proven international models, particularly Australia's Integrated Marine Observing System (IMOS), while incorporating Indonesia-specific requirements for tropical marine environments, multi-stakeholder governance, and community engagement protocols.

2.1 Key Components

1. **Next-Generation Enterprise Geospatial Platform:** The software core for data visualization, analysis, and decision support. This includes the professional services required to design, build, customize, and integrate the platform.
2. **Advanced Ocean Monitoring Tools:** A fleet of state-of-the-art Autonomous Underwater Vehicles (AUVs), Unmanned Aerial Vehicles (UAVs), and a comprehensive network of fixed autonomous sensors (buoys, acoustic arrays) to collect high-resolution environmental, ecological, and surveillance data. The requisition is also open to vendor recommendations of additional or alternative suite of MPA site level sensors, data platforms, and devices to accelerate progress towards EVIKA measured MPA management effectiveness scores.
3. **On-Premise Hyper-Converged Infrastructure (HCI):** A secure, high-performance computing and storage cluster that will be the digital backbone of the OMS.

2.2 Strategic Justification for On-Premise HCI

The decision to host the OMS on an on-premise HCI is based on a comprehensive analysis of cost, security, performance, and national interest. This approach delivers:

- **Superior Long-Term Cost:** For the projected data volume, which is **1.5 PB in the first three years and is estimated to grow towards 6 PB over the system's 10-year lifecycle**, an on-premise model avoids the prohibitively expensive perpetual fees for cloud storage and data egress, replaces a massive, unending operational expense with a predictable, one-time capital investment in hardware that KKP owns. This conclusion is based on a detailed 3-year data generation forecast of 1.5 PB (see Appendix C.1), which validates the cost-effectiveness of the on-premise model at this scale.
- **Non-Negotiable National Data Sovereignty:** Ensures Indonesia's critical marine data resides exclusively within KKP's data centers, subject only to Indonesian law and free from foreign legal jurisdictions (e.g., U.S. CLOUD Act).
- **Guaranteed System Performance:** Provides dedicated, uncontended resources and ultra-low latency essential for performance-intensive workloads like the Digital Twin and real-time AI analytics.
- **Alignment with National Cybersecurity Mandates:** Directly follows the recommendation from **Badan Siber dan Sandi Negara (BSSN)** that critical national information infrastructure be hosted on-premise to reduce the attack surface and ensure full control for incident response.

2.3 World Bank Compliance and Dual-Use Technology Framework

2.3.1 World Bank Operational Policy Compliance

The Ocean Monitoring System procurement and implementation strictly adheres to World Bank Operational Policy 7.50 (Projects on International Waterways) and Operational Policy 7.60 (Projects in Disputed Areas), ensuring full compliance with World Bank financing policies regarding equipment specifications and dual-use technology restrictions.

All equipment specifications have been designed to meet civilian-grade requirements and avoid any classification as military or dual-use technology that could trigger export control restrictions or violate World Bank financing policies. This compliance framework includes:

- Pre-Procurement Compliance Assessment: All equipment specifications undergo comprehensive review against World Bank Operational Policy 7.50 and OP 7.60, as well as Indonesian Ministry of Defense dual-use technology guidelines, prior to procurement initiation.

- Civilian-Grade Specification Requirements: Technical specifications explicitly limit equipment capabilities to civilian applications, with specific restrictions on operational ranges, payload capacities, and advanced capabilities that could be classified as dual-use.

- Regulatory Coordination: Formal consultation with relevant Indonesian regulatory authorities, including the Ministry of Defense, to obtain pre-approval for proposed equipment categories and ensure compliance with national security regulations.

2.3.2 Dual-Use Technology Risk Management

The procurement of advanced monitoring equipment must navigate strict limitations on military-grade specifications to ensure compliance with World Bank financing policies and Indonesian national security regulations.

Specific Risk Factors and Mitigation Measures:

- UAV Systems: Operational ranges restricted to maximum 50 kilometers, flight altitudes limited to 3,500 meters AGL, and payload capacities under 55 kilograms to maintain civilian-grade classification.

- High-Resolution Imaging: Systems limited to resolutions appropriate for environmental monitoring, with data storage prioritized over real-time transmission for high-resolution imagery to avoid dual-use restrictions.

- Acoustic Monitoring: Systems designed specifically for marine wildlife monitoring with frequency limitations that exclude submarine detection capabilities.

- Encryption and Communication: Security systems utilize commercial-grade encryption standards (AES-256) without military-grade secure communication features that could trigger export control regulations.

- AI and Machine Learning: Capabilities focused exclusively on environmental monitoring and conservation applications, with explicit exclusion of target identification or surveillance applications that could be considered military.

2.3.3 Vendor Certification and Documentation Requirements

All equipment vendors must provide comprehensive documentation demonstrating civilian-grade classification, including:

- Export Control Compliance Certificates: Documentation confirming equipment does not fall under military or dual-use export control restrictions.

- End-User Agreements: Formal agreements specifying civilian scientific use only, with explicit exclusion of military applications.

- Technical Specifications Documentation: Detailed technical specifications that explicitly exclude military-grade features and capabilities.

- Civilian-Grade Classification: Official certification from relevant authorities confirming civilian-grade status of all equipment.

2.3.4 Indonesian Ministry of Defense Coordination

The project includes formal coordination with the Indonesian Ministry of Defense to ensure compliance with national dual-use technology guidelines and obtain necessary clearances for advanced monitoring equipment. This coordination includes:

- Pre-procurement consultation on equipment specifications
- Formal approval process for advanced sensor and communication systems
- Ongoing coordination during implementation to ensure continued compliance
- Regular reporting on equipment deployment and operational parameters

3.0 Implementation Plan: A Single, Multi-Year Procurement

The OMS will be implemented via a single, multi-year turnkey contract that combines Goods and Services. The implementation strategy is designed to manage complexity, mitigate risk, and ensure the delivery of a fully operational and validated system. This is achieved through a phased approach that balances the need for rapid, tangible progress with the prudence of performance-based validation before committing to a full national rollout.

The framework is structured into two sequential phases, governed by strict performance criteria. Progression from the initial phase to the national scale-up is contingent upon the successful, verifiable achievement of predefined technical and operational outcomes.

Phase 1: Foundational Capability and Pilot Validation (Months 1-18)

The primary objective of this initial 18-month phase is to establish the core OMS infrastructure and prove its integrated effectiveness in a controlled, real-world operational setting. This de-risks the entire investment by ensuring the "system of systems" functions as a cohesive whole before wider deployment. This phase consists of two distinct, sequential activities.

- **Phase 1A: Rapid Mobilization and Infrastructure Establishment (Months 1-6)** This activity focuses on immediate, tangible progress. The vendor will procure all long-lead-time items, including the on-premise Hyper-Converged Infrastructure (HCI), enterprise software licenses, and an initial tranche of autonomous vehicles (AUVs/UAVs). Concurrently, the core technical environment will be established at KKP's data centers, preparing the digital foundation for the system's integration. *At the same time, the* Service Provider *will execute 'Task 5: Historical Data Integration,' ensuring that valuable historical datasets are collected, digitized, and ready for*

ingestion into the OMS platform as soon as it is operational. The key outcome is a fully provisioned and installed baseline infrastructure, ready for system integration.

- **Phase 1B: Integrated System Pilot and Performance Verification (Months 7-18)** This activity commences only after the foundational infrastructure from Phase 1A is in place. The focus shifts entirely to systems integration, field testing, and operational validation within the two designated pilot Marine Protected Areas (Gili Matra & Sawu Sea). The vendor must demonstrate the seamless integration of all components: the HCI, the geospatial platform, and the data streams from AUVs and UAVs. This culminates in rigorous User Acceptance Testing (UAT) by KKP staff to certify that the pilot system meets all specified performance indicators and is delivering actionable intelligence for MPA management.

Phase 2: National Rollout and Capability Enhancement (Months 19 onward)

This phase will only be initiated following the formal certification of the pilot's success. Its objective is to replicate the proven blueprint from Phase 1 across the remaining LAUTRA MPA network. This involves deploying the remaining hardware, configuring the OMS for the unique ecological and operational needs of each new location, and conducting comprehensive training for local management teams. This phase also includes the delivery of enhanced system modules, such as advanced predictive modeling, ensuring the OMS continues to evolve and meet the strategic needs of KKP.

Governing Implementation: Performance, Milestones, and Risk Control

This phased implementation is underpinned by a rigorous governance framework designed to ensure accountability and control. The project's progression is tied to the achievement of specific, measurable, and verifiable milestones that correspond to the completion of key work packages in each phase.

Crucially, the transition between critical stages is controlled by formal **Governance Gates**. These are major decision points requiring official confirmation that all technical and operational prerequisites have been met before the project can proceed. This ensures that KKP and the World Bank retain full oversight and that financial commitments are only unlocked upon demonstrated success.

The following chapter provides the detailed financial architecture for this project, outlining the budget allocation, procurement methodology, and the milestone-based reimbursement schedule that is strictly aligned with this strategic implementation framework.

4.0 Budget, Procurement, and Reimbursement Plan

The project will be delivered through a single multi-year procurement contract.

4.1 Budget Allocation and Procurement Categories

The contract will be separated into two categories for procurement purposes:

- **Goods:** Including all HCI hardware, AUVs, UAVs, sensors, switches, routers, and workstations.
- **Services:** Including the enterprise software platform, all integration services, custom development, the National Management Consultant (NMC) team, training, project management, and long-term support, and the delivery of a comprehensive, multi-level training and knowledge transfer program, including modules for executive, management, technical, and field-level staff. *This also includes the budget for 'Task 5: Historical Data Integration and Baseline Enhancement' which covers data archeology, digitization, and integration services.*

4.2 Procurement Approach: Single-Stage Bidding (Two-Envelope)

Given the technical complexity of the OMS, procurement will be conducted using a **Single-Stage, Two-Envelope Request for Proposal (RFP)** process, as per World Bank Procurement Regulations. This process will be preceded by a comprehensive **Early Market Engagement (EME)** to ensure the market is well-informed and to maximize competition.

In this process, bidders will submit their complete Technical and Financial proposals simultaneously, in separate sealed envelopes. The technical proposals will be evaluated first for compliance. Only the financial proposals of bidders who pass the mandatory technical evaluation will be opened and considered. The financial evaluation will be based on a 10-Year Lifecycle Cost (LCC) to ensure long-term value for money.

4.3 Milestone-Based Reimbursement Plan

All payments are strictly tied to the verifiable achievement of deliverables and long-term system performance. The payment structure is heavily back-loaded to ensure the vendor is fully invested in the successful operation of the OMS for its entire contract duration.
The total contract price will be disbursed as follows:

Milestone ID	Deliverable Milestone	Key Technical Achievements & Verifiers	Indicative Payment (%)	Phase Linkage	Governance / NOL Requirement
1	**Contract Signing & Mobilization**	Project Kick-Off Meeting held. Submission and KKP acceptance of a Mobilization Report that includes: (a) the definitive list of key assigned personnel (NMC/PM), and (b) the high-level project execution plan.	5% (3.25M)	Phase 1A	N/A
2	**Detailed Design & Procurement Plan Approval**	Submission and approval of the final system architecture, Bill of Quantities (BoQ) for all hardware/software, and the detailed implementation plan.	5% (3.25M)	Phase 1A	NOL required to formally approve the technical design aligned with the advertised technical specifications and further guidelines to ensure successful deployment of the OMS and authorize the start of

Milestone ID	Deliverable Milestone	Key Technical Achievements & Verifiers	Indicative Payment (%)	Phase Linkage	Governance / NOL Requirement
					procurement.
3	**Hardware Delivery & Foundational Setup Complete**	Confirmed delivery of required hardware to pilot KKP sites. Minimal HCI and core software are installed in data centers, forming the pilot baseline.	10% (6.5M)	Phase 1A	Triggers Gate 1. A NOL is required to authorize the project to proceed to Pilot Integration (Phase 1B).
4	**Pilot System Fully Integrated & Functionally Operational**	Full integration of all components in pilot sites. Live, validated data streams from AUVs/UAVs and sensors are successfully ingested and visualized on the OMS platform.	10% (6.5M)	Phase 1B	Refer to KPI 3, 5, 6 in Appendix Table B3 for NOL criteria.
5	**Pilot Certified "Success" & Ready for Scale-Up**	The pilot system meets all operational KPIs. User Acceptance Testing (UAT) is complete and formally signed off by KKP. Masterplan for Phase 2 is approved.	10% (6.5M)	Phase 1B	Refer to KPI 1, 2, 4, and 8 in Appendix Table B3 for key NOL Criteria. Triggers Gate 2. A NOL is required to certify the pilot's success and authorize the project to proceed to National Scale-Up (Phase 2).
6	**National Scale-Up & Final Project Acceptance**	All remaining hardware for national deployment is delivered, installed, and verified across all LAUTRA MPA sites as per the Phase 2 Masterplan.	20% (13M)	Phase 2	Refer to KPI 7 in Annex Table B3 for NOL criteria.

Milestone ID	Deliverable Milestone	Key Technical Achievements & Verifiers	Indicative Payment (%)	Phase Linkage	Governance / NOL Requirement
7	**Performance-Based "Uptime" Payments**	The nationally-scaled OMS system is fully operational. **This payment is not a lump sum.** It is disbursed in **4 equal quarterly installments of 8.75% (totaling 35%) over 1 year.** Each payment is conditional on the vendor providing a quarterly report demonstrating achievement of all operational KPIs from Appendix B.3, including: ≥99% system availability, ≥90% equipment operational readiness, and adherence to support SLAs.	35% (22.75M)	Phase 2	Quarterly Performance Reports must be accepted by KKP.
8	**Final Acceptance & Contract Completion**	All installation, setup, training, knowledge transfer, and documentation are complete and signed off. Final project report accepted.	5% (3.25M)	Post-Phase 2	Final acceptance and signoff by the governance criteria.
	Total		**100%**		

4.4 Governance Gates for Phase Progression

In addition to the payment milestones, progression between key stages of the project is governed by formal approval to ensure technical readiness and manage risk.

- **Gate 1 (Proceed to Pilot Integration):** Transition from **Phase 1A to 1B** requires a **No-Objection Letter (NOL) from KKP and the World Bank**, confirming that all hardware has been delivered and the foundational setup is complete as per Milestone 3.
- **Gate 2 (Proceed to National Scale-Up):** Transition from **Phase 1 to Phase 2** requires a **No-Objection Letter (NOL) from KKP and the World Bank**, formally certifying the success of the pilot phase as per Milestone 5.

All technical specifications for the Goods and Services outlined in this project are detailed in the

Appendices of this Terms of Reference.

5.0 Technical Specifications and Performance-Based Procurement

5.1 Overarching Procurement Philosophy

To ensure open competition, value for money, and prevention of vendor lock-in, all procurement will adhere to the following principles:

- **Performance-Based Outcomes:** Bids will be evaluated against their ability to meet or exceed functional outcomes, not on their ability to supply a specific brand.
- **Brand-Name-or-Equal:** Any brand names mentioned (e.g., "miniVUX-class") are illustrative only. Bidders may offer alternatives that meet the performance criteria.
- **Open Standards and Interoperability:** All hardware and software must use open standards (e.g., OGC, MAVLink, LAS 1.4) to ensure seamless integration with KKP's existing and future systems.
- **Source-Code Preference:** Extra scoring will be given for open-source control stacks and the publication of custom drivers under permissive licenses.

5.2 Mandatory Vendor Pre-Qualification

5.2.1 Mandatory Experience Criterion

To ensure the successful delivery of this complex system and to mitigate implementation risk, any bidding firm or consortium must provide verifiable evidence of having successfully designed, integrated, and delivered at least two of the three core OMS components for a government or quasi-government entity in another country. This track record is a non-negotiable pre-qualification criterion. The detailed requirements for what constitutes a "similar contract" are specified in Section 5.2.2.

5.2.2 Assessment of Specific Experience for a "Similar Contract"

A minimum number of 1 (one) similar contract has been satisfactorily and substantially completed as a prime contractor, joint venture member, management contractor, or subcontractor between 1st January 2020 and the application submission deadline.

To be considered a "similar contract," the bidder or JV must provide verifiable evidence of contract(s) that covers work from at least TWO of the three core component categories listed below. Experience in only one category is not sufficient.

- **Core Component Category 1: Enterprise Geospatial & Data Platform**
  Demonstrated experience in delivering large-scale software platforms for data analysis and visualization. This includes projects described as:
  - Enterprise Geospatial Visualization Platform and Digital Twin Project
  - Geospatial Developer/Provider
  - Digital Government Project (where the core was a data integration and analytics platform)
  - System Integrator Project (where the focus was integrating diverse data sources

into a central software platform)

- **Core Component Category 2: Advanced Autonomous Data Collection**
  Demonstrated experience in the deployment and operational integration of advanced autonomous tools for large-scale monitoring. This includes projects involving:
  - Geospatial data collection tools and services using fleets of Autonomous Underwater Vehicles (AUVs) or Unmanned Aerial Vehicles (UAVs).
  - Integration of data streams from oceanographic buoys and ocean sensor networks into a unified system.
  - Large-scale aerial/marine imaging, mapping, surveying, and inspection services using autonomous platforms.

- **Core Component Category 3: On-Premise Critical Data Infrastructure**
  Demonstrated experience in designing and deploying the secure, high-performance hardware backbone for data-intensive national systems. This includes projects focused on:
  - On-premise Hyper-Converged Infrastructure (HCI) design and deployment, including all supporting network and security infrastructure for a national-level system.

5.2.3 Consortium and Joint Venture (JV) Structural Requirements

To provide clarity on the formation and assessment of consortiums or Joint Ventures (JVs), the following framework shall apply:

(a) Lead Member Designation: Each joint venture shall designate a Lead Member who shall be the sole point of contact with the Procuring Entity and shall bear primary responsibility for Contract performance.

(b) Member Limitations: Joint ventures shall be limited to a maximum of two (2) members to ensure effective coordination and clear accountability.

(c) Individual Qualification: Each joint venture member must individually satisfy the general experience and legal/financial pre-qualification requirements applicable to their role and area of responsibility.

(d) Joint and Several Liability: All joint venture members shall be jointly and severally liable for the performance of the entire Contract.

5.3 Summary of Technical Requirements

This section outlines the summary of technical requirements for all goods and services. All technical solutions must adhere to the overarching procurement philosophy detailed in Section 5.1.

5.3.1 Maintenance and Support Framework

To ensure the long-term operational sustainability of the OMS and to establish clear lines of responsibility, the project will adhere to a three-tiered maintenance and support hierarchy. The Service Provider shall be primarily responsible for providing comprehensive Level 3 support and must deliver the necessary training, documentation, and tools to empower KKP personnel to effectively manage Level 1

and Level 2 issues.

This framework will form the basis of the long-term Service Level Agreement (SLA) to be included in the final contract.

Level	**Responsible Party**	**Scope of Work (Illustrative)**	Service Provider **'s Obligation**
Level 1: Field Support	**KKP Field Staff (UPT)**	First-line response. Includes daily checks, battery swaps, cleaning, basic software restarts, logging issues in a ticketing system, and executing routine pre-flight/pre-deployment checklists.	Provide Standard Operating Procedures (SOPs), user manuals, quick-reference guides, and hands-on **Field Level training** for all Level 1 tasks.
Level 2: Central Technical Support	**KKP Central Technical Team (PUSDATIN)**	Second-line, remote and on-site support. Includes advanced troubleshooting, software configuration issues, user account management, diagnosis of non-critical hardware faults, and managing system-wide alerts.	Provide detailed technical manuals, administrator guides, a dedicated knowledge base, and in-depth **Technical Level training** to empower the PUSDATIN team. Establish a clear escalation protocol to Level 3.
Level 3: Expert / Vendor Support	**The** Service Provider **/ Original Equipment Manufacturer (OEM)**	Final escalation point. Includes major hardware failures, core software bugs, warranty claims, security patch deployment, data recovery, and repairs requiring proprietary tools or expertise.	Provide direct, expert-level support with guaranteed response and resolution times as defined in the SLA. Manage all warranty claims with OEMs. Maintain the system's core software and platform.

5.3.2 Detailed Technical Tasks

(This section will contain the detailed specifications as laid out in the Appendices. The scope has been expanded to include new critical tasks.)

- **Task 1: Enterprise Geospatial Visualization Platform** (See Appendix A.1)
- **Task 2: State-of-the-Art Tools for Data Collection – AUV/Fixed Sensor Suite** (See Appendix A.2)
- **Task 3: State-of-the-Art Tools for Data Collection – UAV** (See Appendix A.3)
- **Task 4: Hyper-Converged Infrastructure Hardware** (See Appendix A.4)
- **Task 5: Historical Data Integration and Baseline Enhancement** (See Appendix A.5)
- **Task 6: Intelligent EVIKA Automation and SEEA-EA Compliance Platform** (See Appendix A.6)

6.0 Governance, Safeguards, and Risk Management

The project is governed by a robust framework to ensure effective implementation, manage institutional, technical, social, environmental risks, and guarantee alignment with national strategic objectives. This includes a comprehensive risk assessment with proactive mitigation, contingency planning, and continuous monitoring.

6.1 Institutional Arrangements

- **Lead Executing Agency: Directorate General of Marine Spatial Planning (DG MSP), KKP.** Responsible for overall program oversight, strategic direction, policy alignment, and ultimate accountability for project success.
- **Technical Implementation Unit: Center for Data, Statistics, and Information (PUSDATIN), KKP.** Responsible for day-to-day technical leadership, hosting and securing the on-premise infrastructure, and ensuring all data management aligns with national standards.
- **Field Implementation Partners: Marine Protected Area Management Units (UPT).** Responsible for field deployment, operational use of the OMS, data collection, and local stakeholder engagement at the MPA level.

6.2 Project Steering Committee

To ensure high-level coordination and strategic alignment with national priorities, an **OMS Project Steering Committee** will be established to provide oversight, review major milestones, and resolve any inter-agency issues. The composition of the committee shall be as follows:

- **Chairman:** Director General of Marine Spatial Planning (DG MSP), KKP.
- **Vice Chairman:** Head of the Center for Data, Statistics, and Information (PUSDATIN), KKP.
- **Members:**
    - A representative from the **National Development Planning Agency (Bappenas)** to ensure alignment with the National Medium-Term Development Plan (RPJMN) and Blue Economy roadmap.
    - A representative from the **National Research and Innovation Agency (BRIN)** to ensure scientific coordination and integration with the *Satu Data Indonesia* initiative.
    - A representative from the **National Cyber and Crypto Agency (BSSN)** to provide oversight on cybersecurity compliance for critical national infrastructure.
    - A representative from the **Ministry of Finance (Kemenkeu)** to provide financial oversight.

- The Heads of the UPTs for the designated pilot sites (Gili Matra & Sawu Sea) to provide operational representation.

Secretariat: The vendor-supplied **National Management Consultant (NMC)** team will serve as the Secretariat for the committee.

6.3 World Bank Safeguard Compliance

The project will adhere strictly to all World Bank Environmental and Social Standards (ESS 1-10). This includes comprehensive measures for biodiversity protection (ESS6), community health and safety (ESS4), and resource efficiency (ESS3). Detailed compliance measures are outlined in Appendix B.6.

To ensure compliance the project establishes a Compliance Oversights and Governance Committee.

Compliance Oversight and Governance

- **World Bank Compliance Committee:**
  - The project establishes a dedicated World Bank Compliance Committee comprising:
    - KKP Project Manager (Chair)
    - World Bank Task Team Leader
    - Indonesian Ministry of Defense Representative (for dual-use technology oversight)
    - Legal Compliance Officer
    - Technical Specifications Reviewer

- **Committee Responsibilities:**
  - Pre-procurement compliance review and approval
  - Ongoing compliance monitoring and assessment
  - Non-compliance issue resolution
  - Regular compliance reporting to World Bank and Indonesian authorities
  - Equipment modification or replacement decisions for compliance issues

- **Meeting Schedule:**
  - Monthly compliance review meetings
  - Quarterly comprehensive compliance assessment
  - Annual compliance audit and certification
  - Ad-hoc meetings for compliance issues or concerns

6.4 Risk Mitigation

- **Dual-Use Technology:** All equipment is specified as **civilian-grade only**, with auditable restrictions on range, payload, and capabilities to comply with World Bank and national security policies. The vendor must provide certification of civilian use.

- **Data Privacy & Security:** A "Privacy-by-Design" approach will be implemented in alignment with Indonesia's Personal Data Protection Law (UU PDP), with technical measures including data anonymization, role-based access control (RBAC), and community consent protocols.
- **Stakeholder Engagement:** A comprehensive Stakeholder Engagement Framework ensures meaningful, documented participation from local communities, including the integration of traditional ecological knowledge and the operation of a robust and accessible grievance redress mechanism.

7.0 Monitoring & Evaluation (M&E) Framework and Project Indicators

The project's success will be measured against a clear results framework. The overall success will be tracked through three high-level Project Development Objective (PDO) indicators.

- **Indicator 1: OMS Pilot Phase Successfully Completed & Foundational for Scaled Deployment**
  - **Definition:** Pilot completed in Gili Matra and Sawu Sea; core components are operational (e.g., sensor uptime ≥90%); a comprehensive OMS Masterplan for Phase 2 is developed and approved by KKP and World Bank.
  - **Target (End of Month 18):** Pilot completion certified.
- **Indicator 2: Scaled OMS Functionally Operational and Accessible in Target MPAs**
  - **Definition:** Key hardware deployed; MPA-specific dashboards are live and regularly updated; system is accessible to authorized MPA managers with >99% uptime.
  - **Target (End 2028):** Operational in at least 12 LAUTRA MPAs.
- **Indicator 3: OMS-Informed Adaptive Management Implemented in Target MPAs**
  - **Definition:** MPA authorities demonstrably use OMS data to implement significant, documented adaptive management actions (e.g., adjusting patrol strategies, modifying zoning). The automated EVIKA platform shows a measurable improvement in management effectiveness scores.
  - **Target (End 2028):** ≥50% of MPAs with an operational OMS are using it for adaptive management, with EVIKA scores showing a positive trajectory.

These high-level indicators are underpinned by a detailed set of Key Performance Indicators (KPIs) that will be used for ongoing performance management of the Service Provider. This KPI framework, detailed in **Appendix B.3**, provides the specific, measurable targets that must be achieved to pass the project's formal Governance Gates. The successful achievement of these KPIs is directly linked to the **NOL assessment criteria detailed in Appendix K**.

APPENDICES

This section provides detailed technical specifications, frameworks, and justifications that support the strategic proposal outlined in the main body of the Terms of Reference.

Appendix A: Detailed Technical Specifications (Tasks 1-6)

A.1: Task 1 - Enterprise Geospatial Visualization Platform and Digital Twin

This task involves the end-to-end design, procurement, and implementation of a geospatial visualization platform to support MPA management under the Ocean Monitoring System (OMS). The system will provide an integrated, scalable, and interactive environment for spatial data visualization, digital twin simulation, and carbon ecosystem monitoring.

a) Core Functional Requirements:

- **Centralized Marine Spatial Data Platform:** An enterprise-grade solution for acquisition, management, and analysis of marine spatial data, compatible with KKP's Ocean Big Data and Ocean Accounting systems.
- **Advanced 2D–3D Spatial Modeling and Digital Twin Capabilities:** Enable immersive 3D/4D simulations of coastal and marine environments, incorporating dynamic data streams for real-time and predictive modelling.
- **Integration of Monitoring Data Streams:** Ingest and visualize data from all deployed tools (AUVs, UAVs, sensors, satellites).
- **Carbon Monitoring and Valuation Module:** Provide geospatial carbon stock visualization and analytics to support blue carbon financing schemes.
- **High-Resolution Marine Data Layers:** Display integrated 3D bathymetry, coastline evolution, seabed composition, and habitat zones with time-series analytics.

b) System Architecture and Visualization Stack

- **Architecture:** Service-Oriented Architecture (SOA) framework.
- **Visualization Technology:** Lightweight, high-performance technologies (WebGL, HTML5, JavaScript) for web environments.
- **Features:** Satellite imagery, dynamic drone visualizations, drag-and-drop file uploads (SHP, GeoTIFF, 3DTiles), layered map views.

c) Data Processing and Interoperability

- **Supported Data Formats:** TIFF, GeoTIFF, SHP, 3DTiles, JPEG/TIFF images, MKV video (2K–4K, 30/60 FPS), LIDAR LAS, CSV logs, JSON mission plans.
- **Processing Capabilities:** Automated conversion, filtering, QA/QC, and indexing for all supported data types; real-time processing of incoming sensor streams.

d) Data Management and System Serving

- **Deployment:** On-premise or hybrid cloud deployment tailored to MMAF and PUSDATIN architecture.
- **Platform Features:** Browser-based UI with RBAC, PostgreSQL/PostGIS integration, full OGC-compliant services (WMS, WFS, WCS), and a REST API for downstream integration.

e) Web-Based Visualization and Decision Support Application

- **Core Features:** Unified 2D/3D views, GPU-accelerated rendering, interactive tools for spatial analysis, alert visualization, and patrol planning.
- **Customizability:** User-configurable layers, thematic maps, styling rules, and low-code support for interface customization.

f) Core Technical Deliverables

1. **Security, Access Control, and Authentication:**
    - Implement Role-Based Access Control (RBAC).
    - Integrate with government's identity provider framework, supporting Single Sign-On (SSO) via **SAML** or **OAuth2**.
    - Secure all APIs with methods like API Key, OAuth2, or JWT, and encrypt via HTTPS.
    - Protect against common vulnerabilities (SQL injection, XSS, etc.).
2. **Platform Architecture and Performance:**
    - Modular, service-oriented architecture (SOA) or microservices.
    - Comprehensive documentation for all reusable services.
    - Support horizontal and vertical scaling.
3. **Geospatial Data Ingestion and Visualization:**
    - Ingest multiple formats including Shapefiles, GeoJSON, KML, and GeoTIFF.
    - Include data integrity checks (validation, cleansing, QC).
    - Provide a file server for UAV/AUV data uploads.
    - Allow client-side customization of UI, layers, and workflows.
4. **System Availability, Operations, and Infrastructure:**
    - High-availability design with redundancy and rapid failover.
    - Incorporate data replication, regular backups, and disaster recovery.
    - Include real-time monitoring, logging, and alerting features.
5. **Deployment Environment and Compliance:**
    - The solution shall be deployed within KKP's designated data centers.
    - All necessary hardware and software (OS, middleware, databases) must be procured and installed by the vendor.
    - Comply with all KKP IT policies and national cybersecurity regulations.

A.2: Task 2 - State-of-the-Art Tools for Data Collection – Data Collection Suite

This task covers the procurement and integration of the AUV fleet and fixed sensor network. Procurement will be based on the following performance-based criteria and cost-optimized specifications.

Specifications	Total

Autonomous Underwater Vehicle Navigation System • Range : 1000m+ • Position Accuracy (5m range) : 0.1m • Position Accuracy (100m range) : 0.5m • Position Accuracy (1000m range) : 5.0mHCC • Velocity Accuracy : 0.01 m/s • Roll and Pitch Accuracy : 0.1° • Heading Accuracy : 0.3° • Integrated GNSS/INS : Yes • Integrated GNSS Antenna : In top of hydrophone array • Pressure Sensor Range : 1000m • Pressure Sensor Accuracy : 1.5m **Include License Software Photogrammetry :** • Software for photogrammetric processing of digital images. • Converts data inputs into 3D spatial data essential for various applications such as GIS, cultural heritage preservation, and visual effects production. • Supports wide range of cameras and laser scanners, allowing to create point clouds, textured models, orthomosaics, and digital surface models. • Advanced features include shadow and texture artifact removal, vegetation index calculation, and point cloud classification. • Has distributed processing capability enables handling of large datasets, either locally across a cluster or in the cloud, offering flexibility and scalability. • Combines digital photogrammetry techniques with computer vision methods, resulting in an automated processing system. • Detailed reports generated after processing provide insights into the quality and integrity of the generated data **Includes services:** • Configuration, test and commissioning • Includes warranty & support for a period of 2 years • Manufacturing limited warranty for 2 years • Onsite Training	**3 Unit**

AUV (Autonomous Underwater Vehicle) • Speed : 1.5knots • Max Range : 1.3 km • Max Endurance : 2 hrs • Depth Rating : 300m • Approximate dimensions : 520 x 264 x 235 mm	**15 Unit**

• Weight : 7.1 kg • Video Resolution : 4K @ 60 FPS • Lighting : 20,000 Lumen *Features:* • Depth & Time: Capable of operating at 300m for ~30 mins • Speed: Capable of capturing survey data at up to 1.5 knots (0.77m/s) Orientation: camera facing down, 10 degree pitch • Capable of transiting at speeds of 2 knots (1m per second) Oreantation: Camera facing down, typical vertical speed: 0.7m/s • Range: Capable of propelling itself 1500m while conducting survey operations • Endurance: Capable of station-keeping for 2.5 hours; and capable of surveying for ~2 hours • Capacity: Capable of Storing more than 2 hours of survey data onboard • Recharge time: Capable of fully charging its battery in less than 3.5 hours Imaging System: Able to capture images with sufficient resolution and illumination to determine heads/tails on a 10 cent coint, from altitude, with no natural light **Includes services:** • Configuration, test and commissioning • Includes warranty & support for a period of 2 years • Manufacturing limited warranty for 2 years • Onsite Training	
AUV (Autonomous Underwater Vehicle) with Sensors • Have a maximum dimension of φ250 mm × 2300 mm. • Capable of operating at a maximum depth of 300 m. • Have an endurance of minimum 12 hours at 3 knots. • Have a maximum speed of 10 knots. • Have a maximum weight of 100 kg. • Use a 3.5 kWh rechargeable battery. • Support a communication range of minimum 2 km using LoRa protocol. • Equipped with a navigation system including GPS, INS, and DVL. **Shore-Based Control System** • The control system shall integrate navigation with GPS, INS, and DVL.	**4 Unit**

• The navigation system shall provide accuracy of up to 2% of traveled distance. • The DVL shall have a maximum effective range of 80 m. **Side-Scan Sonar** • The sonar shall operate at a frequency of 900 kHz. • The sonar shall have a maximum slant range of 75 m at 900 kHz. **Camera** • The system shall include a camera with a resolution of minimum 1920 × 1080 pixels. • Acoustic Beacon • The acoustic beacon shall provide a coverage range of minimum 2 km. **Environmental Sensors** • Include a Dissolved Oxygen sensor. • Include a pH sensor. **Include a CTD sensor:** • Include Conductivity: 0–70 mS/cm • Include Temperature: –2℃ to +35℃ Includes services: • Installation, configuration, test and commissioning • Manufacturing limited warranty for 2 years • Training	

Cross-Cutting Openness & Safeguards (AUV)

Requirement	Minimum Outcome	Verification
E-Waste & Batteries	OEM take-back programme for Li-ion packs; recycling certificate in line with Basel Convention.	Signed commitment letter.

A.3: Task 3 - State-of-the-Art Tools for Data Collection – UAV (Unmanned Aerial Vehicle)

This task covers the procurement of a cost-optimized, civilian-grade VTOL UAV fleet for MPA surveillance and coastal LiDAR mapping.

Specifications	Total
UAV (Unmanned Aerial Vehicle) **Airframe & Propulsion** • Have approximate length of 2000 mm, height of 696 mm. and wingspan of 3744 mm (rear wing) and 2820 mm (front wing). • Made of aviation-grade carbon fiber composites. • The propulsion system shall use a gasoline engine. • The payload capacity shall be a minimum of 18 kg (including payload & gasoline). • The maximum take-off weight shall not exceed 40 kg. • The cruising speed shall be within 22–40 m/s, with a nominal cruising speed of at least 25 m/s. • The fuel consumption shall not exceed 0.96 L/h. • The flight endurance shall be a minimum of 12 hours. • The maximum altitude shall be a minimum of 5000 m. • The operating temperature range shall be -20℃ to +55℃. • The system shall withstand wind resistance of at least level 5 during take-off and level 6 during cruising. • The system shall include the following: • Triple frequency DGPS RTK (L1+L2+B1/B2) with ±2 cm post-processed accuracy • ADS-B (input/output), dual IMUs, redundant autopilot • 24GHz obstacle avoidance micro radar • ASTM F3389-22 parachute with auto-return (low fuel/signal lost) • Real-time DGPS RTK precision landing **EO & IR Camera** • Operate with 12V working voltage. • Support input voltage 3S–6S and output 5V (PWM). • Consume maximum 1600 mA @12V. • Operate in the temperature range of -20℃ to +60℃. • Provide output via Micro-HDMI (1080p30/60fps) and IP (1080p/720p 30/60fps). • Shall support local storage with SD card up to 128GB. • Shall support control by PWM / SBUS / TTL / TCP (IP version). **Gimbal Specs** • Mechanical pitch/tilt: -55° to +130° • Mechanical roll: ±45° • Mechanical yaw/pan: ±300° / ±360°*N (IP/SDI version) • Controllable pitch/tilt: -45° to +90° • Controllable yaw/pan: ±290° / ±360°*N • Stabilization accuracy: ±0.02° (pitch/roll/yaw) • Shall support one-key centering **Camera Sensor** • Sensor: 1/2.8" Sony IMX462LQR CMOS • Resolution: Full HD 1920×1080 • Effective pixels: minimum 2.13 MP	**8 Unit**

• Optical zoom: minimum 40x (F=4.25–170mm) • Digital zoom: up to 32x • Minimum illumination: 0.01 lux (color) • S/N ratio: ≥50 dB **IR Camera** • Type: Uncooled LWIR thermal imager (8–14 μm) • Resolution: minimum 640×512 • Pixel size: 12 μm • NETD: ≤50 mK (@25℃) • Digital zoom: up to 8x • Frame rate: 30 Hz • Detection capability: ≥10 simultaneous targets (car/human) • Detection rate: ≥85%, false alarm ≤10% • Physical • Net weight: maximum 1.04 kg • Dimensions: approx. 118×137×213 mm • Shall include gimbal, mounting hardware, and damping components **LiDAR** • Use Class 1 laser with wavelength 1535 nm. • Have detection range of minimum 10–1000 m @ 80% reflectivity. • Support up to 7 multiple returns. • Have repeatability of 3 mm @100 m. • Provide angular resolution of minimum 0.001°. • Have horizontal accuracy 0.01 m and vertical accuracy 0.02 m after post-processing. • Weight shall not exceed 2.3 kg (including IMU, GNSS, storage, camera). • Dimensions shall not exceed 235×110×131 mm. **Dual Screen Ground Control System** • Shall run on Windows 10/Linux with Intel i7-11 processor, 256 GB SSD, and minimum 8 GB RAM. • Provide dual displays: 15.6" main (1920×1080) and 12.1" secondary (1280×800). • Displays support 10-point multi-touch and brightness of minimum 1000 nits. • Include interfaces: USB 3.0, HDMI, LAN, Audio I/O. • Operate on 177 Wh battery, with operation time of minimum 4 hours. • Weight shall not exceed 8 kg. • Operate in temperature range -10℃ to +60℃. • Provide 18 control channels, dual joysticks, rocker, switches, and knobs. • Shall include expansion space (140×70×27 mm) with multiple ports (RS232, USB, RJ45). Includes services: • Installation, configuration, test and commissioning	

• Manufacturing limited warranty for 2 years • Training	

4. Cyber- & Wildlife Safeguards

- Jetson Orin Nano edge computer redacts PII pre-down-link
- AES-256 encrypted storage
- Wildlife SOP: climb to ≥ 120 m AGL when seabird proximity < 50 m
- OEM Li-ion take-back program

Performance-Based Criteria (UAV)

Domain	Minimum Performance Outcome	Verification Method
Endurance & Range	≥ 2.5 h continuous survey flight while carrying a 5–10 kg mapping payload at 100 – 120 km h^{-1}.	Flight log replay & fuel/battery telemetry.
LiDAR Productivity	Acquire ≥ 80 points m^{-2} and ≤ 3 cm RMS vertical accuracy at 200 m AGL over ≥ 200 line-km in a single sortie.	Test flight point-cloud + ASPRS report.
EO/IR Surveillance	Continuous HD daylight video (≥ 1080 p) with 20× optical zoom and thermal imaging ≥ 640 × 512, object-tracking CEP ≤ 15 m.	Gimbal spec sheets + live demonstration.
Wildlife Safeguard Logic	Autonomous climb to ≥ 120 m AGL within 5 s when bird proximity sensor (< 50 m) triggers; event must be logged.	Scenario simulation in FAT.

World Bank Compliance Specifications:

- Maximum Operational Range: 50 kilometers (civilian-grade limitation per World Bank OP 7.50)
- Maximum Operating Altitude: 3,500 meters AGL (civilian aviation compliance)
- Maximum Payload Capacity: 55 kilograms MTOW (civilian UAS classification)
- Communication Systems: Commercial frequencies only, no military communication protocols
- Navigation Systems: Civilian GPS and commercial inertial navigation only
- Data Transmission: Commercial encryption standards (AES-256), no military-grade secure communication
- End-Use Restriction: Environmental monitoring and marine conservation only, explicit exclusion of military applications

Vendor Certification Requirements:

- Civilian-grade classification certificate from manufacturer

- Export control compliance documentation
- Indonesian DGCA civilian drone regulation compliance
- End-user agreement for scientific research use only

A.4: Task 4 – On-Premise Hyper-Converged Infrastructure (HCI)

Resilient Infrastructure Design Principles

The design and deployment of the HCI and supporting infrastructure shall adhere to the following core principles to ensure long-term operational excellence:

- **Comprehensive Cybersecurity:** A defense-in-depth cybersecurity framework, aligned with **BSSN guidelines**, must be implemented. This includes multi-layer security, end-to-end AES-256 encryption for all data, real-time intrusion detection/prevention, and edge computing capabilities to reduce the attack surface and improve response times.

HCI and Server Infrastructure

Item	Description	Total
Hyperconverged Infrastructure – Storage Node	min raw capacity 245 TB mirroring; 2x Intel Xeon Gold 2.8GHz, 16C; 256GB RAM; 2x 960GB NVMe RAID1; 8x 7.68TB SSDs; 2x 2 ports 25GbE	4 Unit
Hyperconverged Infrastructure – Compute Node Type 1	2x Intel Xeon Platinum 2.8 GHz, 32C; 1024 GB RAM; 2x 960 GB NVMe RAID1; 2x 2 ports 25GbE; 1x 2 ports 32Gb FC HBA	12 Unit
Hyperconverged Infrastructure – Compute Node Type 2	2x Intel Xeon Gold 2.8 GHz, 16C; 256 GB RAM; 2x 960 GB NVMe RAID1; 2x 2 ports 25GbE; 1x 2 ports 32Gb FC HBA	4 Unit
Hyperconverged Infrastructure – Management Cluster	2x Intel Xeon Gold 2.8 GHz, 16C; 512 GB RAM; 5x 1.92 TB SSDs; 2x 960 GB NVMe RAID1; 3x 2 ports 25GbE	3 Unit
Enterprise NAS Storage	min NVMe usable 135 TiB; min HDD usable 485 TiB; 2x 25GbE + 2x 100GbE ports; NFS/SMB/S3/HDFS support	2 Unit
Object Storage	min usable 1,040 TiB; S3/NFSv3 support; HA front/back-end switches	1 Unit
AI Server	2x Intel Xeon Platinum 1.9G, 64C; 2,048GB RAM; 8x 7.68TB NVMe; min 8x NVIDIA HGX H200 8-GPU SXM 141GB	1 Unit
Backup Server	2U, 2x Intel Xeon Gold 2.9G, 24C, 256GB RAM	1 Unit

Backup Storage	min usable 120 TB appliance	1 Unit
Workstation	Intel i9-13950HX or better; 64GB RAM; NVIDIA RTX 5000 Ada series; 512GB + 1TB NVMe SSDs	6 Unit

Networking and Security Infrastructure

Item	Description	Total
Core Switch	1U, min 32x 400GbE QSFP-56DD ports	2 Unit
Internet Switch	1U, min 48x 25GbE SFP28, 4x 100GbE QSFP28 ports	4 Unit
WAN Switch	1U, min 48x 25GbE SFP28, 4x 100GbE QSFP28 ports	4 Unit
Spine Switch	1U, min 32x 100GbE QSFP28 ports	2 Unit
Leaf Switch	1U, min 48x 25GbE SFP28, 4x 100GbE QSFP28 ports	4 Unit
Management Switch	1U, min 48x 1GbE BaseT, 4x 10GbE SFP+ ports	2 Unit
Border Switch	1U, min 24x 25GbE SFP28, 4x 100GbE QSFP28 ports	2 Unit
Internet Router	1U, 1G/10G flexible interfaces, Inline hardware-accelerated encryption	2 Unit
WAN Router	1U, 1G/10G flexible interfaces, Inline hardware-accelerated encryption	2 Unit
Load Balancer WAF	100 Gbps L4 Throughput; OWASP Top 10 protection	2 Unit
NGFW (Server Farm)	High-performance firewalls with threat protection and VPN	2 Unit
NGFW (Perimeter)	High-performance firewalls with threat protection and VPN	2 Unit
NGFW (Management)	High-performance firewalls with threat protection and VPN	2 Unit
CRS Firewall	18x GE RJ45, 8x GE SFP, 4x 10GE SFP+ slots	2 Unit

Platform and Software Infrastructure

Item	Description	Total
Platform for Containerized Applications	Subscription for self-managed OpenShift on bare-metal servers, Premium 24x7 support	12 Unit
Platform for Managing AI and Machine Learning	Subscription for self-managed OpenShift AI, Premium 24x7 support	1 Unit
AI Accelerator Software Support	Support for NVIDIA Hopper or newer architecture AI accelerators	1 Unit
Operating System	Enterprise grade Linux OS with management/automation tools, Premium 24/7 Support	1 Unit

A.5: Task 5 – Historical Data Integration and Baseline Enhancement

A.5.1 Comprehensive Historical Data Integration Workflow

The Service Provider shall implement a phased systematic approach to historical data integration following international best practices for marine data archaeology and baseline establishment:

Phase 1: Data Discovery and Inventory (Months 1-2)

- **Comprehensive Data Audit:**
  - Survey of all KKP databases, archives, and legacy systems
  - Identification of university research datasets and collaborative programs
  - Traditional ecological knowledge documentation from local communities
  - Private sector data availability assessment (tourism, fishing industry)
- **Data Cataloging and Prioritization:**
  - Metadata creation following ISO 19115 geographic information standards
  - Data quality assessment using FAIR (Findable, Accessible, Interoperable, Reusable) principles
  - Temporal coverage analysis identifying data gaps and overlaps
  - Spatial coverage mapping with resolution and accuracy assessment
  - Priority ranking based on scientific value and integration feasibility

Phase 2: Data Digitization and Quality Control (Months 3-4)

Digitization Procedures:
High-resolution scanning of paper records and charts (minimum 600 DPI)
Optical Character Recognition (OCR) with manual verification for critical data
Legacy database migration with format conversion and validation
Georeferencing of historical maps and survey data with ±10-meter accuracy
Metadata preservation including data lineage and uncertainty quantification
Quality Control and Validation:

- Statistical outlier detection and expert review procedures
- Cross-validation between multiple data sources and time periods
- Uncertainty quantification and confidence interval establishment
- Data completeness assessment with gap identification and documentation
- Quality metrics: ≥95% data accuracy, ≥90% completeness for priority datasets

Phase 3: Integration and Baseline Establishment (Months 5-6)

- **Data Integration and Harmonization:**
  - Standardization of units, coordinate systems, and temporal references
  - Gap-filling using statistical interpolation and machine learning techniques
  - Multi-source data fusion with uncertainty propagation
  - Time series analysis and trend detection using robust statistical methods
  - Spatial interpolation and gridding for continuous coverage
- **Scientific Baseline Establishment:**
  - 10-year historical trend analysis for key ecological and environmental indicators
  - Reference condition establishment for pristine or minimally impacted areas
  - Natural variability quantification and seasonal pattern identification
  - Climate change signal detection and attribution analysis
  - Ecosystem service baseline valuation for SEEA-EA compliance

A.5.2 Data Quality Standards and Validation Procedures

All historical data integration shall meet the following quality standards:

Data Accuracy and Precision:

- Spatial Accuracy: ≤50-meter horizontal accuracy for georeferenced data
- Temporal Accuracy: ≤1-day precision for time-stamped observations
- Measurement Accuracy: Within ±10% of original measurement uncertainty
- Metadata Completeness: 100% completion of mandatory metadata fields

Validation and Verification:

- Expert Review: Independent validation by subject matter experts
- Cross-Validation: Comparison with contemporary data sources where available
- Statistical Validation: Outlier detection and trend analysis validation
- Community Validation: Local knowledge verification for traditional ecological data

Documentation and Traceability:

- Data Lineage: Complete documentation of data sources and processing steps
- Uncertainty Quantification: Statistical uncertainty estimates for all derived products
- Version Control: Comprehensive versioning with change documentation
- Access Control: Role-based access with audit trail for data modifications

A.6: Task 6 - Intelligent EVIKA Automation and SEEA-EA Compliance Platform

A.6.1 Automated EVIKA Assessment Workflow

The Service Provider shall implement a fully automated EVIKA assessment system providing real-time management effectiveness scoring:

Legal and Regulatory Requirements Business Function Requirements

Legal and Regulatory Compliance Requirements (World Bank OP 7.50 and 7.60)*:* The deployment of the OMS shall fully comply with World Bank Operational Policy 7.50 regarding projects on international waterways through the following measures:

Equipment Category	Compliance Requirement	Verification Method
UAV Systems	Civilian-grade specifications only; operational range ≤50km; altitude ≤3,500m AGL	Technical specification review; vendor certification; flight testing verification
AUV Systems	Scientific research classification; depth limitations appropriate for civilian use; commercial navigation systems only	Pressure testing certification; navigation system verification; civilian-grade component documentation
Sensor Systems	Environmental monitoring applications only; commercial-grade specifications; no military sensing capabilities	Sensor calibration certificates; application-specific testing; frequency limitation verification
Communication Systems	Commercial encryption standards; scientific research frequencies; no military communication protocols	Frequency allocation documentation; encryption standard verification; communication protocol testing

In accordance with OP 7.60, all equipment procurement avoids any specifications that could be classified as military or dual-use technology through:

Technical Specification Limitations	Explicit restrictions on capabilities that could trigger dual-use classification
Vendor Pre-Qualification	Requirements for civilian-grade certification and export control compliance. Please see section E.2.1 of the Technical Specifications document for further detail.
Documentation Requirements	Comprehensive compliance documentation for all advanced equipment. Please see section E.2.2 for further detail
Regulatory Approval	Pre-approval from relevant Indonesian authorities for advanced monitoring systems

Real-Time Data Integration:

- Automated Data Ingestion: Direct integration with all OMS data sources (AUVs, UAVs, sensors)
- Multi-Source Fusion: Integration of field observations, remote sensing, and administrative data
- Quality Assurance: Automated data validation and quality control with anomaly detection
- Temporal Synchronization: Time-stamped data alignment for consistent temporal analysis
- Spatial Registration: Automated georeferencing and spatial alignment of all data sources

23-Indicator Calculation Engine:

- **Context Indicators (6 indicators):**
  - Automated threat assessment using available or future satellite imagery and vessel tracking
  - Socioeconomic data integration from census and survey data
  - Stakeholder engagement metrics from consultation databases
  - Legal framework assessment from regulatory compliance monitoring
  - Climate vulnerability assessment from environmental data
- **Planning Indicators (4 indicators):**
  - Management plan currency and implementation tracking
  - Objective setting and target achievement monitoring
  - Resource allocation efficiency analysis
  - Adaptive management implementation assessment
- **Input Indicators (6 indicators):**
  - Staff capacity and training level assessment
  - Infrastructure adequacy and utilization monitoring
  - Equipment availability and operational status tracking
  - Budget allocation and expenditure analysis
  - Research and monitoring program evaluation
  - Community engagement and participation metrics
- **Process Indicators (4 indicators):**
  - Management action implementation tracking
  - Enforcement activity monitoring and effectiveness
  - Research and monitoring execution assessment
  - Stakeholder engagement process evaluation
- **Output Indicators (3 indicators):**
  - Conservation outcome achievement measurement
  - Sustainable use target attainment
  - Ecosystem service delivery assessment

Machine Learning Validation and Calibration:

- Training Dataset: Historical EVIKA assessments with expert validation
- Model Validation: Cross-validation with manual assessments achieving ≥95% accuracy
- Continuous Learning: Adaptive algorithms improving accuracy over time
- Expert Review: Regular validation by EVIKA-certified assessors

- Bias Detection: Automated detection and correction of systematic biases

A.6.2 Real-Time Monitoring and Alert Systems

Automated monitoring and alert generation for proactive management:

Threshold Monitoring:

- Performance Thresholds: Automated monitoring of key performance indicators
- Trend Analysis: Statistical trend detection with early warning capabilities
- Anomaly Detection: Machine learning algorithms identifying unusual patterns
- Predictive Alerts: Forecasting potential management effectiveness declines
- Escalation Procedures: Automated alert routing based on severity and urgency

Alert Generation and Communication:

- Real-Time Alerts: Immediate notification of critical threshold breaches
- Daily Summaries: Automated daily performance summaries for management teams
- Weekly Reports: Comprehensive weekly EVIKA score updates with trend analysis
- Monthly Scorecards: Detailed monthly management effectiveness assessments
- Annual Reports: Comprehensive annual EVIKA evaluation with recommendations

Dashboard and Visualization:

- Real-Time Dashboard: Live EVIKA scores with traffic light indicators
- Trend Visualization: Historical trends and projections with confidence intervals
- Comparative Analysis: Benchmarking against other MPAs and international standards
- Interactive Maps: Spatial visualization of management effectiveness across MPA networks
- Mobile Access: Responsive design for field staff and mobile device access

A.6.3 SEEA-EA Compliance and Natural Capital Accounting

Automated ecosystem accounting following UN SEEA-EA standards:

Ecosystem Asset Accounting:

- Habitat Mapping: Automated habitat classification and extent measurement
- Condition Assessment: Ecosystem health indicators and condition scoring
- Asset Valuation: Natural capital valuation using standardized methodologies
- Change Detection: Temporal analysis of ecosystem asset changes
- Uncertainty Quantification: Statistical uncertainty estimates for all accounts

Ecosystem Service Flow Accounting:

- Service Identification: Automated identification and quantification of ecosystem services
- Beneficiary Analysis: Spatial analysis of ecosystem service beneficiaries
- Economic Valuation: Monetary valuation using replacement cost and market pricing
- Flow Mapping: Spatial mapping of ecosystem service flows and dependencies

- Temporal Analysis: Time series analysis of ecosystem service provision

Integration with Economic Accounts:

- GDP Integration: Contribution of marine ecosystems to national economic accounts
- Blue Economy Metrics: Quantification of blue economy sector contributions
- Natural Capital Depreciation: Assessment of natural capital depletion and degradation
- Investment Tracking: Monitoring of conservation and restoration investments
- Policy Impact Assessment: Economic impact analysis of management interventions

A.6.4 Performance Validation and Quality Assurance

Comprehensive validation framework ensuring accuracy and reliability:

Validation Methodology:

- Expert Comparison: Regular comparison with manual EVIKA assessments by certified experts
- Cross-Validation: Validation against independent data sources and assessments
- Sensitivity Analysis: Testing of algorithm sensitivity to input data variations
- Uncertainty Analysis: Quantification of uncertainty in automated assessments
- Bias Testing: Regular testing for systematic biases and correction procedures

Quality Metrics and Standards:

- Accuracy Target: ≥95% agreement with expert manual assessments
- Precision Target: ≤5% coefficient of variation for repeated assessments
- Completeness Target: ≥90% data completeness for all 23 indicators
- Timeliness Target: Real-time processing with ≤1-hour delay for alert generation
- Reliability Target: ≥99% system uptime with automated failover capabilities

Continuous Improvement:

- Algorithm Updates: Regular updates based on new data and validation results
- Expert Feedback: Integration of expert feedback for algorithm refinement
- Performance Monitoring: Continuous monitoring of algorithm performance metrics
- Calibration Procedures: Regular recalibration based on validation results
- Documentation Updates: Maintenance of comprehensive algorithm documentation

Appendix B: Supporting Frameworks

B.1: Risk Management Framework (Summary)

Risk Category	Key Risks	Proposed Mitigation Measures
Technical	Integration failure across platforms and hardware	Establish standard protocols (APIs); deploy modular design; phased pilot testing.
Operational	Limited site-level capacity to manage technology	Targeted training for UPT staff; embed SOPs; include 12-month support services.
Procurement	Delays in tendering and delivery	Bundle procurement into lots; allow multiple vendors; use performance-based specs.
Institutional	Fragmented coordination and limited buy-in	Form dedicated OMS Steering Committee with representatives from all key directorates.
Data Governance	Non-compliance with data security/privacy regulations	Host within KKP data centers (on-premise); follow BSSN/Kominfo standards; RBAC.
Sustainability	Insufficient budget for long-term operations	Include OMS costs in KKP's medium-term expenditure planning; explore blended finance.
Military/Dual-Use	• Equipment classified as military-grade or dual-use technology; • World Bank OP 7.50/7.60 violations; • Indonesian Ministry of Defense clearance issues; • Export control restrictions | Comprehensive Compliance Framework	• Strict civilian-grade specifications with explicit operational limitations (UAV range ≤50km, altitude ≤3,500m AGL, payload ≤55kg) • Pre-procurement compliance assessment against World Bank OP 7.50 and OP 7.60 • Formal coordination with Indonesian Ministry of Defense for dual-use technology clearance • Vendor certification requirements for civilian-grade classification • Export control compliance documentation for all advanced equipment • Technical specifications explicitly excluding military-grade features • Regular compliance monitoring and reporting throughout implementation
Financial & Fiduciary Risk	Misuse of funds; payment for non-performing or un-adopted systems ("shelf-ware").	**Back-loaded, Milestone-Based Reimbursement:** 60% of the total budget is back-loaded for the final national scale-up, payable only after the successful validation

Risk Category	Key Risks	Proposed Mitigation Measures
		of the pilot project. **Performance-Based Procurement:** Bids are evaluated on demonstrated outcomes, not just delivery of components. **Rigorous Pilot Validation:** The Phase 1B gateway ensures the integrated system is proven to work before major national scale-up funding is released.

B.2: Governance and Institutional Arrangements

- **Lead Executing Agency: Directorate General of Marine Spatial Planning (DG MSP)** - Program oversight, technical leadership, alignment with national goals.
- **Technical Implementation Unit: PUSDATIN (Center for Data and Information)** - Hosts infrastructure, ensures data standardization, security, and integration.
- **Site-Level Partners: UPT Kawasan Konservasi (MPA Field Units)** - Responsible for field deployment, ground-truthing, and use of OMS for site-level management.
- **Coordination Mechanism: OMS Project Steering Committee** - To review milestones, coordinate across directorates, and oversee risk management.

Capacity Building and Knowledge Transfer Framework

To ensure long-term sustainability and full KKP ownership of the OMS, the vendor is required to deliver a structured, multi-level training program. This program must be designed to build capacity across all relevant levels of the organization. The summary of the required training modules is as follows:

Training Level	Target Audience (Illustrative)	Core Focus & Objectives
Executive	DG-level Leadership (Eselon I), Directors (Eselon II)	**Strategic Decision Support:** Understanding the OMS's strategic value, interpreting executive dashboards for policy-making, and communicating project impacts.
Management	PUSDATIN & UPT Management (Eselon III/IV), Team Leaders	**Operational Management:** Managing OMS-related workflows, allocating resources, interpreting analytical outputs for MPA management, and team leadership.
Technical	PUSDATIN technical staff, Data Analysts, System Administrators	**Hands-On System Mastery:** In-depth training on HCI administration, database management, data processing, advanced analytics, and Level 2 troubleshooting.
Field	UPT Field Staff,	**Operational Field Competency:** Safe

	Rangers, Boat Operators	deployment, operation, and recovery of AUVs/UAVs; field data collection protocols; basic equipment maintenance (Level 1).

B.3: Detailed Monitoring & Evaluation (M&E) Framework

This appendix provides the detailed Key Performance Indicators (KPIs) that will be used to monitor the Service Provider 's performance throughout the project lifecycle, particularly during the critical Pilot Phase (Phase 1B). The achievement of these targets provides the primary evidence base for assessing the success criteria for Governance Gate 2, as outlined in Appendix K.

KPI Category	Key Performance Indicator (KPI)	Definition & Measurement	Performance Target (End of Phase 1B)	Link to NOL Gate 2 Criteria (Appendix K)
Strategic	**1. MPA Management Effectiveness**	Percentage improvement in EVIKA scores in the two pilot MPAs, facilitated by OMS-generated data. Measured via KKP's annual EVIKA assessment.	Achieve a documented trajectory toward moving EVIKA scores from Bronze/Silver to Gold readiness.	2.8 (UAT Sign-Off) `2.9` (KKP Operational Independence)
	2. Data-Driven Decision Making	Percentage of significant MPA management decisions (e.g., patrol plans, zoning adjustments) that are demonstrably supported by OMS data and analytics. Measured via management decision logs and reports.	≥ 75% of key management decisions are supported by OMS data.	2.8 (UAT Sign-Off) `2.9` (KKP Operational Independence)
Operational	**3. System Availability**	Overall uptime and availability of the integrated	≥ 99.5% system availability demonstrated	2.1 (System Availability)

		OMS platform, including the HCI, core software, and network infrastructure. Measured via automated monitoring tools.	over a continuous 3-month period.	
	4. Data Quality & Accuracy	Accuracy and completeness of data generated by the OMS (e.g., automated analysis of coral cover). Measured by comparing OMS outputs against manually verified ground-truth data.	≥ 95% data accuracy for core analytical modules.	2.2 (Data Accuracy)
	5. Equipment Operational Performance	Operational availability of the deployed AUV and UAV fleet, calculated as (Total Successful Mission Hours / Total Planned Mission Hours). Measured via mission and maintenance logs.	≥ 90% operational availability across the fleet.	2.3 (Equipment Operational Availability)
Institutional	**6. Staff Competency & Certification**	Percentage of designated KKP staff (technical and field) who have successfully completed the required training	≥ 95% certification rate for all designated staff.	2.7 (Training Program Completion)

		modules and achieved formal certification.		
	7. Knowledge Transfer Effectiveness	Demonstrated ability of KKP staff to operate the system independently. Measured via an Observed Performance Assessment where KKP staff plan and execute a full mission cycle without vendor intervention.	100% successful completion of the observed independent mission.	2.9 (KKP Operational Independence)
	8. Stakeholder Satisfaction	Satisfaction level among key user groups (UPT managers, PUSDATIN staff) with the system's functionality, usability, and support. Measured via structured surveys and feedback sessions.	Achieve an average satisfaction score of ≥ 4.0 out of 5.0.	2.8 (UAT Sign-Off)

B.4: Justification for Pilot Site Selection

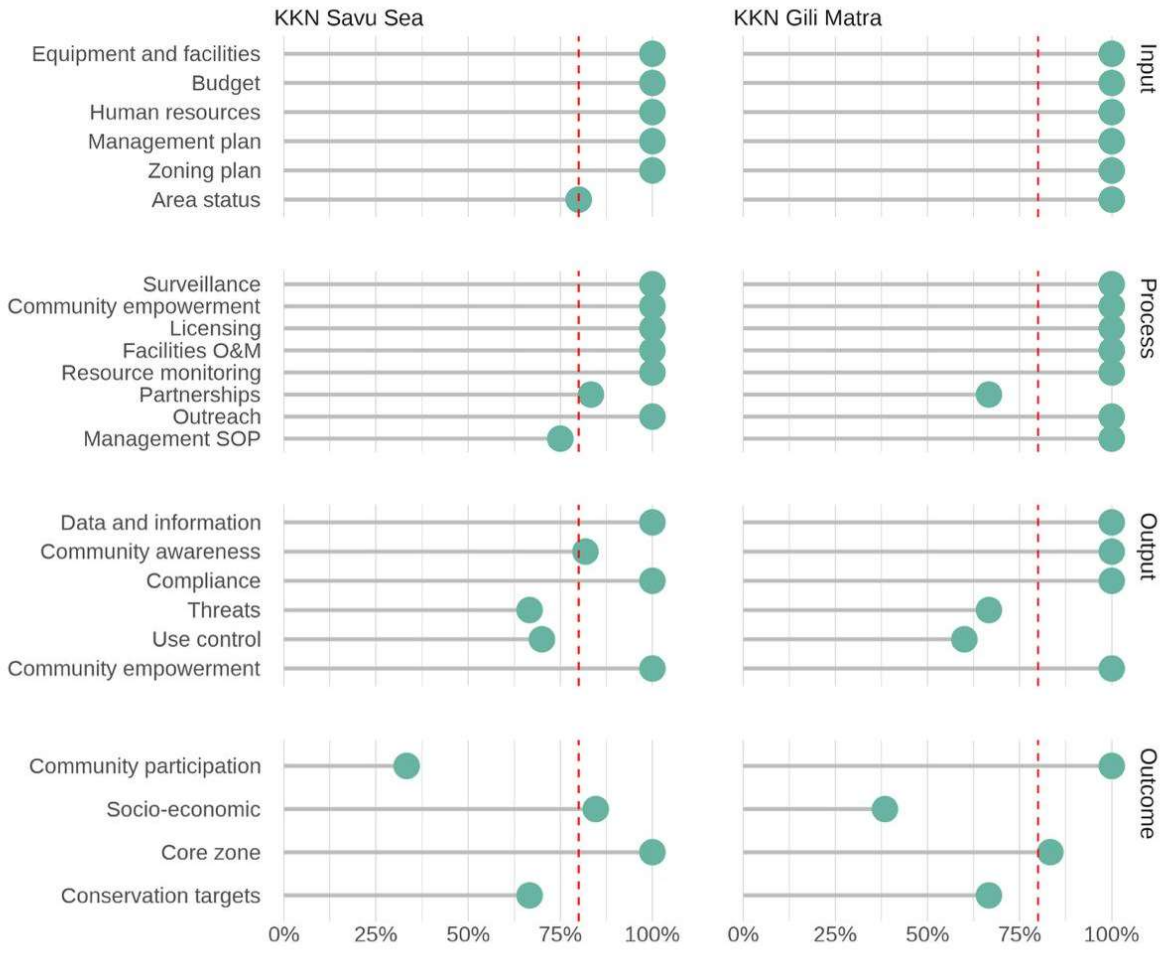
- **Gili Matra MPA:** chosen as a "low-complexity, high-visibility" site. Its small size (2,274 ha), high accessibility, and reliable connectivity offer an ideal environment for initial deployment, equipment calibration, and user training.
- **Sawu Sea MPA:** chosen as a "high-impact, high-challenge" site. Its massive size (3.5 million ha) and remote, multi-district geography provide a robust testbed for system scalability, satellite data links, and complex operational logistics.

B.5: EVIKA Status of LAUTRA MPAs and Detailed Status of Pilot Site

Status of LAUTRA MPA Sites in 2024 as Evidence of Progress towards Achievement of PDO Indicator 1. Bronze EVIKA rating: <50%; Silver EVIKA rating: 50% - 85%; Gold EVIKA rating: >85%.

No.	MPA	Area (ha)	2022 EVIKA Score	2023 EVIKA Score (%)	2024 EVIKA Score (%)
1	KKN Gili Matra	2,268.58	82.00	88.71	89.75
2	KKN Laut SAWU	3,355,352.82	75.00	88.52	92.26
3	KKD Selat Pantar (Alor)	276,693.38	82.00	88.20	92.95
4	KKN Laut Sulawesi Bagian Utara (Proposed)	697,000.00	N/A	N/A	N/A
5	KKPD Teluk Gorontalo	76,529.35			39,97
6	KKPD Benggai Dalaka	856,649.13	55.00	68.00	53,49
7	KKPD Teluk Moramo	21,902.34	39.00	49.00	56.00
8	KKN Kapoposang	49,923.55	68.00	85.27	89.27
9	KKN Laut Banda	2,501.98	65.00	74.00	79.04
10	KKN Aru Tenggara	94,874.14	59.00	72.00	70.15
11	KKPD Pulau Kei Kecil	150,000.00	62.00	74.00	71.58
12	KKPD Babar (Proposed)	371,837.79	N/A	N/A	13.43
13	KKPD Wetar (Proposed)	350,000.00	N/A	N/A	N/A
14	KKPD Buru Selatan (Proposed)	87,774.17	N/A	N/A	N/A
15	KKPD Buru (Proposed)	112,068.96	N/A	N/A	N/A
16	KKPD Pulau Mare	7,060.87	67.00	63.00	66.73
17	KKN Kepulauan Raja Ampat	57,875.76	81.00	86.76	85.42
18	KKN Kepulauan Waigeo Sebelah Barat	267,209.18	73.00	85.00	88.69
19	KKPD Kepulauan Raja Ampat	1,348,459.47	88.00	92.00	88.69
20	KKN Padaido	177,411.35			85.81

Status of EVIKA Indicators for the Two Target Pilot MPAs According to the 2024 DaEVIKA Assessment. Red line indicates the 80% Threshold for EVIKA Gold Status.



B.6: OMS Generated Data & EVIKA Alignment

EVIKA Domain	OMS Data Type	Primary Data Source
Legal & Institutional	Geospatial zoning data, institutional roles	Digital Twin & Spatial Platform
Surveillance & Enforcement	Real-time patrol tracking, vessel detection logs	Drones, AIS data, Command Center
Biodiversity & Ecosystem Health	Coral health, seagrass/mangrove extent	AUVs, ROVs, underwater sensors
Fisheries Management	Catch reports, fishing effort data	Mobile apps, VMS
Monitoring & Research	Sensor logs (temp, pH), acoustic logs	Sensor packages, habitat models
Sustainable Financing	Carbon stock metrics, valuation	Carbon Monitoring Module

EVIKA Domain	OMS Data Type	Primary Data Source
	data	
Stakeholder Engagement	Training logs, participatory monitoring inputs	Community platforms, OMS dashboard

B.7: World Bank Environmental and Social Safeguards (ESS) Compliance

The project will maintain strict compliance with all World Bank ESS policies.

World Bank ESS	OMS Implementation Measures
ESS1: Assessment	Comprehensive ESIA completed for all sites.
ESS2: Labor	Service Provider compliance with Indonesian labor laws and worker safety protocols.
ESS3: Resource Efficiency	Low-impact deployment methods; battery recycling programs (Basel Convention compliant).
ESS4: Community Safety	Navigation safety protocols; drone safety management plan; privacy protection framework.
ESS6: Biodiversity	System designed to support conservation; AUV acoustic output < 140 dB; lighting IEC 62471 G1; drone wildlife "dark-zone" logic.
ESS7: Indigenous Peoples	Free, prior, and informed consent (FPIC) processes; integration of traditional knowledge.
ESS8: Cultural Heritage	Cultural heritage screening; protection of traditional use areas.
World Bank OP 7.50/7.60 Compliance	Comprehensive pre-procurement compliance assessment; civilian-grade equipment specifications only; formal coordination with Indonesian Ministry of Defense; vendor certification for civilian use only; ongoing compliance monitoring and reporting
Dual-Use Technology Risk Management	Technical specification limitations to ensure civilian-grade classification; export control compliance documentation; end-user agreements excluding military applications; regular equipment performance verification against civilian parameters.

Appendix C: Data Storage and Compute Infrastructure Justification

C.1: 3-Year Data Storage Forecast

A detailed forecast based on the planned fleet of AUVs and UAVs reveals the following storage requirements over three years.

- **AUV Data Generation (3 Years):** Based on AUVs operating 200 days/year, each collecting imagery and 2K video for 2 hours per mission, the projected data volume is **1.29 Petabytes (PB)**.
- **UAV Data Generation (3 Years):** Based on UAVs operating 250 days/year, each collecting LiDAR and camera data for 6 hours per mission, the projected data volume is **0.21 PB**.
- **Combined Total Data Generation (3 Years):** 1.29 PB + 0.21 PB = **1.50 PB**.

The procured HCI infrastructure provides a total usable capacity of **1.82 PB** (1,820 TiB), including 1.04 PB of object storage for long-term archiving. This ensures the system has sufficient capacity to handle the projected data growth for the initial 3-year period. The HCI architecture is designed to be easily scalable, allowing for the addition of further storage nodes to accommodate projected growth towards a 10-year data volume of approximately 6 PB.

C.2: Compute Infrastructure Overview

The specified compute infrastructure is designed to handle the demanding workloads of the OMS.

- **Total Compute Power:** The data center will deliver **1,168 CPU cores** and **17,152 GB (17.1 TB) of RAM**.
- **OpenShift Container Platform Nodes (12 Units):** Provide the primary muscle for data processing, analytics, and serving the geospatial platform to hundreds of concurrent users.
- **Dedicated AI/ML Server (1 Unit):** Equipped with **8x NVIDIA H200 GPUs**, this server is essential for training and running the AI models for threat detection, coral bleaching analysis, and other predictive analytics.
- **Management & Backup Nodes:** Ensure system resilience, high availability (>99% uptime), and data protection, fulfilling key performance indicators.

This comprehensive infrastructure provides the necessary power, resilience, and scalability to support the entire OMS ecosystem, from real-time data ingestion to complex AI-driven modeling.

Appendix D: Enhanced Standard Operating Procedures Framework

D.1 Civilian-Grade Equipment Deployment Protocols

D.1.1 Autonomous Underwater Vehicle (AUV) Deployment Specifications

The Ocean Monitoring System utilizes civilian-grade autonomous underwater vehicles designed specifically for marine research and environmental monitoring applications. All AUV systems comply with International Maritime Organization (IMO) guidelines for civilian marine vehicles and Indonesian Ministry of Transportation regulations for unmanned marine systems.

Primary AUV Navigation Systems

- **Capabilities:** Technical specifications ensure civilian-grade capabilities suitable for marine protected area monitoring while maintaining compatibility with existing Indonesian marine traffic management systems.
- **Operating Depth:** Maximum operating depth of 200 meters ensures operation within continental shelf areas without requiring military-grade pressure vessels or navigation systems.
- **Propulsion:** Systems utilize commercial electric thrusters with a maximum speed of 4 knots, well below military vehicle capabilities while providing sufficient performance for comprehensive marine surveys.
- **Battery & Endurance:** Systems provide 8-12 hour operational endurance using commercial lithium-ion technology with integrated safety systems preventing thermal runaway and ensuring safe recovery.
- **Navigation:** Systems integrate civilian GPS, commercial inertial navigation units, and acoustic positioning beacons operating on frequencies allocated for scientific research. Navigation accuracy of ±2 meters horizontal and ±0.5 meters vertical meets scientific monitoring requirements while utilizing only civilian-grade positioning technology.
- **Payload Capacity:** 30 kilograms capacity accommodates comprehensive environmental monitoring equipment including water quality sensors, acoustic monitoring systems, and optical imaging equipment. Payload bay dimensions of 60cm x 40cm x 30cm provide flexibility for different sensor configurations.
- **Communication:** Systems utilize commercial satellite communication and VHF radio systems on scientific research frequencies. Data transmission rates of 1-10 Mbps enable real-time monitoring using civilian communication protocols and encryption standards.

Smaller AUV Systems

- **Capabilities:** Compact AUV systems provide distributed monitoring with simplified civilian-grade specifications optimized for routine environmental monitoring.
- **Operating Depth:** Maximum operating depth of 100 meters ensures operation in nearshore environments without specialized pressure-resistant components.
- **Propulsion:** Commercial electric motors with a maximum speed of 2 knots provide efficient survey capabilities while maintaining low acoustic signatures that minimize marine wildlife disturbance.
- **Battery & Endurance:** 4-6 hours of endurance enables comprehensive survey missions using standard commercial battery technology.

- **Sensors:** Commercial water quality sensors measure temperature (±0.1°C), salinity (±0.01 PSU), dissolved oxygen (±2%), pH (±0.1 units), and turbidity (±5%).
- **Data Storage:** 32 GB capacity using commercial solid-state storage. Data compression algorithms reduce storage requirements while maintaining data quality.
- **Recovery Systems:** Commercial acoustic pingers (37.5 kHz) and emergency flotation systems ensure equipment retrieval using only civilian marine safety technology.

D.1.2 Unmanned Aerial Vehicle (UAV) Privacy-Protected Deployment

UAV systems incorporate comprehensive privacy protection measures ensuring community acceptance. All operations comply with Indonesian Civil Aviation Authority (DGCA) regulations and World Bank guidance.

Enhanced UAV Systems

- **Classification:** Civilian-grade specifications ensure compliance with Indonesian aviation regulations. Maximum takeoff weight of 140 kg places systems within civilian drone categories.
- **Flight Performance:** Maximum altitude of 5,000 meters and maximum speed of 162 km/h. Flight endurance of 8 hours enables extensive marine surveys.

Privacy Protection Systems

- **Geofencing:** Automated no-fly zones within 500 meters of residential areas, schools, religious sites, and other sensitive locations.
- **Facial Recognition Blocking:** Real-time system automatically detects and blurs human faces in all imagery (99.5% accuracy) before storage or transmission.
- **Privacy Zone Detection:** Machine learning algorithms identify populated areas and private property, triggering flight path modifications to maintain a minimum 300-meter distance.
- **Community Notification:** 48-hour advance notice of all planned UAV operations via SMS, bulletin boards, and traditional authorities.

Camera and Sensor Specifications

- **Electro-optical Camera:** Civilian 4K resolution sensors with maximum 30x optical zoom.
- **Thermal Infrared Sensor:** 640x480 resolution with temperature accuracy of ±2°C.
- **Object Tracking:** Commercial computer vision algorithms for marine species and vessels, respecting privacy protocols.
- **LiDAR:** Maximum range of 1,800 meters and point density of 80 points/m² at 200-meter altitude for detailed mapping.

Acoustic Emission Standards

- **Noise Levels:** Maximum acoustic levels of 65 dB at a 100-meter distance during normal operations.
- **Propulsion:** Commercial electric motors with noise-optimized propeller designs to reduce acoustic signatures.

D.1.3 Sensor Package Deployment and Calibration

Environmental sensor packages provide comprehensive monitoring using civilian-grade instrumentation.

Multi-Parameter Water Quality Sensors

- **Temperature:** Accuracy of ±0.1°C and resolution of 0.01°C.
- **Conductivity (Salinity):** Accuracy of ±0.01 PSU and resolution of 0.001 PSU.
- **Dissolved Oxygen:** Optical measurement with accuracy of ±2% of saturation.
- **pH:** Commercial glass electrode with accuracy of ±0.1 pH units.
- **Turbidity:** Nephelometric technology with accuracy of ±5% of reading.

Deployment and Recovery Protocols

- **Deployment:** Commercial marine anchoring systems with biodegradable components.
- **Recovery:** Commercial acoustic releases (37.5 kHz) with backup timer releases.
- **Calibration:** Pre-deployment verification using certified reference standards traceable to international measurement standards.

D.2 Privacy-Protected Operations and Maintenance

D.2.1 Community Privacy Protection Protocols

Privacy protection protocols integrate technological safeguards with procedural controls and community engagement.

- **Automated Privacy Zone Management:** Geographic privacy zones (500m buffer) around sensitive locations identified via community consultation, with real-time detection and dynamic adjustments.
- **Data Protection and Encryption:** All data is encrypted using AES-256 standards. Personal identification is automatically removed in real-time. Role-based access controls and audit trails are implemented.
- **Community Notification and Consent:** 48-hour minimum advance notice for UAV operations, with opt-out mechanisms for community members and real-time communication channels for concerns.

D.2.2 Equipment Maintenance and Calibration Standards

Maintenance protocols ensure reliable operation while minimizing community disturbance and environmental impact.

- **Preventive Maintenance Schedules:**
  - **AUVs:** Monthly inspections, quarterly component replacement, and annual overhauls.
  - **UAVs:** Pre-flight inspections, 25-hour service intervals, and 100-hour major inspections.
  - **Sensors:** Monthly verification and quarterly laboratory calibration.
  - **Vendor Recommendations:** The Purchaser welcomes vendor recommendations of alternative, adequate maintenance schedules for the various equipment

- **Environmental Protection During Maintenance:** Use of biodegradable lubricants, approved cleaning agents, and proper waste management according to Indonesian environmental

regulations. Spill prevention measures are in place. The Purchaser welcomes vendor recommendations of alternative, adequate environmental protection protocol during maintenance

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– **D.3 Emergency Response and Safety Protocols**

D.3.1 Equipment Emergency Procedures

Emergency protocols ensure rapid and effective response to equipment failures, weather, and safety incidents.

- **AUV Emergency Response:**
  - Lost AUV recovery via commercial marine search and rescue protocols.
  - Emergency surfacing systems activate automatically on communication loss, low battery, or malfunction.
  - Immediate notification to environmental authorities in case of equipment damage or loss.
- **UAV Emergency Procedures:**
  - Automated emergency landing procedures to select safe sites away from populated areas.
  - Lost link procedures implement automatic return-to-home functions.
  - Automatic flight termination during severe weather.

D.3.2 Community Safety and Communication

Safety protocols integrate international best practices with local community needs.

- **Safety Zone Management:** Minimum distances from populated areas (300m for UAVs, 100m for surface vessels) with dynamic adjustments for community activities. Emergency evacuation procedures are coordinated with local services.
- **Community Communication Systems:** Real-time safety communication, safety education programs, and 24/7 emergency contact systems to operations centers.

Appendix E: World Bank Compliance and Equipment Certification Framework

E.1 World Bank Operational Policy Compliance Matrix

E.1.1 OP 7.50 Compliance Requirements

The Ocean Monitoring System fully complies with World Bank Operational Policy 7.50 regarding projects on international waterways through the following measures:

Equipment Category	Compliance Requirement	Verification Method
UAV Systems	Civilian-grade specifications only; operational range ≤50km; altitude ≤3,500m AGL	Technical specification review; vendor certification; flight testing verification
AUV Systems	Scientific research classification; depth limitations appropriate for civilian use; commercial navigation systems only	Pressure testing certification; navigation system verification; civilian-grade component documentation
Sensor Systems	Environmental monitoring applications only; commercial-grade specifications; no military sensing capabilities	Sensor calibration certificates; application-specific testing; frequency limitation verification
Communication Systems	Commercial encryption standards; scientific research frequencies; no military communication protocols	Frequency allocation documentation; encryption standard verification; communication protocol testing

E.1.2 OP 7.60 Compliance Requirements

All equipment procurement avoids any specifications that could be classified as military or dual-use technology through:

Technical Specification Limitations	Explicit restrictions on capabilities that could trigger dual-use classification
Vendor Pre-Qualification	Requirements for civilian-grade certification and export control compliance
Documentation Requirements	Comprehensive compliance documentation for all advanced equipment
Regulatory Approval	Pre-approval from relevant Indonesian authorities for advanced monitoring systems

E.2 Equipment Certification Requirements

E.2.1 Civilian-Grade Certification Standards

All equipment must meet the following civilian-grade certification requirements:

Primary Certification Requirements:

- Civilian Use Only: Official certification that equipment is designed and intended for civilian scientific research only
- Export Control Compliance: Documentation confirming equipment does not fall under military or dual-use export control restrictions

- Technical Limitation Verification: Testing and certification that equipment operates within civilian-grade performance parameters
- End-User Agreement: Formal agreement specifying civilian scientific use with explicit exclusion of military applications

Secondary Certification Requirements:
- Regulatory Compliance: Certification of compliance with Indonesian civilian equipment regulations
- Safety Standards: Compliance with international safety standards for civilian marine and aerial equipment
- Environmental Compliance: Certification of environmental impact compliance for marine deployment
- Quality Assurance: ISO certification for equipment quality and reliability standards

E.2.2 Vendor Documentation Requirements

All equipment vendors must provide the following documentation:

Pre-Procurement Documentation:
- Export Control Classification: Official classification confirming civilian-grade status
- Technical Specification Declaration: Detailed specifications with explicit exclusion of military features
- Regulatory Compliance Certificate: Confirmation of compliance with relevant civilian equipment regulations
- End-User Agreement Template: Standard agreement for civilian scientific use only

Post-Delivery Documentation:
- Installation Certification: Confirmation of proper civilian-grade installation and configuration
- Operational Verification: Testing results confirming civilian-grade operational parameters
- Compliance Monitoring Plan: Ongoing monitoring procedures to ensure continued compliance
- Maintenance and Support Agreement: Civilian-grade maintenance and support services only

E.3 Ongoing Compliance Monitoring

E.3.1 Compliance Monitoring Framework

The project includes comprehensive ongoing monitoring to ensure continued World Bank compliance:

Monthly Monitoring:
- Equipment operational parameter verification
- Compliance documentation review
- Vendor performance assessment against civilian-grade requirements

Quarterly Reporting:
- Comprehensive compliance status report to World Bank
- Equipment performance verification against civilian-grade specifications
- Regulatory compliance update and certification renewal

Annual Assessment:
- Full compliance audit by independent third party
- Equipment re-certification for civilian-grade status
- Compliance framework review and update as needed

E.3.2 Non-Compliance Response Procedures

In the event of any compliance issues, the following response procedures will be implemented:

Immediate Response (0-24 hours):
- Equipment operation suspension if necessary
- Compliance issue documentation and reporting
- Vendor notification and corrective action request

Short-term Response (1-7 days):
- Detailed compliance investigation
- Corrective action plan development
- Stakeholder notification and coordination

Long-term Response (1-4 weeks):
- Implementation of corrective measures
- Equipment modification or replacement if necessary
- Compliance framework enhancement to prevent recurrence

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- Equipment modification or replacement if necessary
- Compliance framework enhancement to prevent recurrence

Appendix E: Enhanced Environmental & Social Management Framework (ESMF)

E.1 Quantified Environmental Impact Assessment

E.1.1 Marine Ecosystem Impact Thresholds and Monitoring

- **Acoustic Impact:** Max underwater noise from AUVs at 120 dB re 1 µPa @ 1m. Continuous acoustic monitoring at 5 fixed stations per MPA. Automatic AUV shutdown if marine mammals approach within 500 meters.
- **Water Quality Impact:** Monitor temperature changes (threshold ±0.5°C), turbidity (max increase 10 NTU), chemical contamination (detection limits of 10 ppb for petroleum), and dissolved oxygen (min 5 mg/L).
- **Benthic Habitat Protection:** Max allowable benthic disturbance area of 0.1% of total MPA area. Minimum 50m distance from coral reefs and 25m from seagrass beds.

E.1.2 Terrestrial and Coastal Impact Quantification

- **Coastal Vegetation:** Zero net loss of mangrove area (3:1 replacement ratio). Limit coastal forest removal to 0.5 ha per site with immediate revegetation.
- **Coastal Erosion:** Monitor shoreline stability (max 10% increase in erosion over background rates). Manage sediment transport (max 20% disruption).
- **Infrastructure:** Stormwater management systems to remove 90% of suspended sediments. Maintain 5m distance from freshwater wells during construction.

E.1.3 Climate Change Adaptation Specifications

- **Sea Level Rise:** Infrastructure to accommodate 0.3-0.6m rise by 2070 with a 0.5m safety margin. Use living shoreline approaches for coastal protection.
- **Temperature Adaptation:** Equipment designed for 2-4°C temperature increases.
- **Extreme Weather Resilience:** Storm protection systems for all equipment. Flood protection systems for critical infrastructure. Backup power systems with 72-hour autonomous capability.
-

E.2 Social Impact Assessment with Quantified Metrics

E.2.1 Community Livelihood Impact Measurement

- **Fishing Livelihoods:** Monitor household fishing income (threshold ±20% variation), fishing effort (max 15% cost increase), and fish catch (threshold ±25% variation in CPUE).
- **Tourism Livelihoods:** Monitor community tourism revenue (threshold ±30% variation) and visitor satisfaction (min 80% satisfaction rate with equipment visibility).
- **Alternative Livelihoods:** Target 30% local hiring (30% female participation), 80% training program completion, and support for 10 new microenterprises per MPA.

E.2.2 Cultural Heritage Protection Quantification

- **Tangible Heritage:** 200m buffer zones around archaeological sites. Documentation of all traditional architecture within 1 km of sites. Protection of sacred sites and visual integrity of cultural landscapes.
- **Intangible Heritage:** Documentation of marine knowledge from at least 50 knowledge holders per MPA. Support for local language use (min 50% of communications) and traditional governance systems.

E.2.3 Gender and Social Inclusion Quantification

- **Gender Equality:** Minimum 30% female participation in training, 25% of employment opportunities, and 40% representation in community consultations. Zero tolerance for gender-based violence.
- **Social Inclusion:** Minimum 20% youth participation, 15% elder participation, and 5% participation of persons with disabilities in appropriate activities. Target 40% of benefits to households in the lowest income quintile.
-

E.3 Environmental and Social Mitigation Implementation

E.3.1 Quantified Environmental Protection Measures

- **Marine Ecosystem:** AUV noise reduction to 120 dB, 500m wildlife protection zones, zero discharge spill prevention, and precision positioning (±2m) to avoid benthic habitats.
- **Coastal Ecosystem:** Zero net loss of native vegetation (3:1 replacement), erosion control achieving 95% sediment retention, stormwater systems with 90% pollutant removal, and 50m wide wildlife corridors.

E.3.2 Social Impact Mitigation with Performance Targets

- **Livelihoods:** No net loss of fishing income, 20% increase in tourism revenue, 100 direct jobs per MPA (70% local), and 50% household income diversification within 3 years.
- **Cultural Heritage:** 100% protection of identified heritage sites, 80% integration of traditional knowledge into protocols, and 100% continuity of traditional ceremonies.
- **Capacity Building:** 80% of community members demonstrate basic tech understanding, 100% of relevant organizations receive support, 60% female participation in leadership training, and 90% of conflicts resolved locally.

Appendix F: Enhanced Stakeholder Engagement Framework

F.1 Comprehensive Stakeholder Identification and Privacy Protection

F.1.1 Quantified Stakeholder Mapping and Engagement Targets

- **Fishing Community:** Target 90% household participation in consultations.
- **Tourism Operators:** Target 100% participation of registered operators.
- **Traditional Authorities:** Maintain continuous consultation.
- **Government Agencies:** Hold monthly coordination meetings.
- **Privacy Protection:** Zero unauthorized disclosure of personal information, confidentiality of household data, and community-controlled access to traditional knowledge.

F.1.2 Free, Prior, and Informed Consent (FPIC) Implementation

- **Process:** 100% community awareness of project, minimum 6-month consultation period, 80% adult community participation in consent decisions, and culturally appropriate documentation of consent.
- **Governance:** Formal roles for traditional leaders, integration of customary law into protocols, and accommodation of traditional decision-making processes.

F.1.3 Community Participation Mechanisms with Privacy Safeguards

- **Participatory Monitoring:** Train 80% of interested community members, target 60% household participation, ensure community data ownership, and integrate 90% of feedback into management.
- **Communication:** Provide anonymous feedback systems, confidential consultation options, and secure, multi-language communication channels.

F.2 Traditional Knowledge Integration with Intellectual Property Protection

F.2.1 Traditional Knowledge Documentation and Protection Standards

- **Documentation:** Interview minimum 50 knowledge holders per MPA, verify knowledge with 90% accuracy, and ensure permanent community access to documented knowledge.
- **IP Protection:** Legally recognize community IP rights, establish benefit-sharing agreements (min 50% of commercial benefits to communities), and require proper attribution.

F.2.2 Collaborative Research and Knowledge Co-Production

- **Partnerships:** Train community members as researchers, include traditional knowledge in 60% of research projects, and incorporate 70% of traditional knowledge recommendations into protocols.
- **Monitoring:** Integrate a minimum of 20 traditional indicators per MPA into monitoring, achieve 80% community participation in collaborative monitoring, and use traditional knowledge to trigger adaptive management.

F.3 Grievance Mechanisms and Conflict Resolution

F.3.1 Quantified Grievance Response Systems

- **Performance:** Acknowledge grievances in 48 hours, resolve in 30 days. Target 90% resolution satisfaction. Ensure 100% accessibility and confidentiality.
- **Integration:** Involve traditional authorities in resolution, use customary methods, achieve 80% resolution rate via community mediation, and use restorative justice approaches.

F.3.2 Conflict Prevention and Community Cohesion

- **Early Warning:** Monitor conflict indicators, stakeholder relationships, and communication effectiveness monthly.
- **Capacity Building:** Train 80% of community leaders in conflict resolution, develop communication skills for 70% of key stakeholders, and support leadership development (60% female participation).
- **Cohesion Activities:** Facilitate inter-community exchanges, collaborative projects, cultural celebrations, and youth engagement programs (target 70% youth participation).

Appendix G: Enhanced Performance Monitoring System

G.1 Data Quality Assurance Protocols with Quantified Standards

G.1.1 Sensor Calibration and Maintenance Specifications

- **Calibration Accuracy:** Temperature (±0.1°C), Salinity (±0.01 PSU), Dissolved Oxygen (±2% saturation), pH (±0.1 units), Turbidity (±5% reading).
- **Quality Control:** Real-time QC systems detect drift, data validation algorithms flag questionable data, and backup sensors provide redundancy.

G.1.2 Data Transmission and Storage Quality Standards

- **Transmission:** 99.5% reliability, 100% data integrity verification (checksums), max 15-minute latency for real-time data.
- **Storage & Backup:** 99.99% storage uptime, hourly backups with 7-year retention, and max 4-hour recovery time for critical data. AES-256 encryption for all stored data.

G.1.3 Data Processing and Analysis Quality Control

- **Processing:** 95% algorithm accuracy vs. manual methods, 100% reproducible results, standardized quality flagging.
- **Data Products:** 90% accuracy for derived products, 95% temporal coverage, and daily products available within 24 hours of collection.

G.2 User Adoption and Engagement Tracking

G.2.1 Stakeholder Usage Monitoring with Privacy Protection

- **Usage Metrics:** Monitor data access and tool utilization via anonymized, aggregated reporting.
- **Adoption Targets:** 90% of government agencies, 70% of community organizations, 80% of research institutions, and 60% of private sector stakeholders actively using OMS data.

G.2.2 Capacity Building Effectiveness Assessment

- **Training:** 85% of trainees demonstrate competency, with 80% skill retention after 12 months.
- **Institutional Capacity:** Track improvements in governance, technical capacity, and sustainability planning.

G.2.3 Technology Adoption and Digital Literacy

- **Literacy:** Target 80% of users demonstrating basic digital skills and 75% demonstrating competency in OMS-specific tools.
- **Accessibility:** Ensure 100% accessibility for users with disabilities, provide interfaces in local languages, and address economic barriers to technology access.

G.3 Impact Assessment and Conservation Outcome Monitoring

G.3.1 Marine Conservation Impact Quantification

- **Ecosystem Health:** Track coral cover (5% detection capability), fish populations (20% detection capability), and marine debris density (25% detection capability).
- **Biodiversity:** Monitor species richness and endemic species populations.
- **Fisheries:** Conduct quarterly stock assessments (15% precision for biomass estimates) and track adoption of sustainable fishing practices.

G.3.2 Management Effectiveness and Adaptive Capacity

- **Performance:** Track improvements in decision-making (target 80% decisions supported by OMS data) and enforcement effectiveness (target 90% violation detection).
- **Adaptive Capacity:** Assess institutional learning systems, innovation adoption, and collaboration effectiveness.

G.3.3 Socioeconomic Impact and Community Benefit Assessment

- **Economic Impact:** Track tourism revenue, fishing income, and direct/indirect employment.
- **Social Development:** Measure impacts on education, health, gender equality (target 30% female participation), and social cohesion.
- **Sustainability:** Track development of local ownership, financial sustainability, and cultural preservation.

G.4 Implementation Timeline and Resource Requirements

Timeline for Framework Implementation

- **Phase 1: Framework Development and Training (Months 1-6)**
- **Phase 2: Pilot Implementation and Testing (Months 7-12)**
- **Phase 3: Full Implementation and Optimization (Months 13-30)**

Personnel Resource Requirements Summary

- **Framework Coordination Team:** 6 full-time specialists
- **Training and Capacity Building Team:** 8 specialists
- **Community Engagement Team:** 12 community liaisons
- **Technical Support Team:** 10 technical specialists

Appendix H: Detailed Performance Metrics and Measurement Criteria

H.1 Quantified Performance Thresholds and Benchmarks

H.1.1 Technical Performance Standards with Specific Metrics

- **Equipment Performance:** AUVs (95% mission success), UAVs (98% flight completion), Sensors (±5% accuracy of reference), Data Transmission (99.5% reliability).
- **System Performance:** 90% successful data integration, max 24-hour processing delay for routine data, max 3-second UI response time.

H.1.2 Environmental Impact Threshold Specifications

- **Marine:** Max noise 120 dB @ 1m, strict water quality limits (e.g., <±0.5°C temp change), max benthic disturbance 0.1% of MPA annually, minimum wildlife distances (e.g., 500m for marine mammals).
- **Coastal:** Max vegetation removal 0.5 ha/site, erosion <10% of background, noise <65 dB @ 100m, max structure height 15m.

H.1.3 Social Impact Performance Criteria

- **Community Benefits:** 100+ direct jobs/MPA (70% local, 30% female), 15% increase in household income, 85% competency from training.
- **Cultural Heritage:** 100% protection of identified sites, 80% integration of traditional knowledge, 100% continuity of cultural practices.

H.2 Monitoring and Evaluation Framework with Quantified Indicators

H.2.1 Results-Based Monitoring System

- **Conservation Outcomes:** 10% increase in species richness, 15% increase in fish biomass, 20% reduction in pollution indicators within defined timeframes.
- **Management Effectiveness:** 80% of decisions supported by OMS data, 90% violation detection rates, 85% stakeholder satisfaction.

H.2.2 Impact Assessment Methodology with Statistical Rigor

- **Statistical Design:** 80% statistical power to detect 20% changes, use of matched control groups (min 3 per site), and stratified random sampling.
- **Attribution Methods:** Use of Difference-in-Difference, Propensity Score Matching, and Regression analysis to isolate project impacts.

H.2.3 Adaptive Management Performance Metrics

- **Learning System:** 90% documentation of lessons learned, 80% implementation of improvements within 12 months.
- **Responsiveness:** 50% reduction in management response times for critical issues, 85% decision effectiveness ratings.

H.3 Performance Reporting and Accountability Framework

H.3.1 Reporting Standards and Frequency Specifications

- **Schedule:** Monthly operational reports, quarterly progress reports, and annual comprehensive reports. Special event reports within 48 hours.

- **Stakeholders:** Specific reporting formats and frequencies for the Indonesian government, the World Bank, local communities, and the scientific community.

H.3.2 Accountability Mechanisms with Performance Standards

- **Performance Management:** 80% target achievement required annually, budget variance within ±10%, 90% milestone completion on schedule.
- **Corrective Actions:** Performance Improvement Plans for underperformance, clear escalation procedures, and 90% complaint resolution satisfaction.

H.3.3 Transparency and Public Disclosure Standards

- **Public Disclosure:** Quarterly public disclosure of key performance indicators, annual financial reports, and monthly environmental data updates via an online portal.
- **Access Standards:** Public access to non-sensitive data, key information in local languages, and multiple accessible formats. Timely response (max 15 days) to information requests.

Appendix I: Governance Gate Assessment Criteria

Introduction

This appendix details the minimum criteria that must be met for the Service Provider to receive a formal **No-Objection Letter (NOL)** from the Ministry of Marine Affairs and Fisheries (KKP) and the World Bank. The achievement of these criteria is mandatory to authorize progression to the next major phase of the project and to unlock the associated payments.

The criteria are designed to be objective and verifiable, ensuring that project advancement is based on demonstrated performance and technical readiness. The Service Provider is responsible for providing all necessary documentation and facilitating demonstrations to prove that each criterion has been fully satisfied.

Gate 1: Proceed to Pilot Integration (Phase 1A to Phase 1B)

This gate is triggered upon the completion of **Milestone 3**. Its purpose is to confirm that the foundational infrastructure is in place and technically sound before the complex work of systems integration begins.

Category	Assessment Criterion	Verifier
Technical	**1.1. Hardware Delivery & Installation:** All hardware specified in the approved Bill of Quantities (BoQ) for Phase 1 has been delivered to KKP-designated sites and physically installed in the data centers.	Signed delivery receipts, completed installation checklists, and photographic evidence for all major components (HCI nodes, AUVs, UAVs).
	1.2. Foundational Software Setup: The core enterprise software licenses are activated. The baseline software stack (OS, hypervisor, core platform) is installed on the HCI, and basic functionalities are	System logs demonstrating successful installation and a live demonstration of core software interfaces loading successfully.

	operational.	
	1.3. Initial Security Posture: Essential cybersecurity measures, including network firewalls, initial Role-Based Access Controls (RBAC), and physical security for the data center, are in place and have passed a preliminary audit.	Submission of an initial Security Posture Report detailing the implemented controls and the results of a preliminary vulnerability scan.
Operational	**1.4. Staff Orientation:** An initial safety and operational orientation for all procured hardware (AUVs, UAVs) has been delivered to designated KKP pilot staff.	Signed attendance sheets from the orientation sessions and copies of the orientation materials provided to KKP staff.
Institutional	**1.5. Pilot Integration Plan Approval:** A detailed Project Plan for Phase 1B (Pilot Integration) has been submitted and formally accepted by KKP. This plan must include detailed timelines, resource allocation, testing protocols, and risk mitigation strategies for the integration phase.	A formal letter of acceptance for the Phase 1B Project Plan, signed by the KKP Project Manager.

Gate 2: Proceed to National Scale-Up (Phase 1 to Phase 2)

This is the most critical governance gate of the project, triggered upon the completion of **Milestone 5**. Its purpose is to certify the comprehensive success of the integrated pilot system, demonstrating its value and readiness for national replication. Formal approval of this gate authorizes the release of the remaining 60% of the total project budget for Phase 2.

Category	Assessment Criterion	Verifier
Technical	**2.1. System Availability:** The integrated pilot system has demonstrated an availability of **≥ 99.5%** over a continuous three-month testing period.	System uptime logs from the HCI management software and network monitoring tools, validated by the KKP PUSDATIN team.
	2.2. Data Accuracy: The system demonstrates a data accuracy of **≥ 95%** for key analytical outputs (e.g., automated coral cover assessment, vessel detection).	Submission of a Data Quality Report that compares OMS-generated data against manually collected and verified ground-truth data from the pilot sites.
	2.3. Equipment Operational Availability: The fleet of AUVs and UAVs has demonstrated an operational	Mission logs and maintenance records demonstrating successful mission completion rates and adherence to

	availability of ≥ **90%** during the pilot phase.	planned operational schedules.
	2.4. End-to-End System Integration: The seamless, end-to-end functionality of the "system of systems" is fully proven.	A live, comprehensive demonstration of a full data workflow: from mission planning, data collection by an AUV/UAV, automated data ingestion and processing, to final visualization and analysis on the OMS dashboard.
	2.5. Cybersecurity Certification: The fully integrated pilot system has passed a comprehensive security audit and vulnerability assessment, with documentation confirming alignment with **BSSN guidelines** for critical national infrastructure.	Submission of a final, third-party security audit report and a formal letter of compliance from the vendor, accepted by KKP.
Operational	**2.6. Pilot Operational Success:** The system has been used to successfully complete the baseline ecological surveys and surveillance missions as defined in the Pilot Work Plan for both Gili Matra and Sawu Sea.	Submission of the final baseline data products (e.g., 3D habitat maps, surveillance heat maps, biodiversity indices) for both pilot MPAs.
	2.7. Training Program Completion: The training completion rate for all designated KKP staff is ≥ **95%**, with formal certification awarded.	Signed training records, competency assessment results, and copies of certificates for all designated KKP staff.
	2.8. User Acceptance Testing (UAT) Sign-Off: The project has achieved a formal sign-off on the User Acceptance Testing (UAT) from KKP, confirming the system meets all functional and operational requirements specified in the TOR.	The official, signed UAT completion document from KKP, as stipulated in Milestone 5.

Institutional	**2.9. KKP Operational Independence:** Designated KKP personnel can successfully plan, execute, and analyze a complete monitoring mission using the OMS without direct, real-time intervention from the vendor's team.	An observed performance assessment report, co-signed by the KKP Project Manager and the lead of the vendor's NMC, documenting the successful independent mission.
	2.10. Sustainability Plan Approval: A comprehensive, long-term Operations & Maintenance (O&M) and Financial Sustainability Plan for the OMS has been submitted by the vendor and formally approved by the OMS Project Steering Committee.	The approved Sustainability Plan document, with a formal letter of acceptance from the Chairman of the Project Steering Committee.

References and Technical Standards

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2. **Connecticut Department of Public Safety. (2010).** *Annual Cost of Patrol Boat.* Connecticut General Assembly Office of Fiscal Analysis.
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14. **World Bank. (2020).** *Procurement Regulations for IPF Borrowers.* Washington, DC: World Bank Group.

International Standards and Guidelines

[1] World Bank Environmental and Social Standards (ESS) - https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards
[2] International Maritime Organization (IMO) Guidelines for Autonomous Marine Systems - https://www.imo.org/en/OurWork/Safety/Pages/Autonomous-shipping.aspx
[3] International Civil Aviation Organization (ICAO) Standards for Remotely Piloted Aircraft Systems - https://www.icao.int/safety/UA/Pages/Remotely-Piloted-Aircraft-Systems.aspx
[4] NOAA Guidelines for Marine Mammal Acoustic Impact Assessment - https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance
[5] UNESCO Guidelines for Marine Protected Area Management Effectiveness - https://www.iucn.org/theme/protected-areas/our-work/marine-protected-areas

Indonesian Regulatory Framework

[6] Indonesian Ministry of Transportation Regulation on Unmanned Marine Systems - https://dephub.go.id/
[7] Indonesian Civil Aviation Authority (DGCA) Drone Operation Regulations - https://hubud.dephub.go.id/

[8] Indonesian Ministry of Environment and Forestry Marine Conservation Regulations - https://www.menlhk.go.id/
[9] Indonesian Ministry of Marine Affairs and Fisheries MPA Management Guidelines - https://kkp.go.id/
[10] Indonesian Personal Data Protection Law (UU PDP) - https://www.kominfo.go.id/

Technical Standards and Specifications

[11] International Organization for Standardization (ISO) 19115 Geographic Information Metadata - https://www.iso.org/standard/53798.html
[12] American Society for Testing and Materials (ASTM) Standards for Marine Instrumentation - https://www.astm.org/
[13] Institute of Electrical and Electronics Engineers (IEEE) Standards for Marine Electronics - https://www.ieee.org/
[14] International Electrotechnical Commission (IEC) Standards for Marine Equipment - https://www.iec.ch/
[15] Global Ocean Observing System (GOOS) Data Management Standards - https://www.goosocean.org/

Best Practice Guidelines

[16] Australia's Integrated Marine Observing System (IMOS) Implementation Guidelines - https://imos.org.au/
[17] Korea Ocean Observing Network (KOON) Operational Procedures - http://www.koon.kr/
[18] Norway's BarentsWatch Marine Monitoring Framework - https://www.barentswatch.no/
[19] Ireland's Marine Institute Monitoring Standards - https://www.marine.ie/
[20] United States Integrated Ocean Observing System (IOOS) Quality Assurance Guidelines - https://ioos.noaa.gov/

Other Key Frameworks and Precedents

- **World Bank Environmental and Social Standards (ESS 1-10)**
- **Badan Siber dan Sandi Negara (BSSN)** mandates for national cybersecurity.
- The **U.S. CLOUD Act** (as a justification for on-premise data sovereignty).
- The **Basel Convention** (in relation to e-waste and battery recycling).
- The World Bank Guidance Note on Managing the Risks of Unmanned Aircraft Operations In Development Projects.