

**GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH**  
**MINISTRY OF WATER RESOURCES**



**BANGLADESH WATER DEVELOPMENT BOARD (BWDB)**

Coastal Embankment Improvement Project, Phase-1 (CEIP-1)  
Credit No.: 5280-BD

**CONTRACT FOR CONSULTANT'S SERVICES**  
(Time-Based)

for

**Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone  
(Sustainable Polders Adapted to Coastal Dynamics)**

Contract No.: CEIP-1/C3/S4

between

**Bangladesh Water Development Board (BWDB)**

and

**Joint Venture of DHI, Denmark and Stichting Deltares (Deltares), The  
Netherlands**

in association with Sub-Consultants: Institute of Water Modeling, Bangladesh;  
University of Colorado, USA; and Columbia University, USA.

Dated: October 2018

✓

Yusuf



To whom it may concern



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Ref:  
KWO

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Date:  
28 September 2018

Concerning – “Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone (Sustainable Polders Adapted to Coastal Dynamics)” under Coastal Embankment Improvement Project Phase-1, (CEIP-1); (Contract No. CEIP-1/C3/S4)

I, Antoine Labrosse, Chief Executive Officer of DHI, duly authorized to act on behalf of same, hereby authorize and designate

Kim Wium Olesen  
Head of Water Resources Department  
DHI  
Agern Allé 5  
2970 Hørsholm  
Denmark  
Phone number: +45 16 92 00

for and in the name, stead and place of said company to negotiate and sign the contract for the project “Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone (Sustainable Polders Adapted to Coastal Dynamics)” under Coastal Embankment Improvement Project Phase-1, (CEIP-1).

Best regards

**DHI**

Antoine Labrosse  
Chief Executive Officer

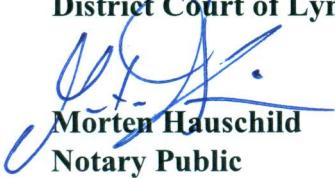


This is to certify that **Mr Antoine Stephane Labrosse** today in my presence at the Notarial Office approved and signed the above document.

No conspicuous corrections or addenda were found in the document.

**Mr Antoine Stephane Labrosse** has proved his identity by presenting driver's licece.

District Court of Lyngby, Denmark the 1st of October 2018.



Morten Hauschild  
Notary Public



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*(Signature)*

*MWD*

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গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

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একশত টাকা

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Card  
Dhaka  
Bank  
Branch

## I. Form of Contract

### TIME-BASED

This CONTRACT (hereinafter called the "Contract") is made the 04 day of the month of October, 2018 between, on the one hand, Bangladesh Water Development Board (BWDB) (hereinafter called the "Client") and, on the other hand, a Joint Venture (JV) of DHI and Deltares consisting of the following entities, each member of which will be jointly and severally liable to the Client for all the Consultant's obligations under this Contract, namely, **JV of DHI, Denmark and Stitchting Deltares (Deltares), the Netherlands** in association with Sub-Consultants: Institute of Water Modeling, Bangladesh; University of Colorado, USA; and Columbia University, USA (hereinafter called the "Consultant").

WHEREAS

- (a) the Client has requested the Consultant to provide certain consulting services as defined in this Contract (hereinafter called the "Services");
- (b) the Consultant, having represented to the Client that it has the required professional skills, expertise and technical resources, has agreed to provide the Services on the terms and conditions set forth in this Contract;
- (c) the Client has received financing from the International Development Association [IDA] (the "Bank") in the form of a credit (hereinafter called "credit") and a grant from Pilot Programming Climate Resilience [PPCR] under the Strategic Climate Fund (SCF) (hereinafter called "grant") toward the cost of the Services and intends to apply a portion of the proceeds of these credit and grant to eligible payments under this Contract, it being understood that (i) payments by the Bank will be made only at the request of the Client and upon approval by the Bank; (ii) such payments will be subject, in all respects, to the terms and conditions of the financing agreement, including prohibitions of withdrawal from the credit account for the purpose of any payment to persons or entities, or for any import of goods, if such payment or import, to the knowledge of the Bank, is prohibited by the decision of the United Nations Security council taken under Chapter VII of the Charter of the United Nations; and (iii) no party other than the Client shall derive any rights from the financing agreement or have any claim to the credit and grant proceeds;

"দেশের শপথ নিন, দুর্নীতিকে বিদায় দিন"

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01 OCT 2018

মোট হেলাক ডালন  
ট্রাম্প ভেঙ্গার  
লাইসেন্স নং-০২১৩৭৯৫  
বনানী ঢাকা  
০১৬২২-৫৫১৬৮৬

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

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একশত টাকা

কফ ৮৪৭৬২০৮

Dhaka  
K. M.

NOW THEREFORE the parties hereto hereby agree as follows:

1. The following documents attached hereto shall be deemed to form an integral part of this Contract:
  - (a) The General Conditions of Contract (including Attachment 1 "Bank Policy – Corrupt and Fraudulent Practices);
  - (b) The Special Conditions of Contract;
  - (c) Appendices:

Appendix A: Terms of Reference [including Annex-1 related to Structure of EIA Report; Detail TOR and Sample Structure of EIA for each Polder]

Appendix B: Key Experts [TECH-5 and TECH-6 (without CVs)]

Appendix C: Summary of Costs [FIN-2]

Appendix D1: Remuneration Cost Estimate [FIN-3]

Appendix D2: Reimbursable Cost Estimates [FIN-4]

Appendix E: Form of Advance Payments Guarantee; and

Appendix F: Minutes of Negotiation Meetings [signed minutes of negotiations meetings from April 2016, January 2017 and January 2018, including Proposal Adaptations, 4<sup>th</sup> version qualifying the adaptations to Technical and Financial Proposals resulting from negotiation meetings and negotiations through letters and e-mails]

In the event of any inconsistency between the documents, the following order of precedence shall prevail: the Special Conditions of Contract; the General Conditions of Contract, including Attachment 1; Appendix A; Appendix B; Appendix C; Appendix D1; Appendix D2; Appendix E and Appendix F. For the number of expert months to be deployed, Appendices B and D1 shall take precedence over Appendix A. Any reference to this Contract shall include, where the context permits, a reference to its Appendices.

2. The mutual rights and obligations of the Client and the Consultant shall be as set forth in the Contract, in particular:
  - (a) the Consultant shall carry out the Services in accordance with the provisions of the Contract; and
  - (b) the Client shall make payments to the Consultant in accordance with the provisions of the Contract.

“দেশপ্রেমের শপথ নিন, দুর্লভিকে বিদায় দিন”

০১ OCT 2018

মেগা হেলাল অ্যালিন  
কুণ্ডলপুর পৌতার  
জাইদেশ নং-০২৫৭৯৮  
বনানী চৰকাৰ  
০১৯২২-৫৫১৬৮৬

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

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IN WITNESS WHEREOF, the Parties hereto have caused this Contract to be signed in their respective names as of the day and year first above written.

For and on behalf of BWDB

(Md. Habibur Rahman)  
Chief Engineer, and  
Project Director, CEIP-1,  
BWDB

For and on behalf of the JV

(Dr. Kim Wium Olesen)  
Head of Water Resources Department,  
DHI

Witness:

(Md. Kabir Ahmed)  
Additional Director (Accounts)  
PMU, CEIP-1, BWDB

(Md. Zahirul Haque Khan)  
Director, Coast, Port and Estuary Division  
Institute of Water Modelling

“দেশপ্রেমের শপথ নিন, দুর্নীতিকে বিদায় দিন”

৬০  
১ OCT 2018

মোট প্রক্ষেপণ উদ্দিন  
ষাণ্মাত্র ক্ষেত্রের  
পরিমাণ ৫৫-০২/১৯২৯  
সন্মুক্ত ছাতা  
০১৯২২-০০১৯২৯

## II. General Conditions of Contract

### A. GENERAL PROVISIONS

#### 1. Definitions

- 1.1. Unless the context otherwise requires, the following terms whenever used in this Contract have the following meanings:
- (a) “Applicable Guidelines” means the Guidelines for Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, dated January 2011 (“Consultants’ Guidelines”).
  - (b) “Applicable Law” means the laws and any other instruments having the force of law in the Client’s country, or in such other country as may be specified in the **Special Conditions of Contract (SCC)**, as they may be issued and in force from time to time.
  - (c) “Bank” means the International Bank for Reconstruction and Development (IBRD) or the International Development Association (IDA).
  - (d) “Borrower” means the Government, Government agency or other entity that signs the financing agreement with the Bank.
  - (e) “Client” means the implementing agency that signs the Contract for the Services with the Selected Consultant.
  - (f) “Consultant” means a legally-established professional consulting firm or entity selected by the Client to provide the Services under the signed Contract.
  - (g) “Contract” means the legally binding written agreement signed between the Client and the Consultant and which includes all the attached documents listed in its paragraph 1 of the Form of Contract (the General Conditions (GCC), the Special Conditions (SCC), and the Appendices).
  - (h) “Day” means a working day unless indicated otherwise.
  - (i) “Effective Date” means the date on which this Contract comes into force and effect pursuant to Clause GCC 11.
  - (j) “Experts” means, collectively, Key Experts, Non-Key Experts, or any other personnel of the Consultant, Sub-consultant or JV member(s) assigned by the Consultant to perform the Services or any part thereof under the Contract.
  - (k) “Foreign Currency” means any currency other than the currency of the Client’s country.

- (l) "GCC" means these General Conditions of Contract.
- (m) "Government" means the government of the Client's country.
- (n) "Joint Venture (JV)" means an association with or without a legal personality distinct from that of its members, of more than one entity where one member has the authority to conduct all businesses for and on behalf of any and all the members of the JV, and where the members of the JV are jointly and severally liable to the Client for the performance of the Contract.
- (o) "Key Expert(s)" means an individual professional whose skills, qualifications, knowledge and experience are critical to the performance of the Services under the Contract and whose Curricula Vitae (CV) was taken into account in the technical evaluation of the Consultant's proposal.
- (p) "Local Currency" means the currency of the Client's country.
- (q) "Non-Key Expert(s)" means an individual professional provided by the Consultant or its Sub-consultant to perform the Services or any part thereof under the Contract.
- (r) "Party" means the Client or the Consultant, as the case may be, and "Parties" means both of them.
- (s) "SCC" means the Special Conditions of Contract by which the GCC may be amended or supplemented but not over-written.
- (t) "Services" means the work to be performed by the Consultant pursuant to this Contract, as described in Appendix A hereto.
- (u) "Sub-consultants" means an entity to whom/which the Consultant subcontracts any part of the Services while remaining solely liable for the execution of the Contract.
- (v) "Third Party" means any person or entity other than the Government, the Client, the Consultant or a Sub-consultant.

2.1. Nothing contained herein shall be construed as establishing a relationship of master and servant or of principal and agent as between the Client and the Consultant. The Consultant, subject to this Contract, has complete charge of the Experts and Sub-consultants, if any, performing the Services and shall be fully responsible for the Services performed by them or on their behalf hereunder.

### **3. Law Governing Contract**

3.1. This Contract, its meaning and interpretation, and the relation between the Parties shall be governed by the Applicable Law.

<b>4. Language</b>	4.1. This Contract has been executed in the language specified in the SCC, which shall be the binding and controlling language for all matters relating to the meaning or interpretation of this Contract.
<b>5. Headings</b>	5.1. The headings shall not limit, alter or affect the meaning of this Contract.
<b>6. Communications</b>	<p>6.1. Any communication required or permitted to be given or made pursuant to this Contract shall be in writing in the language specified in Clause GCC 4. Any such notice, request or consent shall be deemed to have been given or made when delivered in person to an authorized representative of the Party to whom the communication is addressed, or when sent to such Party at the address specified in the SCC.</p> <p>6.2. A Party may change its address for notice hereunder by giving the other Party any communication of such change to the address specified in the SCC.</p>
<b>7. Location</b>	7.1. The Services shall be performed at such locations as are specified in Appendix A hereto and, where the location of a particular task is not so specified, at such locations, whether in the Government's country or elsewhere, as the Client may approve.
<b>8. Authority of Member in Charge</b>	8.1. In case the Consultant is a Joint Venture, the members hereby authorize the member specified in the SCC to act on their behalf in exercising all the Consultant's rights and obligations towards the Client under this Contract, including without limitation the receiving of instructions and payments from the Client.
<b>9. Authorized Representatives</b>	9.1. Any action required or permitted to be taken, and any document required or permitted to be executed under this Contract by the Client or the Consultant may be taken or executed by the officials specified in the SCC.
<b>10. Corrupt and Fraudulent Practices</b>	10.1. The Bank requires compliance with its policy in regard to corrupt and fraudulent practices as set forth in Attachment 1 to the GCC.
<b>a. Commissions and Fees</b>	10.2. The Client requires the Consultant to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the selection process or execution of the Contract. The information disclosed must include at least the name and address of the agent or other party, the amount and currency, and the purpose of the commission, gratuity or fee. Failure to disclose such commissions, gratuities or fees may result in termination of the Contract and/or sanctions by the Bank.

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## **B. COMMENCEMENT, COMPLETION, MODIFICATION AND TERMINATION OF CONTRACT**

- 11. Effectiveness of Contract**      11.1. This Contract shall come into force and effect on the date (the "Effective Date") of the Client's notice to the Consultant instructing the Consultant to begin carrying out the Services. This notice shall confirm that the effectiveness conditions, if any, listed in the SCC have been met.
- 12. Termination of Contract for Failure to Become Effective**      12.1. If this Contract has not become effective within such time period after the date of Contract signature as specified in the SCC, either Party may, by not less than twenty two (22) days written notice to the other Party, declare this Contract to be null and void, and in the event of such a declaration by either Party, neither Party shall have any claim against the other Party with respect hereto.
- 13. Commencement of Services**      13.1. The Consultant shall confirm availability of Key Experts and begin carrying out the Services not later than the number of days after the Effective Date specified in the SCC.
- 14. Expiration of Contract**      14.1. Unless terminated earlier pursuant to Clause GCC 19 hereof, this Contract shall expire at the end of such time period after the Effective Date as specified in the SCC.
- 15. Entire Agreement**      15.1. This Contract contains all covenants, stipulations and provisions agreed by the Parties. No agent or representative of either Party has authority to make, and the Parties shall not be bound by or be liable for, any statement, representation, promise or agreement not set forth herein.
- 16. Modifications or Variations**      16.1. Any modification or variation of the terms and conditions of this Contract, including any modification or variation of the scope of the Services, may only be made by written agreement between the Parties. However, each Party shall give due consideration to any proposals for modification or variation made by the other Party.  
16.2. In cases of substantial modifications or variations, the prior written consent of the Bank is required.
- 17. Force Majeure**
- a. **Definition**      17.1. For the purposes of this Contract, "Force Majeure" means an event which is beyond the reasonable control of a Party, is not foreseeable, is unavoidable, and makes a Party's performance of its obligations hereunder impossible or so impractical as reasonably to be considered impossible under the circumstances, and subject to those requirements, includes, but is not limited to, war, riots, civil disorder, earthquake, fire, explosion, storm, flood or other adverse weather conditions, strikes, lockouts or other industrial action, confiscation or any other action by Government agencies.

17.2. Force Majeure shall not include (i) any event which is caused by the negligence or intentional action of a Party or such Party's Experts, Sub-consultants or agents or employees, nor (ii) any event which a diligent Party could reasonably have been expected to both take into account at the time of the conclusion of this Contract, and avoid or overcome in the carrying out of its obligations hereunder.

17.3. Force Majeure shall not include insufficiency of funds or failure to make any payment required hereunder.

**b. No Breach of Contract**

17.4. The failure of a Party to fulfill any of its obligations hereunder shall not be considered to be a breach of, or default under, this Contract insofar as such inability arises from an event of Force Majeure, provided that the Party affected by such an event has taken all reasonable precautions, due care and reasonable alternative measures, all with the objective of carrying out the terms and conditions of this Contract.

**c. Measures to be Taken**

17.5. A Party affected by an event of Force Majeure shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall take all reasonable measures to minimize the consequences of any event of Force Majeure.

17.6. A Party affected by an event of Force Majeure shall notify the other Party of such event as soon as possible, and in any case not later than fourteen (14) calendar days following the occurrence of such event, providing evidence of the nature and cause of such event, and shall similarly give written notice of the restoration of normal conditions as soon as possible.

17.7. Any period within which a Party shall, pursuant to this Contract, complete any action or task, shall be extended for a period equal to the time during which such Party was unable to perform such action as a result of Force Majeure.

17.8. During the period of their inability to perform the Services as a result of an event of Force Majeure, the Consultant, upon instructions by the Client, shall either:

(a) demobilize, in which case the Consultant shall be reimbursed for additional costs they reasonably and necessarily incurred, and, if required by the Client, in reactivating the Services; or

- (b) continue with the Services to the extent reasonably possible, in which case the Consultant shall continue to be paid under the terms of this Contract and be reimbursed for additional costs reasonably and necessarily incurred.

17.9. In the case of disagreement between the Parties as to the existence or extent of Force Majeure, the matter shall be settled according to Clauses GCC 48 & 49.

## **18. Suspension**

18.1. The Client may, by written notice of suspension to the Consultant, suspend all payments to the Consultant hereunder if the Consultant fails to perform any of its obligations under this Contract, including the carrying out of the Services, provided that such notice of suspension (i) shall specify the nature of the failure, and (ii) shall request the Consultant to remedy such failure within a period not exceeding thirty (30) calendar days after receipt by the Consultant of such notice of suspension.

## **19. Termination**

### **a. By the Client**

19.1.1 The Client may terminate this Contract in case of the occurrence of any of the events specified in paragraphs (a) through (f) of this Clause. In such an occurrence the Client shall give at least thirty (30) calendar days' written notice of termination to the Consultant in case of the events referred to in (a) through (d); at least sixty (60) calendar days' written notice in case of the event referred to in (e); and at least five (5) calendar days' written notice in case of the event referred to in (f):

(a) If the Consultant fails to remedy a failure in the performance of its obligations hereunder, as specified in a notice of suspension pursuant to Clause GCC 18;

(b) If the Consultant becomes (or, if the Consultant consists of more than one entity, if any of its members becomes) insolvent or bankrupt or enter into any agreements with their creditors for relief of debt or take advantage of any law for the benefit of debtors or go into liquidation or receivership whether compulsory or voluntary;

(c) If the Consultant fails to comply with any final decision reached as a result of arbitration proceedings pursuant to Clause GCC 49.1;

- (d) If, as the result of Force Majeure, the Consultant is unable to perform a material portion of the Services for a period of not less than sixty (60) calendar days;
- (e) If the Client, in its sole discretion and for any reason whatsoever, decides to terminate this Contract;
- (f) If the Consultant fails to confirm availability of Key Experts as required in Clause GCC 13.

19.1.2 Furthermore, if the Client determines that the Consultant has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Client may, after giving fourteen (14) calendar days written notice to the Consultant, terminate the Consultant's employment under the Contract.

**b. By the Consultant**

19.1.3 The Consultant may terminate this Contract, by not less than thirty (30) calendar days' written notice to the Client, in case of the occurrence of any of the events specified in paragraphs (a) through (d) of this Clause.

- (a) If the Client fails to pay any money due to the Consultant pursuant to this Contract and not subject to dispute pursuant to Clauses GCC 49.1 within forty-five (45) calendar days after receiving written notice from the Consultant that such payment is overdue.
- (b) If, as the result of Force Majeure, the Consultant is unable to perform a material portion of the Services for a period of not less than sixty (60) calendar days.
- (c) If the Client fails to comply with any final decision reached as a result of arbitration pursuant to Clause GCC 49.1.
- (d) If the Client is in material breach of its obligations pursuant to this Contract and has not remedied the same within forty- five (45) days (or such longer period as the Consultant may have subsequently approved in writing) following the receipt by the Client of the Consultant's notice specifying such breach.

**c. Cessation of Rights and Obligations**

19.1.4 Upon termination of this Contract pursuant to Clauses GCC 12 or GCC 19 hereof, or upon expiration of this Contract pursuant to Clause GCC 14, all rights and obligations of the Parties hereunder shall cease, except (i) such rights and obligations as may have accrued on the date of termination or expiration, (ii) the obligation of confidentiality set forth in Clause GCC 22, (iii) the Consultant's obligation to permit inspection, copying and auditing of their accounts and records set forth in Clause GCC 25, and (iv) any right which a Party may have under the Applicable Law.

- d. Cessation of Services**
- 19.1.5 Upon termination of this Contract by notice of either Party to the other pursuant to Clauses GCC 19a or GCC 19b, the Consultant shall, immediately upon dispatch or receipt of such notice, take all necessary steps to bring the Services to a close in a prompt and orderly manner and shall make every reasonable effort to keep expenditures for this purpose to a minimum. With respect to documents prepared by the Consultant and equipment and materials furnished by the Client, the Consultant shall proceed as provided, respectively, by Clauses GCC 27 or GCC 28.
- e. Payment upon Termination**
- 19.1.6 Upon termination of this Contract, the Client shall make the following payments to the Consultant:
- (a) remuneration for Services satisfactorily performed prior to the effective date of termination, and reimbursable expenditures for expenditures actually incurred prior to the effective date of termination; and pursuant to Clause 42;
  - (b) in the case of termination pursuant to paragraphs (d) and (e) of Clause GCC 19.1.1, reimbursement of any reasonable cost incidental to the prompt and orderly termination of this Contract, including the cost of the return travel of the Experts.

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## C. OBLIGATIONS OF THE CONSULTANT

### 20. General

- a. Standard of Performance
- 20.1 The Consultant shall perform the Services and carry out the Services with all due diligence, efficiency and economy, in accordance with generally accepted professional standards and practices, and shall observe sound management practices, and employ appropriate technology and safe and effective equipment, machinery, materials and methods. The Consultant shall always act, in respect of any matter relating to this Contract or to the Services, as a faithful adviser to the Client, and shall at all times support and safeguard the Client's legitimate interests in any dealings with the third parties.
- 20.2 The Consultant shall employ and provide such qualified and experienced Experts and Sub-consultants as are required to carry out the Services.
- 20.3 The Consultant may subcontract part of the Services to an extent and with such Key Experts and Sub-consultants as may be approved in advance by the Client. Notwithstanding such approval, the Consultant shall retain full responsibility for the Services.
- b. Law Applicable to Services
- 20.4 The Consultant shall perform the Services in accordance with the Contract and the Applicable Law and shall take all practicable steps to ensure that any of its Experts and Sub-consultants, comply with the Applicable Law.
- 20.5 Throughout the execution of the Contract, the Consultant shall comply with the import of goods and services prohibitions in the Client's country when
- (a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country; 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 from that country or any payments to any country, person, or entity in that country.
- 20.6 The Client shall notify the Consultant in writing of relevant local customs, and the Consultant shall, after such notification, respect such customs.

## **21. Conflict of Interests**

**a. Consultant  
Not to Benefit  
from  
Commissions,  
Discounts, etc.**

21.1 The Consultant shall hold the Client's interests paramount, without any consideration for future work, and strictly avoid conflict with other assignments or their own corporate interests.

**b. Consultant  
and Affiliates  
Not to Engage  
in Certain  
Activities**

21.1.1 The payment of the Consultant pursuant to GCC F (Clauses GCC 41 through 46) shall constitute the Consultant's only payment in connection with this Contract and, subject to Clause GCC 21.1.3, the Consultant shall not accept for its own benefit any trade commission, discount or similar payment in connection with activities pursuant to this Contract or in the discharge of its obligations hereunder, and the Consultant shall use its best efforts to ensure that any Sub-consultants, as well as the Experts and agents of either of them, similarly shall not receive any such additional payment.

21.1.2 Furthermore, if the Consultant, as part of the Services, has the responsibility of advising the Client on the procurement of goods, works or services, the Consultant shall comply with the Bank's Applicable Guidelines, and shall at all times exercise such responsibility in the best interest of the Client. Any discounts or commissions obtained by the Consultant in the exercise of such procurement responsibility shall be for the account of the Client.

**c. Prohibition of  
Conflicting  
Activities**

21.1.3 The Consultant agrees that, during the term of this Contract and after its termination, the Consultant and any entity affiliated with the Consultant, as well as any Sub-consultants and any entity affiliated with such Sub-consultants, shall be disqualified from providing goods, works or non-consulting services resulting from or directly related to the Consultant's Services for the preparation or implementation of the project, unless otherwise indicated in the SCC.

**d. Strict Duty to  
Disclose  
Conflicting  
Activities**

21.1.4 The Consultant shall not engage, and shall cause its Experts as well as its Sub-consultants not to engage, either directly or indirectly, in any business or professional activities that would conflict with the activities assigned to them under this Contract.

21.1.5 The Consultant has an obligation and shall ensure that its Experts and Sub-consultants shall have an obligation to disclose any situation of actual or potential conflict that impacts their capacity to serve the best interest of their Client, or that may reasonably be perceived as having this effect. Failure to disclose said situations may lead to the disqualification of the Consultant or the termination of its Contract.

**22. Confidentiality**

22.1 Except with the prior written consent of the Client, the Consultant and the Experts shall not at any time communicate to any person or entity any confidential information acquired in the course of the Services, nor shall the Consultant and the Experts make public the recommendations formulated in the course of, or as a result of, the Services.

**23. Liability of the Consultant**

23.1 Subject to additional provisions, if any, set forth in the SCC, the Consultant's liability under this Contract shall be as determined under the Applicable Law.

**24. Insurance to be Taken out by the Consultant**

24.1 The Consultant (i) shall take out and maintain, and shall cause any Sub-consultants to take out and maintain, at its (or the Sub-consultants', as the case may be) own cost but on terms and conditions approved by the Client, insurance against the risks, and for the coverage specified in the SCC, and (ii) at the Client's request, shall provide evidence to the Client showing that such insurance has been taken out and maintained and that the current premiums therefore have been paid. The Consultant shall ensure that such insurance is in place prior to commencing the Services as stated in Clause GCC 13.

**25. Accounting, Inspection and Auditing**

25.1 The Consultant shall keep, and shall make all reasonable efforts to cause its Sub-consultants to keep, accurate and systematic accounts and records in respect of the Services in such form and detail as will clearly identify relevant time changes and costs.

25.2. The Consultant shall permit and shall cause its Sub-consultants to permit, the Bank and/or persons appointed by the Bank to inspect the Site and/or all accounts and records relating to the performance of the Contract and the submission of the Proposal to provide the Services, and to have such accounts and records audited by auditors appointed by the Bank if requested by the Bank. The Consultant's attention is drawn to Clause GCC 10 which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under this Clause GCC 25.2 constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility under the Bank's prevailing sanctions procedures.)

**26. Reporting Obligations**

26.1 The Consultant shall submit to the Client the reports and documents specified in **Appendix A**, in the form, in the numbers and within the time periods set forth in the said Appendix.

**27. Proprietary Rights of the Client in Reports and Records**

27.1 Unless otherwise indicated in the SCC, all reports and relevant data and information such as maps, diagrams, plans, databases, other documents and software, supporting records or material compiled or prepared by the Consultant for the Client in the course of the Services shall be confidential and become and remain the absolute property of the Client. The Consultant shall, not later than upon termination or expiration of this Contract, deliver all such documents to the Client, together with a detailed inventory thereof. The Consultant may retain a copy of such documents, data and/or software but shall not use the same for purposes unrelated to this Contract without prior written approval of the Client.

27.2 If license agreements are necessary or appropriate between the Consultant and third parties for purposes of development of the plans, drawings, specifications, designs, databases, other documents and software, the Consultant shall obtain the Client's prior written approval to such agreements, and the Client shall be entitled at its discretion to require recovering the expenses related to the development of the program(s) concerned. Other restrictions about the future use of these documents and software, if any, shall be specified in the SCC.

**28. Equipment, Vehicles and Materials**

28.1 Equipment, vehicles and materials made available to the Consultant by the Client, or purchased by the Consultant wholly or partly with funds provided by the Client, shall be the property of the Client and shall be marked accordingly. Upon termination or expiration of this Contract, the Consultant shall make available to the Client an inventory of such equipment, vehicles and materials and shall dispose of such equipment, vehicles and materials in accordance with the Client's instructions. While in possession of such equipment, vehicles and materials, the Consultant, unless otherwise instructed by the Client in writing, shall insure them at the expense of the Client in an amount equal to their full replacement value.

28.2 Any equipment or materials brought by the Consultant or its Experts into the Client's country for the use either for the project or personal use shall remain the property of the Consultant or the Experts concerned, as applicable.

## D. CONSULTANT'S EXPERTS AND SUB-CONSULTANTS

- 29. Description of Key Experts**
- 29.1 The title, agreed job description, minimum qualification and time-input estimates to carry out the Services of each of the Consultant's Key Experts are described in **Appendix B**.
- 29.2 If required to comply with the provisions of Clause GCC 20a, adjustments with respect to the estimated time-input of Key Experts set forth in **Appendix B** may be made by the Consultant by a written notice to the Client, provided (i) that such adjustments shall not alter the original time-input estimates for any individual by more than 10% or one week, whichever is larger; and (ii) that the aggregate of such adjustments shall not cause payments under this Contract to exceed the ceilings set forth in Clause GCC 41.2.
- 29.3 If additional work is required beyond the scope of the Services specified in **Appendix A**, the estimated time-input for the Key Experts may be increased by agreement in writing between the Client and the Consultant. In case where payments under this Contract exceed the ceilings set forth in Clause GCC 41.1, the Parties shall sign a Contract amendment.
- 30. Replacement of Key Experts**
- 30.1 Except as the Client may otherwise agree in writing, no changes shall be made in the Key Experts.
- 30.2 Notwithstanding the above, the substitution of Key Experts during Contract execution may be considered only based on the Consultant's written request and due to circumstances outside the reasonable control of the Consultant, including but not limited to death or medical incapacity. In such case, the Consultant shall forthwith provide as a replacement, a person of equivalent or better qualifications and experience, and at the same rate of remuneration.
- 31. Approval of Additional Key Experts**
- 31.1 If during execution of the Contract, additional Key Experts are required to carry out the Services, the Consultant shall submit to the Client for review and approval a copy of their Curricula Vitae (CVs). If the Client does not object in writing (stating the reasons for the objection) within twenty two (22) days from the date of receipt of such CVs, such additional Key Experts shall be deemed to have been approved by the Client.
- The rate of remuneration payable to such new additional Key Experts shall be based on the rates for other Key Experts position which require similar qualifications and experience.

- 32. Removal of Experts or Sub-consultants**
- 32.1 If the Client finds that any of the Experts or Sub-consultant has committed serious misconduct or has been charged with having committed a criminal action, or shall the Client determine that Consultant's Expert or Sub-consultant have engaged in corrupt, fraudulent, collusive, coercive or obstructive practice while performing the Services, the Consultant shall, at the Client's written request, provide a replacement.
- 32.2 In the event that any of Key Experts, Non-Key Experts or Sub-consultants is found by the Client to be incompetent or incapable in discharging assigned duties, the Client, specifying the grounds therefore, may request the Consultant to provide a replacement.
- 32.3 Any replacement of the removed Experts or Sub-consultants shall possess better qualifications and experience and shall be acceptable to the Client.
- 33. Replacement/ Removal of Experts – Impact on Payments**
- 33.1 Except as the Client may otherwise agree, (i) the Consultant shall bear all additional travel and other costs arising out of or incidental to any removal and/or replacement, and (ii) the remuneration to be paid for any of the Experts provided as a replacement shall not exceed the remuneration which would have been payable to the Experts replaced or removed.
- 34. Working Hours, Overtime, Leave, etc.**
- 34.1 Working hours and holidays for Experts are set forth in **Appendix B**. To account for travel time to/from the Client's country, experts carrying out Services inside the Client's country shall be deemed to have commenced or finished work in respect of the Services such number of days before their arrival in, or after their departure from, the Client's country as is specified in **Appendix B**.
- 34.2 The Experts shall not be entitled to be paid for overtime nor to take paid sick leave or vacation leave except as specified in **Appendix B**, and the Consultant's remuneration shall be deemed to cover these items.
- 34.3 Any taking of leave by Key Experts shall be subject to the prior approval by the Consultant who shall ensure that absence for leave purposes will not delay the progress and or impact adequate supervision of the Services.

## E. OBLIGATIONS OF THE CLIENT

### 35. Assistance and Exemptions

35.1 Unless otherwise specified in the SCC, the Client shall use its best efforts to:

- (a) Assist the Consultant with obtaining work permits and such other documents as shall be necessary to enable the Consultant to perform the Services.
- (b) Assist the Consultant with promptly obtaining, for the Experts and, if appropriate, their eligible dependents, all necessary entry and exit visas, residence permits, exchange permits and any other documents required for their stay in the Client's country while carrying out the Services under the Contract.
- (c) Facilitate prompt clearance through customs of any property required for the Services and of the personal effects of the Experts and their eligible dependents.
- (c) Issue to officials, agents and representatives of the Government all such instructions and information as may be necessary or appropriate for the prompt and effective implementation of the Services.
- (d) Assist the Consultant and the Experts and any Sub-consultants employed by the Consultant for the Services with obtaining exemption from any requirement to register or obtain any permit to practice their profession or to establish themselves either individually or as a corporate entity in the Client's country according to the applicable law in the Client's country.
- (e) Assist the Consultant, any Sub-consultants and the Experts of either of them with obtaining the privilege, pursuant to the applicable law in the Client's country, of bringing into the Client's country reasonable amounts of foreign currency for the purposes of the Services or for the personal use of the Experts and of withdrawing any such amounts as may be earned therein by the Experts in the execution of the Services.
- (f) Provide to the Consultant any such other assistance as may be specified in the SCC.

**36. Access to Project Site**

36.1 The Client warrants that the Consultant shall have, free of charge, unimpeded access to the project site in respect of which access is required for the performance of the Services. The Client will be responsible for any damage to the project site or any property thereon resulting from such access and will indemnify the Consultant and each of the experts in respect of liability for any such damage, unless such damage is caused by the willful default or negligence of the Consultant or any Sub-consultants or the Experts of either of them.

**37. Change in the Applicable Law Related to Taxes and Duties**

37.1 If, after the date of this Contract, there is any change in the applicable law in the Client's country with respect to taxes and duties which increases or decreases the cost incurred by the Consultant in performing the Services, then the remuneration and reimbursable expenses otherwise payable to the Consultant under this Contract shall be increased or decreased accordingly by agreement between the Parties hereto, and corresponding adjustments shall be made to the ceiling amounts specified in Clause GCC 41.1

**38. Services, Facilities and Property of the Client**

38.1 The Client shall make available to the Consultant and the Experts, for the purposes of the Services and free of any charge, the services, facilities and property described in the Terms of Reference (**Appendix A**) at the times and in the manner specified in said **Appendix A**.

38.2 In case that such services, facilities and property shall not be made available to the Consultant as and when specified in **Appendix A**, the Parties shall agree on (i) any time extension that it may be appropriate to grant to the Consultant for the performance of the Services, (ii) the manner in which the Consultant shall procure any such services, facilities and property from other sources, and (iii) the additional payments, if any, to be made to the Consultant as a result thereof pursuant to Clause GCC 41.3.

**39. Counterpart Personnel**

39.1 The Client shall make available to the Consultant free of charge such professional and support counterpart personnel, to be nominated by the Client with the Consultant's advice, if specified in **Appendix A**.

39.2 If counterpart personnel are not provided by the Client to the Consultant as and when specified in **Appendix A**, the Client and the Consultant shall agree on (i) how the affected part of the Services shall be carried out, and (ii) the additional payments, if any, to be made by the Client to the Consultant as a result thereof pursuant to Clause GCC 41.3.

39.3 Professional and support counterpart personnel, excluding Client's liaison personnel, shall work under the exclusive direction of the Consultant. If any member of the counterpart personnel fails to perform adequately any work assigned to such member by the Consultant that is consistent with the position occupied by such member, the Consultant may request the replacement of such member, and the Client shall not unreasonably refuse to act upon such request.

**40. Payment Obligation**

40.1 In consideration of the Services performed by the Consultant under this Contract, the Client shall make such payments to the Consultant and in such manner as is provided by GCC F below.

**F. PAYMENTS TO THE CONSULTANT**

**41. Ceiling Amount**

41.1 An estimate of the cost of the Services is set forth in **Appendix C** (Remuneration) and **Appendix D** (Reimbursable expenses).

41.2 Payments under this Contract shall not exceed the ceilings in foreign currency and in local currency specified in the SCC.

41.3 For any payments in excess of the ceilings specified in GCC41.2, an amendment to the Contract shall be signed by the Parties referring to the provision of this Contract that evokes such amendment.

**42. Remuneration and Reimbursable Expenses**

42.1 The Client shall pay to the Consultant (i) remuneration that shall be determined on the basis of time actually spent by each Expert in the performance of the Services after the date of commencing of Services or such other date as the Parties shall agree in writing; and (ii) reimbursable expenses that are actually and reasonably incurred by the Consultant in the performance of the Services.

42.2 All payments shall be at the rates set forth in **Appendix C** and **Appendix D**.

42.3 Unless the SCC provides for the price adjustment of the remuneration rates, said remuneration shall be fixed for the duration of the Contract.

42.4 The remuneration rates shall cover: (i) such salaries and allowances as the Consultant shall have agreed to pay to the Experts as well as factors for social charges and overheads (bonuses or other means of profit-sharing shall not be allowed as an element of overheads), (ii) the cost of backstopping by home office staff not included in the Experts' list in **Appendix B**, (iii) the Consultant's profit, and (iv) any other items as specified in the SCC.

42.5 Any rates specified for Experts not yet appointed shall be provisional and shall be subject to revision, with the written approval of the Client, once the applicable remuneration rates and allowances are known.

### **43. Taxes and Duties**

43.1 The Consultant, Sub-consultants and Experts are responsible for meeting any and all tax liabilities arising out of the Contract unless it is stated otherwise in the **SCC**.

43.2 As an exception to the above and as stated in the **SCC**, all local identifiable indirect taxes (itemized and finalized at Contract negotiations) are reimbursed to the Consultant or are paid by the Client on behalf of the Consultant.

### **44. Currency of Payment**

44.1 Any payment under this Contract shall be made in the currency(ies) specified in the **SCC**.

### **45. Mode of Billing and Payment**

45.1 Billings and payments in respect of the Services shall be made as follows:

- (a) *Advance payment.* Within the number of days after the Effective Date, the Client shall pay to the Consultant an advance payment as specified in the **SCC**. Unless otherwise indicated in the **SCC**, an advance payment shall be made against an advance payment bank guarantee acceptable to the Client in an amount (or amounts) and in a currency (or currencies) specified in the **SCC**. Such guarantee (i) is to remain effective until the advance payment has been fully set off, and (ii) is to be in the form set forth in **Appendix E**, or in such other form as the Client shall have approved in writing. The advance payments will be set off by the Client in equal installments against the statements for the number of months of the Services specified in the **SCC** until said advance payments have been fully set off.
- (b) *The Itemized Invoices.* As soon as practicable and not later than fifteen (15) days after the end of each calendar month during the period of the Services, or after the end of each time interval otherwise indicated in the **SCC**, the Consultant shall submit to the Client, in duplicate, itemized invoices, accompanied by the receipts or other appropriate supporting documents, of the amounts payable pursuant to Clauses GCC 44 and GCC 45 for such interval, or any other period indicated in the **SCC**. Separate invoices shall be submitted for expenses incurred in foreign currency and in local currency. Each invoice shall show remuneration and reimbursable expenses separately.
- (c) The Client shall pay the Consultant's invoices within sixty (60) days after the receipt by the Client of such itemized invoices with

supporting documents. Only such portion of an invoice that is not satisfactorily supported may be withheld from payment. Should any discrepancy be found to exist between actual payment and costs authorized to be incurred by the Consultant, the Client may add or subtract the difference from any subsequent payments.

- (d) *The Final Payment*. The final payment under this Clause shall be made only after the final report and a final invoice, identified as such, shall have been submitted by the Consultant and approved as satisfactory by the Client. The Services shall be deemed completed and finally accepted by the Client and the final report and final invoice shall be deemed approved by the Client as satisfactory ninety (90) calendar days after receipt of the final report and final invoice by the Client unless the Client, within such ninety (90) calendar day period, gives written notice to the Consultant specifying in detail deficiencies in the Services, the final report or final invoice. The Consultant shall thereupon promptly make any necessary corrections, and thereafter the foregoing process shall be repeated. Any amount that the Client has paid or has caused to be paid in accordance with this Clause in excess of the amounts payable in accordance with the provisions of this Contract shall be reimbursed by the Consultant to the Client within thirty (30) days after receipt by the Consultant of notice thereof. Any such claim by the Client for reimbursement must be made within twelve (12) calendar months after receipt by the Client of a final report and a final invoice approved by the Client in accordance with the above.
- (e) All payments under this Contract shall be made to the accounts of the Consultant specified in the SCC.
- (f) With the exception of the final payment under (d) above, payments do not constitute acceptance of the Services nor relieve the Consultant of any obligations hereunder.

#### **46. Interest on Delayed Payments**

46.1 If the Client had delayed payments beyond fifteen (15) days after the due date stated in Clause GCC 45.1 (c), interest shall be paid to the Consultant on any amount due by, not paid on, such due date for each day of delay at the annual rate stated in the SCC.

## **G. FAIRNESS AND GOOD FAITH**

#### **47. Good Faith**

47.1 The Parties undertake to act in good faith with respect to each other's rights under this Contract and to adopt all reasonable measures to ensure the realization of the objectives of this Contract.

## **H. SETTLEMENT OF DISPUTES**

### **48. Amicable Settlement**

48.1 The Parties shall seek to resolve any dispute amicably by mutual consultation.

48.2 If either Party objects to any action or inaction of the other Party, the objecting Party may file a written Notice of Dispute to the other Party providing in detail the basis of the dispute. The Party receiving the Notice of Dispute will consider it and respond in writing within fourteen (14) days after receipt. If that Party fails to respond within fourteen (14) days, or the dispute cannot be amicably settled within fourteen (14) days following the response of that Party, Clause GCC 49.1 shall apply.

### **49. Dispute Resolution**

49.1 Any dispute between the Parties arising under or related to this Contract that cannot be settled amicably may be referred to by either Party to the adjudication/arbitration in accordance with the provisions specified in the SCC.

## II. General Conditions

### **Attachment 1: Bank's Policy – Corrupt and Fraudulent Practices**

(the text in this Attachment 1 shall not be modified)

#### **Guidelines for Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, dated January 2011:**

##### **“Fraud and Corruption**

1.23 It is the Bank’s policy to require that Borrowers (including beneficiaries of Bank loans), consultants, and their agents (whether declared or not), sub-contractors, sub-consultants, service providers, or suppliers, and any personnel thereof, observe the highest standard of ethics during the selection and execution of Bank-financed contracts [footnote: In this context, any action taken by a consultant or any of its personnel, or its agents, or its sub-consultants, sub-contractors, services providers, suppliers, and/or their employees, to influence the selection process or contract execution for undue advantage is improper.]. In pursuance of this policy, 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<sup>20</sup>;
- (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<sup>21</sup>;
- (iii) “collusive practices” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party<sup>22</sup>;

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<sup>20</sup> For the purpose of this sub-paragraph, “another party” refers to a public official acting in relation to the selection process or contract execution. In this context “public official” includes World Bank staff and employees of other organizations taking or reviewing selection decisions.

<sup>21</sup> For the purpose of this sub-paragraph, “party” refers to a public official; the terms “benefit” and “obligation” relate to the selection process or contract execution; and the “act or omission” is intended to influence the selection process or contract execution.

<sup>22</sup> For the purpose of this sub-paragraph, “parties” refers to participants in the procurement or selection process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish prices at artificial, non-competitive levels, or are privy to each other’s bid prices or other conditions.

- (iv) “coercive practices” 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<sup>23</sup>;
  - (v) “obstructive practice” is
    - (aa) 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
    - (bb) acts intended to materially impede the exercise of the Bank’s inspection and audit rights;
- (b) will reject a proposal for award if it determines that the consultant recommended for award or any of its personnel, or its agents, or its sub-consultants, sub-contractors, services 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) will declare misprocurement and cancel the portion of the Loan allocated to a contract if it determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the Loan were engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the selection process or the implementation 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 they knew of the practices;
- (d) will sanction a firm or an individual at any time, in accordance with prevailing Bank’s sanctions procedures<sup>24</sup>, including by publicly declaring such firm or an ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Bank-financed contract, and (ii) to be a nominated<sup>25</sup> sub-consultant, supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract.

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<sup>23</sup> For the purpose of this sub-paragraph, “party” refers to a participant in the selection process or contract execution.

<sup>24</sup> A firm or an individual may be declared ineligible to be awarded a Bank-financed contract upon (i) completion of the Bank’s sanctions proceedings as per its sanctions procedures, including inter alia: cross-debarment as agreed with other International Financial Institutions, including Multilateral Development Banks, and through the application of the World Bank Group corporate administrative procurement sanctions procedures for fraud and corruption; and (ii) as a result of temporary suspension or early temporary suspension in connection with an ongoing sanctions proceedings. See footnote 12 and paragraph 8 of Appendix 1 of these Guidelines.

<sup>25</sup> A nominated sub-consultant, supplier, or service provider is one which has been either (i) included by the consultant in its proposal because it brings specific and critical experience and know-how that are accounted for in the technical evaluation of the consultant’s proposal for the particular services; or (ii) appointed by the Borrower.

### **III Special Conditions of Contract**

<b>Number of GC Clause</b>	<b>Amendments of, and Supplements to, Clauses in the General Conditions of Contract</b>
<b>1.1(b) and 3.1</b>	The Contract shall be construed in accordance with the law of the People's Republic of Bangladesh
<b>4.1</b>	The language is: English.
<b>6.1 and 6.2</b>	<p>The addresses are:</p> <p>Client : Bangladesh Water Development Board (BWDB)</p> <p>Attention : Md. Habibur Rahman, Chief Engineer; and Project Director, CEIP-1, BWDB</p> <p>Facsimile : +88-02-9899325</p> <p>Phone: +88-02-9899373</p> <p>E-mail: pdpmuceip@gmail.com.</p> <p>Consultant : JV of DHI and Deltares, in association with Sub-Consultants: Institute of Water Modeling, University of Colorado and Columbia University</p>
	<p>The Lead Member on behalf of the JV is DHI, Denmark:</p> <p>Attention : Dr. Kim Wium Olesen</p> <p>Phone: +45 4516 9264</p> <p>Mobile: +45 4089 3259</p> <p>Facsimile : +45 4516 9292</p> <p>E-mail : kwo@dhigroup.com</p>
<b>9.1</b>	<p>The Authorized Representatives are:</p> <p>For the Client: Md. Habibur Rahman, Chief Engineer; and Project Director, CEIP-1, BWDB, Dhaka, Bangladesh</p> <p>For the Consultant: Dr. Kim Wium Olesen, Head of Water Resources Department, DHI, Denmark</p>

<b>11.1</b>	The effectiveness conditions are the following: advance payment made.  The Contract shall come into force and effect on the 11 <sup>th</sup> day after its signing; and no further instruction shall be issued in this regard.
<b>12.1</b>	Termination of Contract for Failure to Become Effective:  The time period shall be: Three (3) months.
<b>13.1</b>	Commencement of Services:  The number of days shall be: 28 (twenty-eight)  Confirmation of Key Experts' availability to start the Assignment has been submitted to the Client in writing as a written statement signed by each Key Expert.
<b>14.1</b>	Expiration of Contract:  The time period shall be: 30 (thirty) months
<b>21 b</b>	The Client reserves the right to determine on a case-by-case basis whether the Consultant should be disqualified from providing goods, works or non-consulting services due to a conflict of a nature described in Clause GCC 21.1.3: Yes
<b>23.1</b>	Limitation of the Consultant's Liability towards the Client:  (a) Except in the case of gross negligence or willful misconduct on the part of the Consultant or on the part of any person or a firm acting on behalf of the Consultant in carrying out the Services, the Consultant, with respect to damage caused by the Consultant to the Client's property, shall not be liable to the Client:  (i) for any indirect or consequential loss or damage; and  (ii) for any direct loss or damage that exceeds one time the value of the contract;  (b) This limitation of liability shall not  (i) affect the Consultant's liability, if any, for damage to Third Parties caused by the Consultant or any person or firm acting on behalf of the Consultant in carrying out the Services; and  (ii) be construed as providing the Consultant with any limitation or exclusion from liability which is prohibited by the Applicable Law.

<b>24.1</b>	<p>The insurance coverage against the risks shall be as follows:</p> <ul style="list-style-type: none"> <li>(a) Professional liability insurance, with a minimum coverage of the ceiling amount of contract;</li> <li>(b) Third Party motor vehicle liability insurance in respect of motor vehicles operated in the Client's country by the Consultant or its Experts or Sub-consultants, with a minimum coverage of in accordance with the applicable law in the Client's country;</li> <li>(c) Third Party liability insurance, with a minimum coverage of in accordance with the applicable law in the Client's country;</li> <li>(d) employer's liability and workers' compensation insurance in respect of the experts and Sub-consultants in accordance with the relevant provisions of the applicable law in the Client's country, as well as, with respect to such Experts, any such life, health, accident, travel or other insurance as may be appropriate; and</li> <li>(e) insurance against loss of or damage to (i) equipment purchased in whole or in part with funds provided under this Contract, (ii) the Consultant's property used in the performance of the Services, and (iii) any documents prepared by the Consultant in the performance of the Services.</li> </ul>
<b>27.1</b>	No exceptions to proprietary rights provision
<b>27.2</b>	The Consultant shall not use these documents and software for purposes unrelated to this Contract without the prior written approval of the Client.
<b>41.2</b>	<p>The ceiling in currencies is USD 2,659,178, EUR 3,185,873 and BDT 274,570,551 exclusive of provisional contingency and local income and value added taxes as defined in Appendix C; and</p> <p>The ceiling in currencies is USD 3,589,891, EUR 4,300,929 and BDT 438,170,244 inclusive of provisional contingency and local income and value added taxes as defined in Appendix C.</p>

42.3	<p><b>Price adjustment on the remuneration</b> applies to both foreign and local currencies Payments for remuneration made in [foreign <i>and</i> local] currency shall be adjusted as follows:</p> <p>(1) Remuneration paid in foreign currency on the basis of the rates set forth in Appendix D1 shall be adjusted every 12 months and, the first time, with effect for the remuneration earned in the 13<sup>th</sup> calendar month after the date of the Contract Effectiveness date by applying the following formula:</p> $R_f = R_{fo} \times \left[ 0.1 + 0.9 \frac{I_f}{I_{fo}} \right]$ <p>where</p> <p><math>R_f</math> is the adjusted remuneration;</p> <p><math>R_{fo}</math> is the remuneration payable on the basis of the remuneration rates (Appendix D1) in foreign currency;</p> <p><math>I_f</math> is the official index for salaries in the country of the foreign currency for the first month for which the adjustment is supposed to have effect; and</p> <p><math>I_{fo}</math> is the official index for salaries in the country of the foreign currency for the month of the date of the Contract.</p> <p>The Consultant shall state here the name, source institution, and any necessary identifying characteristics of the official index for salaries corresponding to <math>I_f</math> and <math>I_{fo}</math> in the adjustment formula for remuneration paid in foreign currency:</p> <p>The index for price adjustment of remuneration for DK is to be based on Statistics Denmark, Indices of average earnings in Corporations and Organizations (1.quater 2005 =100), Knowledge-based services.  <a href="http://www.statistikbanken.dk/statbank5a/default.asp?w=1366">http://www.statistikbanken.dk/statbank5a/default.asp?w=1366</a></p> <p>The index for price adjustment of remuneration for NL is to be based on the annual corrective salary agreement of the Dutch Government (contributing for 70%) and the Consumer Price Index (contributing for 30%). The sources of information are:  <a href="https://www.government.nl/latest/news/2015/12/17/outcome-of-the-negotiations-on-the-police-s-collective-labour-agreement">https://www.government.nl/latest/news/2015/12/17/outcome-of-the-negotiations-on-the-police-s-collective-labour-agreement</a> and  <a href="http://statline.cbs.nl/Statweb/publication/?DM=SLEN&amp;PA=83131eng&amp;D1=0-6&amp;D2=0&amp;D3=(1-39)-1&amp;LA=EN&amp;VW=T">http://statline.cbs.nl/Statweb/publication/?DM=SLEN&amp;PA=83131eng&amp;D1=0-6&amp;D2=0&amp;D3=(1-39)-1&amp;LA=EN&amp;VW=T</a>.</p> <p>The index for price adjustment of remuneration for USD is to be based official consumer price index:  <a href="http://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/">http://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/</a></p> <p>(2) Remuneration paid in local currency pursuant to the rates set forth in Appendix D1 shall be adjusted every 12 months and, for the first time, with effect for the remuneration earned in the 13<sup>th</sup> the calendar month after the date of the Contract Effectiveness date by applying the following formula:</p>
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$$R_l = R_{lo} \times \left[ 0.1 + 0.9 \frac{I_l}{I_{lo}} \right]$$

Where

$R_l$  is the adjusted remuneration;

$R_{lo}$  is the remuneration payable on the basis of the remuneration rates (Appendix D1) in local currency;

$I_l$  is the official index for salaries in the Bangladesh for the first month for which the adjustment is to have effect; and

$I_{lo}$  is the official index for salaries in the Bangladesh for the month of the date of the Contract.

The index for price adjustment of remuneration for BD is to be based upon the Consumer Price Index (CPI) [www.bbs.gov.bd](http://www.bbs.gov.bd) in Bangladesh as published by the Bangladesh Bureau of Statistics.

- (2) Any part of the remuneration that is paid in a currency different from the currency of the official index for salaries used in the adjustment formula, shall be adjusted by a correction factor  $X_0/X$ .  $X_0$  is the number of units of currency of the country of the official index, equivalent to one unit of the currency of payment on the date of the contract.  $X$  is the number of units of currency of the country of the official index, equivalent to one unit of the currency of payment on the first day of the first month for which the adjustment is supposed to have effect.

<b>43.1 and 43.2</b>	<p>The Client warrants that the Client shall pay on behalf of the Consultant, the Sub-consultants and the Experts any indirect income and value added taxes, duties, fees, levies and other impositions imposed, under the applicable law in Bangladesh, on the Consultant, the Sub-consultants and the Experts in respect of:</p> <ul style="list-style-type: none"> <li>(a) Applicable: any payments whatsoever made to the Consultant, Sub-consultants and the Experts (<i>other than nationals or permanent residents of Bangladesh</i>), in connection with the carrying out of the Services.</li> <li>(b) Not Applicable: any equipment, materials and supplies brought into the Client's country by the Consultant or Sub-consultants for the purpose of carrying out the Services and which, after having been brought into such territories, will be subsequently withdrawn by them;</li> <li>(c) Applicable: any equipment imported for the purpose of carrying out the Services and paid for out of funds provided by the Client and which is treated as property of the Client;</li> <li>(d) Not Applicable: any property brought into Bangladesh by the Consultant, any Sub-consultants or the Experts (<i>other than nationals or permanent residents of Bangladesh</i>), or the eligible dependents of such experts for their personal use and which will subsequently be withdrawn by them upon their respective departure from Bangladesh, provided that:</li> </ul>
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	<p>(i) the Consultant, Sub-consultants and experts shall follow the usual customs procedures of Bangladesh in importing property into Bangladesh; and</p> <p>If the Consultant, Sub-consultants or Experts do not withdraw but dispose of any property in Bangladesh upon which customs duties and taxes have been exempted, the Consultant, Sub-consultants or Experts, as the case may be, (a) shall bear such customs duties and taxes in conformity with the regulations of Bangladesh, or (b) shall reimburse them to the Client if they were paid by the Client at the time the property in question was brought into Bangladesh.</p>
<b>44.1</b>	The currencies of payment shall be the following: USD, EUR and BDT
<b>45.1(a)</b>	<p>The following provisions shall apply to the advance payment and the advance bank payment guarantee:</p> <p>(1) An advance payment of ten (10) percent of Contract Price in both foreign and local currencies shall be made within 28 days after the Effective Date if so requested by the Consultant in the form of invoices in appropriate currencies and upon receipt by the Client of a bank guarantee for advance payment. The advance payment will be set off by the Client in equal installments against the statements for the first <u>21 (twenty-one) months OR seven (7) quarters of the Services</u> until the advance payment has been fully set off.</p> <p>(2) The advance bank payment guarantee shall be in the amount and in the currency (ies) of the advance payment.</p>
<b>45.1(b)</b>	The Consultant shall submit to the Client itemized statements at time intervals of: Every quarter. Separate Invoices for each of the currencies shall be submitted.
<b>45.1(e)</b>	<p>The accounts are:</p> <p><b>The accounts are:</b></p> <p>for foreign currency: USD [IBAN DK38 3000 4360 163369, SWIFT CODE: DABA DKKK]</p> <p>for foreign currency: Euro [IBAN DK38 3000 4360 163369, SWIFT CODE: DABA DKKK]</p> <p>for local currency: BDT [Standard Chartered Bank, Gulshan Branch, 67 Gulshan Avenue, Gulshan, Dhaka 1212, Account Name: DHI Account No.: 01-1308972-01]</p>
<b>46.1</b>	The interest rate is: 1-year LIBOR + 2%.

<p><b>49.</b></p>	<p>Disputes shall be settled by arbitration in accordance with the following provisions:</p> <p>1. <b><u>Selection of Arbitrators.</u></b> Each dispute submitted by a Party to arbitration shall be heard by a sole arbitrator or an arbitration panel composed of three (3) arbitrators, in accordance with the following provisions:</p> <ul style="list-style-type: none"> <li>(a) Where the Parties agree that the dispute concerns a technical matter, they may agree to appoint a sole arbitrator or, failing agreement on the identity of such sole arbitrator within thirty (30) days after receipt by the other Party of the proposal of a name for such an appointment by the Party who initiated the proceedings, either Party may apply to the Fédération Internationale des Ingénieurs-Conseil (FIDIC) of Lausanne, Switzerland] for a list of not fewer than five (5) nominees and, on receipt of such list, the Parties shall alternately strike names there from, and the last remaining nominee on the list shall be the sole arbitrator for the matter in dispute. If the last remaining nominee has not been determined in this manner within sixty (60) days of the date of the list, the Fédération Internationale des Ingénieurs-Conseil (FIDIC) of Lausanne, Switzerland shall appoint, upon the request of either Party and from such list or otherwise, a sole arbitrator for the matter in dispute.</li> <li>(b) Where the Parties do not agree that the dispute concerns a technical matter, the Client and the Consultant shall each appoint one (1) arbitrator, and these two arbitrators shall jointly appoint a third arbitrator, who shall chair the arbitration panel. If the arbitrators named by the Parties do not succeed in appointing a third arbitrator within thirty (30) days after the latter of the two (2) arbitrators named by the Parties has been appointed, the third arbitrator shall, at the request of either Party, be appointed by the Secretary General of the International Centre for Settlement of Investment Disputes, Washington, D.C.</li> <li>(c) If, in a dispute subject to paragraph (b) above, one Party fails to appoint its arbitrator within thirty (30) days after the other Party has appointed its arbitrator, the Party which has named an arbitrator may apply to the Secretary General of the International Centre for Settlement of Investment Disputes, Washington, D.C to appoint a sole arbitrator for the matter in dispute, and the arbitrator appointed pursuant to such application shall be the sole arbitrator for that dispute.</li> </ul>
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2. Rules of Procedure. Except as otherwise stated herein, arbitration proceedings shall be conducted in accordance with the rules of procedure for arbitration of the United Nations Commission on International Trade Law (UNCITRAL) as in force on the date of this Contract.
3. Substitute Arbitrators. If for any reason an arbitrator is unable to perform his/her function, a substitute shall be appointed in the same manner as the original arbitrator.
4. Nationality and Qualifications of Arbitrators. The sole arbitrator or the third arbitrator appointed pursuant to paragraphs 1(a) through 1(c) above shall be an internationally recognized legal or technical expert with extensive experience in relation to the matter in dispute and shall not be a national of the Consultant's home country [*Note: If the Consultant consists of more than one entity, add: or of the home country of any of their members or Parties*] or of the Government's country. For the purposes of this Clause, "home country" means any of:
- (a) the country of incorporation of the Consultant [*Note: If the Consultant consists of more than one entity, add: or of any of their members or Parties*]; or
  - (b) the country in which the Consultant's [or any of their members' or Parties'] principal place of business is located; or
  - (c) the country of nationality of a majority of the Consultant's [or of any members' or Parties'] shareholders; or
  - (d) the country of nationality of the Sub-consultants concerned, where the dispute involves a subcontract.
5. Miscellaneous. In any arbitration proceeding hereunder:
- (a) proceedings shall, unless otherwise agreed by the Parties, be held in Singapore or any country which is neither the Client's country nor the Consultant's country;
  - (b) the English language shall be the official language for all purposes; and
  - (c) the decision of the sole arbitrator or of a majority of the arbitrators (or of the third arbitrator if there is no such majority) shall be final and binding and shall be enforceable in any court of competent jurisdiction, and the Parties hereby waive any objections to or claims of immunity in respect of such enforcement.

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*WWS*

## **IV. Appendices**

- Appendix A: Terms of Reference [including Annex-1 related to Structure of EIA Report; Detail TOR and Sample Structure of EIA for each Polder]
- Appendix B: Key Experts [TECH-5 and TECH-6 (without CVs)]
- Appendix C: Summary of Costs [FIN-2]
- Appendix D1: Remuneration Cost Estimates [FIN-3]
- Appendix D2: Reimbursable Cost Estimates [FIN-4]
- Appendix E: Form of Advance Payments Guarantee
- Appendix F: Minutes of Negotiation Meetings [signed minutes of negotiations meetings from April 2016, January 2017 and January 2018, including Proposal Adaptations, 4th version qualifying the adaptations to Technical and Financial Proposals resulting from negotiation meetings and negotiations through letters and e-mails]

**Appendix A – Terms of Reference**

for

*LONG TERM MONITORING, RESEARCH AND ANALYSIS OF BANGLADESH COASTAL ZONE*

**(SUSTAINABLE POLDERS ADAPTED TO COASTAL DYNAMICS),**

**CONTRACT PACKAGE NO. CEIP-I/C3/S4**

**Revised to reflect changes agreed upon during contract negotiations**

**May, 2018**

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**1.0: INTRODUCTION**

Bangladesh is situated at the confluence of three great trans-Himalayan rivers — the Ganges, the Brahmaputra or Jamuna, and the Meghna (GBM). While over 90 percent of the catchment of the GBM system lies outside of Bangladesh, more than 200 rivers and tributaries and distributaries of the GBM system drain through the country via a constantly changing network of channels, tidal inlets and creeks, before emptying out into the Bay of Bengal<sup>1</sup>. Thus, the coastal zone of Bangladesh, a landmass just above the mean sea level, is continually influenced by these Himalayan drainage systems that form one of the largest and most active deltas in the world.

The coastal zone<sup>2</sup> of Bangladesh spans over 710 km of coastline and is prone to multiple threats. Sixty- two percent of the coastal land has an elevation less than 3 meters and eighty-three percent is within 5 meters above mean sea level<sup>3</sup>. The flow of the rivers entering the GBM delta is the third largest in the world and river floods occur regularly, often leading to flooding of one thirds of the country. In 1998, the flooded area covered as much as two thirds of the country. With a sediment supply of 1 billion tons per year, this is the delta with the largest sediment supply in the world. This leads to accretion of the land area in the coastal zone (5-10 km<sup>2</sup>/year, mainly in the Meghna Estuary), and to highly unstable river branches and estuaries. In fact the entire coastal belt is subject to regular erosion and deposition process. The large amounts of sediments deposited form loose land mass and obviously subsides under natural conditions of over burden pressure. It is also known that there formations of peat soils in the coastal deposits. It has been noticed that the subsidence rate may be higher in places due to anthropogenic factors like drainage and ground water extraction. On top of that there are tectonic movements in the deep subsoil, caused by horizontal plate movements.

The coastal zone constitutes 32 percent of the land area and hosts nearly 28 percent of the population<sup>4</sup> (i.e., nearly 42 million<sup>5</sup>). The coastal population is projected to grow to 61 million by 2050<sup>6</sup>. A high pace of population growth

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<sup>1</sup> Yu W. et al., 2010. Climate Change Risks and Food Security in Bangladesh. World Bank

<sup>2</sup> The delineation of the Coastal Zone, approved by the Ministry of Water Resources in 2003, comprises 19 districts, 147 upazillas and the exclusive economic zone

<sup>3</sup> Bangladesh Water Development Board. Coastal Embankment Improvement Project, Draft Final Report, Sept 2012

<sup>4</sup> Islam, M.R., 2004. Where land meets the sea: a profile of the coastal zone of Bangladesh. Dhaka, the University Press Limited. 317 pp.

<sup>5</sup> Based on a total population of 148.7 million in 2010; as per World Bank Open Data

<sup>6</sup> Ahmad, M. 2005. Living in the coast: urbanization. Dhaka, Program Development Office for Integrated Coastal Zone Management Plan Project, Water Resources Planning Organization

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characterizes coastal districts<sup>7</sup>. This trend continues to push millions of people to live in the low-lying coastal areas, which are highly vulnerable to natural hazards. However, in recent years it has been noticed that population growth is much lower than rest of the country, specially in the western part of the coastal belt, possibly resulting from out migration due to several factors including increase in storm surges and cyclonic events.

## 2.0: BACKGROUND ON POLDERS AND THE COASTAL EMBANKMENT IMPROVEMENT PROJECT –I (CEIP-I)

The Government of Bangladesh's commitment to develop a safe and inhabitable coastal zone can be dated back to the mid 1960s. Compelled by the call for intensive rice cultivation during the green revolution, the government constructed a series of embankments and polders<sup>8</sup> in order to provide tidal flood protection for coastal population; thereby enabling intensification of crop production and agricultural growth. Coastal embankment projects put in place regulators and other structures to control water intake and drainage of polder areas with the primary principle of improving agriculture productivity.

Primarily, the coastal embankment system brought benefits to the people living along low lying areas. The system was originally designed to protect the low-lying land against inundation from the high spring tides, in monsoon-months, that occur twice a month during new moon and full moon, that may last over three four days. When the polders were initially constructed attention was not given to storm surges that could over-top the polder and thus result in submergence of the protected area and destruction of crops as well as homesteads often killing hundreds of people. Recent cyclones, that had occurred in 2007 (Sidr), 2009 (Aila) etc, had brought substantial damage to the embankments and threaten the integrity of the coastal polders, through breaching of the embankment. Siltation of peripheral rivers surrounding the embankment caused the coastal polders to suffer from water logging, which lead to large scale environmental, social and economic degradation in the affected areas. Poor maintenance and inadequate management of the polders have also contributed to internal drainage congestion and heavy external siltation. As a result, in some areas soil fertility and productivity in agriculture sector are declining resulting from water logging and salinity increase inside polders.

For a long time , it has been questioned whether the polder concept, as it is practiced now, will provide a durable and sustainable solution for protection of the coastal belt against salinity intrusion, tidal flooding, storm surges, and maintain production level in agriculture sector. Water logging inside the polders especially in the south-west region as the bed of peripheral rivers has silted up is another serious morphological challenge. Before the polders were constructed huge volume of sediment entered the land area and contributed to raise the land level and compensate any subsidence that might have taken place. After completion of network of polders, the connectivity between land and rivers that used to bring in tidal inundation and facilitated deposition of sediment on land were lost and the polderized areas were deprived of natural sediment supply. Further, drainage system that were introduced inside the polders , possibly lead to subsidence of the soil, which is similar to the polders in the Netherlands that lie below sea level, due to lowering of land levels. To manage the ground level in the Netherlands, pumping activities are carefully regulated and monitored. In the much more dynamic GBM delta, this problem has to handle with appropriate solutions based on proper understanding of underlying factors. The situation in Bangladesh is possibly more complex. The issue of subsidence is not properly understood and the problem may not yet be so strongly manifested even after few decades of construction of the polders.

The vulnerability of the coastal population is on the rise due to climate change. Climate variability and change will accentuate the intrinsic risks facing coastal Bangladesh. These risks span: (i) cyclones and storm surges (ii) river bank erosion and vulnerability of islands and chars, (iii) sea level rise, (iv) salinity intrusion, (v) floods, (vi) droughts, (vii) drainage congestions and (viii) coastal erosion. Much is still to be understood of this dynamic delta. The coastal belt is

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<sup>7</sup> In 1990s, population growth is estimated to be 2.25% according to Mcgranahan G., D. Balk, and Bridget, A., 2000. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. Environment and Urbanization April 2007 vol. 19 no. 1 17-37, doi: 10.1177/0956247807076960

<sup>8</sup> The Dutch term "polder" is used, in Bangladesh, to designate areas that are enclosed on all sides by dykes, levees or embankments, separating them from the surrounding river system Polders offer protection against tidal floods/inundation resulting from high spring tides, especially in monsoon months, and salinity intrusion; but in the process the natural sedimentation process is interrupted. Polders are equipped by in- and outlets to control the water inside the embanked area

considered to be the most vulnerable area of Bangladesh from adverse impacts of climate change. Rise in salinity is another problem in the polders.

Changing relations between river discharges and tides, aggravated by climate change and sea level rise, can make agricultural activities in the area more and more difficult. In some polders, agriculture is gradually replaced by aquaculture. It is not really clear if this has to do with salinity conditions in the rivers around a polder or with the profitability of the activities, regardless of physical conditions.

### 3.0 : THE OBJECTIVES OF CEIP-I:

- a) Increase the area protected in selected polders from tidal flooding and frequent storm surges, which are expected to worsen due to climate change
- b) Improve agricultural production by reducing saline water intrusion in selected polders; and
- c) Improve the Government of Bangladesh's capacity to respond promptly and effectively to an eligible crisis or emergency

As part of the strategic polder assessment, a multi criteria analysis was developed to guide the prioritization process of selection of polders. The analysis relies on the following key criteria: physical condition of the embankment and the drainage system, economic activities in the polders (agriculture, fishery or forestry), population and socio economic conditions, environmental condition and economic efficiency considerations. Based on this assessment a first priority group of 17 polders was selected. Among the seventeen, 4 have been considered for the first package of investment (originally 5, see Figure 1).

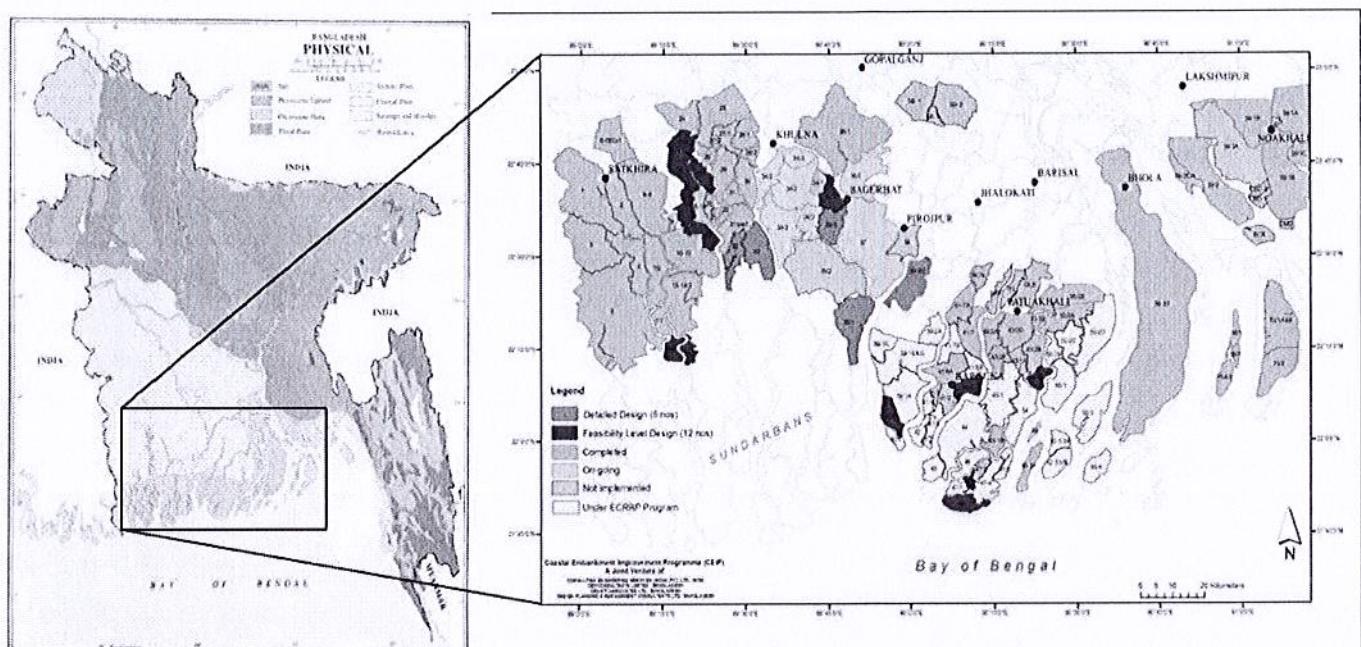
In CEIP-1, the selected polders will be reconstructed by adding additional height for controlling possible storm surge level along with necessary appurtenant drainage structures and improvement of drainage channels. Experience gathered through implementation of this phase will be incorporated to improve planning, design and overall management programs of the polders that will be upgraded in subsequent phases. This research has been proposed with this objective in mind, for carrying out studies and research on complimentary activities for fulfilling the overall goal of the entire coastal zone improvement project.

### 4.0: LONG TERM MONITORING, RESEARCH AND ANALYSIS OF CEIP-I

The Long Term Monitoring, Research and Analysis of CEIP-I entitled "Research, Monitoring, and Analysis of Bangladesh Coastal Zone Towards Long Term Sustainable Polder Development and Management with attention to Physical, Economic and Social Dynamics" has been designed to find out well-grounded answers to a number of issues on which further research is required so that the findings may be incorporated in the following phases of the CEIP. Notable among the issues are morphological changes in the coastal zone, the process of land subsidence, impact of tectonic effects, sedimentation process in the river network resulting in drainage congestion inside the polders, increase in salinity and its impact in establishing proper water management practices, etc. The need to improve hydro-meteorological and hydro-morphological data collection network has been proposed. Further, over last five decades, many research activities as well as pilot level studies have been undertaken by the country to study various aspects of managements of the coastal zone. It is important that lessons are drawn from these studies. It will also be prudent to develop a strong monitoring mechanism for evaluation of performances of the reconstructed polders that will be constructed in phases.

With the aforesaid objectives this Terms of Reference for the CEIP-1/C3/S4 has been drawn up. This will focus on **'research, monitoring, and analyses of Bangladesh coastal zone towards long term sustainable polder development and management with attention to geo-morphological, environmental, economic and ecological aspects'**. The ever changing boundary conditions due to the changing coastal dynamics and climate change as well as changes in land use process makes such research type exercise very useful for planning of next phases.

#### IV. Appendices



**Figure 1: Coastal zone of Bangladesh and polders in CEIP-I project**

Stakeholder consultation workshop with active participation of government officials, academics and researchers and other stakeholders was organized and the following issues and questions emerged.

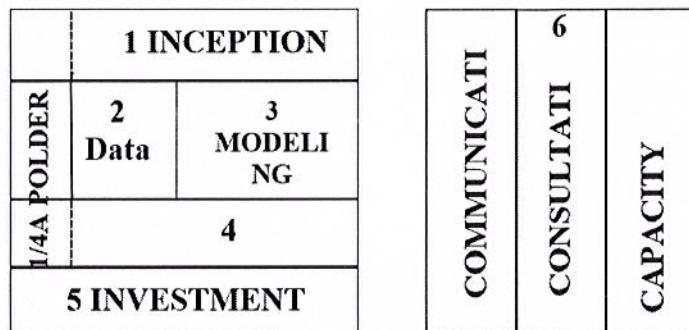
Issues	Questions
<ol style="list-style-type: none"> <li>1. Subsidence and tectonic behavior</li> <li>2. Erosion, sedimentation and morphological changes in the channel network</li> <li>3. Cyclones and Storm Surges</li> <li>4. Floods, drainage congestions and Droughts</li> <li>5. Salinity Increase and, Sea level Rise and other impacts of climate Change</li> <li>6. Sustainable Land use and integrated water management inside the polders through effective participation of beneficiaries and pertinent stakeholders</li> </ol>	<ol style="list-style-type: none"> <li>1. How serious are these issues? How well these issues are understood with proper scientific evidences.</li> <li>2. Is there a clear trend and what are the drivers?</li> <li>3. Magnitude of these problems will vary along the coastline. What will be the situation in 25, 50 or 100 years from now?</li> <li>4. BWDB has acquired lots of professional as well as practical experiences through pilot and experimental projects on sustainable land use and integrated water management practices. How much of these experiences may be applied, in Phases, in various zones of CEIP.</li> </ol>

To find answers to these questions, the workshop suggested the following steps:

- Pertinent Mapping exercise (demography, topography, bathymetry, land use, etc.)
- Hydro-meteorological and geo-morphological data collection, including subsidence, sea level rise, etc. Research on changing land use, socio-economic concerns and impact monitoring through appropriate research methodology.
- Capacity building of professionals

Based on the outcome of these discussions, the phenomena related to the delta dynamics to be studied were clustered into seven categories, which will be addressed in this ToR.

1. Tectonic behavior of the delta and Subsidence pattern
2. Polder design considering storm surges and other pertinent factors including coastal and river erosion pattern and finalization of design protocol and standards.
3. Morphological dynamics of the river networks and Estuaries
4. Climate change related phenomena and including intrusion of salinity level
5. Polder design and long term integrated water management plan
6. Upgradation of data collection network and data management mechanism
7. Capacity building of professionals, beneficiaries as well as local stakeholders.



**Figure 2: Building blocks of ToR**

Initially, the focus in the CEIP-I was on the dynamics of the delta to get insight in the changing boundary conditions for polder design, where the design itself focused on embankments and drainage only. During the workshops and discussion sessions that were conducted in finalizing the project proposal, it became clear that it is time to come with a new approach for construction as well management of the polders in the coastal zone that will be inclusive in nature and responsive to emerging issues. However such an approach may not be possible right from initiation of the project and such approach will have to be introduced gradually in phases.

This understanding led to formulation of this “Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone (Sustainable Polders Adapted to Coastal Dynamics)” for conducting ‘research, monitoring, and analyses of Bangladesh coastal zone towards long term sustainable polder development and management with attention to geo-morphological, environmental, economic and ecological aspects’. These discussions, including the reasons mentioned in the Background on CEIP-I, have led the Government to re-focus its strategy on the coastal area. The Government has recognized not only the need for a systematic approach to upgrade the coastal embankment system but also wants to come to a sustainable polder concept that is well tuned to the dynamics of the delta as well as to the aspirations of the people living there.

## **5.0: OBJECTIVES OF LONG TERM MONITORING, RESEARCH AND ANALYSIS:**

*Objectives are:*

- a) Create a framework for polder design, based on understanding of the long term and large scale dynamics of the delta and on sustainable polder concepts. These polders should offer their inhabitants a safe environment to live in and sufficient opportunities for their livelihood. Among other issues, land use (agriculture including cropping pattern and adaptation of new varieties of cultivars that are emerging through research, aquaculture, housing, urbanization, etc), management of drainage congestion through control over ground level, sedimentation balance inside and outside the polder, and salinity in rivers

and groundwater, are the key parameters in coming to these concepts, taking climate change into account

- b) Present an overview of values of relevant parameters at locations in the polder area, now and in the future, as boundary conditions for polder design and management
- c) Develop a long term investment plan for implementation of the proposed design and management improvements leading to integrated water resources management, targeting sustainable development goals.
- d) Build the analytical foundation and technical capacity of BWDB and other stake holders including local communities, as appropriate, to engage in science driven decisions on floods, storm surges and drought hazards in the coastal region of Bangladesh;

The vision is also to expand the analytical capacity and data driven decision making into an “ecosystem” in which professionals cooperate, and exchange knowledge and information in a community of practice, using a common infrastructure, to be housed in BWDB and other organization would have access to data system. Starting with the researchers directly involved in the coastal area and the polders, the future extension will be to bring onboard the whole coastal belt and the Bangladesh water management community.

Beside geography and community involved, a third dimension in this movement is quality. With one of the most complicated deltas in the world, understanding and application of this knowledge is of paramount importance. Activities described in this ToR should be carried out primarily in Bangladesh in cooperation with BWDB and related agencies ("training on the job"). Among the deliverables in the ToR, will be workshops and training as elements of capacity building and an explicit indication of future steps for further improvement.

It may be worthwhile to mention here that the government of Bangladesh has already approved a Coastal Zone Policy and Action Plan in 2005. Over last three/four decades, BWDB has completed many action plan and pilot studies with an aim of achieving Integrated Coastal Zone Management (ICZM) and Integrated Water Resources Management practices in the country.

Evidence based decision making to improve coastal region of Bangladesh requires improved monitoring scheme, solid analytical foundation, and up to date technical capacities. The activities envisaged to achieve this goal are structured around the following components:

*COMPONENT-1: Inception report (Finalization of methodology and Work Plan)*

*COMPONENT-2: Detailed Literature Review and its summary and lessons learnt;*

*COMPONENT-3: Development of input datasets for models of the long-term physical processes*

*COMPONENT-4: Modeling of the long-term physical processes in the coastal zone;*

*COMPONENT-5: Finalization of approach for reconstruction of the Polder at different coastal zones including their phasing and construction program;*

*COMPONENT-6: Updating of design parameters and specifications for planning & design works; review of approaches for management of polders with active participation of beneficiaries and stake holders;*

*COMPONENT-7: Investment plan for the entire CEIP;*

*COMPONENT-8: Action plan for Capacity Building of concerned professionals and relevant stake holders in planning, design and management of the polders.*

*COMPONENT-9: Outreach and communication strategy*

This ToR requests for expert input required to successfully executing the entire CEIP with active involvement of the Ministry of Water Resources (MoWR) and the Bangladesh Water Development Board (BWDB). All activities described in this ToR are to be carried out in cooperation with MoWR and BWDB to ensure knowledge transfer and capacity building. In addition, among the deliverables in the ToR will be workshops as may be appropriate and training program for relevant government officials.

**Note: It is expected that national firm (s)/ institute(s)/ research organization(s) will be engaged, in Joint Venture, or, as Partners or associates with International Firms/ Research organizations /Institutes for providing the services. Particularly for the Components-3 and Component-4 a national research firm/ Institute, experienced and active in Water Modeling in Bangladesh, is expected to be involved.**

### **COMPONENT-1: Inception Report (Finalization of Methodology and Work Plan)**

The Inception phase is, besides fine-tuning the activities in the program, about developing new polder concepts, based on available data and what is known of delta dynamics now. In the subsequent stages, this will also focus on developing new knowledge on delta dynamics and use this for elaborating promising polder concepts for the 13 Feasibility Level polders in the CEIP-I project (see Figure 2 in the completion phase).

The inception phase is meant to review the overall approach of the program and to align strengths and capacities between consultant and MoWR/BWDB to come to a common view on its implementation.

Through the Inception report the Consultant will firm up the proposed TOR as well as the methodology and staffing proposed by them. The focus is on how to ensure the concept of sustainable polders will be achieved; also, the coherence between the physical processes in the coastal zone of the delta will be ensured.

#### ***Sustainable polders***

The rationale behind the new polder concepts is that the drainage in the polder, together with the lack of sediment supply, lowers the soil level inside the polder, eventually leading to very low lying polders with increasing problems to drain into the rivers and estuaries, while the sediment that used to cover the land, now settles in these rivers, giving water-logging, making drainage even more difficult. This is further exacerbated by sea level rise and possibly by increased storm surges, river discharges and local extreme rainfall.

The idea to come to sustainable polders in the coastal zone of the GBM delta is not completely new but there are no concrete options until now. In hydraulic engineering, ‘Building with nature’<sup>9</sup> is becoming more and more an option, but until now the focus there is predominantly on shore protection. In the Netherlands some ideas exist on ‘polders wrapping’ where sediment (and salt water) is allowed for some years after which, on the raised bottom, agriculture is carried out again. In fact, the wheel has to be invented here, but necessary elements of knowledge are present around the world.

Sediment management will be an important issue, where both subsidence of the polder soil and water logging in the peripheral rivers is to be avoided, either in a natural or artificial way. “Natural” does not mean without technical means: an intelligent system of gates, to be opened or closed at will, can play an important role to manage the sediment balance. “Artificial” means actively taking up sediment with mechanical (dredging) equipment.

Another issue is how to deal with salinity, either by fighting it as much as possible by means of water management or by embracing it through changing livelihood from agriculture to aquaculture. The idea is to develop concepts that fit well in the dynamic environment, where salt or fresh is not a prerequisite. Rice cultivation, aquaculture, salt tolerant crops are possibilities for livelihood, depending on the salinity situation. In the inception phase it should become clear what options will be taken into account, which will be worked on parallel with the research on delta dynamics.

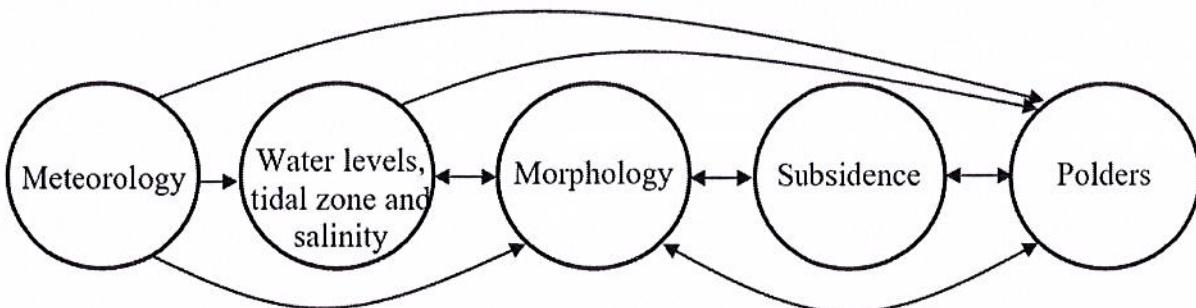
#### ***Coherence***

There are complex relationships between all the physical processes and the polders. Hence, the modeling and design work should incorporate the interdependency of the processes of the built and natural environments. Figure-3 visualizes these relations. Meteorology influences polders via local rainfall and water levels via rainfall in the Himalaya and via wind in the coastal area. Of course, climate change is an important element in the meteorological component of the program. Meteorology influences morphology indirectly via water levels and discharges in the rivers, while conversely, morphology influences water levels in the rivers and

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<sup>9</sup> For more information on Building with nature, see e.g. [www.ecoshape.nl](http://www.ecoshape.nl), [www.wageningenur.nl](http://www.wageningenur.nl)

estuaries. Water levels, storm surges level, and salinity is boundary conditions for polder design and management. Subsidence can influence morphology (via tectonics) and, conversely, soil compaction depends on the thickness and composition of sediment layers. Subsidence will influence polder (embankment) levels and, conversely, polder management influences the soil compaction inside the polders. Tidal river morphology can erode polder embankments through meandering channels and can cause water-logging which is again influenced by polder management where sediment is allowed to enter the polder area or not.



**Figure 3: Relations between physical processes and polders**

#### Objectives

- Come with promising options for sustainable polders in terms of dealing with physical factors like sediment and salinity taking into account the socio-economic factors such as the choice between agriculture and aquaculture or combinations in space or time
- Specify the modeling approach taking into account the interdependencies between the physical processes, built and natural environment; asses initial data needs for each approach, specify the required computational framework including mechanism for filling potential data gaps, and set up an overall work plan

#### Activities

- 1) **Inventory present situation:** Description of the polders as they function now and their relation with the environment. The relevant physical, social, economic and environmental characteristics of the polders and the coastal environment will be identified, including upstream hydraulic infrastructure and current polder management and operation. Field visits will be made to the polders and weaknesses in functioning will be inventoried from the responsible (local level) authorities. All previous studies and development plans will be collected and studied. Stakeholders will be identified and consultations will be organized. This inventory will be described, mapped and summarized in e.g. tables, index cards in order to make the findings comparable.
- 2) **Range of boundary conditions for polder management:** Description of tides, salinity and sediment in the waters around polders, including best estimates for possible climate change based on available data and knowledge. Description of seasonal variations of these parameters and the implications for irrigation, drainage, sediment input of polders. This overview will be leading for the data collection in Component-3 (Development of input data sets)
- 3) **Possible polder concepts:** Brainstorm on possible polder designs with safe and profitable living conditions and feasible with the environmental boundary conditions as derived in activity 2 i.e. salinity conditions varying from fresh water year round to salt water year round and variations in between, possibilities for sediment balance between polder and adjacent rivers year round. Spatial planning in polder areas to locate essential functions such as housing on higher ground above normal high water, where other parts of the polder can be inundated. Derive at least three basic concepts, one for a fresh water area, one for a salt water area and one for alternating conditions, all three with a sediment balance that is in equilibrium with the environment. These concepts are on 'feasibility level', meaning that they offer acceptable socio-economic conditions within the physical boundary conditions.

- 4) **Modelling approach:** Based on the problem identification and activities 1) and 2), an overall modelling approach shall be set up, including the review of Component-4 of this ToR. It is imperative that the models developed capture the interdependencies among the physical processes, the built and natural environments in the coastal areas. The proposed models should be agreed upon with the Client and should be flexible in such a way to run with the available data and subsequently be calibrated and verified with additional acquired data at any time interval.
- 5) **Data needs and availability:** An initial scoping of the availability and quality of data required for the agreed analysis approach will be made. This preliminary overview of the data availability will in part form a selection of the analysis approach. At an early stage additional data needs shall be identified, including the review of Component-3 of this ToR. The necessary measurements and equipment shall be specified and scheduled for implementation and execution in due course
- 6) **Work plan:** An overall Project Work Plan shall be made, detailing and scheduling the activities for under each component
- 7) **Staffing and Collaboration:** MoWR and BWDB will provide a counterpart team. The nominated staff will be bound to stay in the Project for its duration. The consultant, MoWR and BWDB should decide and agree upon on the terms of collaboration.

**Deliverables**

- 1) **Inception Report and Inception Workshop:** The findings during the Inception Phase including problem identification, promising polder options, a final scheme of the activities in Component-3 for data needs and availability, a final scheme of the activities in Component-4 for further research to be included. Staffing, capacity building and work plan to be submitted. The approach and preliminary conclusions will be presented and discussed in stakeholder workshops.

## **COMPONENT-2: Detailed Literature Review and Its Summary and Lessons Learnt**

In Bangladesh, over last 5 decades many important projects have been taken up in the coastal belt. There have been many detailed studies, research projects, pilot studies addressing various aspects of coastal zone management. In Bangladesh, Water Master Plans have been prepared in 1964, 1972, 1986, 1996, and 2002. They spell out development approach for the entire country including considerations for coastal belt including the coastal islands. Feasibility studies that lead to construction of the Coastal embankment project between 1965 and 1970 will provide useful insights into the initial approach and rationale for construction of polders. A Coastal Zone Policy and Strategy was developed in 2005. National Water policy 1999 had proposed integration of ICZM strategies with IWRM approaches.

Concerns have been documented in BCCSAP 2009 that identifies the coastal belt as the most vulnerable area from adverse impacts of Climate Change. There have been many studies in support of effective land and water management in the coastal belt. Notable among them are WMIP, IPSAM, etc. Water logging in the southern Bangladesh led to preparation of host of research publication.

It is expected that the consultant will carry out a comprehensive literature review of published research papers and reports. It is also expected that the Consultant will review feasibility reports of important, technical studies and project reports. Based on these reviews an annotated bibliography will be produced. The Consultant will also produce critical analyses of lessons learnt from completed initiatives, identify research and data gaps, and provide guidance for future initiatives concerning the coastal belt. This component will provide a learning process to the project professionals on the basis of success or failure of completed projects and studies, his component and may be carried over a long time during the entire length of the project, but should release interim reports. It will be prudent for the Consultants to develop a work plan for this component that will be able to provide useful input at various decision taking stages. It is expected that the Consultants will propose and finalize a detailed work plan and output delivery schedule at the time of finalization of the Inception Report.

### COMPONENT-3: Development of input datasets for modeling the physical processes

During the stakeholder consultations, limited organizational capacity was mentioned as the main shortcoming, limiting quantity and quality in availability of data and data collection activities. However, required data on bathymetry, sediment, water flow, tide, subsidence needs to be collected with available capacity, state-of-art survey technology and equipment. In addition to data collection and processing, there will be a focus on improving organizational capacity and technical capacity to improve quantity and quality of data collection, and on evaluating the results of adding the new data collection stations in other projects. This project will not invest in equipment and in situ data collection on a large scale. However, **some specific equipment as needed will be installed and this will be mentioned explicitly in the relevant part of the ToR.** Large efforts are being made to improve the availability of measuring equipment through other projects. For example, a World Bank supported Water Management Improvement Project will install **29 new automatic water level recorders** of which about one third will be in the coastal zone<sup>10</sup>; a network of groundwater salinity stations has been installed<sup>11</sup><sup>17</sup> under the Climate Change Resilience Trust Fund; the BWDB has plans for upgrading its existing network.

#### Objectives

- Collect all input datasets, undertake Quality Assurance/Quality Checking (QA/QC) and update/modify datasets as necessary for use in the modeling of the physical processes in the coastal zone of Bangladesh
- Improve the processes of data collection, QA/QC and data dissemination and sharing among the government agencies

#### Activities

- 1) *Data collection* for model development, calibration, validation and application, including but not limited to (and to be reviewed during the Inception phase):
  - a) Digitized maps (GIS)<sup>12</sup>
    - High resolution DEM for the coastal zone *based on available Topographic maps of IDMS project of SoB,*
    - Soil maps
    - Geological maps based on compaction measurement data
    - Land-use maps, including historical changes in land-use, based on remote sensing and census data
  - b) Bathymetry surveys of river branches and estuaries covered by the hydraulic and morphological models. Consultants in consultation with BWDB shall specify the locations of the cross sections; critically validate the results of the survey and the connections with the DEM used in the modeling. The results shall be referenced to the Survey Datum. Data collection on sediment and flow of major river system to assess the annual sediment load to coastal area
  - c) Monitoring of cross sections in the selected peripheral rivers of polders to see the sedimentation/erosion rate for examining the change in drainage conveyance over the years and river dynamics
  - d) Details of monitoring networks for rainfall, cyclone intensity, hydrometric, salinity, ground water, sediment concentration, soil, subsidence etc. and their operation history (see also Annex 3, 4 and 5)
  - e) Aquifer parameters, pump test data, and well characteristics
  - f) Salinity measurement data in surface and ground water

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<sup>10</sup> See Annex 3 for a list with the planned locations of these 29 new automatic water level recorders

<sup>11</sup> Annex 4 shows maps of the nested and line wells installed within the framework of the Climate Change Resilience Trust Fund

<sup>12</sup> All spatial data should meet OGC standards <http://www.opengeospatial.org/standards>. See also *Data Standards, Transfer Media and Licensing* in chapter *Further information about the Consultancy Data Standards, Transfer Media and Licensing*



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- g) Time series of rainfall data: daily series covering at least the period of 1980-2014 to estimate current conditions and to assess the changes in rainfall patterns, including annual rainfall, monsoon rainfall, and temporal and spatial distributions
  - h) Time series of cyclonic data to estimate current conditions and assess the changes in frequency and intensity of cyclones.
  - i) Time series of surface and ground water levels, including tidal levels, based on measurements and historical flood marks
  - j) Time series of discharges upstream of the coastal zone in the Ganges, the Brahmaputra and the Meghna rivers at least at the borders of Bangladesh, in addition to the Jessore-Chandpur line in relevant rivers inter alia Lower Meghna and Gorai
  - k) Relative Mean Sea Level rise estimations, based on the 5<sup>th</sup> Assessment Report of IPCC and considering the local effects for the Bay of Bengal. Consultant shall put these sea level rise estimations in a local context.
  - l) Estimation of precipitation projections in the coastal area for the climate change scenario of the 5<sup>th</sup> Assessment Report (RCP2.6, RCP4.5, RCP6 and RCP 8.5)
  - m) Field measurements of flood plain sedimentation applying Surface Elevation Tables (SETs) along with sedimentation plots and marker horizons to understand elevation changes and compaction rates
  - n) Sediment concentration in the river branches, estuaries and along the coast, sediment transportation through the delta and sedimentation measurements in the delta and estuaries. If necessary, execute additional field measurements to create additional data for the validation of the morphological models
  - o) Quantification of sediment load of Ganges, Brahmaputra, Meghna and Padma rivers to the Bay of Bengal
  - p) Land erosion and accretion using Remote Sensing or in situ measurements
  - q) Measure vertical movement due to compaction at statistically relevant and representative points, in addition to already available information, and extrapolate to the polder area in the coastal zone. Install extra equipment if necessary
  - r) Estimate the vertical movement due to Tectonics (neo) in the polder area of the coastal zone based on literature review
  - s) Measure the annual subsidence rate for the area either by means of installing stationary GPS or by methods that employ Interferometry Synthetic Aperture Radar (InSAR). For identification of historic subsidence trends, the use of InSAR is advised. Compare both methods and choose the appropriate (one or both) in consultation with BWDB taking into account the technical feasibility and cost implications. Elaborate on the costs for the different options and the technical advantages and disadvantages. Install equipment where necessary
  - t) Land-use data, focusing on agriculture versus aquaculture; historical spatial and temporal distribution of land-use classifications using remote sensing and census data; demands on fresh water for different land-use classifications. Elaborate on the methods to be used
  - u) Analyze the current procedures of data collection within the Government of Bangladesh (GoB) for all types of data. The consultant will make recommendation to optimize the data collection within the GoB, including but not limited to recommendations on organizational and technical capacity, automating of measurement stations, data collection schemes etc.
- 2) *Data processing, validation and completion*
- a) Consultant will process and validate all collected data in consultation with the Government counterparts
  - b) Organize and store data in appropriate format to be used as input to the model
  - c) Where necessary and possible the consultant will complete and/or digitize data. Consultant shall specify completion procedures

- d) Analyze the current data processing and validation procedures within the GoB and recommend data processing and validation improvements, including but not limited to recommendation on organizational and technical capacity (also taking into account the time horizons as used in Component-4: 25, 50 and 100 years).
- 3) *Data dissemination.*
- Store all the collected primary data including meta-data in database or Sharepoint system in BWDB
  - Analyze the procedures of data dissemination within the GoB for all type of data, including mandates for disseminating the data and recommend data dissemination improvements within the water community of Bangladesh,
  - Develop interactive database or Sharepoint system for archiving, analyzing, updating and retrieval of time series and spatial data including a national coastal polder database and to be housed in BWDB
  - Analytical results, graphs, tables will be shared in GeoNode

**Deliverables**

- Soft and hard copies of map of the location of all the current field measurement stations, by type, stored in Database or Sharepoint system of BWDB. Map showing the location of primary BM with values
- Raw datasets of all type of data, including meta-data, stored in Database or Sharepoint system of BWDB
- Completed and validated dataset including meta-data, stored in Database or Sharepoint system of BWDB
- GIS based National Coastal Polder Database/Management Information System/Database or Sharepoint system
- Boundary conditions and data for calibration and validation of models
- Monitoring results on sedimentation rate in rivers and floodplain
- Annual and seasonal sediment load of major rivers and to Bay of Bengal
- Technical memorandum describing the validation and completion procedures that have been used by the consultant for all type of data; for reproducibility purposes and to be stored in Database or Sharepoint system of BWDB
- Memorandum with recommendations to improve the data collection, processing, validation and dissemination within the GoB.

**COMPONENT-4: Modeling of the long-term physical processes in the coastal zone of Bangladesh**

The objective of this component is to develop mathematical models and datasets that describe the long-term physical processes in the coastal zone of Bangladesh, taking into account climate change. In relation to polder management and design, the following long-term physical processes are important, and will subsequently be discussed in this component:

- Tidal River and Coastal Morphology, on macro, meso and micro scale
- Subsidence
- Meteorology
- The effect of climate change on the tidal zone and salinity intrusion

**Component-4A: Morphology**

The dynamics of the delta are most visible in the morphology. Coastal accretion (mainly in the lower Meghna area), shifting of river branches and siltation in peripheral branches are some of the phenomena that need more clarification. The overall objective of morphological analysis is to understand the phenomena and quantify of present and future erosion and sedimentation. The morphology component is divided into three studies on different length scale and with different scope. See also Figure 3-4:

- A) Macro scale      Sediment balance sheet GBM delta
- B) Meso scale      River and estuary dynamics
- C) Micro scale      Water logging and polder management

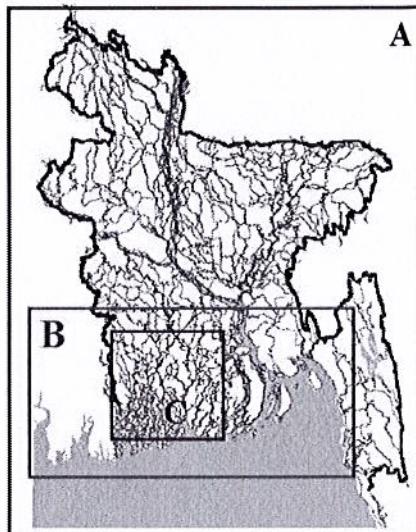


Figure 4: Three scales for Morphological Research Component

#### Component-4A-1: Morphology on a macro scale (Sediment balance of the GBM delta)

Natural influx of sediment from the Himalaya may change in the future due to natural causes (changes in the erosion pattern in the mountains, earthquakes and landslides, etc.) or due to human interference (e.g. construction of dams upstream of Bangladesh). The abundance of sediment input leads to increase of the land area in the coastal zone.

Another issue is the amount of sediment that enters the Bay of Bengal and remains in suspension or is easily mobilized by waves and currents in the area. These sediments can play a role in the so-called tidal pumping phenomenon, in which the sediment in the estuaries is moving to and fro with the tides. Therefore, the amount of sediment should be considered as a boundary condition for erosion and sedimentation on a meso scale.

Finally, sediment will settle in the delta, on floodplains, in river branches, etc. Hence, this study should give the overall picture of the current and future total sediment balance which will serve as the base for all other morphological processes.

#### Objectives

- Understand sediment dynamics of the GBM delta
- Selection and prioritization of drivers of change and development of future scenarios (example: change in transboundary flow through dams, river linking, land use change, infrastructure development)
- Estimate future changes, using possible scenarios for future(natural and anthropogenic) developments

#### Activities

- 1) Use available and proven mathematical model to describe the sediment processes (transport, deposition, re-suspension by river flow, waves and tides, etc.)
- 2) Calibrate and validate the model with field measurements and remote sensing data.
- 3) Make a description, using this model, of the sediment processes during a year (monsoon, dry season, wind along the coast, etc.) and give yearly averages

- 4) Study future changes (up to 25, 50 and 100 years from present), both natural and anthropogenic, such as but not limited to:
  - a) Expected erosion in Himalaya
  - b) Tectonic activities causing changes in sediment supply (such as an event like the 1950 landslide), including their probability. This should be done on a ‘what if’ level, since tectonics in the Himalayas are outside the scope of this ToR.
  - c) Sensitivity analysis of the sediment processes to changes in discharges in the upper regions of the river (due to for example the construction of dams in the upstream basin)

**Deliverables**

- 1) The software newly developed under this project with all source code and accompanying technical document with detailed explanation of the methodology and assumptions
- 2) Geospatial datasets of main sources and deposits of sediment at present, including full meta-data are restored and archived in Database or Sharepoint system of BWDB
- 3) Geospatial datasets of main sources and deposits of sediment for 100 years from present, including full meta-data are published on archived in Database or Sharepoint system of BWDB
- 4) Technical Reports with description and explanation of geospatial analysis of sediment deposits at present and for 25, 50 and 100 years from present, including a description of seasonal variations, the report shall include erosion and accretion in the fluvial part, tidal river & Bay of Bengal, tidal pumping (quantity and seasonal variation), used models, indication of more and less likely scenarios, and full metadata. This report may be combined with the paper for Component-4A-2: Morphology on a meso scale

**Component-4A-2: Morphology on a meso scale (River and Estuary Dynamics)**

Several processes play a role in the dynamics of the lower reaches of the rivers in the delta. One is the ever changing course of river branches and estuaries due to meandering and other natural changes in morphology. Another issue is the influence of polders on the hydrodynamics of the region and its consequences for sediment transport. In general, with polders the sediment coming from upstream will be transported more directly to the sea, while in areas without polders (e.g. the Sundarbans) the sediment will remain (longer or permanently) in the area. With the help of measurements and model computations, more knowledge on the dynamics of the complicated network of SW-Bangladesh (including the coastline) should lead to a better insight in future developments in the area.

**Objectives**

- Understanding the dynamics of the river branches and estuaries in the coastal zone of the GBM delta, channel switching and bank erosion both in the fluvial-dominated parts of the delta as well as in the tidally-influenced river delta.
- Estimate future changes, predicting erosion and sedimentation in the coastal area

**Activities**

- 1) Use available and proven mathematical model to describe the relevant morphological processes in three dimensions, including river flow, tidal flow and wave action
- 2) Calibrate and validate the model with field measurements and remote sensing data
- 3) Assess the effects of past interventions such as polderization in the coastal area on tidal prism, amplitude, morphological conditions using numerical modeling technology
- 4) Quantify river, tide and storm surge flooding and associated sedimentation rates in the natural and human-impacted coastal zone
- 5) Improve estuarine modeling to assess the impact of polders on estuarine flow, sediment budgets and morpho-dynamics and the future impact of sea level rise

- 6) Study future changes in the morphological processes based on possible scenarios coming from the macro scale approach such as (but not limited to) possible dam construction, probable natural changes etc
- 7) Interpret these changes in terms of drainage and irrigation in polders, and erosion of embankments.

**Deliverables**

- 1) The available model will be further upgraded & updated under this project and accompanying technical report with detailed explanation of the methodology and assumptions
- 2) Geospatial datasets of erosion and sedimentation in the coastal zone at present for various seasons and circumstances if relevant (average river flow, extreme discharge, average tide, extreme spring tide, storm surges and cyclone). These geospatial datasets should include full meta-data and be stored and archived in Data base of BWDB.
- 3) Geospatial datasets of erosion and sedimentation in the coastal zone for possible scenarios 25, 50 and 100 years from now, for various seasons and circumstances if relevant (average river flow, extreme discharge, average tide, extreme spring tide, storm surges, cyclone). These geospatial datasets should include full meta-data and be stored and archived in Data base of BWDB.
- 4) Technical report with description and explanation of geospatial analysis of erosion and sedimentation in the coastal zone at present and for 25, 50 & 100 years from present, including description of relevant seasonal variations, sediment distribution and budget, used models, indication of more and less likely scenarios, and full metadata. The Research shall indicate what the consequences of future scenarios are for drainage and irrigation in the polders, and for erosion of the embankments.

**Component-4A-3: Morphology on a micro scale (water-logging and polder management)**

Before polders were constructed, the tides inundated large areas in the coastal zone. This had two effects: sedimentation on the land (up to a level of approximately HW) while the flow velocity in the adjacent river branches remained high due to the deep penetration of tides. After the construction of polder embankments, the flow in the river branches diminished (before embanking, the whole area was filled and emptied through the river branches, while after embankment this happens only in the river area itself, giving a much smaller tidal flow), leading to sedimentation in these branches. Of course, sedimentation in the polder areas stopped completely and the sediment now settles in the adjacent peripheral river branches. Water drains from the polder into the rivers and estuaries through sluice gates under the influence of gravity. The sedimentation in the branches hampers the free flow of water from the polders into the estuaries. This phenomenon is called water-logging.

Over the past 15 years, experiments have shown the possibility to reduce water-logging by creating openings in the low lying areas of the polders ("beels") that allow tidal flow to occur (Tidal River Management-TRM). The idea is to extend this approach to the polders as a whole. In the Inception phase and in component 4 of this ToR, possibilities to allow sedimentation in the polder areas will be studied. This component-4A.3 is the direct link between polder management and morphology in the river branches.

**Objectives**

- Understand the dynamics of water-logging in the polder and tidal river system and develop measures to reduce water-logging in combination with restoring natural sedimentation processes within polder area sand adjacent tidal rivers.

**Activities**

- 1) Provide analysis and an overview of existing methods and experiences that reduce water-logging (e.g. TRM) in the coastal zone of Bangladesh
- 2) Use available and proven mathematical model to study tidal flow and sedimentation/erosion in peripheral river branches, "beels" and polder areas, including deposition of silt. Area C shown in Figure 35 is only indicative of the scale of geographical coverage of the area that is expected to be looked at for this component. The model should contain at least one river branch together with some (polder) areas that can be inundated. This model is to be used in the Completion phase for the conceptual

- design of polders. The final decision of the study area will be made in consultation with BWDB
- 3) Stakeholder consultations for selection of polders facing water logging as well as sediment management technique in tidal rivers and polders
  - 4) Recommend techniques to reduce water-logging and polder subsidence, including possibilities to use seasonal fluctuations in sediment content and land-use in polders based on findings and use of the mathematical model.

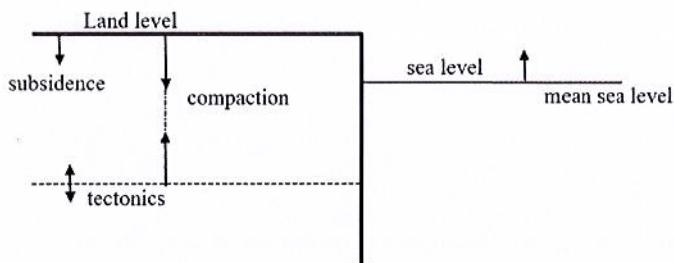
#### **Deliverables**

- 1) The model setup developed will be updated under this project with all accompanying technical document with detailed explanation of the methodology and assumptions
- 2) A report that describes the pros and cons of the different methodologies to prevent water-logging within the polder and sedimentation of tidal river system including polder subsidence. The report will include meta-data on the models used and measurements, recommendations for polder design including drainage and long term management plan, and recommendations for pilot area/polder to implement the ideas, such as but not limited to location, methods and measurements
- 3) Recommended plan to manage sediment at the downstream stretch of the tidal river and in the polder

#### **Component-4B: Subsidence**

The land level with regard to the sea level is an important parameter in the design and management of polders. This parameter determines, to a certain extent, the height of embankments, drainage conditions, sustainability of sluice gates, etc.

Figure -5 shows the key elements of the phenomena behind this parameter. Subsidence is the total movement downwards of the soil level and consists of two components: compaction of the upper sediment layers (Holocene and Pleistocene deposits of river sediment) and tectonic movements<sup>13</sup> (caused mainly by movements of the Indian plate and the Burma arc). Compaction can have natural (gravity, organic) or anthropogenic causes (groundwater extraction, drainage). Sea level rise is due to temperature changes causing melting of glaciers and expansion of the ocean volume.



**Figure 5: Key elements of subsidence**

Measuring and determining absolute values for these parameters is often difficult. Sea level rise derived from very long term water level recordings always contains the subsidence of the soil on which the gauge is founded. Subsidence derived from GPS devices on buildings (as is the case in Bangladesh) contains the settlement of the building in the subsoil. Figures on SLR and subsidence, therefore, are often relative, while absolute figures are necessary in understanding the processes.

In the research as covered by this ToR, sea level rise will not be studied separately. The 5th Assessment Report of IPCC contains information on (absolute) SLR in the Bay of Bengal. The results of IPCC 5 will be used in downscaling and considering local effect & regional circulation in this project as the estimate for the sea level rise due to climate change.

<sup>13</sup> Tectonic movements can of course also cause uplifting

#### **Objectives**

- Estimate the annual rate of subsidence of the polder area in the coastal zone for four regions: southwest zone, south central zone, south east zone and eastern hill regions
- Estimate the annual rate of subsidence of specific polders of four regions, due to drainage or other anthropogenic causes and its effect on the defense structures

#### **Activities**

- 1) Literature survey on subsidence in the polder area of the coastal zone, more specific on the (neo)tectonics and compaction
- 2) Make an inventory of natural and anthropogenic causes of compaction, estimate the rate of compaction due to these causes and indicate their contribution to the total subsidence in the regions of the polder area of the coastal zone at present and for over 25, 50 and 100 years.
- 3) Use a subsidence model to estimate the subsidence in specific polders (to be designated by BWDB) at present and for 25, 50 and 100 years from now. The Research Team shall collect &use subsidence and compaction data to validate the subsidence model. Information on soil type, drainage practice, natural and anthropogenic causes of compactions can be used as input parameters for the model.

#### **Deliverables**

- 1) Geospatial datasets of total subsidence at present and for 25, 50 and 100 years from now, including full metadata and stored in Database or Sharepoint system of BWDB and Estimate the annual rate of subsidence.
- 2) Detailed Technical Report with description and explanation of geospatial analysis of the total subsidence in the four regions of the polder area of the coastal zone at present and for 25, 50 and 100 years from present, including description of the causes of subsidence (natural/anthropogenic compaction, tectonic movement), full metadata, and stored in Database or Sharepoint system of BWDB
- 3) Report on the total subsidence in specific polders (designated by BWDB) in 25, 50 and 100 years from now when no sediment is supplied to the polder, including the amount of sediment needed to counteract this subsidence. This Report may be combined with the report for Component 3: Polder management and design

#### **Component-4C: Meteorology**

During the stakeholder consultations it was repeatedly mentioned that rainfall figures are changing, such as more "erratic" rainfall and a possible shift from four to three seasons (monsoon and post monsoon are more or less one). At this moment, there is no real drought problem in the coastal area but due to changing rainfall figures, this could change when periods without rain lengthen. Statistical processing of data can shed light on these processes. For the future, expectations could be derived based on climate models and scenarios. The same can be done for rainfall figures in the Himalaya (important for river floods in the coastal zone), and for cyclone frequency and intensity.

#### **Objectives**

- Identify current trends in rainfall, temperature, in Bangladesh and in the different zones of the coastal area and cyclone frequency and intensity
- Estimate future changes in rainfall, temperature and cyclone frequency & intensity considering climate change

#### **Activities**

- 1) Assess the changes in rainfall patterns, including annual rainfall, monsoon rainfall, and temporal and spatial distributions in the polder area of the coastal zone, based on historical data
- 2) Assess the changes in frequency and intensity of cyclones based on historical data

- 3) Compute future scenarios for rainfall, temperature and cyclone frequency and intensity for the next 25, 50 and 100 years by downscaling global climate models(Statistical and Dynamic downscaling)

**Deliverables**

- 1) Technical Report describing current trends and future scenarios in rainfall in the polder area of coastal zone for four, coastal regions (including estimation of rainfall distribution over the year) and cyclone frequency and intensity for the next 25, 50 and 100 years from now, including metadata of the datasets used for the trend analyses and stored and archived in Database or Sharepoint System of BWDB. The Research Team shall include a description of the statistical and downscaling methods used for reproducibility reasons.
- 2) Geospatial Dataset and archived in Database or Sharepoint System of BWDB.

**Component-4D: The effect of climate change on water levels, salinity intrusion and storm surges**

Under a changing climate, droughts and fresh water availability can become problematic. Fresh water availability in a delta depends largely on the salinity intrusion from salt water. Sea level rise and river discharges will influence both the extent of the tidal zone and salt intrusion (in surface water as well as in ground water). When tidal water levels increase, due to sea level rise, the tidal zone will shift landwards and the salinity intrusion will increase. Higher river discharges have a counter effect; they push the tidal zone and the salinity intrusion seawards. Salinity intrusion will have major impacts on the freshwater ecosystem, irrigation and drinking water availability. Higher storm surges will lead to a larger wave run-up at the embankments of the polders, possibly causing overtopping or breaches, which will lead to major salinization of the flooded polders. Higher storm surges may also damage the polder infrastructure and can cause morphological changes in the river.

Sea level rise and changes in discharge levels will also influence the tidal water levels in the delta. Higher tidal water levels mean less opportunity to drain water from the polders to the rivers and estuaries through sluice gates under gravity. The higher tidal water levels combined with a larger wave run-up at the embankment, caused by an increase in storm surge, will lead to higher design levels for the embankments. The objective of CEIP-I is to increase the area protected in selected polders from tidal flooding and frequent storm surges, under a changing climate. Therefore, it is important to quantify the change in water levels due to climate change.

**Objectives**

- To have an overview of extreme water levels due to storm surges and cyclones
- To have an overview of tidal water levels and salinity in the river, estuary and groundwater system in the coastal zone at present and in the future
- To devise scenarios and strategies to optimize salinity levels in the coastal zone

**Activities**

- 1) Estimate changes in storm surges and discharge levels using the future scenarios on rainfall in the catchment area and cyclone frequency and intensity (coming from component 3C, Meteorology) as input for computational models
- 2) Compile available measurements and model results on tides and water levels, including monsoonal variations, extreme high water due to river discharges and storm surges/cyclones at present and for 25, 50 and 100 years from now. The Research Team will use the changes in storm surges and river discharges, as well as estimations for sea level rise, as input for their hydraulic models
- 3) Compile available measurements and model results on salinity in the river and estuary system and in the groundwater system of the coastal zone at present and for 25, 50 and 100 years from now. The Research Team will use the changes in storm surges, river discharges and local rainfall, as well as estimations for sea level rise, as input for their salinity models
- 4) Develop reasonable alternatives of redistribution of river water in the delta (more water from the Ganges or Brahmaputra to river branches in the South West) and determine the effect on salinity in the river system, applying the available tested numerical models.

**Deliverables**

- 1) Geospatial datasets of High Water, Low Water and maximum salt intrusion in all river branches for average tide in the wet and dry season at present, and at 25, 50 and 100 years from now, including full metadata and stored and archived in Database or Sharepoint System of BWDB.
- 2) Geospatial datasets of groundwater salinity at 3 relevant levels (in the upper shallow, lower shallow and deeper aquifers, to be designated by BWDB) at present, and at 25, 50 and 100 years from now, including full metadata and stored and archived in Database or Sharepoint System of BWDB
- 3) Tidal and salinity curves for key locations in the coastal zone (about 20, to be designated by BWDB) in the wet and dry season at present, and at 25, 50 and 100 years from now
- 4) Exceedance frequency curves for water levels in the same 20 stations at present, and at 25, 50 and 100 years from now
- 5) Define extreme water levels in the polder of coastal zone at 25, 50 and 100 years from now, due to cyclonic storm surges.
- 6) Technical Report with description and explanation of the geospatial datasets of surface and ground water salinity, and the tidal salinity and water level curves, including description of relevant seasonal variations, used models, indication of more and less likely scenarios, and full metadata. The Research Team shall also discuss the effect of at least two relevant options of redistribution of river water in the South West delta on salt intrusion.

**COMPONENT-5 Finalization of approach for reconstruction of the Polder at different coastal zones including their phasing and construction program**

The purpose of this Research is to refine concepts for polder design and management to see in which of the remaining polders in the CEIP-I project these concepts could be applied. Based on the boundary conditions around the polders, that were derived in component 3 and 4, the promising polder options from the Inception Phase are translated into conceptual polder designs. ‘Conceptual’ means up to the level of spatial planning inside the polder and seasonal management of gates (where ‘Detailed design’ means ready for tendering and implementation). After the Inception phase, the work on elaborating the polder concepts will be continued parallel to the research on the delta dynamics.

**Component-5.A: Reconstruction of the Polder at different coastal zones including their phasing and construction program**

**Objectives**

- Design the recommended polder improvement measures and develop long term management plans for the 17 polders in the CEIP-I project, with due consideration to; opportunities for livelihood, spatial planning, water management and operation, subsidence, raising of low lying area and future climate change scenarios.

**Activities**

- 1) Make an inventory of the present situation in 139 polders in general and details of 17 polders under CEIP-I with regards to; land use, population, economic activities, social organization, infrastructure, functioning of flood protection and water management system
- 2) List the boundary conditions for each polder, based on available data and outcomes of the research of component-4A to D, including influence of climate change
- 3) Make a match between the promising polder options from the Inception phase and the outcomes of activity 1 and 2. Where necessary, the work on the polder concepts of the Inception phase is extended to come to realistic options

- 4) Establish design for 3 polders as pilot program considering climate change, subsidence, possible land heights, land use, economic activities, infrastructure needed for water management and water management policy, drinking water facilities (especially in salt water conditions) for long term stability.
- 5) Development of new and additional polders as may be considered necessary. If found beneficial, hydraulically, some polders may be lumped together to create a bigger polder;
- 6) Make a cost estimate for the redesign of the polders and estimate the benefits and beneficiaries in the new situation

**Deliverables**

- 1) Technical Report on Long term Polder Improvement measures and Polder Development Plan
- 2) Design of polder improvement measures of 17 polders under CEIP-I with consideration of existing improvements with a description of ; opportunities for livelihood, spatial planning, water management and operation, subsidence, raising of low lying area and future climate change scenarios.
- 3) Report for each of the 3-5 polders with a description of;
  - Present situation
  - Boundary conditions (scenarios)
  - Matching with polder options
  - Establish design, including management plan
  - Costs and benefits

**Component-5-B: Coherence and Overall picture Delta**

One of the main objectives of this research is to create a framework for polder design, or as the subtitle of the program says: sustainable polders adapted to the coastal dynamics. Therefore, to complete the picture, an overview of the delta dynamics in the future is useful, also to see where future investments can be most favorable in terms of economical, physical and societal aspects. Besides that, after having done all the studies in component 3 and the overview of data as obtained in component 2, it is good to see where the interdependencies lie and where future research would be most useful. Basis for these interdependencies is shown in Figure 3. Consideration for new and additional Polders (if found necessary) may be proposed.

**Objectives**

- Obtain an overall picture of the delta dynamics in the future
- Obtain a picture of (the need for) possible large scale interference in the coastal zone of the delta to reach optimal living conditions
- Quantify the mutual effects of physical processes and obtain an indication where more research is wanted

**Activities**

- 1) Describe the interdependencies and mutual effects in detail, also based on the outcome of the studies in component 3
- 2) Quantify these for the future (the same 25, 50 and 100 year horizons to be used but more as a framework than as exact figure) and indicate possible consequences for the boundary conditions for the polders (water levels, salinity, erosion and sedimentation patterns, subsidence, etc.)
- 3) Based on the results of activity 2, component 4A (polder design) and the possibilities to influence the salinity situation in the delta (activity in component 3D), investigate the need or desirability of large scale changes in the coastal zone (river diversions, damming river mouths, etc.).

**Deliverables**

Report describing the

- Interdependencies and relations between the processes and parameters
- The consequences for the boundary conditions
- Recommendations for future action plan/research (white spots, inexplicable phenomena)
- Potential large scale interventions

**COMPONENT-6: Updating of design parameters and specifications for construction works, and management practices of the polders including development of performance monitoring mechanism**

The original Coastal Embankment Project (CEP) was planned and designed in the nineteen sixties; most of the polders were constructed, mainly, in sixties and seventies. Since then there has been many pilot studies to improve performance of these polders and introduction of improved water management practices. Notable among those initiatives are the System Rehabilitation Project, Flood Action Plan, Delta Development Plan, Land Reclamation Plan, Water management Improvement Project, CDSP etc. Many proposals have been tried. Many of these ideas have been implemented successfully and some did not work out, in the long run. It is time now to review those initiatives and results of pilot activities and propose an updated set of design parameters and specifications for construction/re-construction of the polders as well as associated appurtenant structures.

**COMPONENT-6.1 Updating of design parameters and specifications for construction works**

The present design standards of BWDB will be critically reviewed and modified, as appropriate taking into account availability of construction materials, modern equipment and construction techniques. The Consultants will review performances of appurtenant structures across the entire coastal belt and identify why some of the structures are not performing efficiently. It needs to be seriously studied where failure of dykes/ embankments have occurred and proposes changes, in design and construction methods, as may be appropriate. Design standards updated by US Army Corp of Engineers, recently as well those used in Europe will be reviewed by the Consultants and incorporate their approaches as far as practicable. It is expected that the Consultants will propose and finalize a detailed work plan and output delivery schedule at the time of finalization of the Inception Report.

**COMPONENT-6.2 Review of approaches for management of polders with emphasis on active participation of beneficiaries and local stake holders:**

Bangladesh has long tradition of construction of embankments and their maintenance. But in recent years many failures of embankment have been reported. Some of the embankment reaches have failed as the river has eroded the off-set distance and attacked the embankment directly, resulting in their failure. On the other-hand, lack of maintenance or poor maintenance of the dykes has been identified as the main factors for such failures. Another major factor that is often cited is the institutional mechanism for maintenance and management of the embankments and the associated appurtenant structures. Presently, beneficiaries and local stakeholders do not take part in such activities. This is an issue that must be resolved if it is to be ensured that interventions under CEIP will remain effective in future. It is expected that the Consultants will propose management plans for the polders as well as the appurtenant structures with emphasis on active participation of beneficiaries and local stake holders.

A detailed work plan and output delivery schedule will be proposed by the Consultants at the time of finalization of the Inception Report.

**COMPONENT-6.3: Setting up a Performance Monitoring Mechanism:**

To monitor the performance of the re-constructed polders it will be prudent to set up a participatory monitoring mechanism. It will require setting up of overall goal of the development activity, performance targets and indicators for each of the polders. It may be assumed that eventually routine maintenance and routine operation will be carried by beneficiaries either directly or through a mechanism where they will be taking responsibility for covering the basic costs. But when and if the polders require major repair works



or some remodeling for better performance, the capital expenditure will be covered by the government. A performance monitoring mechanism will alert the concerned responsible authority to take necessary step. An annual review will also assist the managers responsible for effective as well as smooth functioning of the polders.

Setting up the goals and targets will be a very important task. Recent trends in changes in land-use inside the area, protected by the polder demand that BWDB establishes the goals and targets for re-construction of the polders and gets approval from the government. Presently, most of the lands inside many polders have been converted into shrimp farms whereas the original intention of construction of polders was to provide enabling environment for cropped agriculture. MoWR and BWDB authorities must guide the project Director of the CEIP on this critical question. Then, the Consultants will be able to develop appropriate goals and targets that will lead to indicators that may then be used to evaluate performance of each of the polders. There may be separate goals, targets and indicators for each of the polders.

A detailed work plan and output delivery schedule will be proposed by the Consultants at the time of finalization of the Inception Report.

#### **COMPONENT-7: Investment Plan for the Entire CEIP.**

Based on the data gathered and analyzed in component 3, the modeling completed in Component 4, and the polder improvement design and management plan developed in Component 4A, the Research Team, in consultation with the client, will prioritize and define an investment plan to improve the resilience of the communities living in Bangladesh's 139 polders to hydro-meteorological events. This will be completed in two phases. The first phase will assess the elaboration of the design of the final 17 polders under CEIP. The second phase will define the investment plan at a lower aggregate level of detail for the remaining 122 polders (139-17). Once the investment plan is designed, the Research Team will work with the Government of Bangladesh to define a fundraising rationale for the international community to raise the grant resources necessary to enable the Government to finance a revamping of the coastal protection system that is necessary.

##### ***Objectives***

- Develop a programmatic investment plan to sustainably improve the resilience of communities in 139 polders
- Assessment of opportunities and approach for accessing Green Climate Fund and other funds from global level.

##### ***Activities***

- 1) Develop a macro-level multi-phased investment plan for the construction of the selected polder improvement measures based on priorities agreed with the client
- 2) Develop an investment plan for long term management of the polders and their effective operation
- 3) Assessment of opportunities and approach for accessing Green Climate Fund and other funds from global level.
- 4) Develop a plan for fundraising and technical collaboration with the international community

##### ***Deliverables***

- 1) An investment plan describing a phased polder improvement roadmap and required budget
- 2) An investment plan for long term management of the polders, including the expansion of monitoring systems, and the required maintenance and operations cost
- 3) An execution plan including financing and fundraising strategies and plans; and technical collaboration plan

**COMPONENT-8: Action plan for Capacity Building of professionals and stakeholders in planning, design, construction supervision and management of the polders, as appropriate.**

**Component-8.1 Capacity Building**

***Objective***

- To build the capacity of the BWDB and related agencies/institute responsible for designing and managing the built as well as the natural environment in coastal zone of Bangladesh and strengthen the university level curriculum in water resources/coastal engineering and management.

***Activities***

1. Provide on the job training to technical and relevant government counterparts on a regular basis and conduct a number of specialized training courses. The training on the job will include but not limited to;
  - a) Feasibility study of alternative plans including multi-criteria analysis
  - b) Quality assurance / quality checking of data
  - c) Statistical analysis of trends in data
  - d) Development and calibration of models
  - e) Design of polder improvements and the development of management plans
  - f) Development of investment plans and financing strategies
  - g) Provide overseas training mainly of BWDB Engineers on coastal hydraulics, morphology, salinity intrusion, storm surges modeling under changing climate.
  - h) Sharing Experiences of BWDB Engineers and policy makers through overseas seminars/study tour and workshop.
2. In collaboration with academic institutions and professional bodies , strengthen the curriculum in water resources/coastal engineering and management to develop a solid scientific cadre in Bangladesh

***Deliverables***

1. On the job technical training plan for each of the sections described
2. Report detailing the results of the on job training, list of participants and measure of success
3. The Research Team shall organize International workshop on understanding the dynamical processes in the coastal zone of Bangladesh, including morphology, subsidence, meteorological changes due to climate change, salinity intrusion, water levels, and the effect on polder management and design
4. The Research Team shall provide training on the job for the technical and scientific counterpart staff on a regular basis, by carrying out the activities in the ToR in Bangladesh in cooperation with the counterpart staff or by giving specialized trainings. The training on the job will include – at minimum – the quality assurance / quality checking of data, the statistical analysis of trends in data, the development and calibration of new models, and the use of new techniques and analyses
5. Teach the teacher: students at universities are the future members of the Bangladeshi water community. New and advanced techniques used in the execution of this ToR should be taught at universities. Develop new curriculum materials in cooperation with academic institutions and professional bodies

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## **COMPONENT-9: Outreach program and communication strategy towards transparency and accountability**

### **Component-9.1 Outreach program**

#### ***Objective***

- To ensure that the client and stakeholders participate and are well informed of the developments and results of the project

#### ***Activities***

Organize the following workshops with selected group and plenary session:

1. At the beginning of the Inception Phase to discuss the polder problems and identify and assess the current condition
2. Upon finalizing the Inception Phase: to discuss the initial findings and proposed basin approaches
3. At the end of data collection phase: to discuss extent of existing data, identify gaps and propose improvement methods
4. At the end of the modelling phase: to discuss the findings of the analyses and its implications
5. At the end of development of design and implementation phase: to discuss the effectiveness of the selected interventions and their social, environmental and economic implications
6. At the end of the development of investment plan phase: to select the most promising alternative and discuss risk reduction investment strategy

Consultants shall actively participate in the workshops, in their development, in the discussions and in drafting the conclusions.

#### ***Deliverables***

1. Report at each stage of the consultation including the summary of the discussions, list of participants and the conclusion reached

### **Component-9.2: Communication Strategy**

#### ***Objectives***

- The objective of this task is to ensure that all analysis and results of the study, the data collected and generated, cost-benefit analysis are able to be updated, interactively communicated and understood by a wide range of stakeholders

#### ***Activities***

1. Upload and store all collected and generated data in the Database or Sharepoint System of BWDB,
2. Share all analysis and results from this study with all stakeholders
3. Communicate the results of the project and benefit-cost analysis through a series of stakeholder workshops. This should include production of dissemination material such as brochures with results and illustrative material that will inform various stakeholders

#### ***Deliverables***

1. All datasets will stored in Database or Sharepoint System of BWDB for use in a variety of ministries, with illustrative material
2. Communication materials such as brochures, animations etc. that will help communicate the proposed improvements

## **6.0: Project Management:**

BWDB will be responsible for the implementation of CEIP-I. The Consultants will work closely with the Project Director (PD) and the Project Management Unit (PMU) set up for the CEIP Project. It will have a central Project Office located at the headquarters of BWDB in Dhaka. The Research Institute/Firm will establish their office in Dhaka and the field at convenient location from BWDB offices to whom they will be reporting on a day to day basis. After the inception stage the Research Institute/Firm shall prepare a detailed schedule and task-flow diagram, which depicts the interrelationship of various tasks in the assignment which lead to the completion works and mechanism of coordination with the client and other related entities. The Research Institute/Firm's proposal shall propose a standard form for the Project Report, which should be concise. It is anticipated that the Research Institute/Firm shall prepare each technical report in such a manner as to readily facilitate preparation of the Project Report. This would be kept and update throughout the Project duration. Members of the Independent Panel of Experts (IPOE) will be available for consultation and guidance, as may be appropriate.

## **7.0: Definitions, Technical Standards and Documentation**

**Language** – The working languages for this project shall be English. All draft and final deliverables shall be in English.

**Reports** – Technical Memoranda and reports shall be delivered in hard copy & electronic format in MS word document and Adobe PDF format. The Project report shall be presented in printed and electronic format with accompanying materials as discussed above.

### ***Data Standards, Transfer Media and Licensing Data formats and requirements:***

The minimum requirements to be followed for all geospatial (GIS) data are:

**Metadata:** Detailed documentation needs to be provided for each data set. This metadata must include description, source, contact, date, accuracy, restrictions. A description of attributes needs to be provided for vector and tabular data sets. Spatial data must include details of projection. There are available ISO standards commonly used by World Bank projects to guide the development of metadata.

**Vector data:** Geospatial vector data must be converted into a standard OGC format or well-known format. This list includes, but is not limited to, ESRI shape file, KML, GML, WKT. Additional formats may be used with approval. Where possible, styling information should be provided in SLD format. All files must include projection parameters.

**Raster data:** Geospatial raster data must be converted into a standard OGC or well-known format. This list includes, but is not limited to, geoTiff, JPEG, JPEG2000, ERDAS img, ArcInfo ASCII or Binary grid, MrSid. Additional formats may be used with approval. Where possible, styling information should be provided in SLD format. All files must include projection parameters.

**Tabular data:** Tabular data must be converted into a readily accessible or well-known format. This list includes, but is not limited to, CSV, tab delimited text file, or spreadsheet. Additional formats may be used with approval.

**8.0: Selection Procedure:**

The Consultants would be selected following Quality Based Selection (QBS) criteria as set out in the World Bank's Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" published by the Bank in January 2011 and form of contract would be Complex Time Based Contract.:

**9.0: Duration of the Assignment.**

Duration of the contract would be 30 months. Last but not least is the undertaking of the Consultants (standard) on obligatory responses to any technical related query arising from time to time after the implementation of the project but during the first year after closure (post warranty period).

**10.0: Personnel Requirements**

**10.1: International Key & Non-Key Professionals with Qualification and Task**

The consultants/research institutes are encouraged to use the expertise available in Bangladesh to the extent possible. However, international experience and experience with the World Bank Financed projects are necessary to carry out the assignment. The consultants are free to propose a staffing plan and skill mix necessary to meet the objectives and scope of the research projects. If all the required skills are not available within the consulting firms, they are encouraged to make joint ventures with other firms. Following is an indicative list of the positions where the firms will propose required professionals but not limited to carrying out the assignment: (**flexibility will be allowed to adjust man-month as allocated or introduce new discipline as considered necessary also under implementation of the project**)

<b>SL No.</b>	<b>International Key Professionals</b>	<b>Total Man Month</b>
IK-1	Team Leader	22.0
IK-2	River and Estuarine morphologist	8.3
IK-3	River and Coastal & Estuarine Morphological Modeler	9.7
IK-4	Integrated Coastal Zone and polder Management Expert	8.5
IK-5	Coastal and Estuarine Morphologist	6.1
IK-6	Tidal River and Sediment Management Specialist	11.3
IK-7	Macro Scale Delta Morphologist	11.0
IK-8	Large Scale Delta Morphologist/Geologist	8.7
IK-9	Subsidence Expert/Geo-morphologist	10.5
	<b>Sub-Total of Key Professionals</b>	<b>96.2</b>
	<b>International Non-Key Professionals</b>	
INK-10	Storm Surge and Wave Specialist	4.0
INK-11	Climate Change Risk Assessment and Adaptation Specialist	8.2
INK-12	Economist	7.0
INK-13	Salinity Specialist	1.0
INK-14	Remote Sensing Expert	5.0
INK-15	River Morphologist	7.0
INK-16	Capacity Building and Estuarine Modelling	6.0
INK-17	Fine sediment modelling	6.0
INK-18	Polder Design	3.0
INK-19	Remote Sensing image analyst expert	3.0
INK-20	CC expert and rain-fall analysis	AOPD
INK-21	Salinity Specialist ground water	2.0
INK-22	Data management expert (GIS)	AOPD
INK-23	Climate Change Specialist	AOPD
INK-24	Macro Scale Delta Morphology and socio economics	3.0
INK-25	SET compaction meters, and polder/TRM impacts	4.0
INK-26	Tidal hydrodynamics and sediment mass flux	1.0
INK-27	Coastal Morphologist	AOPD
INK-28	Statistical analysis of meteorological data	2.0
INK-29	Coastal Flooding and Storm surge expert	AOPD
INK-30	Investment plans and PPP specialist	AOPD
INK-31	Morphodynamics modelling expert	4.0
INK-32	Coastal and Estuarine Modeller	3.0
INK-33	American post doc	15.0
	<b>Sub-Total of International Non-Key Professionals</b>	<b>84.2</b>
	<b>Total International Key &amp; Non-Key Professionals</b>	<b>180.3</b>

## 10.2 National Key & Non-Key Professionals

SL No.	National Key Professionals	Total Man-month
NK-34	Deputy Team Leader	30
NK-35	River Morphological Modeler	24
NK-36	Coastal and Estuarine Morphological Modeling Specialist	28
NK-37	Integrated Coastal Zone & Water Resources Management Specialist	28
NK-38	Tidal River Morphologist	28
NK-39	Storm Surge and Wave Modeling Specialist	24
NK-40	Long-Term Polder Management Specialist	28
NK-41	Sediment Management Specialist	28
NK-42	Database Development Specialist	28
	<b>Sub-Total of National Key Professionals</b>	<b>246</b>
	<b>National Non-Key Professionals</b>	
NNK-43	River Morphological Modeler	24
NNK-44	Coastal and Estuarine Morphological Modeling Specialist	24
NNK-45	Geo-Morphologist	28
NNK-46	Groundwater Specialist	28
NNK-47	Remote Sensing Specialist	24
NNK-48	Salinity Specialist	24
NNK-49	GIS Specialist	20
NNK-50	Large Scale Delta Morphologist	28
NNK-51	Macro Scale Delta Morphologist	28
NNK-52	Economist	10
NNK-53	Environmentalist	12
NNK-54	Sociologist and Institutional Specialist	11
NNK-55	Communication and Out-reach specialist	7
NNK-56	Hydraulic Structure Design specialist	14
NNK-57	Survey and monitoring specialist	12
NNK-58	Survey and monitoring Specialist	17
NNK-59	Climate Change Modelling Specialist	8
NNK-60	Basin Modelling Specialist	13
	<b>Sub-Total of National Non-Key Professionals</b>	<b>332</b>
	<b>Total National Key &amp; Non-Key Professionals</b>	<b>578</b>

## 11.0: Task and Qualification of Professionals (International and National)

### 11.1: Task and Qualification of International Key & Non- Key Professionals

Discipline	Qualifications and Tasks
<b>Team Leader</b>	<p>He/she should have Ph.D. degree in Civil Engineering/Coastal Engineering/Water Resources Engineering/ Hydraulic Engineering/ Physical Science/Earth science. He/she should have 20 years professional experience and at least 15 years' experience in the relevant field such as river morphology, morphological modelling, coastal management, climate change, delta management, subsidence analysis including leading and managing a multidisciplinary research/ consultancy team for river morphology, costal morphology, land subsidence, climate change sea level rise and long-term morphological changes,</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Guide professionals on assessing long-term morphological changes under different scenarios in the estuary and river systems of the coastal area</li> <li>- Responsible for assessment of sediment transport in the river systems of the coastal area and large alluvial rivers</li> <li>- Development of long-term sediment management plan in rivers and coastal polders based on sustainable polder concept;</li> <li>- Preparation of monitoring plan on polder performance, river and coastal morphology, land subsidence for adaptive polder management</li> <li>- Prepare project work plans, schedules</li> <li>- Maintain liaison with BWDB and other relevant agencies</li> <li>- Guide and supervise the project activities,</li> <li>- Project management and quality assurance</li> <li>- Preparation of different reports as required for the different research activities</li> <li>- Preparation of Final Report as needed under the contract.</li> <li>- Organize workshops and dissemination of results in home and abroad</li> </ul>
<b>River and Estuarine Morphologist</b>	<p>He/she should have Ph.D. Degree in Civil/Water Resources /Coastal/ Hydraulic engineering/Fluid mechanics/physical science/earth science/Environmental engineering and science from any recognized institution having 20 years of professional experience with 15 (fifteen) years experiences in the relevant field like morphological modelling, sediment transport in river and estuary, geomorphology, river and estuarine morphology, , Coastal polder management, climate change and sea level rise, river bank erosion protection, storm surge analysis. Previous experience in similar working environment will be preferred.</p>

	<p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Responsibilities to carry out morphological studies, prediction of estuarine and river morphology, assessment of impact of polderization on tide and river morphology;</li> <li>- Guiding the team for morphological impact assessment of various future development strategies in the river systems and upstream basin;</li> <li>- Responsible for development of framework for polder design on sustainable polder concept, based on long term and large scale dynamics of the coastal area;</li> <li>- Guiding field data collection, quality assurance, database development</li> <li>- Guide and supervise the morphological modelling activities</li> <li>- Responsible for training and capacity development of BWDB professionals</li> <li>- Formulate future monitoring plan</li> <li>- Assist Team Leader in preparation of different reports, organizing workshops and maintaining Liaison with client and different stakeholders</li> </ul>
<b>River and Coastal &amp; Estuarine Morphological Modeler</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources Engineering/river engineering/coastal engineering/ Hydraulic engineering having 15 years of professional experience with 10 (ten) years working experience in the relevant field, River morphology, coastal estuarine morphology, Sediment transport and morphological modelling of river and estuary, river siltation river bank erosion protection etc. Previous experience in similar working environment will be preferred. He/She should have proven knowledge in development and set-up of morphological models.</p> <p><b>Task:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Guiding in developing, calibrating and validating, updating and improving available water flow and morphological models</li> <li>- Responsible for simulation of morphological conditions of rivers and estuaries for impact assessment of various future development strategies in the river basins within Bangladesh and in GBM basin and their impacts on to the coastal area.</li> <li>- Medium and long-term morphological simulations</li> <li>- Assessment of impact of climate change on river morphology for medium and long-term perspective and sustainable polder concept</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>

<b>Integrated Coastal Zone and Polder Management Expert</b>	<p>He/she should have Minimum Masters' degree in Earth Sciences/ Environmental/Water Resources Engineering/Sociology/ Geography/ Hydrology/ Agriculture with special training in carrying out study on ICZM. He/she should have at least overall 15 years working experience in similar assignments. Working experience on environmental planning, planning of projects in holistic and integrated approach, disaster risk assessment and management, policy formulation on coastal zone management</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following: Review of policy and plans of different ministries</p> <ul style="list-style-type: none"> <li>- Responsible for making inventory of the polders as they function now and their relation with the environment.</li> <li>- Compilation of land-use maps, including historical changes in land-use, based on remote sensing and census data</li> <li>- Analyze the socio-economic conditions before and after polder system development</li> <li>- Establish the relevant physical, social, economic and environmental characteristics of the polders and the coastal environment</li> <li>- Description of upstream hydraulic infrastructure and current polder management and operation. Assess the potential impacts of the project activity on surrounding environment</li> <li>- Responsible for the overall management and co-ordination to develop an integrated coastal zone management plan for coastal polders in holistic and integrated approach</li> <li>- Formulate recommendations, policy brief in support of the settlers to cope with the consequences of climate change.</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Coastal and Estuarine Morphologist</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources Engineering/river engineering/coastal engineering/ Hydraulic engineering/geo-morphology having 15 years of professional experience with 10 (ten) years working experience in the relevant field, coastal and estuarine morphology, delta development and delta dynamics, morpho-dynamics of tidal rivers. Previous experience in similar working environment will be preferred. He/she should have proven knowledge in development and set-up of morphological models.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Assessment of coastal and estuarine dynamics</li> <li>- Assessment of effects of polderization on tidal and sediment dynamics of tidal rivers and estuary</li> <li>- Establish relation between tidal river sedimentation and polder water-logging</li> <li>- Review the TRM basin practices for tidal river management, improve the concept and preparation of long-term plan</li> </ul>

	<ul style="list-style-type: none"> <li>- Responsible in planning for field survey and quality assurance</li> <li>- Sediment balance and budgeting in the coastal area</li> <li>- Responsible for development of framework for polder improvement on sustainable polder concept, based on long term and large scale dynamics of the estuary and tidal rivers</li> <li>- Close interaction with modelling team</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Tidal River and Sediment Management Specialist</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources Engineering/river engineering/coastal engineering/ Hydraulic engineering/geo-morphology/geology/earth science/ environmental science having 10 years of professional experience with 8 (eight) years working experience in the relevant field, coastal and estuarine morphology, 1D, 2D and 3D morphological modelling, modelling of tidal rivers. Previous experience in similar working environment will be preferred. S/he should have proven knowledge in development and set-up of morphological models.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Assessment of tidal and sediment dynamics of the estuary and tidal rivers</li> <li>- Review of present practices of tidal river management</li> <li>- Sediment budget and balance in the tidal rivers specially in the southwest region</li> <li>- Guiding in developing, calibrating and validating, updating and improving available water flow and morphological models for the tidal rivers and estuary</li> <li>- Responsible for simulation of morphological conditions of rivers for impact assessment of various future development scenarios;</li> <li>- Simulation of tidal river basin integrating with rivers for sediment management for development of innovative concept of sediment management and raising of land inside the polders interacting with river and polders</li> <li>- Morphological modelling for estuary and tidal rivers</li> <li>- Assessment of effects of climate change and upstream changes on the morphology of the peripheral rivers of polders for short, medium and long-term perspective</li> <li>- Responsible in planning for field survey</li> <li>- Sediment balance and budgeting in the tidal rivers and estuary</li> <li>- Close interaction with other team members</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>

<b>Macro Scale Delta Morphologist</b>	<p>He/ she should have PhD/Master's Degree in Civil/ Water Resources/ coastal/hydraulic Engineering/ Applied Earth Science/Geology having 12 years of professional experience with 08 (eight) year experience in the relevant field like modelling of fluvio- deltaic processes, sustainability of deltaic systems with an integrated modelling, land subsidence, delta processes and long-term prediction of coastal system etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Responsible for Earth System analysis to assess vulnerability and sustainability of coastal system of Bangladesh;</li> <li>- Responsible for planning the data collection program and specifications</li> <li>- Carry out sustainability of deltaic systems with an integrated modelling framework for risk assessment of coastal polder system and devising sustainable solution plan for polder system</li> <li>- Carryout activities to understand fluvial and marine sediment transport and processes responsible for distributing sediments in the GBM tidal delta;</li> <li>- Comprehensive assessment to characterize sedimentation patterns and sources of sediment deposited in the coastal tidal delta plain and river systems of Bangladesh;</li> <li>- Guide and supervise the work of national modelling team</li> </ul> <p>Assist in preparation of different reports as required by the team leader</p>
<b>Large Scale Delta Morphologist/Geologist</b>	<p>He/ she should have PhD/Master's Degree in Water Resources/ Coastal Engineering/Coastal geo-morphology/Geology/Earth science/ marine science/Environmental science/ Applied Earth Science having 15 years of professional experience with 08 year experience in the relevant field like geo- morphology, subsidence and climate change adaptation, modern sediment budget, assessment of sediment load, tidal sedimentology polder and river interactions etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Assessment of evolution of coastal delta</li> <li>- Reconstruction of river histories and Holocene Bangladesh delta evolution</li> <li>- Carry out integrated assessment of GBM delta</li> <li>- Assess the geological evolution and human impact of coastal area of Bangladesh</li> <li>- Responsible for Holocene and modern sediment budget for the GBM Delta</li> <li>- Geomorphology study and climate change adaptation in the polder river systems of the coastal area</li> </ul>

	<ul style="list-style-type: none"> <li>- Measure subsidence due to compaction at representative points, in addition to already available information, and extrapolate to the polder area in the coastal zone. Install extra equipment if necessary</li> <li>- Carryout the research activities to understand the processes, controls, and patterns of sediment distribution across the Bangladesh delta and how this dispersal of sediment drives the construction, erosion, and maintenance of the polder and river systems</li> <li>- Assist in preparation of different reports as required by the team leader.</li> </ul>
<b>Subsidence Expert/Geo-morphologist</b>	<p>He/she should have PhD/Master's Degree in Water Resources /Coastal engineering/coastal geo-morphology/geology/earth science/marine science/ environmental science/ Applied Earth Science /geo-physics having 12 years of professional experience with 08 year experience in the relevant field like assessment of subsidence, geomorphology/ establishment of Relative mean Sea Level Rise, geological analysis, establishment of vertical datum etc.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Preparation of field measurement and monitoring program of land subsidence</li> <li>- Measure vertical movement due to compaction at statistically relevant and representative points, in addition to already available information, and extrapolate to the polder area in the coastal zone. Install extra equipment if necessary</li> <li>- Estimate the vertical movement due to tectonics (neo)in the polder area of the coastal zone based on literature review Measure the annual subsidence rate for the area either by means of installing stationary GPS, remeasuring existing markers by campaign GPS, or by methods that employ Interferometry Synthetic Aperture Radar (InSAR).</li> <li>- Identification of historic subsidence trends.</li> <li>- Assist in preparation of different reports as required by the team leader.</li> </ul>
<b>Storm Surge and Wave Specialist</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources/ coastal engineering/hydraulic engineering/disaster management having 10 years of professional experience with 6 (six) years working experience in the relevant field like storm surge risk assessment, cyclonic storm surge modelling, climate change and sea level rise, hydraulic engineering etc. Previous experience in similar working environment will be preferred. He/she should have proven knowledge in development of storm surge modelling, calibration and validation.</p>

	<p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <p>Estimate changes in storm surges and discharge levels using the future scenarios on rainfall in the catchment area and cyclone frequency and intensity as input for computational models</p> <ul style="list-style-type: none"> <li>- Responsibilities to carry out 2D and 3D numerical modelling, Numerical hydrodynamics, Storm Surge Modelling,</li> <li>- Development storm surge model and updating and improving of available storm surge model for the Bay of Bengal;</li> <li>- Carry out simultaneous simulation of storm surge and cyclonic wave</li> <li>- Establish improved methodology of designing polder crest level considering storm surge, significant wave height and climate change and sea level rise</li> <li>- Assess the impact of storm surge on estuarine and river morphology</li> <li>- Analyze the storm surge level /height for establishing return period of storm surge level at different location of the coastal area.</li> <li>- Assess the risk of storm surge considering sea level rise and other climate change impact</li> <li>- Carry out wave analysis and wave modelling for computing wave run-up for sea-dyke.</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Climate Change Risk Assessment and Adaptation Specialist</b>	<p>He/she should have Master's Degree in Civil/ Water resources/ coastal/ hydraulic engineering/ hydrology/ climate change having 10 years of professional experience in the field and 7( seven) on hydrology, climate change sea level rise, statistical and dynamic downscaling, modelling, impact assessment of climate change on physical and social systems, devising adaptation measures etc. Experience in the similar nature of works will be given preference.</p> <p><b>Task:</b></p> <p>His/her major task includes but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Assess the changes in rainfall patterns, including annual rainfall, monsoon rainfall, and temporal and spatial distributions in the polder area of the coastal zone, based on historical data</li> <li>- Relative Mean Sea Level rise estimations, based on the 5<sup>th</sup> Assessment Report of IPCC and considering the local effects for the Bay of Bengal. Consultant shall put these sea level rise estimations in a local context</li> <li>- Estimation of precipitation projections in the coastal area for the climate change scenario of the 5<sup>th</sup> Assessment Report (RCP2.6,RCP4.5,RCP6 and RCP 8.5)</li> </ul>

	<ul style="list-style-type: none"> <li>- Guide the national team in salinity intrusion modelling under climate change</li> <li>- Development of innovative coastal risk assessment methods</li> <li>- Tidal inlet processes</li> <li>- Study the influence of climate change on the situation in study area</li> <li>- Study the impact of climate change on the sustainability of the polder functionality</li> </ul>
<b>Economist</b>	<p>He/she should have at least Masters' degree in economics with minimum 15 year experience including at least 10years experience in economic appraisal of water resources projects. A significant portion of this experience may also include natural resources management, physical and monetary valuation of possible environmental impacts. Higher Degree &amp; experience in relevant field will be preferred.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Review the 7th five year plan, perspective plan and Bangladesh Delta Plan2100</li> <li>- Assessment of risk to the projects viability; this will include social risks as well as traditional benefits</li> <li>- Responsible for developing a macro-level multi-phased investment plan for the construction of the selected polder improvement measures based on priorities agreed with the client</li> <li>- Developing an investment plan for long term management of the polders and the their effective operation</li> <li>- Developing a plan for fundraising and technical collaboration with the international community</li> <li>- Assist Team Leader in preparation of reports</li> </ul>
<b>Salinity Specialist</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources/Coastal/Hydraulic Engineering having 10 years of professional experience with 5 (five) years experiences in the relevant field like river salinity, salinity intrusion, sea level rise and assessment of climate change impact etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <p>His/her major responsibilities shall include but not necessarily be limited to the following :</p> <ul style="list-style-type: none"> <li>- To review all the previous reports and related journals on salinity modelling and analysis</li> <li>- Guide &amp; supervise the salinity modelling and analysis of national team</li> <li>- Prepare zoning map of river water salinity for the coastal area at present and in future in relation to agriculture and fisheries intensification</li> <li>- Establish relation between river salinity, soil salinity and groundwater salinity</li> </ul>

	<ul style="list-style-type: none"> <li>- Assessment of leaching effect of soil salinity</li> <li>- Contribution to report writing and presentation to the client</li> <li>- Assist Team Leader in preparation of reports</li> </ul>
<b>Remote Sensing Expert</b>	<p>He/ she should have PhD/Master's Degree in Water Resources /Coastal engineering/coastal geo-morphology/geography/earth science/GIS/ marine science/environmental science/ Applied Earth Science / Geophysics/remote sensing having 12 years of professional experience with 08 years experiences in the relevant field like preparation of land-use maps and development of digital elevation model/altimetry analysis etc.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Need assessment of remote sensing analysis for characterizing of the coastal area and coastal polders</li> <li>- Preparation of digital elevation model with available data</li> <li>- Preparation of land-use map</li> <li>- Assessment and mapping of decadal changes of the coastal area</li> </ul>

### 11.2: Task and Qualification of National Key & Non- Key Professionals

Discipline	Qualifications and Tasks
<b>Deputy Team Leader</b>	<p>Minimum Masters' degree in Coastal/Civil / Water Resources Engineering having a minimum of 20 years of professional experience with at least 15years experience on river morphology, coastal and estuarine morphology, tide, wave and storm surge modelling, climate change impact assessment. polder water management, tidal river management, erosion protection, Previous experience in similar working environment will be preferred</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Review of past study reports</li> <li>- Assist the team to carry out morphological studies, prediction of estuarine and river morphology, assessment of impact of polderization on tide and river morphology;</li> <li>- Supervise and guiding the team for morphological impact assessment of various future development strategies in the river systems and upstream basin;</li> <li>- Assist team leader and deputy team leader for development of framework for polder design on sustainable polder concept, based on long term and large scale dynamics of the coastal area;</li> <li>- Guiding field data collection, quality assurance, database development</li> <li>- Guide and supervise the morphological modelling activities</li> <li>- Responsible for training and capacity development of BWDB professionals</li> <li>- Assist in formulate future monitoring plan</li> <li>- Assist Team Leader in preparation of different reports, organizing workshops and maintaining Liaison with client and different stakeholders</li> </ul>
<b>River Morphological Modeller</b>	<p>Minimum Master's Degree in Civil/ Water Resources Engineering/river engineering/coastal engineering/Hydraulic engineering having 12 years of professional experience with 8 (eight years working experience in the relevant field, River morphology of alluvial rivers, Sediment transport and morphological modelling river siltation, river bank erosion protection etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Developing, calibrating and validating, updating and improving available water flow and morphological models for Brahmaputra, Padama, Gorai, Lower Meghna rivers at present and future</li> </ul>

	<ul style="list-style-type: none"> <li>- Responsible for simulation of morphological conditions of rivers for impact assessment of various future development strategies in the river basins within Bangladesh and in GBM basin and their impacts on to the coastal area.</li> <li>- Medium and long-term morphological simulations</li> <li>- Assist in preparation of different reports as required by the Team Leader.</li> </ul>
<b>Coastal and Estuarine Morphological Modeling Specialist</b>	<p>Minimum have Master's Degree in Civil/ Water Resources /coastal/Hydraulic engineering/ physical science having 8 years of professional experience with six (six) years experiences in the relevant field like morphological modelling, sediment transport in river and estuary, Bay of Bengal, coastal polder management, climate change and sea level rise, coastal erosion protection. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b>  His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Planning of field survey and monitoring</li> <li>- Responsibilities for carrying out morphological studies, coastal and estuarine process</li> <li>- Updating of available 1 D and 2D models</li> <li>- Simulations of estuarine morphology for impact assessment of various future development strategies in the river systems and upstream basin;</li> <li>- Assess long-term morphological conditions of river and estuary for development of sustainable polder management</li> <li>- Model results interpretation and Morphological analysis</li> <li>- Provide training on morphological modelling to BWDB engineers</li> <li>- Formulate future monitoring plan</li> <li>- Assist Team Leader in preparation of different reports</li> </ul>
<b>Integrated Coastal Zone &amp; Water Resources Management Specialist</b>	<p>He/she should have Minimum Masters' degree in Environmental /Civil Water Resources Engineering/Hydrology. He/she should have at least overall 20 years working experience in similar assignments. Working experience on environmental planning, planning of projects in holistic and integrated approach, disaster risk assessment and management, development of plan and guidelines, policy formulation on coastal zone management</p> <p><b>Tasks:</b>  His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Review of Costal Zone Policy (CZPo), Coastal Development Strategy (CDS), Priority Implementation Project (PIP) and Bangladesh Delta Plan etc;</li> <li>- Formulate integrated plan for costal polders and coastal zones</li> <li>- Review and updating of land use planning of coastal zones</li> </ul>

	<ul style="list-style-type: none"> <li>- Formulating rules, regulations, guidelines and manual for polder management based on sustainable polder management, new knowledge and best practices under different projects in the coastal area</li> <li>- Knowledge management, updating of CDS, PIP and other documents involving multi-stakeholders</li> <li>- Identification of future probable social negative impacts of the polder development and possible positive social impact</li> <li>- Consultation with local people about the potential scenarios of polder water management improvement</li> <li>- Responsible for the overall management and co-ordination to develop an integrated coastal zone management plan for coastal polders in holistic and integrated approach.</li> <li>- Prepare survey specification and survey requirement for the morphological assessment</li> <li>- Guide and quality control of survey, tidal analysis, morphological assessment;</li> <li>- Analyze hydrological and morphological data for characterizing alluvial and tidal river systems and coastal polders</li> <li>- Analyze the sounding chart/ river and coastal bathymetry to find the past erosion and sedimentation pattern in the coastal area</li> <li>- Formulate recommendations, policy brief in support of polder improvement and for the settlers to cope with the consequences of climate change.</li> </ul>
<b>Tidal River Morphologist</b>	<p>Minimum B. Sc. Degree in Civil/Water Resources Engineering having a minimum of 25 years of professional experience with at least 15 years experiences in morphological analysis tidal river morphology and Coastal hydraulics. Previous experience in similar working environment will be preferred</p> <p><b>Tasks:</b> His/her major responsibilities shall include but not necessarily be limited to the following :</p> <ul style="list-style-type: none"> <li>- Prepare survey specification and survey requirement for the morphological assessment</li> <li>- Guide and quality control of survey, tidal analysis, morphological assessment;</li> <li>- Analyze hydrological and morphological data for characterizing alluvial and tidal river systems and coastal polders</li> <li>- Analyze the sounding chart/ river and coastal bathymetry to find the past erosion and sedimentation pattern in the coastal area</li> <li>- Assessment of TRM in polder</li> <li>- Assessment of tidal and sediment dynamics</li> <li>- Assessment of sediment balance in the river systems</li> <li>- Formulate the strategy for improvement of coastal polder and management of sediment</li> </ul>

	<ul style="list-style-type: none"> <li>- Present study findings to all stakeholders</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Storm Surge and Wave Specialist</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources/ coastal engineering/hydraulic engineering/disaster management having 6 years of professional experience with 4 (four) years working experience in the relevant field like storm surge risk assessment, cyclonic storm surge modelling, climate change and sea level rise, hydraulic engineering etc. Previous experience in similar working environment will be preferred. He/she should have proven knowledge in development of storm surge modelling, calibration and validation.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Update and upgrade the existing storm surge model</li> <li>- Estimate changes in storm surges height using the future scenarios and change in cyclone frequency and intensity as input for computational models</li> <li>- Responsibilities to carry out 2D and 3D numerical modelling, Numerical hydrodynamics, Storm Surge Modelling,</li> <li>- Carry out simultaneous simulation of storm surge and cyclonic wave</li> <li>- Establish improved methodology of designing polder crest level considering storm surge, significant wave height and climate change and sea level rise</li> <li>- Assess the impact of storm surge on estuarine and river morphology</li> <li>- Analyze the storm surge level /height for establishing return period of storm surge level at different location of the coastal area.</li> <li>- Assess the risk of storm surge considering sea level rise and other climate change impact</li> <li>- Carry out wave analysis and wave modelling for computing wave run-up for sea-dyke</li> </ul>
<b>Long-Term Polder Management Specialist</b>	<p>He/she should have minimum of Masters' degree in Environmental /Civil/ Water Resources Engineering/Sociology/Hydrology with special experience on coastal polder management in Bangladesh. He/she should have at least overall 15 years working experience in similar assignments. Working experience on environmental planning, planning of projects in holistic and integrated approach, disaster risk assessment and management, policy formulation on polder water management</p>

	<p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Review of policy and plans of different ministries</li> <li>- Responsible for making inventory of the polders as they function now and their relation with the environment.</li> <li>- Compilation of land-use maps of polders, including historical changes in land-use, based on remote sensing and census data</li> <li>- Analyze the socio-economic conditions before and after polder system development</li> <li>- Analyze the soil, groundwater and surface water salinity and devising of future polder improvement</li> <li>- Formulate plan and strategy of polder management in terms of long-term and sustainable concept for implementation on pilot basis</li> <li>- Establish the relevant physical, social, economic and environmental characteristics of the polders</li> <li>- Description of upstream hydraulic infrastructure and current polder management and operation.</li> <li>- Prepare the plan for internal water management</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Sediment Management Specialist</b>	<p>Minimum Master's Degree in Civil/ Water Resources Engineering/ river engineering/coastal engineering/Hydraulic engineering/geomorphology/geology/earth science/ environmental science having 9 years of professional experience with 5 years working experience in the relevant field, coastal and estuarine morphology, 1D, 2D and 3D morphological modelling, modelling of tidal rivers. Previous experience in similar working environment will be preferred. He/She should have proven knowledge in development and set-up of morphological models.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Planning of field data collection on water level, land of beels and basin, salinity, flow and sediment concentration in the peripheral rivers of polders</li> <li>- Review of present practices and performance of tidal river management</li> <li>- Sediment budget and balance in the tidal rivers specially in the southwest region</li> <li>- Responsible for developing, calibrating and validating, updating and improving available water flow and morphological models for the tidal rivers and estuary</li> <li>- Responsible for simulation of morphological conditions of rivers for impact assessment of various future development scenarios;</li> <li>- Simulation of tidal river basin integrating with rivers for sediment management for development of innovative concept of sediment management and raising of land inside the polders interacting with river and polders</li> </ul>

	<ul style="list-style-type: none"> <li>- Establish the dynamics of water-logging in the polder and tidal river system and develop measures to reduce water-logging in combination with restoring natural sedimentation processes within polder areas and adjacent tidal rivers.</li> <li>- Morphological modelling for estuary and tidal rivers;</li> <li>- Assessment of effects of climate change and upstream changes on the morphology of the peripheral rivers of polders for short, medium and long-term perspective;</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Database Development Specialist</b>	<p>Minimum M.Sc. degree in Computer Science/ Computer Science and Engineering/Electrical Engineering/ Mechanical Engineering/ Civil Engineering/Water resources engineering. He/she should have at least 15 years experiences in the field of Software Project Management, System Analysis &amp; Design, Software Engineering, Programming, Data Modelling and Database Design etc. He/she should have practical experience in developing software/database and leading software development project team.</p> <p><b>Tasks:</b></p> <p>Collecting, organizing, eliciting and analysing user requirements;</p> <ul style="list-style-type: none"> <li>- Analyze system requirements, document user requirements as well as system requirements;</li> <li>- Develop data models based on the requirements; Perform OOAD using UML; documenting design specifications;</li> <li>- Architect and design desktop application, web application software and mobile apps (preferably android and cross-platform hybrid apps);</li> <li>- Develop desktop win form apps/tools, client-server software application using C#, .NET framework 4.0/4.6, LINQ, EF, RDLC/ Active Reports/ Crystal reports etc.</li> <li>- Develop web application using C#, ASP.NET MVC using .NET framework 4.0/4.6, LINQ, EF, RDLC/ Active Reports/ Crystal reports,</li> <li>- Handling geo-spatial data using GeoServer, PostgreSQL/PostGIS, Open Layer etc.</li> <li>- REST web services need to be developed (if required);</li> <li>- Develop UX/UI using JavaScript, jQuery, AJAX, Angular JS, Open Layer, HTML5, CSS3 etc.</li> <li>- Install and configure IIS/ Node.JS /Apache in production environment as required;</li> <li>- Design, build and maintain relational databases in MS SQL Server/ MySQL/ Oracle/ PostgreSQL or Sharepoint System ;</li> <li>- Design, build and maintain NoSQL database (document databases) in Mongo DB or Sharepoint System;</li> <li>- Performance tuning of databases; Writing stored procedures, triggers and advanced SQL query;</li> <li>- Backup and recovery of NoSQL databases such as- MongoDB;</li> </ul>

	<ul style="list-style-type: none"> <li>- Backup and recovery of relational databases such as- MS SQL Server/MySQL/ Oracle;</li> <li>- Prepare project management plan, system requirement specification, design document, test plan, test cases, technical manual, user manual, training plan, training manual and presentation etc.</li> <li>- Performing software quality assurance and software testing of the system; prepare installation package/setup etc.</li> <li>- Piloting the system; Develop mechanism for help desk support and issue tracking;</li> <li>- Conduct technology transfer through training program;</li> <li>- Implementing software in client premises and conducting end user training</li> </ul>
<b>Geo-morphologist</b>	<p>Minimum a Masters' degree in Civil/Water Resources Engineering/ Riverine Engineering/ geology/earth science having a minimum of 125 years of professional experience with at least 6 year experience in morpho-dynamics of the river and coastal engineering problems (bank erosion, channel migration, formation of bars and islands) by means of river/coastal-survey data. Analyzing of land subsidence data. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b>  His/her major responsibilities shall include but not necessarily be limited to the following :</p> <ul style="list-style-type: none"> <li>- Exploring available literature on coastal geomorphology, its changes and impacts on polders</li> <li>- Study the development of polders and problem identification from past polders and getting lessons for future design with respect to geomorphology</li> <li>- Study geo-morphological changes of river and coastal systems over the decades</li> <li>- Assist expatriate consultant in measuring vertical movement due to compaction at statistically relevant and representative points, in addition to already available information, and extrapolate to the polder area in the coastal zone. And installation of extra equipment</li> <li>- Responsible in analyzing the annual subsidence rate for the area either by means of installing stationary GPS, campaign GPS measurements of existing SoB markers, or by methods that employ Interferometer Synthetic Aperture Radar (InSAR).</li> </ul>
<b>Groundwater Specialist</b>	<p>He/ she should have minimum Master's Degree in Civil/ Water Resources/Geology having 15 years of professional experience with 8 (eight) years experiences in the relevant field like groundwater resource assessment, field investigations, groundwater hydraulics, and groundwater modelling, groundwater salinity dynamics in the coastal area and climate change impact. Previous experience in similar working environment will be preferred.</p>

	<p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Responsible for planning field data collection</li> <li>- Establish Aquifer parameters, pump test data, and well characteristics</li> <li>- Assess groundwater resources in CEIP-1 area/southwest coastal region</li> <li>- Groundwater modelling to find river aquifer connectivity</li> <li>- Assessment of salinity intrusion into groundwater system under climate change</li> </ul>
<b>Remote Sensing Specialist</b>	<p>Minimum M. Sc. Degree in Civil Engineering/Water Resources Engineering/Urban and Rural Planning/Hydrology / Masters in Geography. He/she should have at least 8 years of experiences in producing GIS coverage, contour map, Digital Elevation Model.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Preparation of digital elevation model with available data</li> <li>- Preparation of land-use map</li> <li>- Assessment and mapping of decadal changes of the coastal area</li> <li>- Mapping of soil salinity in the polder system applying remote sensing technology</li> <li>- Preparation of land use map of polders</li> <li>- Preparation of geological and geomorphological maps</li> <li>- Preparation of project maps</li> <li>- Preparation map for future scenarios</li> <li>- Preparation of maps for new concept on polder development</li> <li>- Remote sensing analysis for extracting data</li> <li>- Analyses of time series satellite images to find the shifting characteristics of river systems and coast lines</li> <li>- Preparation of maps for data collections and future monitoring plan</li> <li>- Assist the research team in GIS analysis and mapping</li> </ul>
<b>Salinity Specialist</b>	<p>He/ she should have minimum of Master's Degree in Civil/ Water Resources Engineering having 7 years of professional experience with 5 (five) years experiences in the relevant field like Mathematical modelling, river salinity, salinity intrusion, sea level rise and assessment of climate change impact etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <p>His/her major responsibilities shall include but not necessarily be limited to the following :</p> <ul style="list-style-type: none"> <li>- To prepare an extensive data collection plan on surface water salinity, soil salinity, groundwater salinity ;</li> <li>- To review all the previous reports and related journals on salinity modelling and analysis</li> </ul>

	<ul style="list-style-type: none"> <li>- Prepare zoning map of river water salinity for the coastal area at present and in future in relation to agriculture and fisheries intensification</li> <li>- Updating, calibrating and validating of available Bay and river salinity models</li> <li>- Exposure analysis of community and their livelihood to high salinity</li> <li>- Establish relation between river salinity, soil salinity and groundwater salinity</li> <li>- Assessment of leaching effect of soil salinity</li> <li>- Contribution to report writing and presentation to the client</li> <li>- Assist Team Leader in preparation of reports</li> </ul>
<b>GIS Specialist (GIS application development)</b>	<p>Minimum M.Sc. degree in GIS/ GIS &amp; Remote sensing/ Geography/ Urban and regional planning/Computer Science/ Applied Physics. She/he should have at least 10 year experiences in the field of GIS, GIS application development. The Geospatial Specialist is desired to have a wide ranges of experiences GIS and remote Sensing field. She/he is expected to have programming skills in order to develop geo-spatial web portal for information dissemination. She/he is expected to have advance knowledge in geospatial technologies and will work on projects with improvement and utilization of geographic information for achieving goals and objectives. The Geospatial Specialist will take part in an interdisciplinary team and will be required to work independently with limited guidance.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Stream lining the data processing for optimum outputs to be used in geo-database and web GIS application;</li> <li>- Collecting, organizing, eliciting and analyzing user requirements for geo-spatial module of the web application;</li> <li>- Active participation of Analyzing system requirements, document user requirements as well as system requirements for geo-spatial module;</li> <li>- Utilize ESRI's suite ArcGIS software applications with relational databases including MS SQL Server/ Oracle/ PostgreSQL-PostGIS.</li> <li>- Develop, deploy, and maintain GIS applications built with Geo-Server and PostgreSQL/PostGIS.</li> <li>- Develop mash-ups with other mapping technologies such as Google Maps and Bing.</li> <li>- Develop functional applications from use case descriptions, write and debug code, create application user documentation, and maintain web applications and software releases.</li> <li>- Develop and maintain client ESRI ArcGIS web applications and services with JavaScript, Open Layer, Query, HTML, CSS, web scripting and SQL programming;</li> <li>- Performance tune servers running ArcGIS and databases, including upgrading various server software packages in a timely manner.</li> </ul>

	<ul style="list-style-type: none"> <li>- Provide training and technical consultancy services on GIS as needed</li> </ul>
<b>Large Scale Delta Morphologist</b>	<p>He/ she should have minimum of Master's Degree in Civil/ Water Resources / Coastal engineering/coastal geo-morphology/geology having 20 years of professional experience with 10 years of experiences in the relevant field like geo-morphology and climate change adaptation, modern sediment budget,, assessment of sediment load, morphological modelling, tidal sedimentology polder and river interactions etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Compilation of morphological data for river and costal systems</li> <li>- Establishment of river histories and Holocene Bangladesh delta evolution</li> <li>- Carryout morphological analysis for river systems, estuary and Bay</li> <li>- Assist in carrying out integrated assessment of GBM delta</li> <li>- Assess the geological evolution and human impact of coastal area of Bangladesh</li> <li>- Assist in Holocene and modern sediment budget for the GBM Delta</li> <li>- Geomorphology study and climate change adaptation in the polder river systems of the coastal area</li> <li>- Long-term morphological modelling for the estuary and river system</li> <li>- Involve in the research activities to understand the processes, controls, and patterns of sediment distribution across Bangladesh delta and how this dispersal of sediment drives the construction, erosion, and maintenance of the polder and river systems.</li> <li>- Assist in preparation of different reports as required by the team leader.</li> </ul>
<b>Macro Scale Delta Morphologist</b>	<p>He/she should have minimum of Master's Degree in Civil/ Water Resources/coastal/hydraulic Engineering/Hydrology having 10 years of professional experience with 08 (eight) years experiences in the relevant field like modelling of river and coastal processes, sustainability of deltaic systems with an integrated modelling, land subsidence, delta processes and long-term prediction of coastal system etc. Previous experience in similar working environment will be preferred.</p> <p><b>Tasks:</b></p> <p>His/her major tasks include but not limited to the following:</p> <ul style="list-style-type: none"> <li>- Responsible for planning the data collection program and specifications</li> <li>- Responsible of data collection and data compilation</li> <li>- Responsible for analyzing morphological data, bathymetry for river and costal system</li> </ul>

	<ul style="list-style-type: none"> <li>- Processing of coastal DEM and subsidence data</li> <li>- Carry out morphological modelling for the delta</li> <li>- Assist in Earth System analysis to assess vulnerability and sustainability of coastal system of Bangladesh;</li> <li>- Involve in sustainability of deltaic systems with an integrated modelling framework for risk assessment of coastal polder system and devising sustainable solution plan for polder system</li> <li>- Carryout activities to understand fluvial and marine sediment transport and processes responsible for distributing sediments in the GBM tidal delta;</li> <li>- Comprehensive assessment to characterize sedimentation patterns and sources of sediment deposited in the coastal tidal delta plain and river systems of Bangladesh;</li> <li>- Assist in preparation of different reports as required by the team leader</li> </ul>
<b>Economist</b>	<p>He/she should have at least Masters' degree in economics with minimum 20 years experiences including at least 12 years experiences in economic appraisal of water resources projects. A significant portion of this experience may also include natural resources management, physical and monetary valuation of possible environmental impacts. Higher Degree &amp; experience in relevant field will be preferred.</p> <p><b>Tasks</b></p> <p>His/her major responsibilities shall include but not necessarily be limited to the following:</p> <ul style="list-style-type: none"> <li>- Review the 7<sup>th</sup> five year plan, perspective plan and Bangladesh Delta Plan 2100</li> <li>- Assessment of risk to the projects viability; this will include social risks as well as traditional benefits</li> <li>- Responsible for developing a macro-level multi-phased investment plan for the construction of the selected polder improvement measures based on priorities agreed with the client</li> <li>- Assist in Developing an investment plan for long term management of the polders and the their effective operation</li> <li>- Assist Team Leader in preparation of reports</li> </ul>
<b>Environmentalist</b>	<p>He/she should have at least Masters' degree in environmental science/Environmental engineering/MSc in ecology with minimum 20 years experiences including at least 15 years experiences in establishing environmental setting including the biological environment. Experience on coastal ecosystem is preferable. Higher Degree &amp; experience in relevant field will be preferred.</p>

	<p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Characterization of natural habitats and any critical natural habitats (including any parks, reserves and sanctuaries, areas proposed for legal protection, or other areas of known biodiversity value); in the polder systems and over all coastal area</li> <li>- Identification of aquatic, benthic and terrestrial flora and fauna, including any rare or endangered species (include IUCN Red List status of any listed species) or other species of conservation significance in coastal polders and coastal area</li> <li>- Assessing ecology of any species of conservation significance or concern such as breeding/spawning behaviors and seasons, migratory patterns, food sources, predators, sensitivity to pollution and polder development</li> <li>- Identification of any specific areas or zones of importance for ecosystem functions of key species such as areas of feeding, breeding, calving, and spawning of these species, including related seasonal parameters for each; polders as well as overall coastal area</li> <li>- Identification of valued environmental components</li> <li>- Assessment of likely impacts on valued environmental components</li> <li>- Revisiting of existing environmental monitoring and mitigation plan and EMP and development of improved plans.</li> </ul>
<b>Sociologist &amp; Institutional Specialist</b>	<p>Master Degree in Sociology/ social welfare. He should have at least 15 years experiences in social planning, stakeholder consultation, social impact assessment.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Participate in the field survey work for field data collection;</li> <li>- Responsible for preparing plan for social survey activities in consultation with multidisciplinary team</li> <li>- Organize stakeholder consultation in the field</li> <li>- Make plan on selected polder for sediment management</li> <li>- Preparation of Report</li> </ul>
<b>Communication and Outreach Specialist</b>	<p>Master Degree in Communication and Journalism/Sociology/ social welfare. He should have at least 5 years experiences in communication planning, executing communication strategy, preparing communication outreach</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Prepare strategic communication plan for this research project</li> <li>- Ensure communication strategy is consistent and reflects the projects research works, outputs, outcomes and impacts</li> <li>- Execute communications strategy for key media contacts and multi-stakeholders</li> <li>- Conduct extensive media outreach</li> <li>- Prepare briefing materials on research works, research results and outcomes and publishing in print and electronic media</li> </ul>

	<ul style="list-style-type: none"> <li>- Develop stories on research results and polder development, human safety, intensification of agriculture aquaculture, livelihood improvement of coastal communities</li> <li>- Prepare posters,, videos on research work and results</li> <li>- Coordinate press interviews and stakeholder consultations</li> <li>- Contribute in reports</li> </ul>
<b>Hydraulic Structure Design Specialist</b>	<p>Masters or post graduate Degree in Civil Engineering/Water Resources Engineering. He should have at least 20years experience in design of hydraulic structure. Experiences in designing of coastal polders and sluices are preferable. He/she must have experience in innovative designing of hydraulic structure considering coastal hydraulics, morphology and climate change.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Review of present design criteria for coastal polder development</li> <li>- Assess the performance of the existing coastal sluices in different polder over the years</li> <li>- Assess the present operation rule of the regulator of polders</li> <li>- Devise innovative and size of opening and type of regulator based on past performance of the regulators and future driving forces</li> <li>- Conduct consultation with local stakeholders and BWDB design team</li> <li>- Finalise an innovative, effective and realistic design methods for designing the regulators</li> <li>- Contribute in reports</li> </ul>
<b>Survey and Monitoring Specialist</b>	<p>Bachelor Degree in Civil Engineering/Water Resources Engineering. He should have at least 15years experience in hydrographic, topographic and hydrometric survey and knowledge on using DGPS, ADCP, hydrpro, Arcview, and other technology like Tearra model for processing surveyed data.</p> <p><b>Tasks:</b></p> <ul style="list-style-type: none"> <li>- Participate in the field survey work for field data collection on sediment, installation of tidal station ; monitoring of cross-section</li> <li>- Responsible for timely completion of data acquisition in accordance with the specification mentioned in the ToR;</li> <li>- Preparing detailed specification for all field survey activities</li> <li>- Ensure the quality of the survey</li> <li>- Guide in processing and analyzing the data</li> <li>- Preparation of Survey Report</li> </ul>

## 12.0 Schedules for Completion of Outputs:

<b>Outputs</b>	<b>Completion/submission date</b>
<b>Project Initiation :</b> 1. Detailed work plans 2. Inception Report & Workshop	Within <b>3 months</b> of contract signing
<b>Component 3:</b> 1. All databases that form inputs for mathematical models describing the physical processes in the coastal zone 2. A technical report describing the data collected, its limitations and recommendations to improve datasets progressively through time 3. All deliverables delineated under Component-3	Within <b>9 months</b> of contract signing
<b>Component 4</b> 1. GIS data layers for each aspect of the physical processes in the coastal zone 2. A technical report describing the model results, its limitations and recommendations to model results progressively through time 3. All deliverables delineated under Component-4	Within <b>27 months</b> of contract signing
<b>Component 5 &amp; 6</b> 1. GIS data layer on land-use and salinity intrusion 2. Polder improvement designs and development of management plans 3. Workshops to disseminate mid-term research results 4. All deliverables delineated under Component-5 & 6	Within <b>30 months</b> of contract signing
<b>Component 7</b> 1. An investment plan for the implementation of climate resilient polders 2. All deliverables delineated under Component-7	Within <b>30 months</b> of contract signing
<b>Component 8 &amp; 9</b> 1. Final Report 2. Datasets transmitted in appropriate format 3. Illustrative material (e.g. Brochures) 4. Stakeholder workshops and trainings All deliverables delineated under Component-8 & 9	Within <b>30 months</b> of contract signing
<b>Quarterly Progress Report</b>	At the end of every <b>3 months</b>

## Annex 1: Structure of the EIA Report Detail TORs and Sample Structure of EIA for each Polder

1. **Introduction.** State the purpose of the TORs, identify the projects/sub-projects or activities to be assessed and explain the executing arrangements for the environmental assessment (EA).

2. **Background Information.** Provide pertinent background for any parties who may conduct the EA, whether they are government agencies, consultants or NGOs. Include a brief description of the major components/subcomponents of the proposed project, a statement on its need and objectives, the implementing agency, a brief history of the project (including alternatives considered), its current status and timetable, and the identities of any associated projects. Identify other projects in progress or planned within the region or area which may compete for the same resources.

Major components of the project to be described include, as appropriate: coastal polder, hydraulic structure, afforestation general design, capacity and degree of protection from various flood levels.

3. **Objectives.** Summarize the general scope of the EA and discuss its timing in relation to other aspects of project preparation, design, and execution. Identify constraints, if any, regarding the adequacy of existing environmental baseline data and needs to phase additional data collection (e.g., seasonal rainfall, river flows, peak discharges and recurrence, and extent and frequency of flooding) and assessment efforts to avoid hindering the rest of the project development schedule.

4. **EA Requirements.** Identify regulations and guidelines that will govern the conduct of the assessment or specify the content of its report. They may include any or all of the following:

- National laws and/or regulations on environmental assessments;
- Regional, provincial or communal environmental assessment regulations; and □ EA regulations of any other financing organizations involved in the project.
- World Bank Operational Policy 4.01: "Environmental Assessment," and other pertinent environmental/social safeguard policies, eg, resettlement (land acquisition); and the Disclosure Handbook (December, 2002).

*Note: the project may include a board array of activities, some of which may cause direct adverse environmental and social impacts and are consequently likely to be classified as category A or B; others may cause very limited impacts and are therefore likely to be category C. These TORs focus upon types of activities likely to be classified A and which would therefore require an EA.*

Identify design or operating standards which project components must meet to be in compliance with environmental safeguards, eg., water quality standards, and health and safety requirements.

5. **Study Area.** Specify the boundaries of the study area for the assessment: river basin/catchments, upstream land use, the drainage area and patterns, irrigation and other development scheme(s) – current and proposed

6. **Scope of Work.** In some cases, the tasks to be carried out will be known with sufficient certainty to be specified in the TORs. In other cases, information deficiencies need to be identified and resolved or specialized field studies performed to assess impacts; accordingly, the consultant should define particular tasks in more detail for contracting agency review and approval.

**Task 1. Describe the proposed project.** Provide information on the following: location of all project-related development sites and general layout and extent of facilities at project-related development sites; flow diagrams of facilities/operations; design basis, size, capacity; pre-construction activities; construction activities (land clearing, land grading, worker camps, if any), schedule, staffing and support, facilities and services; operation and maintenance activities (water management, monitoring of flows and groundwater, etc), staffing and support, facilities and services; management of risks, including health and safety; life expectancy for major components. [Components may include any or all of the following: structural control measures (eg, polders, including release regulation); river channel modifications, dikes and levees; overflow basins; floodways and drainage) and nonstructural measures (eg, zoning, floodplain regulations, building and sanitary ordinances and regulation of land use in basin/watershed areas, afforestation).

Provide maps at appropriate scales to illustrate the general setting of project-related development sites, as well as surrounding areas likely to be environmentally affected. These maps shall include topographic contours, as available, as well as locations of major surface waters, roads, villages/towns, parks and reserves, and political boundaries. Also provide, as available, maps to illustrate existing land uses.

**Task 2. Description of the Environment.** Assemble and evaluate and baseline data on the environmental characteristics of the study area, including river basin/watershed, site of polders, inundation, floodplain and biological features (habitats and rare species, fisheries), floodplain (recession) agriculture. Include information on any changes anticipated before the project commences.

(a) Physical environment: geology, topography, soils, climate, surface and ground water hydrology, annual peak discharge, forests, recurrence intervals of various peak discharges and peak stages of various discharges), erosion and sediment loading, existing/projected pollution discharges and receiving water quality; instances of flooding, siltation/erosion;

(b) Biological environment: flora and fauna, including rare or endangered species; sensitive natural habitats, including parks and reserves; potential vectors for disease; exotics and aquatic weeds; application of pesticides and fertilizers (current and projected)

(c) Socio-cultural environment: land use (including current crops and cropping patterns - terracing or contour planting, population in the floodplain, etc.); fisheries and farm/industrial outputs and inputs; transportation; land tenure and land titling; present water supply and water uses (including current distribution of water resources); control over allocation of resource use rights; water-related human health problems; cultural sites.

**Task 3. Legislative and Regulatory Considerations.** Describe the pertinent laws, regulations and standards governing water quality and use, pollutant discharges to surface waters and land, health and safety, protection of sensitive areas and endangered species, siting, land use control, etc., at international, national, regional and local levels (The TORs should specify those that are known and require the consultant to investigate for others). If transboundary impacts are likely, relevant international conventions should be described.

**Task 4. Determination of the Potential Impacts of and Impacts on the Proposed Project.** In this analysis, distinguish between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Identify impacts that are unavoidable or irreversible. Wherever possible, describe impacts quantitatively, in terms of environmental costs and benefits. Assign economic values when feasible. Characterize the extent and quality of available data, explaining significant information deficiencies and any uncertainties associated with predictions of impact. Provide TORs for studies to obtain the missing information. The assessment should include cumulative impact, climate change impacts.

## IV. Appendices

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### IV. Appendices

### Time-Based

Special attention should be given to:

(a) Effects of the polders: direct environmental impacts of the polders construction; effects on fisheries resources (creation of a reservoir fisheries, loss of downstream fisheries); effects on water quantity and quality; effects on floodplain ecology and estuarine/coastal areas, Sundarbans, river morphology, borrow pit;

(b). Effects of flood control structures and measures (e.g., levees, dikes and channelization measures, floodways (high flow diversions or spillways), overflow basins, disposal of dredging spoils) on: aquatic ecology, particularly fish resources; hydrology, including groundwater recharge and exclusion of water from certain areas that may impact the hydrology and associated wildlife and agriculture; water quality; plant and animal ecology of the floodplain (habitat and species); and,

(c). Socio-economic impacts on populations in inundation area and downstream (floodplain dwellers, urban population, etc.) through: land use changes; impacts on water-related economic activities (e.g., fisheries, flood plain agriculture, transportation, etc.); health effects (e.g., increased incidence of water-borne and water related diseases).

**Task 5.Analysis of Alternatives to the Proposed Project.** Describe alternatives that were examined in the course of developing the proposed project and identify other alternatives that would achieve the same objectives. The concept of alternatives extends to siting and design, rehabilitation/construction techniques and phasing, and operating and maintenance procedures and to minimizing structural measures that may pose major negative impacts, eg, revising operations of upstream existing dams/reservoirs to help offset flood risk and use non-structural interventions to reduce flooding risk. Compare alternatives in terms of potential environmental impacts, land requirements, capital and operating costs, reliability, suitability under local conditions, and institutional, training, and monitoring requirements. When describing the impacts, indicate which are irreversible or unavoidable and which may be mitigated. To the extent possible, quantify the costs and benefits of each alternative, incorporating the estimated costs of any associated mitigating measures. Include the alternative of not constructing the project to demonstrate environmental conditions without it.

**Task 6.Development of an Environmental Management Plan (EMP).** Estimate the impacts and costs of the mitigation measures and of the institutional and training requirements to implement them. Assess compensation to affected parties for impacts that cannot be mitigated. Prepare an EMP, including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures, monitoring, etc.

Prepare a detailed plan to monitor the implementation of mitigating measures and the impacts of the project during construction and operation (factors likely to influence the quantity of water entering and being withdrawn from the river (s), the land's capacity to absorb floodwater and potential damage from floods). Include in the plan an estimate of capital and operating costs and a description of other inputs (such as training and institutional strengthening) needed to implement the plan *depending upon local conditions and predicted impacts upon communities/individuals, there may be need for a Resettlement Policy Framework and/or Resettlement Action Plan.*

Review the authority and capability of institutions at local, provincial/regional, and national levels and recommend steps to strengthen or expand them so that the EMP may be effectively implemented. The recommendations may extend to new laws and regulations, new agencies or agency functions, intersectoral arrangements, management procedures and training, staffing, operation and maintenance training, budgeting, and financial support.

## IV. Appendices

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### IV. Appendices

### Time-Based

An outline of the contents of the EMP to be included in the project's Operational Manual should be provided along with environmental/social protection clauses for contracts and specifications.

**Task 7. Assist in Inter-Agency Coordination and Public/NGO Participation.** The Consultant will assist the government in coordinating the EA with relevant agencies and the government will consult with affected groups likely to be affected by the proposed project and with local NGOs on the environmental and social aspects of the proposed project.

For projects categorized A, these groups will be consulted at least twice: in meetings held during preparation before the TORs for the EA are finalized and when a draft EA is available (a summary of the EA will be available prior to the meeting). For projects categorized B, these groups should be consulted once a draft EA has been prepared and a summary of the EA conclusions will be made prior to the meeting. For both A and B category projects the draft EA should also be available in a public place accessible to affected groups and local NGOs.

*Relevant materials will be provided to affected groups in a timely manner prior to consultation and in a form and language that is understandable and accessible to the groups being consulted. The Consultant should maintain a record of the public consultation and the records should indicate: means other than consultations (e.g. surveys) used to seek the views of affected stakeholders; the date and location of the consultation meetings, a list of the attendees and their affiliation and contact address; and, summary minutes.*

7. **Report.** Provide an EIA report that is concise and limited to significant environmental issues. The main text should focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. Detailed or uninterrupted data are not appropriate in the main text and should be presented in appendices or a separate volume. Unpublished documents used in the assessment may not be readily available and should also be assembled in an appendix. Organize the environmental assessment report according to the outline below. (This is the format suggested in OP 4.01; the TORs may specify a different one to satisfy national agency requirements as long as the topics required in the Bank's directive are covered):

- Executive Summary
- Policy, Legal and Administrative Framework
- Description of the Proposed Project
- Description of the Environment
- Significant Environmental Impacts
- Analysis of Alternatives
- Cumulative and reciprocal impact due to the activity
- Climate Change Impact
- Environmental Management Plan, incl. mitigation, monitoring, capacity development and training and implementation schedule and costs
- Inter-Agency and Public/NGO Consultation
- List of References
- Appendices:
  - . List of Environmental Assessment Preparers;
  - . Records of Inter-Agency and Public/NGO Communications;
  - . Data and Unpublished Reference Documents

## IV. Appendices

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### IV. Appendices

### Time-Based

8. **Consulting Team:** Depending on the baseline data needed and the mitigating measures proposed, the team may also include some of the following disciplines: environmental planning and management; river morphology, fisheries and/or aquatic ecology; hydrology, watershed management and forestry (for upstream effects); terrestrial ecology and wildlife ecology, etc. (for impacts in the inundation area and on the floodplain); sociology.

*Note: the team will be required to work closely with specialists undertaking the social analysis and to define arrangements for the final report.*

9. **Schedule:** This section will specify dates for progress reviews, interim and final reports, and other significant events.

10. **Other Information:** Include here lists of data sources, project background reports and studies, relevant publications, and other items to which the consultant's attention should be directed. Examples are prefeasibility studies, population and land use projections, land use plans, industrial activity information, water quality studies, sewerage infrastructure, public health reports.

*[This Appendix shall include the final Terms of Reference (TORs) worked out by the Client and the Consultant during the negotiations; dates for completion of various tasks; location of performance for different tasks; detailed reporting requirements; Client's input, including counterpart personnel assigned by the Client to work on the Consultant's team; specific tasks that require prior approval by the Client.*

*Insert the text based on the Section 7 (Terms of Reference) of the ITC in the RFP and modified based on the Forms TECH-1 through TECH-5 in the Consultant's Proposal. Highlight the changes to Section 7 of the RFP]*

*If the Services consist of or include the supervision of civil works, the following action that require prior approval of the Client shall be added to the "Reporting Requirements" section of the TORs: Taking any action under a civil works contract designating the Consultant as "Engineer", for which action, pursuant to such civil works contract, the written approval of the*

*Client as "Employer" is required.]*

## Appendix B - Key Experts

### TECH-5

#### Overview of deliverables, Component 1 – 4

*22*

Nº	Deliverables	Months								TOTAL
		1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	
D-1	Inception report	X								
	Start-up meeting	X								
	Inception Workshop	X								
D-2	Detailed Literature Review and its Summary and Lessons Learnt									
	Work plan for literature review	X								
D-3	Development of input datasets for modelling the physical processes									
	1) Soft and hard copies of map of the location of all the current field measurement stations, by type, stored in Database of BWDB. Map showing the location of primary BM with values		X							
	2) Raw datasets of all type of data, including meta-data, stored in Database of BWDB		X							
	3) Completed and validated dataset including meta-data, stored in Database of BWDB		X							
	4) GIS based National Coastal Polder Database/ Management Information System/Database		X							
	5) Boundary conditions and data for calibration and validation of models		X							
	6) Monitoring results on sedimentation rate in rivers and floodplain		X							
	7) Annual and seasonal sediment load of major rivers and to Bay of Bengal		X							
	8) Technical memorandum describing the validation and completion procedures that have been used by the consultant for all type of data; for reproducibility purposes and to be stored in Database of BWDB		X							
	9) Memorandum with recommendations to improve the data collection, processing, validation and dissemination within the GoB									
	Morphology on a macro scale									
D-4A-1	Modelling of the long-term physical processes									
	1) The software newly developed under this project with all source code and accompanying technical document with detailed explanation of the methodology and assumptions									X

*Web*

Nº	Deliverables	Months										TOTAL
		1.3	4.6	7.9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
	2) Geospatial datasets of main sources and deposits of sediment at present, including full meta-data a restored and archived in Database of BWDBS				x							
	3) Geospatial datasets of main sources and deposits of sediment for 100 years from present, including full meta-data are published on archived in Database of BWDBS								x			
	4) Technical Report (one report for 4A-1 and 4A-2) <sup>2)</sup>				x				x			
D-4A-2	Draft Final								x		x	
D-4A-2	Modelling of the long-term physical processes Morphology on a meso scale											
	1) Report on upgrade & update of present meso scale model including detailed explanation of the methodology and assumptions			x								
	2) Geospatial datasets of erosion and sedimentation in the coastal zone at present for various seasons and circumstances if relevant. These geospatial datasets should include full meta-data and be stored and archived in Data base of BWDB.				x							
	3) Geospatial datasets of erosion and sedimentation in the coastal zone for possible scenarios 25, 50 and 100 years from now, for various seasons and circumstances if relevant. These geospatial datasets should include full meta-data and be stored and archived in Data base of BWDB.					x						
	4) Technical report (one report for 4A-1 and 4A2) <sup>2)</sup>				x							
D-4A-3	Draft Final							x	x			
D-4A-3	Modelling of the long-term physical processes Morphology on a micro scale								x			
	1) The model setup developed will be updated under this project with all accompanying technical document with detailed explanation of the methodology and assumptions								x			
	2) A report that describes the pros and cons of the different methodologies to prevent water-logging within the polder and sedimentation of tidal river system including polder subsidence. The report will include meta-data on the models used and measurements, recommendations for polder design including drainage and long term management plan, and recommendations											

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Nº	Deliverables	Months										TOTAL
		1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
	for pilot area/polder to implement the ideas, such as but not limited to location, methods and measurements								x			
Draft									x	x		
Final												
	3) Recommended plan to manage sediment at the downstream stretch of the tidal river and in the polder											
D-4B	Subsidence								x			
	1) Geospatial datasets of total subsidence at present and for 25, 50 and 100 years from now, including full metadata and stored in Database of BWDB and Estimate the annual rate of subsidence.								x			
	2) Detailed Technical Report with description and explanation of geospatial analysis of the total subsidence in the four regions of the polder area of the coastal zone at present and for 25, 50 and 100 years from present, including description of the causes of subsidence, full metadata, and stored in Database of BWDB								x			
	3) Report on the total subsidence in specific polders (designated by BWDB) in 25, 50 and 100 years from now when no sediment is supplied to the polder, including the amount of sediment needed to counteract this subsidence.											
Draft												
final								x	x			
4C	Meteorology								x			
	1) Technical Report describing current trends and future scenarios in rainfall in the polder area of coastal zone for four, coastal regions (including estimation of rainfall distribution over the year) and cyclone frequency and intensity for the next 25, 50 and 100 years from now, including meta-data of the datasets used for the trend analyses and stored and archived in Database of BWDB. The Research Team shall include a description of the statistical and downscaling methods used for reproducibility reasons.							x				
	2) Geospatial Dataset and archived in Database of BWDB									x		
4D	Effect of CC on water levels, salinity intrusion and storm surges											
	1) Geospatial datasets of High Water, Low Water and maximum salt intrusion in all river branches for average tide in the wet and dry season at present, and at 25, 50 and 100 years from now.							x				

Nº	Deliverables	Months										TOTAL
		1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
	including full metadata and stored and archived in Database of BWDB.											
	2) Geospatial datasets of groundwater salinity at 3 relevant levels (in the upper shallow, lower shallow and deeper aquifers, to be designated by BWDB) at present, and at 25, 50 and 100 years from now, including full metadata and stored and archived in Database of BWDB							X				
	3) Tidal and salinity curves for key locations in the coastal zone (about 20, to be designated by BWDB) in the wet and dry season at present, and at 25, 50 and 100 years from now							X				
	4) Exceedance frequency curves for water levels in the same 20 stations at present, and at 25, 50 and 100 years from now							X				
	5) Define extreme water levels in the polder of coastal zone at 25, 50 and 100 years from now, due to cyclonic storm surges.							X				
	6) Technical Report with description and explanation of the geospatial datasets of surface and ground water salinity, and the tidal salinity and water level curves, including description of relevant seasonal variations, used models, indication of more and less likely scenarios, and full metadata. The Research Team shall also discuss the effect of at least two relevant options of redistribution of river water in the South West delta on salt intrusion.								X			

- 1) The deliverables from the literature review will be planned during the inception phase
- 2) The technical report for Components 4A-1 and 2 includes:
  - a. description and explanation of geospatial analysis of sediment deposits at present and for 25, 50 and 100 years from present, description of seasonal variations,
  - b. description of erosion and accretion in the fluvial part, tidal river & Bay of Bengal, tidal pumping (quantity and seasonal variation), used models, indication of more and less likely scenarios, and full metadata.
  - c. description and explanation of geospatial analysis of erosion and sedimentation in the coastal zone at present and for 25, 50 & 100 years from present
  - d. description of relevant seasonal variations, sediment distribution and budget, used models, indication of more and less likely scenarios, and full metadata.
  - e. Indication the consequences of future scenarios are for drainage and irrigation in the polders, and for erosion of the embankments.

## Overview of deliverables, Component 5 - 9

Nº	Deliverables	Months								TOTAL
		1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	
D-5A	Finalization of approach for reconstruction of the Polder at different coastal zones including their phasing and construction program 1) Technical Report on Long term Polder Improvement measures and Polder Development Plan 2) Design of polder improvement measures of 17 polders under CEIP-I with consideration of existing improvements Draft report focusing on initial 4 polders to be optimised  Final report, 17 polders								X	
	3) Report for each of the 3-5 polders with a description of, Present situation, Boundary conditions (scenarios), Matching with polder options, Establish design, including management plan, Costs and benefits Draft report focusing on initial 4 polders to be optimised  Final report, 17 polders								X	
D-5B	Coherence and Overall picture of Delta Report describing the interdependencies and relations between the processes and parameters, consequences for the boundary conditions and recommendations for future action plan/research							X		
D-6.1	Updating of design parameters and specifications for construction works, Updating of design parameters and specifications for construction works. Report with updated set of design parameters and specifications for construction/re-construction of the polders as well as associated appurtenant structures. Detailed delivery plan to be developed during the inception phase								X	
D-6.2	Review of approaches for management of polders with emphasis on active participation of beneficiaries and local stake holders  Report on Management plans for the polders									X

Nº	Deliverables	Months												TOTAL
		1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30			
	Detailed delivery plan to be developed during the Inception phase	X												
D-6.3	Setting up a Performance Monitoring Mechanism													
	Report on participatory monitoring mechanism with goals and targets											X		
	Detailed delivery plan to be developed during the Inception phase	X												
D-7	Investment Plan for the Entire CEIP													
	1) An investment plan describing a phased polder improvement roadmap and required budget											X		
	2) An investment plan for long term management of the polders, including the expansion of monitoring											X		
	3) An execution plan including financing and fundraising strategies and plans; and technical collaboration plan											X		
D-8	Action plan for Capacity Building													
	1 + 4) On the job technical training in country	X	X	X	X	X	X	X	X	X	X	X		
	3 Report on: results of the on the job training, list of participants			X		X		X		X		X		
	5 International workshop											X		
	6 Teach the teacher: Teaching at the universities													
D-9.1	Outreach program													
	Workshops	X	X									X		
	Work shop report	X	X									X		
D-9.2	Communication strategy													
	1) Storage of all datasets BWDB													
	2) Communication materials such as brochures, animations etc.)	X										X		

**TECH-6**

No.	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)														Total time-input (in Months)								
		Position		D-1	D-2	D-3	D-4A-1	D-4A-2	D-4A-3	D-4B	D-4C	D-4D	D-5A	D-5B	D-6.1	D-6.2	D-6.3	D-7	D-8	D-9.1	D-9.2	Home	Field	
IK-1	Dr. Ranjit Galappatti	Team Leader	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	22.0	
			[Field]	3.00	2.00	2.00	0.25	0.25	0.25	0.75	0.75	0.75	0.50	0.50	1.67	1.67	1.67	1.00	1.00	2.00	2.00		22.0	
IK-2	Prof. Zheng Wang	River and Estuarine Morphologist	[Home]	0.23	0.50	0.23	0.07	0.07	0.07	0.20	0.20	0.20	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	8.3
			[Field]	0.77	0.00	0.77	0.13	0.13	0.13	0.38	0.38	0.38	0.50	0.50	0.00	0.00	0.00	1.00	0.25	0.25	0.25		5.5	
IK-3	Prof. Dano Roelvink	River and Coastal & Estuarine Morphological Modeler	[Home]	0.00	0.00	0.00	0.43	0.43	0.43	1.30	1.30	1.30	0.11	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	
			[Field]	0.50	0.00	0.00	0.25	0.25	0.25	0.75	0.75	0.75	0.14	0.14	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	9.7	
IK-4	Dr. Marcel Marchand	Integrated Coastal Zone and Polder Management Expert	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	4.3	
			[Field]	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.5	
IK-5	Dr. Bo Braatz Christensen	Coastal and Estuarine Morphologist	[Home]	0.00	0.00	0.00	0.14	0.14	0.14	0.41	0.41	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.1	
			[Field]	0.50	0.00	0.50	0.29	0.29	0.29	0.86	0.86	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5	
IK-6	Dr. Søren Tjerry	Tidal River and Sediment Management Specialist	[Home]	0.00	0.00	0.28	0.28	0.28	0.28	0.83	0.83	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.3	
			[Field]	0.50	0.00	0.50	0.54	0.54	0.54	1.63	1.63	1.63	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	
IK-7	Dr. Irina Overeem	Macro Scale Delta Morphologist	[Home]	0.23	0.50	1.00	0.21	0.21	0.21	0.63	0.63	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	
			[Field]	0.77	0.00	2.00	0.29	0.29	0.29	0.88	0.88	0.88	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	
IK-8	Dr. Steve Goodbred	Large Scale Delta Morphologist/Geologist	[Home]	0.00	0.50	1.00	0.04	0.04	0.04	0.13	0.13	0.13	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	
			[Field]	0.50	0.00	2.00	0.19	0.19	0.19	0.56	0.56	0.56	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7	
IK-9	Dr. Michael Steckler	Subsidence Expert/Geo-Morphologist	[Home]	0.23	0.50	1.00	0.08	0.08	0.08	0.25	0.25	0.25	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.5	
			[Field]	0.77	0.00	2.00	0.25	0.25	0.25	0.75	0.75	0.75	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	
INK-10	Mr. Henrik Rene Jensen	Storm Surge and Wave Specialist	[Home]	0.00	0.00	0.02	0.02	0.02	0.07	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.3	4.0	
			[Field]	0.00	0.00	0.31	0.31	0.31	0.93	0.93	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7		
INK-11	Dr. Alessio Giardino		[Home]	0.00	0.00	0.19	0.19	0.19	0.58	0.58	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.2		

No.	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)														Total time-input (in Months)										
		Position		D-1	D-2	D-3	D-4	D-4A-1	D-4A-2	D-4A-3	D-4B	D-4C	D-4D	D-5A	D-5B	D-6.1	D-6.2	D-6.3	D-7	D-8	D-9.1	D-9.2	Home	Field	Total	
	Climate Change Risk Assessment and Adaptation	[Field]	0.50	0.00	1.00	0.36	0.36	0.36	1.09	1.09	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	
INK-12	Mr. Mark de Bel	[Home]	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.5	
INK-13	Dr Flemming Jacobsen	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5
INK-14	Dr. Christopher Small	[Field]	0.00	0.00	0.08	0.08	0.08	0.08	0.08	0.08	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1.0
INK-15	Dr. Kim Wium Olesen	[Home]	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0
INK-16	Dr. Mick van der Wegen	[Field]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0
INK-17	Dr. Bas van March	[Home]	0.00	0.00	0.17	0.17	0.17	0.17	0.17	0.17	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	5.3
INK-18	Mr. Toine Vergroesen	[Field]	0.00	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	6.0
INK-19	Dr. Stephanie Higgins	[Home]	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5
INK-20	Prof. Henrik Madsen	[Field]	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.5
INK-21	Dr. Torsten Jacobsen	[Home]	0.00	0.00	0.17	0.17	0.17	0.17	0.17	0.17	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	2.0

IV. Appendices

No.	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)														Total time-input (in Months)							
		Position		D-1	D-2	D-3	D-4	D-4A-1	D-4A-2	D-4B	D-4C	D-5A	D-5B	D-6.1	D-6.2	D-6.3	D-7	D-8	D-9.1	D-9.2	Home	Field	Total
INK-22	Dr. Gerrit Hendriksen	Data Management Expert (GIS)	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
INK-23	Prof. Rosshanka Ranasinghe	Climate Change Specialist	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
INK-24	Dr. Kimberly Rogers	Macro Scale Delta Morphology and Socio Economics	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0
INK-25	Dr. Carol Wilson	SET Compaction Meters and Polder/TRM Impacts	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0
INK-26	Dr. Richard Rip Hale	Tidal Hydrodynamics and Sediment Mass Flux	[Home]	0.00	0.00	0.00	0.04	0.04	0.04	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.5
INK-27	Dr. Rolf Deigaard	Coastal Morphologist	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.5
INK-28	Dr. Ferdinand Diermans	Statistical Analysis of Meteorological Data	[Home]	0.00	0.00	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	2.0
INK-29	Dr. Deepak Vatvani	Coastal Flooding and Storm Surge Expert	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0
INK-30	Dr. Monica Altamirano	Investment Plans and PPP Specialist	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
INK-31	Mr. Reinier Schrijvershof	Morphodynamics Modelling Expert	[Home]	0.00	0.00	0.08	0.08	0.08	0.08	0.25	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0
INK-32	Dr. Kasper Kærgård	Coastal and Estuarine Modeller	[Home]	0.00	0.00	0.17	0.17	0.17	0.17	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0

IV. Appendices

No.	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)														Total time-input (in Months)							
		Position		D-1	D-2	D-3	D-4A-1	D-4A-2	D-4A-3	D-4B	D-4C	D-4D	D-5A	D-5B	D-6.1	D-6.2	D-7	D-8	D-9.1	D-9.2	Home	Field	Total
INK-33	Unnamed	American post doc	[Home]	0.00	0.00	1.00	0.17	0.17	0.17	0.50	0.50	0.50	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	15.0	
			[Field]	0.00	0.00	0.00	0.42	0.42	0.42	1.25	1.25	1.25	2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
NK-34	Zahirul Haque Khan	Deputy Team Leader	[Home]	1.50	1.50	3.00	1.00	1.00	1.00	1.50	0.75	0.75	0.75	2.25	1.50	1.13	0.75	0.75	1.13	0.75	1.50	1.50	23.0
			[Field]	0.50	0.50	0.50	0.25	0.25	0.25	0.25	0.25	0.25	0.75	0.50	0.38	0.25	0.25	0.38	0.25	0.50	0.50	30.0	
NK-35	Sarwat Jahan	River Morphological Modeler	[Home]	1.00	1.00	1.00	2.00	4.00	5.00	1.00	0.50	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.00	22.0
			[Field]	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.0
NK-36	Mohammad Ziaur Rahman	Coastal and Estuarine Morphological Modelling Specialist	[Home]	0.38	0.38	1.88	2.25	3.00	5.25	0.38	2.25	0.00	2.25	0.75	0.75	0.75	0.75	0.75	0.75	0.00	0.38	0.00	2.0
			[Field]	0.13	0.13	0.63	0.75	1.00	1.75	0.13	0.75	0.00	0.00	0.75	0.25	0.25	0.25	0.25	0.25	0.00	0.13	0.00	28.0
NK-37	Emaduddin Ahmed	Integrated Coastal Zone and Water Resource Management Specialist	[Home]	2.25	2.25	1.00	1.00	1.00	1.00	1.50	0.75	2.25	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.50	0.75	23.0
			[Field]	0.25	0.75	0.25	0.25	0.00	0.00	0.50	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1.00	0.25	0.00	5.0
NK-38	Dr. Faruq Ahmed Mohiuddin, PEng.	Tidal River Morphologist	[Home]	1.50	1.50	0.75	1.50	3.00	3.00	0.75	1.00	0.00	2.25	0.75	0.75	0.75	1.00	0.75	1.50	1.00	0.75	0.25	22.0
			[Field]	0.50	0.50	0.25	0.50	1.00	1.00	0.25	0.00	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.50	0.00	0.25	0.00	6.0
NK-39	Md. Saiful Islam	Storm Surge and Wave Modelling Specialist	[Home]	0.00	1.00	4.00	0.00	0.00	0.00	2.00	4.50	1.00	0.00	3.00	2.00	0.00	0.00	1.50	1.00	0.00	20.0	0.00	24.0
			[Field]	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	4.0
NK-40	Abu Saleh Khan*	Long-term Polder Management Specialist	[Home]	1.50	1.50	1.50	0.50	1.00	1.00	1.00	2.50	1.50	2.50	1.50	1.25	2.25	1.25	0.75	0.50	0.50	0.50	23.0	28.0
			[Field]	0.50	0.50	0.00	0.25	0.25	0.25	0.00	0.50	0.50	0.50	0.25	0.25	0.25	0.25	0.25	0.00	0.00	0.00	0.00	5.0
NK-41	Tarek Bin Hossain	Sediment Management Specialist	[Home]	1.50	1.50	1.50	2.25	2.25	1.50	0.00	0.00	1.50	0.75	1.50	1.50	1.33	0.38	0.38	0.38	0.38	0.38	21.0	28.0
			[Field]	0.50	0.50	0.50	0.75	0.75	0.75	0.00	0.00	0.50	0.50	0.25	0.50	0.50	0.25	0.25	0.00	0.00	0.13	0.13	7.0
NK-42	Md. Mahbubur Rahman	Database Development Specialist	[Home]	0.50	0.50	11.00	5.50	0.00	0.00	3.00	1.50	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.50	0.50	25.0
			[Field]	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0
NNK-43	Md. Anowar Saadat	River Morphological Modeler	[Home]	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.0
			[Field]	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0

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IV. Appendices

No.	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)														Total time-input (in Months)												
		Position		D-1	D-2	D-3	D-4	D-4A-1	D-4A-2	D-4A-3	D-4B	D-4C	D-4D	D-5A	D-5B	D-6.1	D-6.2	D-6.3	D-7	D-8	D-9.1	D-9.2	Home	Field	Total			
NNK-44	Shume Akhter	Coastal and Estuarine Morphological Modelling Specialist	[Home]	0.00	2.00	3.00	3.00	5.00	5.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	22.0		24.0			
NNK-45	Abdus Salam Sikder	Geo-Morphologist	[Home]	0.38	1.50	1.50	4.50	4.50	1.50	3.75	0.00	0.00	0.00	1.13	0.38	0.00	0.38	0.00	0.75	0.38	0.38	0.38	21.0		28.0			
NNK-46	Md. Tarikul Islam	Groundwater Specialist	[Home]	0.38	1.50	3.00	0.00	0.00	0.00	0.38	1.50	9.00	0.00	0.00	1.50	0.00	1.50	0.00	1.50	0.00	1.50	0.00	0.38	21.0		28.0		
NNK-47	Md. Zahid Hasan Siddique	Remote Sensing Specialist	[Home]	0.00	0.00	9.63	3.50	3.50	1.75	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	21.0			
NNK-48	Md. Raqibul Hasib	Salinity Specialist	[Home]	0.00	1.67	2.50	0.00	0.00	0.00	0.00	2.50	11.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.83	0.42	0.00	20.0		24.0	
NNK-49	Fouzia Khanam	GIS Specialist	[Home]	0.95	0.00	6.65	3.80	3.80	0.00	0.95	0.95	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	19.0		20.0		
NNK-50	Rubayet Alam	Large Scale Delta Morphologist	[Home]	0.00	1.50	0.75	5.25	5.25	1.50	1.50	0.00	0.00	1.50	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.38	21.0		28.0		
NNK-51	Farhana Akhter Kamal	Macro Scale Delta Morphologist	[Home]	0.00	2.00	1.50	10.00	3.00	0.00	0.00	0.00	2.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	23.0		28.0	
NNK-52	Md. Aminul Islam	Economist	[Home]	0.45	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	9.0		10.0
NNK-53	Sheikh Muhammad Abdur Rashid	Environmentalist	[Home]	0.25	1.00	0.00	0.00	0.00	0.00	0.00	1.50	0.50	0.00	0.00	1.25	1.50	0.50	0.00	0.25	0.25	0.25	0.25	0.25	0.25	8.0		12.0	
NNK-54	Md. Mustafizur Rahman	Sociologist and Industrial Specialist	[Field]	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.25	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.27	6.0		11.0
			[Field]	0.23	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23	0.23	0.23	0.23	0.23	5.0		

IV. Appendices

No.	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)														Total time-input (in Months)									
		Position		D-1	D-2	D-3	D-4A-1	D-4A-2	D-4A-3	D-4B	D-4C	D-4D	D-5A	D-5B	D-6.1	D-6.2	D-6.3	D-7	D-8	D-9.1	D-9.2	Home	Field		
NNK-55	Md. Rafiqul Islam	Communication and Out-reach Specialist	[Home]	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	7.0
NNK-56	Md. Anwar Hossain Bhuiyan	Hydraulic Structure Design Specialist	[Home]	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	5.00	0.00	0.75	0.25	0.25	0.38	0.00	0.00	11.0	14.0
NNK-57	Pankaj Kumar Maitra	Survey and Monitoring Specialist	[Home]	0.67	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0
NNK-58	A. B. M. Anwar Haider	Survey and Monitoring Specialist	[Home]	0.00	0.50	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0
NNK-59	Shaikh Nahiduzzaman	Climate Change Monitoring Specialist	[Home]	0.00	0.88	0.00	0.00	0.00	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.0
NNK-60	Tarun Kanti Magumder	Basin Modelling Specialist	[Home]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.30	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0
																									Subtotal 511.9 246.4

\* For international experts, 673 days of the total 3601 days in Bangladesh will be spent in the field outside Dhaka

**Appendix C – Summary of Costs**  
**FIN-2**

Item	Cost		
	USD	EUR	BDT
<b>COST OF THE FINANCIAL PROPOSAL:</b>			
(1) Remuneration Consultants	1,525,778	2,554,363	200,340,539
(2) Reimbursable Expenses	1,133,400	631,510	74,230,013
(3) Contingencies (Provisional sum)	0	0	50,000,000
(4) Total Cost of Financial Proposal (1)+(2)+(3):	2,659,178	3,185,873	324,570,551
<b>(5) ESTIMATES LOCAL TAXES:</b>			
(a) Local income tax (20%) on (4)	531,836	637,175	64,914,110
(b) VAT (15%) on (4)	398,877	477,881	48,685,583
(6) Total of local taxes (5a)+(5b)	930,712	1,115,056	113,599,693
<b>TOTAL CEILING AMOUNT OF THE CONTRACT (4)+(6)</b>	<b>3,589,891</b>	<b>4,300,929</b>	<b>438,170,244</b>




**Appendix D1: Remuneration Cost Estimates**  
**FIN-3**

No.	Name	Position	A. Remuneration					
			Person-month Remuneration Rate	Time Input in Person-month	USD	EUR	BDT	
IK-1	Dr. Ranjit Galappatti	Team Leader	[Home] 16,595	0.0	0	0	0	0
			[Field] 16,595	22.0	365,100	0	0	0
IK-2	Prof. Zheng Wang	River and Estuarine Morphologist	[Home] 31,720	2.8	0	87,951	0	0
			[Field] 33,514	5.5	0	185,850	0	0
IK-3	Prof. Dano Roelvink	River and Coastal & Estuarine Morphological Modeler	[Home] 31,720	5.4	0	172,153	0	0
			[Field] 33,514	4.3	0	143,196	0	0
IK-4	Dr. Marcel Marchand	Integrated Coastal Zone and Polder Management Expert	[Home] 27,727	1.5	0	41,590	0	0
			[Field] 29,259	7.0	0	204,812	0	0
IK-5	Dr. Bo Braatz Christensen	Coastal and Estuarine Morphologist	[Home] 22,702	1.6	0	37,148	0	0
			[Field] 24,022	4.5	0	107,006	0	0
IK-6	Dr. Søren Tjerry	Tidal River and Sediment Management Specialist	[Home] 22,919	3.3	0	76,051	0	0
			[Field] 24,247	8.0	0	193,972	0	0
IK-7	Dr. Irina Overeem	Macro Scale Delta Morphologist	[Home] 19,111	4.2	80,788	0	0	0
			[Field] 19,831	6.8	134,311	0	0	0
IK-8	Dr. Steve Goodbred	Large Scale Delta Morphologist/Geologist	[Home] 23,492	3.0	70,476	0	0	0
			[Field] 24,192	5.7	138,554	0	0	0
IK-9	Dr. Michael Steckler	Subsidence Expert/Geo-Morphologist	[Home] 29,533	3.7	110,078	0	0	0
			[Field] 29,533	6.8	200,020	0	0	0
INK-10	Mr. Henrik Rene Jensen	Storm Surge and Wave Specialist	[Home] 23,863	0.3	0	6,508	0	0
			[Field] 25,226	3.7	0	94,023	0	0

A. Remuneration							
No.	Name	Position	Person-month Remuneration Rate	Time Input in Person-month	USD	EUR	BDT
INK-11	Dr. Alessio Giardino	Climate Change Risk Assessment and Adaptation	[Home] 21,960 [Field] 23,175	2.3 5.9	0 0	50,908 135,890	0 0
INK-12	Mr. Mark de Bel	Economist	[Home] 26,618 [Field] 28,090	1.5 5.5	0 0	39,927 154,494	0 0
INK-13	Dr Flemming Jacobsen	Salinity Specialist Surface water	[Home] 27,643 [Field] 29,193	0.0 1.0	0 0	0 29,193	0 0
INK-14	Dr. Christopher Small	Remote Sensing Expert	[Home] 28,326 [Field] 28,326	3.0 2.0	84,977 56,652	0 0	0 0
INK-15	Dr. Kim Wium Olesen	River Morphologist	[Home] 29,579 [Field] 31,149	1.7 5.3	0 0	51,092 164,241	0 0
INK-16	Dr. Mick van der Wegen	Capacity Building and Estuarine Modelling	[Home] 23,011 [Field] 24,284	4.0 2.0	0 0	92,045 48,569	0 0
INK-17	Dr. Bas van Maren	Fine sediment Modelling	[Home] 24,223 [Field] 25,563	2.0 4.0	0 0	48,445 102,250	0 0
INK-18	Mr. Toine Vergroesen	Polder Design	[Home] 24,223 [Field] 25,563	1.5 1.5	0 0	36,334 38,344	0 0
INK-19	Dr. Stephanie Higgins	Remote Sensing Image Analysis Expert	[Home] 9,618 [Field] 10,328	2.5 0.5	24,045 5,164	0 0	0 0
INK-20	Prof. Henrik Madsen	CC Expert and Rainfall Analysis	[Home] 26,730 [Field] 28,197	0.0 0.0	0 0	0 0	0 0
INK-21	Dr. Torsten Jacobsen	Salinity Specialist Groundwater	[Home] 23,518 [Field] 24,868	0.0 2.0	0 0	0 49,737	0 0

A. Remuneration						
No.	Name	Position	Person-month Remuneration Rate	Time Input in Person-month	USD	EUR
INK-22	Dr. Gerrit Hendriksen	Data Management Expert (GIS)	[Home] 22,115 [Field] 23,339	0.0 0.0	0 0	0 0
INK-23	Prof. Roshanka Ranasinghe	Climate Change Specialist	[Home] 20,463 [Field] 20,463	0.0 0.0	0 0	0 0
INK-24	Dr. Kimberly Rogers	Macro Scale Delta Morphology and Socio Economics	[Home] 10,667 [Field] 11,378	0.0 3.0	0 34,135	0 0
INK-25	Dr. Carol Wilson	SET Compaction Meters and Polder/TRM Impacts	[Home] 16,895 [Field] 17,613	0.0 4.0	0 70,454	0 0
INK-26	Dr. Richard Rip Hale	Tidal Hydrodynamics and Sediment Mass Flux	[Field] 16,506	0.5	8,253	0
INK-27	Dr. Rolf Deigaard	Coastal Morphologist	[Home] 23,500 [Field] 24,849	0.0 0.0	0 0	0 0
INK-28	Dr. Ferdinand Diermanse	Statistical Analysis of Meteorological Data	[Home] 27,549 [Field] 29,072	1.0 1.0	0 0	27,549 29,072
INK-29	Dr. Deepak Vatrani	Coastal Flooding and Storm Surge Expert	[Home] 24,552 [Field] 25,910	0.0 0.0	0 0	0 0
INK-30	Dr. Monica Altamirano	Investment Plans and PPP Specialist	[Home] 19,886 [Field] 20,987	0.0 0.0	0 0	0 0
INK-31	Mr. Reinier Schijvershof	Morphodynamics Modelling Expert	[Home] 11,775 [Field] 12,430	1.0 3.0	0 0	11,775 37,289
INK-32	Dr. Kasper Kærgård	Coastal and Estuarine Modeler	[Home] 18,230 [Field] 19,360	1.0 2.0	0 0	18,230 38,720

A. Remuneration						
No.	Name	Position	Person-month Remuneration Rate	Time Input in Person-month	USD	EUR
INK-33	Unnamed	American post doc	[Home] 8,525 [Field] 9,225	5.0 10.0	42,626 92,253	0 0
NK-34	Deputy Team Leader	Zahirul Haque Khan	[Home] 480,023 [Field] 480,023	23.0 7.0	0 0	11,040,526 3,360,160
NK-35	River Morphological Modeler	Sarwat Jahan	[Home] 452,897 [Field] 452,897	22.0 2.0	0 0	0 9,963,740
NK-36	Coastal and Estuarine Morphological Modelling Specialist	Mohammad Ziaur Rahman	[Home] 290,319 [Field] 290,319	21.0 7.0	0 0	0 905,795
NK-37	Integrated Coastal Zone and Water Resource Management Specialist	Emaduddin Ahmed	[Home] 476,123 [Field] 476,123	23.0 5.0	0 0	0 10,950,823
NK-38	Tidal River Morphologist	Dr. Faruq Ahmed Mohiuddin, PEng.	[Home] 362,317 [Field] 362,317	22.0 6.0	0 0	0 2,380,614
NK-39	Storm Surge and Wave Modelling Specialist	Md. Saiful Islam	[Home] 190,449 [Field] 190,449	20.0 4.0	0 0	0 2,173,902
NK-40	Long-term Polder Management Specialist	Abu Saleh Khan*	[Home] 389,387 [Field] 389,387	23.0 5.0	0 0	0 3,808,982
NK-41	Sediment Management Specialist	Tarek Bin Hossain	[Home] 452,897 [Field] 452,897	21.0 7.0	0 0	0 761,796
NK-42	Database Development Specialist	Md. Mahbubur Rahman	[Home] 290,319 [Field] 290,319	25.0 3.0	0 0	0 8,955,907
NNK-43	River Morphological Modeler	Md. Anowar Saadat	[Home] 290,319 [Field] 290,319	21.0 3.0	0 0	0 1,946,936
						✓

A. Remuneration							
No.	Name	Position	Person-month Remuneration Rate	Time Input in Person-month	USD	EUR	BDT
NNK-44	Coastal and Estuarine Morphological Modelling Specialist	Shume Akhter	[Home] 290,319 [Field] 290,319	22.0 2.0	0 0	0 0	6,387,017 580,638
NNK-45	Geo-Morphologist	Abdus Salam Sikder	[Home] 365,801 [Field] 365,801	21.0 7.0	0 0	0 0	7,681,820 2,560,607
NNK-46	Groundwater Specialist	Md. Tarikul Islam	[Home] 361,853 [Field] 361,853	21.0 7.0	0 0	0 0	7,598,906 2,532,969
NNK-47	Remote Sensing Specialist	Md. Zahid Hasan Siddiquee	[Home] 287,996 [Field] 287,996	21.0 3.0	0 0	0 0	6,047,922 863,989
NNK-48	Salinity Specialist	Md. Raqubul Hasib	[Home] 189,752 [Field] 189,752	20.0 4.0	0 0	0 0	3,795,042 759,008
NNK-49	GIS Specialist	Fouzia Khanam	[Home] 290,319 [Field] 290,319	19.0 1.0	0 0	0 0	5,516,060 290,319
NNK-50	Large Scale Delta Morphologist	Rubayet Alam	[Home] 362,317 [Field] 362,317	21.0 7.0	0 0	0 0	7,608,657 2,536,219
NNK-51	Macro Scale Delta Morphologist	Fathana Akhter Kamal	[Home] 290,319 [Field] 290,319	23.0 5.0	0 0	0 0	6,677,336 1,451,595
NNK-52	Economist	Md. Aminul Islam	[Home] 371,608 [Field] 371,608	9.0 1.0	0 0	0 0	3,344,468 371,608
NNK-53	Environmentalist	Sheikh Muhammad Abdur Rashid	[Home] 362,317 [Field] 362,317	8.0 4.0	0 0	0 0	2,898,536 1,449,268
NNK-54	Sociologist and Industrial Specialist	Md. Mustafizur Rahman	[Home] 362,317 [Field] 362,317	6.0 5.0	0 0	0 0	2,173,902 1,811,585

		A. Remuneration					
No.	Name	Position	Person-month Remuneration Rate	Time Input in Person-month	USD	EUR	BDT
NNK-55	Communication and Outreach Specialist	Md. Rafiqul Islam	[Home] 290,319 [Field] 290,319	6.0 1.0	0 0	0 0	1,741,914 290,319
NNK-56	Hydraulic Structure Design Specialist	Md. Anwar Hossain Bhuiyan	[Home] 464,510 [Field] 464,510	11.0 3.0	0 0	0 0	5,109,605 1,393,529
NNK-57	Survey and Monitoring Specialist	Pankaj Kumar Maitra	[Home] 362,317 [Field] 362,317	4.0 8.0	0 0	0 0	1,449,268 2,898,536
NNK-58	Survey and Monitoring Specialist	A. B. M. Anwar Haider	[Home] 362,317 [Field] 362,317	7.0 10.0	0 0	0 0	2,536,219 3,623,170
NNK-59	Climate Change Monitoring Specialist	Shaikh Nahiduzzaman	[Home] 190,449 [Field] 190,449	7.0 1.0	0 0	0 0	1,333,144 190,449
NNK-60	Basin Modelling Specialist	Tarun Kanti Magumder	[Home] 362,317 [Field] 362,317	12.0 1.0	0 0	0 0	4,347,804 362,317
			Total Costs*	1,525,778	2,554,363	200,340,539	

\* The figures exclude all local income taxes and indirect taxes levied upon the Consultant in Bangladesh. The taxes have been estimated in Form FIN-2 of this Financial Proposal.  
 \* For international experts, 673 days of the total 3601 days in Bangladesh will be spent in the field outside Dhaka



**Appendix D2 – Reimbursable Expenses Cost Estimates**  
**FIN-4**

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-1	Economy flight Europe-Bangladesh-Europe	RaC - Return airfare	1,273	120	0	152,760	0	
R-2	Economy flight US-Bangladesh-US	RaC - Return airfare	2,081	50	104,050	0	0	
R-13	Miscellaneous and mobilisation (e.g. visa, vaccinations, travel to/from airport)	FR	35,600	1	35,600	0	0	
R-3A	Per diem and accommodation international experts Dhaka	FR - Day	120	2,928	351,372	0	0	
R-3B	Per diem and accommodation international experts field	FR - Day	70	673	47,089	0	0	
R-4	Per diem and accommodation national experts field	FR - Day	3,200	2,618	0	0	8,377,600	
R-5	Database software for storage and access as well as modelling software	RaC	153,750	1	0	153,750	0	In addition to database software and SharePoint licenses, modelling licenses - for instance MIKE 11, MIKE 21 and other software modules, to be defined in detail during project inception
R-6	Printing, translation and reproduction	FR	2,300,000	1	0	0	2,300,000	
R-7A	PhD cost Europe for IWM employee, invoiced as three yearly, prepaid instalments	RaC - Person	100,000	0	0	0	0	
R-7B	PhD cost Europe for BWDB employee, invoiced as three yearly, prepaid instalments	RaC - Person	130,000	0	0	0	0	
R-8	PhD cost US, grant, tuition etc., project related subject, invoiced as two yearly, prepaid instalments	RaC - Person	N/A	0	0	0	0	

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-9	Overseas courses, for persons from BWDB at IHE	RaC	300,000	1	0	300,000	0	As a starting point 20 participants, to be defined eventually during project inception
R-10A	Overseas study tours, for persons from BWDB to DK, NL, DE	RaC - Person	5,000	5	0	25,000	0	
R-10B	Overseas study tours, for persons from BWDB to US	RaC - Person	6,000	0	0	0	0	
R-11	Workshops and national training courses	RaC	8,800,000	1	0	0	8,800,000	As a starting point, 10 workshops and 2 national training courses, to be defined eventually during project inception
R-12	Data purchase from institutions, such as, BWDB	RaC	4,200,000	1	0	0	4,200,000	
R-15A.1	Travel budget Bangladeshis to visit Lamont	RaC	31,550	1	31,550			BWDB and other personnel to go to Lamont University for training and collaboration. As a starting point, the cost is expected to cover travel, accommodation and living expenses for five staff to go to US for two weeks, to be defined eventually during project inception
R-15B.	Reimbursable remote sensing equipment, GPS etc items paid up to the ceiling of the group sum				361,520			
R-15B.1	Remote sensing equipment (to become Client property)	RaC	160,736	1	(160,736)			ASD FieldSpec 4 Hi-Res NG portable field-ready spectroradiometer with spectral range of 350 - 2500 nm
R-15B.2	GPS equipment	RaC	17,044	4	(68,178)			Trimble NetR9 receiver with 80 W solar panels, gel cell batteries, power controller, cellular modem, SECO antenna mount, equipment enclosures, etc.

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-15B.3	Computer workstation	RaC	4,590	1	(4590)			High-end workstation computer for BWDB and others to perform e.g. remote sensing processing and archiving
R-15B.4	General materials and supplies	RaC	3,880	4	(15519)			Computer supplies, including specialised printing and plotting
R-15B.5	Archiving GPS data	RaC	1,441	4	(5765)			RAID storage arrays for secure data, internet hosting software and costs for rapid internet connectivity and mirroring of data at DU and LDEO
R-15B.6	Tools and equipment to service GPS	RaC	3,060	1	(3060)			Specialised tools (e.g., cable stripping and crimping, drills and long bits) for installing and maintaining geodetic equipment for Client
R-15B.7	GPS servicing in the field and monument reoccupation for subsidence measurements	RaC	25,918	4	(103673)			Field expenses for visiting sites and servicing fixed GPS instruments including cars and other vehicles for reaching sites including boat rentals. Replacement parts and charges for cellular at GPS sites. Resurveying all SOB geodetic monuments in field area (>60), including rental of multiple GPS units and construction of tripods that fit the monuments, cars and other vehicles for reaching sites including boat rentals, hiring local workers to guard GPS, software purchase and processing of data including seasonal elevation corrections
R-16A.	Reimbursable sedimentation rate monitoring items paid up to the ceiling of the group sum					110,963	3,568,213	

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No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-16A.2	Short-term sedimentation rate monitoring - field team travel	RaC	3,568,213	1				Travel costs in Bangladesh getting to field sites (heavy duty van and boat rental) and local labour costs, such as, translators, higher level personnel, day labours and local custodian to monitor the site (3568213)
R-16A.3	Short-term sedimentation rate monitoring - 16 permanent sedimentation sites	RaC	2,453	16	(39248)			Stainless steel rods, SET arm benchmarks
R-16A.5	Short-term sedimentation rate monitoring - sediment sample analysis	RaC	45,150	1	(45150)			Materials and analyses for determining source and age of sediment, including 1500 sediment tiles @ \$10 for sedimentation rate and analyses of 500+ samples, including grain size @\$10, radiochemistry $^{7}\text{Be}$ @ \$25, $^{210}\text{Pb}$ @ \$25
R-16A.6	Short-term sedimentation rate monitoring - computing services	RaC	26,565	1	(26565)			Purchase of two high-end workstations and two field laptops with hard drives for database, and service use contracts for supercomputer each year
R-16B. Reimbursable coring, sediment samples etc items paid up to the ceiling of the group sum					91,256			
R-16B.3	Coring - drilling	RaC	524	80	(41958)			Cost per core to hire, for instance, tubewell drill team and geology loggers
R-16B.4	Coring - sediment samples	RaC	44,298	1	(44298)			Sediment sampling costs, e.g. 30 x radiocarbon @ \$600; 1600 x XRF @ \$10; 1600 x MagnSusc @ \$6.50
R-16B.5	Coring - open source publications	RaC	5,000	1	(5000)			Required academic publications of results: 2 publication x \$2500 cost each

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-17A. Reimbursable bathymetric survey items paid up to the ceiling of the group sum							8,000,000	
R-17A.1	Bathymetric survey of Lower Meghna	RaC	4,959	1,306	(6476000)			Lower Meghna at 500 m intervals for 100 km, from Chandpur to Tajumuddin, 201 transect lines each 6.5 km. In total 1306 km transects
R-17A.2	Bathymetric survey of Sangu river	RaC	4,000	141	(564000)			Sangu river at 500 m intervals for 70 km, a total of 141 transects
R-17A.3	Yearly monitoring survey	RaC	4,000	240	(960000)			Yearly monitoring at Pussur, Sibsa, Kobadak, Bhairab, Padma and 15 peripheral rivers of selected polders, 20 river at 2 locations twice a year for three years, in total 240 monitoring events
R-18A. Reimbursable water level recording items paid up to the ceiling of the group sum							1,500,000	
R-18A.1	Recording of water level at Hironpoint	RaC	50,000	12	(600000)			Recording and processing of tidal water level data at Hironpoint for 24 hours at 5 minutes interval by installing pressure sensor together with manual gauge plunk for one year
R-18A.2	Recording of water level at Rabnabad	RaC	22,500	40	(900000)			Recording of water level data at Rabnabad outfall & Pyra outfall for 24 hours at 10 minute interval by installing pressure sensor together with manual gauge plunk for two years (two locations for 20 gauge months)

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-19A. Reimbursable discharge measurement items paid up to the ceiling of the group sum							6,880,000	
R-19A.1	Discharge measurement at Brahmaputra river by ADCP	RaC	85,000	18			(1530000)	Discharge measurement and processing of Brahmaputra river by ADCP at Bahadurabad once in a month for one and half year along with BWDB observation schedule, including turbidity observation of 18 measurements
R-19A.2	Discharge measurement at Ganges river by ADCP	RaC	60,000	18			(1080000)	Discharge measurement of Ganges river by ADCP at Hardinge Bridge once in a month for one and a half years along with BWDB observation schedule, including turbidity observation of 18 measurements
R-19A.3	Discharge measurement at Meghna river by ADCP	RaC	60,000	18			(1080000)	Discharge measurement of Meghna river by ADCP at Bhairab once in a month for one and half year along with BWDB observation schedule 18 measurements
R-19A.4	Discharge measurement at Lower Meghna by ADCP	RaC	200,000	3			(600000)	Hourly discharge measurement of Lower Meghna river by ADCP including turbidity measurements at Chandpur once in six month period for one and half year. Three tidal cycle measurements

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-19A.5	Tidal discharge measurement of Gangri by ADCP	RaC	58,864	44				Tidal discharge measurement of Gangri, Pusur (upstream of Mongla port), Shibsa (Nalian), Baleswar (Charduni) and Baleswar (Bhandaria) by ADCP including turbidity observation and covering one spring in every two months and one neap tide in every season (six months) for one and half years. In total 5 locations and 12 tidal cycles (2590000)
R-20A.	Reimbursable sediment sampling items paid up to the ceiling of the group sum							3,983,200
R-20A.1	Vertical sediment samples at Brahmaputra river	RaC	700	1,056				At Brahmaputra (Bahadurabad) for 10 verticals at (0.2d, 0.6d, 0.8d) (1 X 18 times X 30 nos), Hardinge bridge (Ganges), Bairab (Meghna) river for 10 verticals at (0.2d, 0.6d, 0.8d) fortnightly during October- May & weekly during June - September together with BWDB discharge team (2 locations X 18 times X 30 nos)=1056 samples (739200)
R-20A.2	Sediment sampling at Lower Meghna river	RaC	750	234				At Lower Meghna (Chandpur) hourly sediment sampling for 13 hrs at two verticals (0.2, 0.6 & 0.8d) during discharge observation (3 times X 2 vertical X 13 hrs X 3 nos)=234 samples (175500)

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-20A.3	Sediment sampling at Gangril and other rivers	RaC	740	3,432				At Gangril, Pusur (us of Mongla port), Shibsa (Nalian), Balleswar (Charduan & Bhandaria), Akrampoint (Shibsa & Pusur) hourly sediment sampling for 13 hrs at two verticals (0.2, 0.6 & 0.8d) during discharge observation (66 obs X 2 vertical X 13 hrs X 2 nos)=5148 samples
R-20A.4	Suspended sediment sampling	RaC	16,000	33				Suspended sediment sampling during discharge observation (1 samples of minimum 40 liter volume during each observation) and grainsize distribution analysis (11 locations X 3 times)=33 samples
R-21A.	Reimbursable bed sample items paid up to the ceiling of the group sum						265,000	
R-21A.1	Collection of bed samples	RaC	4,818	55				Collection of five bed samples from each river discharge measurement location, including grain size analysis in the laboratory to determine type of bed (only dry sieving will be done) (11 locations X 5 samples)
R-22A.	Reimbursable salinity sample items paid up to the ceiling of the group sum						1,100,000	
R-22A.1	Salinity sampling	RaC	2,716	405				Salinity sampling at 15 locations for one and a half years (15 locations X 18 months)
R-23	High performance computer (DHI)	RaC	3,860,000	1			3,860,000	
R-25A.	Reimbursable items							

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No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
Support staff								
R-25A.1	Office Manager	FR	60000	30			1800000	
R-25A.2	Secretary	FR	45000	30			1350000	
R-25A.3	Data Analyst (3 staff each 30 months)	FR	45000	90			4050000	
R-25A.4	Peon cum Cleaner (2 staff each 30 months)	FR	20000	60			1200000	
Office rent with utilities								
R-25A.5	Office Rent	FR	115000	30			3450000	
R-25A.6	Utility Cost (Electricity, Water, Gas)	FR	30000	30			900000	
Transport rental								
R-25A.7	Car (incl. driver and fuel)	FR	60000	60			3600000	
R-25A.8	Microbus (incl. driver and fuel)	FR	65000	30			1950000	
R-25B.	Reimbursable items paid up to the ceiling of the group sum						3096000	
Office operation cost								
R-25B.1	Office Cost (Stationary etc.)	RaC	10000	30			(300000)	
Computer and printer								
R-25B.2	Computers	RaC	600000	1			(600000)	
R-25B.3	Black& White Laser Printer	RaC	60000	3			(180000)	
R-25B.4	Inkjet Colour Printer (A3 Printing)	RaC	20000	4			(80000)	
R-25B.5	Scanner	RaC	15000	2			(30000)	
Office furniture								
R-25B.6	Senior Executive Table for TL, DTL	RaC	20000	4			(80000)	

No.	Type of Reimbursable Expenses	Unit	Unit Cost	Quantity	USD	EUR	BDT	Description
R-25B.7	Senior Executive Chair for TL, DTL	RaC	15000	4			(60000)	
R-25B.8	Visitor Chair	RaC	4500	7			(31500)	
R-25B.9	Executive Table for Professionals	RaC	10000	16			(160000)	
R-25B.10	Executive Chair for Professionals	RaC	9000	16			(144000)	
R-25B.11	Meeting Table	RaC	75000	1			(75000)	
R-25B.12	Meeting Chair	RaC	4500	15			(67500)	
R-25B.13	Printer Table	RaC	6000	2			(12000)	
R-25B.14	Photocopier Table	RaC	6000	3			(18000)	
R-25B.15	Steel File Cabinet	RaC	18000	5			(90000)	
R-25B.16	2 Ton Split Air Conditioner	RaC	90000	5			(450000)	
R-25B.17	1.5 Ton Split Air Conditioner	RaC	75000	3			(225000)	
R-25B.18	Photocopier	RaC	65000	2			(130000)	
R-25B.19	Electric fan	RaC	3500	8			(28000)	
R-25B.20	Electric Wiring	RaC	200000	1			(200000)	
R-25B.21	Vertical Blind & Painting	RaC	100000	1			(100000)	
R-25B.22	Utensils & Office Accessories	RaC	35000	1			(35000)	
					Total Costs*	1,133,400	631,510	74,230,013

\* The figures exclude all local income taxes and indirect taxes levied upon the Consultant in Bangladesh. The taxes have been estimated in Form FIN-2 of this Financial Proposal.

\* Reimbursable costs are given without adjustment for inflation, except for flights (Flights will be reimbursed as per actual cost incurred in price and number).  
 \* Reimbursement shall be in the currencies specified in this table. Invoices in other currencies than stated will be recalculated to the currency stated and reimbursed in that currency, keeping the ceiling stated.

\* Values in brackets defined as RaC are shown for information purposes only.

\* RaC means reimbursed at cost

\* FR means fixed rate

**Appendix E - Form of Advance Payments Guarantee**  
[See Clause GCC 45.1(a) and SCC 45.1(a)]

*Guarantor letterhead*

**Bank Guarantee for Advance Payment**

Guarantor: \_\_\_\_\_

*[Either a foreign bank having an enforceable correspondent bank in Bangladesh acceptable to the Client Or a scheduled bank in Bangladesh acceptable to the Client]*

Beneficiary: The Project Director, CEIP-1, BWDB, House #15, Road #24(CNW), Gulshan-2, Dhaka-1212, Bangladesh

Date: [insert date]

ADVANCE PAYMENT GUARANTEE No.: \_\_\_\_\_ [insert number] \_\_\_\_\_

We have been informed that \_\_\_\_\_ [name of Consultant or a name of the Joint Venture, same as appears on the signed Contract] (hereinafter called "the Consultant") has entered into Contract No. \_\_\_\_\_ [reference number of the contract] dated \_\_\_\_\_ [insert date] with the Beneficiary, for the provision of \_\_\_\_\_ [brief description of services] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum of \_\_\_\_\_ [insert amount in figures] ( ) [amount in words] is to be made against an advance payment guarantee.

At the request of the Consultant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum of sums not exceeding in total an amount of \_\_\_\_\_ [amount in figures] ( ) [amount in words]<sup>1</sup> upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's written statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Consultant is in breach of their obligation under the Contract because the Consultant:

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<sup>1</sup> The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the Client.

Time-Based

- (a) Has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Consultant has failed to repay;
- (b) has used the advance payment for purposes other than toward providing the Services under the Contract.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Consultant on their account number \_\_\_\_\_ at \_\_\_\_\_ *[name and address of bank]*.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Consultant as indicated in certified statements or invoices marked as "paid" by the Client which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of the payment certificate or paid invoice indicating that the Consultant has made full repayment of the amount of the advance payment, or on the \_\_\_\_ day of \_\_\_\_ *[month]* , *[year]* <sup>2</sup>, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

In the event of an extension of the time for completion of the Contract, the Guarantor agrees to a one-time extension of this guarantee for a period not to exceed one (1) year, in response to the Client's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 revision, ICC Publication No. 758.

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\_\_\_\_\_  
[signature(s)]

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<sup>2</sup> Insert the expected expiration date. In the event of an extension of the time for completion of the Contract, the Client would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Client might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months][one year], in response to the Client's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

*Note: All italicized text is for indicative purposes only to assist in preparing this form and shall be deleted from the final product.*



## Appendix F – Minutes of Negotiation Meetings

1

### Bangladesh Water Development Board

Minutes of Financial Proposal Opening and Negotiations Meeting held  
on 17<sup>th</sup> April 2016 at 10:00 a.m.

As scheduled, the Financial Proposal Opening and the first meeting between the Negotiating Team of CEIP-1/BWDB (Client) and the Team of Joint Venture of DHI and Deltares (Consultant) was held on 17 April 2016, starting from 10:00 a.m. onwards in the meeting hall of the office of the PD, CEIP-1 at House #15, Road #24(CNW), Gulshan-2, Dhaka-1212. The meeting was chaired by Mr. Delwar Hossain , PD, CEIP-1, BWDB.

The Financial Proposal Opening meeting commenced with a welcome address from Mr. Delwar Hossain, PD and the Leader of the CEIP-1, BWDB Team. Mr. Hossain first introduced the CEIP-1, BWDB negotiating team members. The Procurement Panel Team Leader Mr. Narayan D. Sharma joined the negotiations meetings through Skype.

Upon Mr. Hossain's request Mr. Christian Grøn, the Leader of DHI and Deltares JV (Consultant), introduced the participants of Consultant's Team.

Thereafter Mr. M. Aminul Haque, the National Procurement Panel Member, requested the participants to inspect the sealed Financial Proposal envelope. The envelope containing the Financial Proposal was found intact by those present including the Consultant's representatives. As advised, Mr Haque then opened the Financial Proposal of the Consultant and handed it over to the chairperson.

Mr. Hossain read aloud the proposed prices and the corresponding estimated local taxes payable both in foreign and local currencies. Mr. AKM Bodruddoza, Procurement Specialist, recorded the figures, appendices and other papers in the Proposal Opening Sheet (POS). The Consultant's team then verified the information entered in the POS.

After being satisfied with the correctness of the recording on POS both the parties signed the Financial Proposal Opening sheet which is attached. Then Mr. Christain Grøn, representing the Consultant, made a brief presentation on its financial proposal.

### Participants to the Financial Negotiations Meeting of 17<sup>th</sup> April 2016

<b>Client:</b>  Bangladesh Water Development Board (BWDB), assisted by the Procurement Panel (PP), CEIP-I	<b>Consultant:</b> JV of DHI (lead) and DELTARES (member), in association with Sub-Consultants: (i) University of Colorado; (ii) Columbia University; and (iii) Institute of Water Modelling (IWM)
Mr. Md. Delwar Hossain, Project Director (PD), CEIP-I, BWDB	Mr. Christian Gron, Director, Consultancy, DHI; and Leader of Consultant's Negotiating Team
Mr. A.K.M. Bodruddoza, Procurement Specialist, CEIP-I, BWDB	Mr. Hans Jacob Vested, Head of Projects, DHI
Mr Narayan D. Sharma, Team Leader of PP, CEIP-I (participated through Skype from Kathmandu, Nepal)	Mr. Claus Skotner, Head of Projects, DHI
Mr. I.A. Khan, International Technical Expert of PP, CEIP-I	Mr. Tjilte Nauta, Regional Coordinator, DELTARES
Mr. M. Aminul Haque, National Procurement Expert of PP, CEIP-I	Mr. Alessio Giardino, Senior Expert, DELTARES
	Mrs. Irina Overeem, Fellow, Research Scientist III, University of Colorado
	Mr. Abu Saleh Khan, Deputy Executive Director, IWM
	Mr. Zahir-ul-Haque Khan, Project Director, IWM

### Summary of Discussions for Negotiations

Topic	Soft copy of Financial Proposal
Finding	The Client, after checking financial figures and the recorded other information in the Proposal Opening Sheet (POS), requested the Consultant to provide the Financial Proposal and other information in soft copy.  The Consultant provided a soft copy of the financial proposal immediately; and assured that soft copy of all other documents would be provided at a later date.
Action	The consultant to provide the soft copy of other documents
Topic	Technical Review - Interaction with National Professional Bodies
Finding	The Client noted that the Consultant's Technical proposal had mentioned the involvement of professional bodies in Bangladesh as part of the capacity building process. However, the Consultant had not explained how this would be achieved in practice.  In Response the Consultant confirmed the importance of including professional bodies in the process and interacting with these in workshops and in the expert panel. The specific details of this important effort will be worked out during inception phase of the contract.
Action	The Consultant would work out approach in writing during inception phase of contract performance
Topic	Technical Review- Satellite data

<b>Finding</b>	The Client requested the Consultant to provide in-depth information on data monitoring strategy to acquire, e.g., land use maps and soil salinity maps. Particularly, the Client wondered if drone technology would be useful.  The Consultant appreciated the idea and confirmed that the feasibility of using drone technology as a supplement to remote sensed satellite data would be investigated during inception phase of contract performance.
<b>Action</b>	None
<b>Topic</b>	<b>Technical Review- Work plan</b>
<b>Finding</b>	The Client noted that some activities listed in the terms of reference (TOR) components C1-C9 in Section 4.4 of the Consultant's Technical Proposal have not been included in Form TECH-5 Work Schedule of the Consultant's Technical Proposal. The client also noted that the Column named Total in TECH-5 Work Schedule would need to be filled in by the Consultant.  The Consultant clarified that Form TECH-5 Work Schedule was compiled by the Consultant with the objective of providing an overview as opposed to a full break-down. The consultant further demonstrated the detailed project planning given for each document in Chapter 4.4 of Form TECH-4.
<b>Action</b>	The Consultant would provide estimates of Total staff man-months in TECH-5 Work Schedule.
<b>Topic</b>	<b>Technical Review- Number of non-key staff</b>
<b>Finding</b>	The Client noted that the Consultant has suggested a substantial increase in the number of non-key experts as compared to the TOR estimated provision and asked the Consultant to provide clarification/justification.  The Consultant informed that the assignment is technically very challenging, as the deliverables rely on cutting edge technologies and developments in an applied context. In effect, this warrants that a wide range of highly specialised competencies is available to achieve the objectives of the assignment. To this end, the Consultant has proposed an increased number of non-key experts that may be drawn upon in the course of the contract performance based on needs identified during the inception and delivery phases.  Further, the Consultant clarified that the total number of staff-months remained within the estimates given in the TOR, with a minor suggested transfer of inputs from key experts to non-key experts (subject to verification during the inception phase).  The Client accepted the above clarification but reserved the right to ask the Consultant to modify his proposal if considered appropriate.
<b>Action</b>	None
<b>Topic</b>	<b>Technical Review- Replacement of National Experts</b>
<b>Finding</b>	Following a review of the qualifications of all key experts proposed by the Consultant, they were accepted, but the Client found that the qualifications of two (2) national key experts were inadequate and requested these to be replaced.  The Consultant confirmed that two (2) new national key expert CVs have already been submitted to the Client for review and acceptance.
<b>Action</b>	The Client to review submitted CVs

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IV. Appendices

<b>Topic</b>	<b>Request for Documentation - Highest academic certificates, current employer</b>
<b>Finding</b>	The Client requested the Consultant to submit certificates highest academic qualifications; and current employment and, if available, of the past employment of proposed key experts.  For all but one key expert, Michael Steckler, the Consultant submitted the required documentation to the Client for review and acceptance.
<b>Action</b>	The Consultant would submit required documents for Michael Steckler at a later date.
<b>Topic</b>	<b>Financial Review-Basic Information</b>
<b>Finding</b>	The Client browsed through the Financial Proposal submitted by the Consultant and informed the Consultant, that several basic financial items are required, according to the Request for Proposal (RFP). This includes audited financial statements for the last three years, to substantiate its rates salary slips documenting basic salary, statements of social and overhead charges for each entity of the Consultant.  The Consultant informed that some of the missing documents would be submitted during the course of the meeting. The Consultant however stated that numerous similar World Bank projects have been contracted based on similar information and further confirmed that all financial information submitted by the Consultant is correct.
<b>Action</b>	The Consultant to verify that all financial documentation conforms to the RFP requirements and its "Representation Regarding Costs and Charges" contained in its proposal (page 31) also conforms to the RFP. The Consultant is to submit all missing documentation.
<b>Topic</b>	<b>Financial Review – Budget Reductions</b>
<b>Finding</b>	Following an informal review of the Financial Proposal, the Client made an informal sampling in the costs listed in FIN-4 of the Consultant's Financial Proposal and highlighted several unusually large reimbursable expenses to guide the Consultant towards possible cost savings. The Client further informed that the financial offer submitted by the Consultant greatly exceeds the funds available to the Client and thus requested the Consultant to identify potential cost savings, keeping in mind compliance with TOR.  The Consultant confirmed this understanding.
<b>Action</b>	The Consultant to identify possible cost savings and present the result of this effort to the Client during the subsequent meeting scheduled at 10.00 a.m. on 18 <sup>th</sup> April 2016.

09/05/2016

X Ct St

Christian Gran  
Director, Consultancy  
Signed by Christian Gran

Md. Delwar Hossain  
Project Director  
CEIP-1, BWDB, Dhaka

(Narayan D. Sharma)  
Team Leader of PP

## Bangladesh Water Development Board

Minutes of Financial Negotiations Meeting held on 18<sup>th</sup> April 2016 at 10:00 a.m.  
 Participants to the Negotiations Meeting

<b>Client:</b> Bangladesh Water Development Board (BWDB), assisted by the Procurement Panel (PP), CEIP-1	<b>Consultant:</b> JV of DHI (lead) and DELTARES (member), in association with Sub-Consultants: (i) University of Colorado; (ii) Columbia University; and (iii) Institute of Water Modelling (IWM)
Mr. Md. Delwar Hossain, Project Director CEIP-I, BWDB	Mr. Christian Grøn, Director, Consultancy, DHI; and Leader of Consultant's Negotiating Team
Mr. A.K.M. Bodruddoza, Procurement Specialist, CEIP-1, BWDB	Mr. Hans Jacob Vested, Head of Projects, DHI
Mr. Narayan D. Sharma, Team Leader of PP, CEIP-1 (participated through Skype from Kathmandu, Nepal)	Mr. Claus Skotner, Head of Projects, DHI
Mr. I.A. Khan, International Technical Expert of PP, CEIP-1	Mr. Tjisse Nauta, Regional Coordinator, DELTARES
Mr. M. Aminul Haque, National Procurement Expert of PP, CEIP-1	Mr. Alessio Giardino, Senior Expert, DELTARES
	Mrs. Irina Overeem, Fellow, Research Scientist III, University of Colorado
	Mr. Abu Saleh Khan, Deputy Executive Director, IWM
	Mr. Zahir-ul-Haque Khan, Project Director, IWM

### Summary of Discussions for Negotiations

Topic	Financial Review – Basic Information
Findings	<p>The Client opened the meeting and directed focus towards the remuneration rates proposed by the Consultant and again urged the Consultant to supply all required basic information to verify the proposed remuneration rates, covering both international and national entities. The Client also requested the Consultant to provide copies of recent contracts in the South Asia Region and or in Africa for comparison of the proposed remuneration rates.</p> <p>The Consultant informed the meeting that the proposed remuneration rates are very similar to those contracted on numerous other World Bank funded projects regionally as well as globally. The Consultant presented a few examples that demonstrated that the proposed remuneration rates were lower than those contracted elsewhere.</p> <p>Following the disclosure of some prevailing remuneration rates applicable to the services provided by the Consultant elsewhere, the Client responded that fees greater than 5-10 % would require thorough justification.</p>

	<p>The Consultant stated that the higher percentages used include future price escalation in basic salary. The Client clarified that this was not permissible, as there is provision for annual price escalation in the contract within the project contingency.</p> <p>The Client asked the Consultant to submit authenticated recent salary slips. The Consultant agreed to do this.</p> <p>The Client queried the justification of the proposed fee rate for the proposed Team Leader Dr Ranjit Galappatti. The Client noted that the basic salary used in the build-up of his fee rate was significantly higher than that stated on the pay slip submitted with the proposal and also significantly higher than that in an earlier CEIP-I contract. It was also noted that the proposed fee of 56%~64% was very high compared to generally accepted of around 25 to 30%, as in other contracts of BWDB.</p> <p>The Consultant informed that the salary slip submitted for Dr Galappatti was incorrect and promised to provide updated information documenting the proposed salary to be paid out to Dr Galappatti for the consultancy agreement between DHI and Dr Galappatti when entered, as well as examples of other salary agreements between DHI and Dr Galappatti. The fee rate of 56~64 per cent applied on the salary of Dr Galappatti reflects costs associated with head office support, administration and management. The Consultant noted that in spite of high fee percentage the charge rate for Dr Galappatti as a freelance was quite low because of absence of other costs applicable to DHI staff.</p> <p>The Client was not satisfied by the Consultant's statement that the submitted salary slip was incorrect. A historical authenticated document cannot be claimed to be incorrect after its submission.</p>
Action	The Consultant to submit historic and authenticated recent salary slips for all key experts.
Topic	<b>Financial Review – Budget reductions</b>
Finding	<p>Following the earlier request to identify possible cost reductions, the Client asked the Consultant to present these.</p> <p>The Consultant presented a series of possible cost reductions, potentially reducing the cost from about USD 15.8 million to about USD 11.4 million, should the Client wish to implement all of these. Keeping in mind the continued compliance with the ToR and the project objectives, the following types of reductions were identified:</p> <ol style="list-style-type: none"> <li>1. Reductions based on increased accuracy of unit costs associated with e.g. flights, per diem, logistics in Bangladesh and similar</li> <li>2. Savings based on reduction in the number of overseas courses, software procurement, data procurement etc.</li> <li>3. Savings based on a closer inspection and reduction of the proposed survey programme keeping the priority elements.</li> </ol> <p>The Client acknowledged the effort by the Consultant to reduce the cost and noted</p>

	<p>that the proposed budget still should include some software and data procurement. The Client further requested the Consultant to prepare a technical and financial justification of the identified reductions, specifically the following:</p> <ol style="list-style-type: none"> <li>1. Updated Form FIN-2</li> <li>2. Updated Form FIN-3</li> <li>3. Updated Form FIN-4</li> <li>4. Updated breakdown of remuneration rates</li> <li>5. Technical documentation describing each major group of reductions</li> </ol> <p>The Consultant confirmed this understanding.</p>
Action	<p>The Consultant to prepare a technical and financial justification of the identified reductions and present the result of this effort to the Client during the subsequent meeting scheduled at 10:00 a.m. on 19<sup>th</sup> April 2016. The PD would be tied up with a meeting at the Ministry on that day but he authorised his staff and the Panel members to participate in discussions with the Consultant. The PD would be present in a meeting scheduled for 20<sup>th</sup> April 2016 at 3.00 p.m</p>

10/05/2016

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Christian Gron  
Director, Consultancy  
Signed by: Christian Gron

W. S. J. A. Khan

  
 Md. Delwar Hossain  
Joint Director  
CEIP-1, CDDB, Dhaka.  
 N. D. Sharma  
(Narayan D. Sharma)  
Team Leader of PP

## Bangladesh Water Development Board

Minutes of Financial Negotiations Meeting held on 19<sup>th</sup> April 2016 at 10:00 a.m.

### Participants to the Negotiations Meeting

<b>Client:</b> Bangladesh Water Development Board (BWDB), assisted by the Procurement Panel (PP), CEIP-1	<b>Consultant:</b> JV of DHI (lead) and DELTARES (member), in association with Sub-Consultants: (i) University of Colorado; (ii) Columbia University; and (iii) Institute of Water Modelling (IWM)
Mr. A.K.M. Bodruddoza, Procurement Specialist, CEIP-1, BWDB	Mr. Christian Grøn, Director, Consultancy, DHI; and Leader of Consultant's Negotiating Team
Mr. Narayan D. Sharma, Team Leader of PP, CEIP-1 (participated through Skype from Kathmandu, Nepal)	Mr. Hans Jacob Vested, Head of Projects, DHI
Mr. I.A. Khan, International Technical Expert of PP, CEIP-1	Mr. Claus Skotner, Head of Projects, DHI
Mr. M. Aminul Haque, National Procurement Expert of PP, CEIP-1	Mr. Tjisse Nauta, Regional Coordinator, DELTARES
Absent as advised at meeting on 18/04/16 Mr. Md. Delwar Hossain (BWDB Project Director CEIP-I)	Mr. Alessio Giardino, Senior Expert, DELTARES Mrs. Irina Overeem, Fellow, Research Scientist III, University of Colorado

### Summary of Discussions for Negotiations

Topic	Resubmission of financial proposal
Finding	<p>The Client had required the Consultant to revise the financial proposal. A revised financial proposal was presented by the Consultant, still complying with the overall assignment objectives and the TOR</p> <p>The revised proposal (as e-mailed to the Client) includes:</p> <ul style="list-style-type: none"> <li>• Administrative Corrections</li> <li>• General Reduction in Reimbursable Items</li> <li>• Reduction in Remuneration of Experts</li> <li>• Field program reductions</li> </ul> <p>The total cost of the revised proposal was reduced from USD 15.8 million to USD 11.0 million. A summary of the adjustments of the financial proposal was submitted along with revised forms FIN-2, FIN-3, FIN-4, TECH-6 and Breakdown of remuneration rates.</p>
Action	The Client to review revised financial proposal
Topic	Additional documents required to be added to the financial proposal
Finding	<p>The Client noted that a number of required documents were not included as part of the financial proposal for some of the consortium members. In particular:</p> <ul style="list-style-type: none"> <li>• Audited financial statements for the last three (3) years</li> <li>• Overhead and social charges statements for those last three (3) years</li> </ul>

	The Consultant acknowledges that a number of documents were not included in the proposal. A number of those, however, were provided as part of the EoI document.
Action	<p>The Consultant would prepare an overview of all required documents. Also, the following documents would be provided during the meeting scheduled for 20<sup>th</sup> April 2016 (below bold items requested during the meeting):</p> <ul style="list-style-type: none"> <li>▪ <b>Audited financial statements</b></li> <li>▪ <b>Audited overhead and social charges statements</b></li> <li>▪ <b>Copies of latest pay slips and for the year for which audited financial statements and subsequent, if any.</b></li> <li>▪ Power of attorney</li> <li>▪ Confirmation of Availability key staff</li> <li>▪ Highest Academic certificate for key staff</li> <li>▪ Certificate from current employer</li> <li>▪ Examples of similar contracts</li> </ul> <p>Additional documents (if required) may be submitted at a later phase.</p>
Topic	<b>Definition of basic salary in relation to Deltares salary slips; Built-up of Basic Monthly Salary (BMS) and proposed fixed rates</b>
Finding	<p>The Client questioned the definition of basic salary in the Deltares salary slips and the built-up of BMS, as used in the financial proposal.</p> <p>The Consultant acknowledged that the built-up of BMS was not clearly explained in the proposal. The Consultant prepared a presentation to explain to the Client how the salary slips and breakdown rates should be interpreted.</p>
Action	Latest salary slips would be provided to the Client during the meeting scheduled at 10:30 a.m. on 20 April 2016. An additional explanation and justification would be included to show how the Social charge and Overhead charge are used for the "Calculation BMS" and proposed fixed rates.
Topic	<b>Salary proposed for Dr. Ranjit Galapatti in breakdown of remuneration rates</b>
Finding	<p>The Client again pointed out that the salary proposed for Dr. Ranjit Galapatti is higher than in a similar contract for CEIP-I.</p> <p>The Consultant acknowledged that the salary proposed for Dr. Ranjit Galapatti, Team Leader of this contract is higher than in a similar contract for CEIP-I. This is because the salary agreement for this contract was impacted by unfavourable USD to EURO exchange rate changes. This can be documented with salaries paid in other contracts. The Consultant also referred to the high responsibility expected from the Team Leader.</p>
Action	Examples of salaries for Dr. Ranjit Galapatti would be provided to the Client during the meeting scheduled on 20 April 2016.
Topic	<b>Space for possible additional price reduction</b>
Finding	<p>The Client questioned whether additional price reductions are possible in the financial offer.</p> <p>The Consultant informed the Client that the modified financial proposal already included a very low price considering the RFP requirements and the project objectives. The Consultant asked for specific advice for changes from the Client.</p>
Action	The Client would review the revised financial proposal

10/05/2016

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Christian Gran  
Director, Consultancy  
Signed by: Christian Gran

*Belgaum* *J.A. Khan*

*Md. Delwar Hossain*  
Md. Delwar Hossain  
Project Director  
CEIP-1, BWDB, Dhaka.  
*Narayan D. Sharma*  
( Narayan D. Sharma )  
Team Leader of PP

*WMP*

## Bangladesh Water Development Board

Minutes of Financial Negotiations Meeting held on 20<sup>th</sup> April 2016 at 10:30  
a.m.

### Participants to the Negotiations Meeting

<b>Client:</b> <b>Bangladesh Water Development Board (BWDB), assisted by the Procurement Panel (PP), CEIP-1</b>	<b>Consultant:</b> <b>JV of DHI (lead) and DELTARES (member), in association with Sub-Consultants: (i) University of Colorado; (ii) Columbia University; and (iii) Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain, Project Director CEIP-I, BWDB	Mr. Christian Grøn, Director, Consultancy, DHI; and Leader of Consultant's Negotiating Team
Mr. A.K.M. Bodruddoza, Procurement Specialist, CEIP-1, BWDB	Mr. Hans Jacob Vested, Head of Projects, DHI
Mr. Narayan D. Sharma, Team Leader of PP, CEIP-1 (participated through Skype from Kathmandu, Nepal)	Mr. Tjisse Nauta, Regional Coordinator, DELTARES
Mr. I.A. Khan, International Technical Expert of PP, CEIP-1	Mr. Alessio Giardino, Senior Expert, DELTARES
Mr. M. Aminul Haque, National Procurement Expert of PP, CEIP-1	Mr. Abu Saleh Khan, Deputy Executive Director, IWM
	Mr. Zahir-ul-Haque Khan, Project Director, IWM

### Summary of Discussions of Negotiations Meeting

<b>Topic</b>	<b>Summary Status Statements and Documentation</b>
<b>Finding</b>	During the meeting on 19 <sup>th</sup> April 2016, the Client noted that a number of required documents were not included in the financial proposal.  The Consultant presented a table with overview of all required documents. The table gives documents already submitted, additional documents made available during the negotiations and which would be made available.  The additional documents made available during negotiations were handed over both as hard and soft copies (email), with the soft copy as the prevailing one.
<b>Action</b>	The Client would review the documentation provided and advise the Consultant for any other documents that may be necessary.
<b>Topic</b>	<b>Overseas Courses and Study Tours</b>
<b>Finding</b>	The number of participants for overseas courses and study tours had been reduced in Consultant's amended proposal. The Client asked if the number could remain unaltered as originally proposed by the Consultant.  The Consultant noted the question for action.
<b>Action</b>	The Consultant in its revised financial proposal would try not to reduce the number of participants for overseas courses and study tours.
<b>Topic</b>	<b>Averaged Overhead and Social Charges</b>

<b>Finding</b>	The Client drew attention of the Consultant to the provision of RFP for use of average of the last three years of audited overhead and social charges, although lowest of the three could be used reducing the overhead percentage.  The Consultant would update the financial proposal accordingly.
<b>Action</b>	The Consultant in its revised financial proposal would apply the average 2012~2014 audited overhead and social charges.
<b>Topic</b>	<b>Return Airfares</b>
<b>Finding</b>	The Client hinted the possibility of a further reduction on return airfares. The Consultant explained that the airfare cost provided in the updated financial proposal was found realistic considering the project duration and consistent with other on-going projects in Bangladesh involving other European consultants. Furthermore, the airfare costs had already been significantly reduced.
<b>Action</b>	The Consultant would explore the possibility of reducing the airfare by planning in advance, and as appropriate.
<b>Topic</b>	<b>Escalation of Remuneration</b>
<b>Finding</b>	The Client informed that yearly adjustment of remuneration would be met from the provisional contingency sum of BDT 50,000,000 in FIN 2.
<b>Action</b>	The Consultant would in its revised financial proposal exclude contingency costs for escalation of remuneration from the reimbursable costs.
<b>Topic</b>	<b>Bank Guarantee</b>
<b>Finding</b>	The Client informed that the bank guarantee processing costs were usually covered by general overhead costs of the Consultant.  The Consultant accepted that.
<b>Action</b>	The Consultant would cover the bank guarantee costs, and that would be reflected in its revised financial proposal.
<b>Topic</b>	<b>Software Costs</b>
<b>Finding</b>	An issue was raised on the need for software purchases, and a need for database software was identified.  The Consultant would look into the financial implications. Hydraulic software modelling tools would be available at Consultants' office and at IWM for the duration of the contract.
<b>Action</b>	The Consultant would in its revised financial proposal include costs for data base software only.
<b>Topic</b>	<b>Suggestions Contractual Conditions</b>
<b>Finding</b>	The Consultant inquired whether suggestions for change in the contractual conditions should already be listed.  The Client suggested that these issues should be dealt with in writing.
<b>Action</b>	The Consultant to list these points in writing for subsequent discussion and incorporation in the draft contract document.
<b>Topic</b>	<b>Next Meeting</b>
<b>Finding</b>	The Consultant was asked to implement the discussed changes in their budget revision and return for discussions on 21 <sup>st</sup> April 2016 at 3:00 p.m.

IV. Appendices

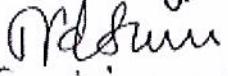
	The Consultant would go through their proposal and submissions and prepare a new budget.
Action	The Consultant to present a further revised financial proposal in the next meeting on 21 <sup>st</sup> April 2016 at 3:00 p.m.

10/05/2016

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Christian Gran  
Director, Consultancy  
Signed by Christian Gran

Chalpan S.A. Khan

  
Md. Delwar Hossain  
Project Director  
CEIP-1, BWDB, Dhaka.  
  
  
(Narayan D. Sharma)  
Team Leader of PP

## Bangladesh Water Development Board

Minutes of Financial Negotiations Meeting held on 21<sup>st</sup> April 2016 at 3:00 p.m.

### Participants to the Negotiations Meeting

<b>Client:</b> <b>Bangladesh Water Development Board (BWDB), assisted by the Procurement Panel (PP), CEIP-1</b>	<b>Consultant:</b> JV of DHI (lead) and DELTARES (member), in association with Sub-Consultants: (i) University of Colorado; (ii) Columbia University; and (iii) Institute of Water Modelling (IWM)
Mr. Md. Delwar Hossain, Project Director CEIP-I, BWDB	Mr. Christian Grön, Director, Consultancy, DHI; and Leader of Consultant's Negotiating Team
Mr. A.K.M. Bodruddoza, Procurement Specialist, CEIP-1, BWDB	Mr. Hans Jacob Vested, Head of Projects, DHI
Mr. Narayan D. Sharma, Team Leader of PP, CEIP-1 (participated through Skype from Kathmandu, Nepal)	Mr. Tjritte Nauta, Regional Coordinator, DELTARES
Mr. I.A. Khan, International Technical Expert of PP, CEIP-1	Mr. Alessio Giardino, Senior Expert, DELTARES
Mr. M. Aminul Haque, National Procurement Expert of PP, CEIP-1	Mr. Zahir-ul-Haque Khan, Project Director, IWM

### Summary of Discussions for Negotiations

Topic	Statements and Documents
Finding	<p>The Consultant inquired whether the additional documents submitted were complete.</p> <p>In response the Client stated that it had not been able to complete review of those documents beyond cursory examination.</p> <p>The Client again raised the issue of the basic salary used by Deltares in the built-up of its fee rate, inter alia, computer allowance and holiday pay etc. were being treated as part of the basic salary. Also the Client noted that the quantum of tax paid by IWM employees suggested that the basic salaries shown on IWM pay slips were in fact lower.</p> <p>It was agreed that the Consultant would address the aforementioned issues in further documentation to be supplied to the Client.</p>
Action	The Client to scrutinise the submitted documentation and request clarifications and/or additional information, as relevant in due course.
Topic	Social Charges Deltares
Finding	The Client requested the Consultant to provide audited financial statements with clear breakdown of items included in social and overhead charges of Deltares. Such a submission needs to be in line with that provided by DHI.



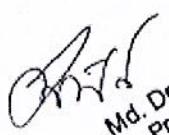
	The Consultant would look into this and following further submission it was suggested that Skype discussion could be held with the Deltares Financial Department to seek further clarifications if considered necessary.
Action	Deltares to look into the basic salary costs in relation to social and overhead charges.
Topic	<b>Financial Statement Deltares Year 2009</b>
Finding	The Client inquired why Deltares had provided a financial statement for the year 2009 when only statements for the years 2012~2014 were required.  The Consultant's response was that in the updated financial proposal the statements for the years 2012~2014 would be included and applied.
Action	The Consultant would include the 2012 ~ 2014 years audited financial statements in the further updated financial proposal to be provided.
Topic	<b>Updated Financial Proposal</b>
Finding	The Consultant tabled an updated version of the breakdown of personnel charge rates and the costs as well updated version of reimbursable costs and its overall budget figure. This was of the order of an equivalent of USD 10.4 million excluding taxes.  The Client noted that rates and fees for some of the experts were so high compared to prevailing market rates and noted that there was such a large variation in fee rates. The Client inquired whether any adjustment was possible in the final financial proposal with respect to these rates and/or expert input.
Action	The Consultant would consider these suggestions in a financial proposal to be revised further.
Topic	<b>Next Negotiation Steps</b>
Finding	The Consultant asked the Client on how to proceed with the contract negotiations process.  In response, the Client suggested that the Consultant to consider all possible costs savings after return to its home office and thereafter submit a further revised financial offer.  The Consultant suggested to exchange comments and questions to the further revised offer to clarify outstanding issues, before continuing the negotiations.
Action	The Consultant to prepare a further revised financial proposal based on all the suggestions which came out of the discussions, inputs and comments received during the negotiations. Without prejudice to the Client's right whether or not to enter in to a contract with the Consultant, this could form the basis for continuing the negotiations.

10/05/2016

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Christian Gron  
Director, Consultancy  
Signed by: Christian Gron

Lucy S. A. Khan



Md. Delwar Hossain  
Project Director  
CEIP-1, BWDB, Dhaka.

Narayan D. Sharma  
( Narayan D. Sharma)  
Team Leader of PP

## CEIP-1 S4: Minutes of Meeting of 22 January 2017

## Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB)</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with Sub-Consultants: University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain, Chief Engineer; and Project Director, CEIP-1, BWDB	Dr. Christian Grøn – DHI
Mr. I.A. Khan- International Technical Expert of Procurement Panel for CEIP-1	Dr. Claus Skotner – DHI
Mr. M. Aminul Haque- National Procurement Expert of Procurement Panel for CEIP-1	Dr. Ranjit Galappatti – DHI
Mr. A.K.M. Bodruddoza - Procurement Specialist, CEIP-1	Mr. Tjritte Nauta – DELTARES
Mr Narayan D. Sharma-- International Procurement Specialist of Procurement Panel for CEIP-1	Mr. Zahir-ul-Haque Khan – IWM

## Summary of Discussions

<b>1. Technical Proposal Presentation by the Consultant</b>	
<b>Topic</b>	<b>Explanation of terms of reference</b>
<b>Introduction</b>	Following the opening of the negotiation meeting by the Client Project Director, the proposed Team Leader made a presentation of the project, highlighting the project background, project objective, scope, deliverables, project organization, work schedule, team composition, assignment and key expert's inputs and counterpart requirements.  Thereafter the negotiations took place, which are presented in the following paragraphs under the headings – topic, deliberations and actions.
<b>Deliberations</b>	The Client asked the Consultant how updated Technical Proposal compared to the original proposal and the terms of reference (TOR). The Consultant informed that the updated Technical Proposal would meet the TOR in full.  The Client wondered about the actual scope of the polder design process in terms of expected outputs. The Consultant replied that the expected polder design basis would comprise, inter alia, embankment top levels taking account of subsidence.

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	<p>The Client also wondered to what extent the project would consider possible embankment failures and design deficiencies of the existing polders. The Consultant replied that such assessment was not within the scope of TOR, but the project may provide very useful information to allow for such an assessment.</p>
<b>Actions</b>	None
<b>Topic</b>	<b>Updated Work Schedule and Planning for Deliverables</b>
<b>Deliberations</b>	<p>The Client asked the Consultant to clarify why the planned data and literature review would be carried out during a prolonged period of 30 months. The Consultant replied that the majority of the data and literature review would be conducted during the early stages of the assignment. However, also with an expectation to revisit these subjects intermittently and in parallel with the modelling activities, since modelling efforts, in practice, require that data and literature be revisited from time to time.</p> <p>Referring to the Consultant's proposed work schedule, the Client noted that polder design activities would start before any modelling results have surfaced. The Consultant informed the Client that that was according to plan, since some activities, e.g. the modelling activities, require inputs relating to the requirements of the polder design activity, also ensuring early application of project results in on-going design activities.</p> <p>The Consultant was asked to highlight more accurately the expected data and literature review in the work schedule.</p>
<b>Actions</b>	As part of the inception phase, the Consultant would revisit the work schedule and make modifications, if required.
<b>Topic</b>	<b>Team Composition, Assignment, and Key Experts' Inputs</b>
<b>Deliberations</b>	<p>The Consultant outlined the roles of the associates, including individual entities and their respective primary technical roles.</p> <p>The Consultant presented a summary of the number of man-months in the updated Technical Proposal, including a distribution among individual entities.</p>
<b>Actions</b>	Based on review by the Client, the Revised Technical Proposal may require a little further revision.
<b>Topic</b>	<b>2. Revised Financial Proposal</b>
<b>Topic</b>	<b>Missing financial statements</b>
<b>Deliberation</b>	The consultant handed over originals of financial statements, in accordance with the summary sent to the Client before the meeting.
<b>Actions</b>	Based on review by the Client, the 3 <sup>rd</sup> Revision of Financial Proposal may require a little further revision.
<b>Topic</b>	<b>Computation of remuneration rates</b>
<b>Deliberation</b>	<p>The Consultant stated that since the start of the negotiations in April 2016, the Client has questioned the remuneration rates computed by the Consultant, primarily in relation to the audited salary slips submitted by the Consultant, since these in some cases included housing or holiday allowance in the basic salary (as per national law), which was not acceptable to the Client.</p> <p>The Consultant and the Client had a formal discussion about the computation of remuneration rates as required to adhere to the provisions of the Request for Proposal (RFP). The Consultant informed that the recalculation by separating the allowances from the salary would not affect the final remuneration rate.</p>

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	<p>The Client and the Consultant agreed that remuneration rates should be computed on the basis of monthly basic salaries, i.e. net salaries that exclude benefits, such as, housing, holiday, transport allowance, bonus or similar, and audited social charge and overhead cost, or similar, and an agreed fee to demonstrate that the rates computed based on audited pay slips would not be changed.</p> <p>While the Consultant promised that the computation of remuneration rates would follow the above principles, it was noted that any changes to the remuneration rates should allow the Consultant to recover all costs documented in the submitted financial statements, effectively indicating that it is only the underlying computational method that may change but not the resulting remuneration rates. It was accordingly agreed, that multipliers could be recalculated to follow RFP provisions to substantiate the statement that there would be no changes with respect to the rates calculated based upon audited social cost and overhead multiplier statements.</p> <p>The Client queried about the salary slip Dr. Kasper Kærgaard for which DHI submitted a Danish salary slip despite the fact that Dr. Kasper Kærgaard is currently employed by DHI Australia. As Dr. Kasper Kærgaard would be relocating back to DHI Denmark shortly, it was agreed that the remuneration rate of Dr. Kasper Kærgaard should be based on the social charge and overhead cost of DHI Denmark as it attracts lower remuneration rate.</p> <p>Likewise, the Client queried about the computation of the remuneration rate of Dr. Flemming Jacobsen who is currently employed by DHI India with a remuneration rate computed based on the social charge and overhead cost of DHI Denmark. Since the social charge and overhead costs of DHI India are higher than those of DHI Denmark, it was agreed that the remuneration rate of Dr. Flemming Jacobsen would be computed based on the social charge and overhead costs of DHI Denmark. That would result in lower remuneration rate.</p> <p>The Client and the Consultant discussed the principles governing the computation of remuneration rates by the American universities and their documentation on basic salaries and social and overhead charges submitted in this regard. Following a presentation by the Consultant on the calculation of remuneration rates by the Universities in comparison to the rules of the RFP, it was agreed that the documentation provided by the American universities was sufficient.</p>
Action	<p>The Consultant shall verify that the salary slip of Dr. Flemming Jacobsen excludes any housing costs.</p> <p>A salary slip documenting salary in Denmark shall be submitted, when available for Dr. Kasper Kærgaard.</p> <p>The Consultant shall provide an example of the calculation of remuneration rates by the American Universities in comparison to the rules of the RFP.</p>
Topic	Bonus payment and Holiday allowance
Deliberation	<p>Referring to the salary slips submitted by the Consultant, the Client expressed concerns about the inclusion of bonuses and holiday allowances in some instances. The following was agreed.</p> <ol style="list-style-type: none"> <li>Holiday allowances currently incorporated into several salary slips (as per national law) would be removed to display a more accurate basic salary for</li> </ol>

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	<p>further analyses and comparisons at Client side. It was agreed that any changes to basic salaries should not affect the resulting remuneration rates, meaning that multipliers would be adjusted accordingly</p> <p>2. Bonus currently included in some salary slips would be removed. This would result in a reduced remuneration rate</p>
<b>Actions</b>	The Consultant would submit revised breakdown of remuneration rates and change social charge and overhead cost for DELTARES to demonstrate that the current remuneration rates are not affected by any changes to the basic salaries, the argument being that the Consultant shall be able to recover costs as per RFP.
<b>Topic</b>	<b>Social and overhead multipliers</b>
<b>Deliberation</b>	<p>The Client and the Consultant agreed to use average overhead cost and social charge rates for the years 2012-2014 for DELTARES, knowing that the most recent values for 2015 are greater. On this basis, the Consultant updated the applied social charge and overhead cost rates in the budget, resulting in a tangible cost reduction.</p> <p>The Client questioned the social charge applied by the Consultant and asked that supporting financial information about amounts behind presented percentages be provided.</p>
<b>Actions</b>	The Consultant promised to send supporting information on social charge accompanied by an accountancy statement, if needed.
<b>Topic</b>	<b>Profit margin</b>
<b>Deliberation</b>	The Client requested the Consultant to further reduce the fee to 5%. The Consultant replied that very significant discounts have been offered already, and that further reductions would not be possible.
<b>Actions</b>	To be discussed and agreed upon
	<b>3. Reimbursable costs</b>
<b>Topic</b>	<b>Per diem and accommodation</b>
<b>Deliberation</b>	The Client had previously indicated that escalation cannot be applied to per diem and accommodation rates proposed by the Consultant. The Consultant agreed that per diem and accommodation rates could be exempt from escalation, provided all such costs can be kept within the ceiling budget allocated towards this purpose.
<b>Actions</b>	None
<b>Topic</b>	<b>PhDs</b>
<b>Deliberation</b>	<p>The Client queried about the costs of the proposed PhDs. In the Technical and Financial Proposal the Consultant has suggested the following:</p> <ol style="list-style-type: none"> <li>One PhD sourced from IWM, with salary from IWM, to work with IHE, The Netherlands on project related subject and results to be used in the project.</li> <li>One PhD sourced from the American universities, with salary, to work with Steve Goodbred on the project related subject and result to be used in the project.</li> </ol> <p>The Client wondered if a person could be sourced from the Client's organization instead of IWM to increase Client capacity. The Consultant replied the following:</p> <p>(i) Both PhDs are critical to ensure that all project entities remain committed to the project, and that work can be delivered in accordance with the TOR;</p>

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	(ii) Capacity building is an integral and highly important part of the project. The Consultant has proposed an extensive set of workshops, training classes and on-the-job training activities to ensure that the Client will have required capacity
<b>Actions</b>	None
<b>Topic</b>	<b>Issues related to equipment</b>
<b>Deliberation</b>	Not discussed
<b>Actions</b>	To be appropriately incorporated in the Contract
	<b>4. Service Contract</b>
<b>Topic</b>	<b>Proposed changes</b>
<b>Deliberation</b>	Following a prior request per email dated 12 January 2017, the Consultant presented the same list of requested changes to the service contract. These included a high priority request for limited liability.
<b>Actions</b>	To be discussed later.
	<b>5. Budget (not on agenda)</b>
<b>Topic</b>	<b>Available budget</b>
<b>Deliberation</b>	The Consultant informed, that with the current USD exchange rate, the budget USD equivalent value is 9.7 million, excluding VAT, income Tax (IT) and contingencies (50 million BDT). The Client informed that the available budget is 9.13 million USD equivalent including VAT, IT and contingencies. Possible approaches to resolve the shortfall were discussed.
<b>Actions</b>	To be agreed upon
<b>Topic</b>	<b>Taxes</b>
<b>Deliberation</b>	The Client indicated that VAT and IT shall be applied on the total amount of the contract. The VAT was 15% and the IT 10% at the time of proposal submission, but IT has now been increased to 20%.
<b>Actions</b>	It would be incorporated in the contract.
<b>Topic</b>	<b>Need for security measures</b>
<b>Finding</b>	The Consultant raised a concern about the recent security issues in Bangladesh and asked the Client to assess this during the contract performance and provide for security as requested by the Consultant. The Client in response explained that Police provides security as and when requested by foreign personnel working in Bangladesh.
<b>Actions</b>	To be further discussed later.

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#### CEIP-1 S4: Minutes of Meeting of 23 January 2017

##### Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB)</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with Sub-Consultants: University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Mahfuzur Rahman -Additional Director General, BWDB*	Dr. Christian Grøn – DHI
Mr. Md. Delwar Hossain, Chief Engineer; and Project Director, CEIP-I, BWDB	Dr. Claus Skotner – DHI
Mr. I.A. Khan --International Technical Expert of Procurement Panel for CEIP-1	Dr.RanjitGalappatti – DHI
Mr. M. Aminul Haque --National Procurement Expert of Procurement Panel for CEIP-1	Mr. TjitteNauta – DELTARES
Mr. A.K.M. Bodruddoza -Procurement Specialist, CEIP-1	Mr. Zahir-ul-Haque Khan – IWM
Mr. Narayan D. Sharma-International Procurement Specialist of Procurement Panel for CEIP-1	

\*Present in the meeting for 1 hr 30 minutes

##### Summary of Discussions

Topic	Appreciation of the Consultant's Technical Proposal
Introduction	Following the formal opening of the meeting by the Additional Director General (ADG), the Consultant provided a brief overview of the updated Technical Proposal. The Client noted the Technical Proposal and the technical adaptations made during the negotiation process with due consideration to meeting the terms of reference (TOR).
Actions	The Client to review later.
Topic	Negotiation process
Deliberation	The Consultant gave an overview of the negotiation process from its start in April 2016 until now. The process has entailed numerous discussions on salary slips, base salaries, social and overhead costs, bonuses and holiday payments. As part of the process, the Consultant has provided revised financial documentation. The Client accepted this information as sufficient except for the reimbursable.

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	The Client further opined that the negotiations process should be concluded at the soonest.
<b>Actions</b>	Parties to expedite the negotiations.
<b>Topic</b>	<b>Negotiation status</b>
	The Consultant presented the latest revised financial proposal. It was noted that the financial proposal excluded the contingency (BDT 50 million) and all direct and indirect taxes. The Client informed that Income Tax (IT) 20% and VAT 15% totaling to 35% of the gross bill will be deducted at source before making the net payments to the Consultant.
<b>Deliberation</b>	The Client requested the Consultant to investigate the possibility for further cost reductions. The Consultant replied that the current budget has been cut to the bone given the ambitious objectives and expected deliverables. However, the Consultant agreed to submit a summary of a revised financial proposal by the end of the day.  The Client also asked if the Consultant could potentially increase the number of participants in the overseas study tours.
<b>Actions</b>	The Consultant will submit a summary of a revised final financial proposal considering the request for reductions and the need for additional participants in the planned overseas study tours.
<b>Topic</b>	<b>Elements of draft contract</b>
<b>Deliberation</b>	The Consultant requested that its liability be capped, initially to the contract amount. It was then suggested to limit the Consultant's direct and indirect liability to three times the paid remuneration of the contract. The Client assured to consider the request favorably.
<b>Actions</b>	The Client to include in draft contract development
<b>Topic</b>	<b>Contract completion process</b>
<b>Deliberation</b>	Once the Consultant has provided a revised summary of a revised final financial proposal, the Client will examine the offer. If acceptable, the Client will invite the Consultant to negotiate the draft contract.
<b>Actions</b>	The Client will initiate the process to establish a draft contract for the assignment immediately and complete on finalization of the financial proposal and invite the Consultant to participate, as needed.

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## CEIP-1 S4: Minutes of Meeting of 24 January 2017

## Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB)</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with Sub-Consultants: University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain, Chief Engineer; and Project Director, CEIP-I, BWDB	Dr. Christian Grøn – DHI
Mr. I.A. Khan -- International Technical Expert of Procurement Panel for CEIP-1	Dr. Claus Skotner – DHI
Mr. M. Aminul Haque - National Procurement Expert of Procurement Panel for CEIP-1	Dr. Ranjit Galappatti – DHI
Mr. A.K.M. Bodruddoza -Procurement Specialist, CEIP-1	Mr. Zahir-ul-Haque Khan – IWM
Mr. Narayan D. Sharma -- International Procurement Specialist of Procurement Panel for CEIP-1	

## Summary of Discussions

<b>Topic</b>	<b>Extension of proposal validity</b>
<b>Deliberation</b>	The Client and the Consultant discussed about the proposal validity. Based on the understanding that the contract negotiations would be successfully concluded and draft contract initiated within the current week, the Consultant offered to provide an extension of proposal validity until 31 March 2017. The Client is keen and indeed would make endeavor to complete the approval process within earliest possible time. However, the time for completing the internal formalities after obtaining WB's "No Objection" on draft contract till approval, requires about two and half months. In that event the Client requires the Consultant to extend its proposal validity accordingly.
<b>Actions</b>	Consultant to provide a written confirmation of extension of its Proposal Validity to the Client.
<b>Topic</b>	<b>Power of Attorney</b>
<b>Deliberation</b>	The Client requested the Consultant to provide fresh/renewed Power of Attorney to negotiate and sign the contract. The Consultant handed over a set of original of the required document to the Client.
<b>Actions</b>	None
<b>Topic</b>	<b>Financial Proposal</b>
<b>Deliberation</b>	The Client received the summary of the 3 <sup>rd</sup> revision of the Financial Proposal submitted by the Consultant the day before and asked the Consultant to provide further clarifications. The Consultant agreed to this.

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	The Client requested the Consultant to consider further reductions on fees. The Consultant regretted for not being able to consider the same.
	The Client and the Consultant discussed on overseas courses and study tours.
<b>Actions</b>	The consultant to reflect the above in the revised Financial proposal.
<b>Topic</b>	<b>Reimbursable expenses – R1 and R2 – International flights</b>
<b>Finding</b>	The Client noted the breakdown leading to the proposed number of international flights and agreed to the concept applied by the Consultant.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable expenses – R1 and R2– per diem days</b>
<b>Deliberation</b>	The principle of converting working days to Per Diem days was accepted by the Client.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable expenses – R3 and R4 – Accommodation and living expenses</b>
<b>Deliberation</b>	<p>The Client questioned the proposed unit rates for accommodation and living expenses associated with work in Bangladesh by the international experts. The Client requested the Consultant to lower down the rates to levels as currently contracted in international contracts including with the Consultants from EU and US countries grouping in the following groups:</p> <ol style="list-style-type: none"> <li>1. Accommodation and living expenses be amalgamated into a single line item as Per Diem.</li> <li>2. Per Diem rate to be established separately for work in Dhaka and outside Dhaka, to be lower for the latter.</li> </ol> <p>The Consultant accepted the above principle and argued that the rates should be based on current UNDP standards, supplemented by the Consultant's experience in Bangladesh.</p>
<b>Actions</b>	Rates to be discussed and agreed upon
<b>Topic</b>	<b>Reimbursable expenses – R5 – Software</b>
<b>Deliberation</b>	The Client suggested that the cost of Software be paid as per actual cost up to a ceiling amount. It was agreed to change "I/s" to "Group Ceiling Amount" (see below under Logistic Costs) as explained in the footnote.
<b>Actions</b>	The Consultant would incorporate this into the updated Financial Proposal to be presented next day and later in the Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses – R6 – Printing, translation and reproduction</b>
<b>Deliberation</b>	The Client suggested that the cost be paid as a quarterly rate aligned with the payment schedule. The Consultant agreed to this. It was agreed that this item will be treated as a "I/s" item to be paid in equal "Quarterly instalment".
<b>Actions</b>	The Consultant would incorporate this into a revised Financial Proposal to be presented next day and later in the Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses – R17-R22 –Surveys (IWM)</b>
<b>Deliberation</b>	The Client asked the Consultant to provide a breakdown of the survey costs. The Consultant displayed a breakdown of these costs. The costs were discussed. IWM was asked to provide a further breakdown of these costs and an official certificate validating the applied unit costs. The Consultant accepted this.
<b>Actions</b>	The Consultant would incorporate this into a revised Financial Proposal to be presented next day, later in the Final Financial Proposal and provide a certificate from IWM on unit costs on survey programme conducted by IWM.

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<b>Topic</b>	<b>Reimbursable expenses – R2S – Project logistics in Bangladesh</b>
<b>Deliberation</b>	<p>The Client asked the Consultant to provide a breakdown of these. The Consultant displayed a detailed breakdown of these costs. To ensure that the proposed costs would be paid at actual cost and to ensure administrative flexibility and efficiency during project implementation, it was agreed to breakdown this cost item into the following:</p> <ol style="list-style-type: none"> <li>1. A group of items with monthly unit rates invoiced every quarter (item unit cost)</li> <li>2. A group of provisional items invoiced at cost up to the ceiling of the group (group ceiling cost)</li> </ol> <p>The Client also pointed out some of the items cost of which should be reduced.</p> <p>It was further agreed that the Consultant would revisit all remaining reimbursable costs items and ensure that these were documented in accordance with the above principle. The Client also noted that some per diem costs were presented in the breakdown provided by the Consultant on project logistics in Bangladesh. It was agreed to move this information to R3/R4.</p>
<b>Actions</b>	The Consultant would incorporate this into a revised Financial Proposal to be presented next day and later in the Final Financial Proposal.
<b>Topic</b>	<b>Direct and indirect liability</b>
<b>Deliberation</b>	<p>It was agreed that the contract shall include liability limited to three times the contract value. The wording shall follow the wording of the contract between the Client and another Consultant.</p>
<b>Actions</b>	Client to provide wording.
<b>Topic</b>	<b>JV registration</b>
<b>Deliberation</b>	<p>The Client informed that the Consultant would require to formally register the Joint Venture (JV) in Bangladesh. The Consultant accepted this.</p>
<b>Actions</b>	None
<b>Topic</b>	<b>Changes in special conditions of contract</b>
<b>Deliberation</b>	<p>The Consultant had previously requested a number of changes to the contract conditions. The Consultant waived these.</p>
<b>Actions</b>	None
<b>Topic</b>	<b>Security in Bangladesh</b>
<b>Deliberation</b>	<p>The Consultant raised a concern about the recent security issues in Bangladesh and asked the Client to assess this during the project and provide security for the Consultant. The Client in response explained that Police provides security as and when requested by foreign personnel working in Bangladesh.</p>
<b>Actions</b>	To be agreed upon
<b>Topic</b>	<b>Question on timing of professional liability insurance</b>
<b>Finding</b>	<p>Upon question by the Consultant, the Client informed that the Consultant will be requested to document the existence of its professional liability insurance after the contract signing and prior to commencement of Services.</p>
<b>Actions</b>	None

It was decided that the Consultant should provide a revised FIN-4 by end of the day for the Client to review 25<sup>th</sup> January 2017 morning and then to reconvene at 11:00.

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#### CEIP-1 S4: Minutes of Meeting of 25 January 2017

##### Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB)</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with Sub-Consultants: University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain, Chief Engineer; and Project Director, CEIP-1, BWDB	Dr. Christian Grøn – DHI
Mr. I.A. Khan- International Technical Expert of Procurement Panel for CEIP-1	Dr. Claus Skotner – DHI
Mr. M. Aminul Haque -National Procurement Expert of Procurement Panel for CEIP-1	Dr. Ranjit Galappatti – DHI
Mr. A.K.M. Bodruddoza -Procurement Specialist, CEIP-1	Mr. Zahir-ul-Haque Khan – IWM
Mr Narayan D. Sharma -International Procurement Specialist of Procurement Panel for CEIP-1	

##### Summary of Discussions

<b>Topic</b>	<b>Contractual issues</b>
<b>Deliberation</b>	The Consultant requested that the list of contractual issues submitted by the Consultant become part of the minutes. The Client accepted.
<b>Actions</b>	Consultant to append list to minutes.
<b>Topic</b>	<b>Direct and indirect liability</b>
<b>Deliberation</b>	The Consultant informed the Client that the liability capped to three times the contract amount exceeds the insurance of JV partner DELTARES. The Consultant proposed to the Client that the liability be capped to either, two times the contract value without Taxes or three times the contract remuneration value subject to not exceeding USD 20 million. The Client undertook to, look into it.
<b>Actions</b>	To be agreed upon
<b>Topic</b>	<b>Reimbursable expenses – R-1 and R-2 - flights</b>
<b>Deliberation</b>	The Client noted the number of proposed flights and the unit costs. It was agreed to maintain the current figures. Payment will be made at actual cost up to the ceiling.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable costs – R-3A and R-3B – per diem rates international expert working in Dhaka and in the field</b>
<b>Deliberation</b>	The Client and the Consultant agreed that the per diem rate for international staff working in Dhaka should be USD 120 per calendar day.

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	The Client and the Consultant agreed that the per diem rate for international staff working in the field should be USD 70 per calendar day.
<b>Actions</b>	Consultant to incorporate into Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable costs – R-4 – per diem rates national staff working in the field</b>
<b>Deliberation</b>	The Client and the Consultant agreed that the per diem rate for national staff working in the field should be BDT 3,200 per calendar day.
<b>Actions</b>	Consultant to incorporate into Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses – R-5 – software</b>
<b>Deliberation</b>	The noted and agreed on the proposed figure. Payment will be made at actual cost up to the ceiling.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable expenses – R-6 – printing, translation and reproduction costs</b>
<b>Deliberation</b>	The Client requested that the proposed figure be rounded as a lump-sum amount. The Consultant agreed to this. Payment will be made in "equal quarterly installment".
<b>Actions</b>	Consultant to incorporate change in Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses – R-7 – PhD in Europe</b>
<b>Deliberation</b>	The Client queried about the proposed PhD in Europe. The Consultant informed that the cost covers tuition costs for an IWM employee to go to IHE, the Netherlands, to do a PhD. IWM covers salary costs. The Client agreed to this and proposed that the cost be considered as lump sum "I/s" and that payments be effected according to a schedule to be defined.
<b>Actions</b>	Consultant to incorporate change in Final Financial Proposal (I/s only).
<b>Topic</b>	<b>Reimbursable expenses – R-8 – PhD in USA</b>
<b>Deliberation</b>	The Client queried about the proposed PhD in the USA. The Consultant informed that the cost covers grant and tuition fees for a student to go Colombia University, USA, to do a PhD. Subject to approval by the Client, the PhD student shall be identified by the Consultant, the Client and national stakeholders and other entities in Bangladesh. The Client agreed to this and also agreed, that the cost be considered as lump sum "I/s" as proposed by the Consultant based on the quotation it received from the Columbia University, and that payments be effected according to a schedule to be defined.
<b>Actions</b>	Consultant to incorporate change in Final Financial Proposal (I/s only).
<b>Topic</b>	<b>Reimbursable expenses – R-9 – overseas courses</b>
<b>Deliberation</b>	The Client queried about the proposed overseas courses. The Consultant informed that the staffs of Client's organization going to IHE, the Netherlands, to receive training in a range of engineering disciplines related to the project. The cost includes flights, accommodation and living costs in the Netherlands. The Client agreed to this and proposed that, payments be effected according to a schedule to be defined.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable expenses – R-10 – overseas study tours</b>
<b>Deliberation</b>	The Client queried about the proposed overseas study tours. The Consultant informed that the senior staff managers in the Client's organization travelling to Europe, including Denmark, Germany and the Netherlands, to observe first hand best engineering practices related to the project. The Client agreed to this and proposed that payment be effected according to a schedule to be defined.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable expenses – R-11 – workshops</b>
<b>Deliberation</b>	The Client queried about the proposed workshops. The Consultant informed that minimum twenty workshops would be anticipated given the complexity and duration

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	of the project and the need for stakeholder involvement, consultation and project outreach. The Client agreed to this and asked the Consultant to round the figure.
<b>Actions</b>	Consultant to incorporate change in Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses – R-12 – data procurement</b>
<b>Deliberation</b>	The Client queried about the proposed data procurement cost. The Consultant informed that the value was reduced during the earlier negotiations in April 2016. The cost is supposed to cover procurement of data, which is not freely available, for instance source through BWDB (Bangladesh Water Development Board), Hydrology, Morphology Directorates, BIWTA (Bangladesh Inland Water Transport Authority), Department of Meteorology, Survey of Bangladesh, Chittagong Port Authority, Mongla Port Authority or SPARSSO (Space Research and Remote Sensing Organization), to mention a few. The Client agreed that the payment will be made at actual subject to not exceeding the ceiling as in all other cases of "Group Ceiling Cost"
<b>Actions</b>	Consultant to improve wording in Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses – R-13 – miscellaneous and mobilization costs</b>
<b>Deliberation</b>	The Client queried about the proposed costs. The Consultant informed that the cost covers e.g. required visas, vaccinations, airport travel and other costs. The Client asked the Consultant to describe this in a revised document. The Client also asked to place this item next to the international travel (item R-2).
<b>Actions</b>	Consultant to improve wording in the Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable expenses - general comment</b>
<b>Deliberation</b>	For operational simplicity, it was agreed to round estimated unit costs, add descriptive header information to each group of costs, where not available already, and delete items that have previously reduced to zero as part of the negotiation process. Furthermore, discount lines shall be deleted and budget items reduced accordingly.
<b>Actions</b>	Consultant to incorporate change in Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable costs – R-15 - R-22 – survey activities by American universities and IWM</b>
<b>Deliberation</b>	The Client queried the unit costs and quantities of the survey activities and asked the Consultant to provide further details on each cost item, its currency and a cost breakdown where needed.
<b>Actions</b>	Consultant to submit a draft document tomorrow with improved explanatory wording, and to provide additional breakdown of cost items with the Final Financial Proposal. Consultant to incorporate improved wording in and add breakdowns to in the Final Financial Proposal and submit this within two weeks.
<b>Topic</b>	<b>Reimbursable costs – R-15A.1 – Bangladeshis to visit Lamont University</b>
<b>Deliberation</b>	The Client asked the Consultant to clarify the cost and the scope, and noted that the identification and selection of staff to visit Lamont University would be done in consultation with the Client and be subjected to Client approval. The Consultant agreed.
<b>Actions</b>	Consultant to improve wording in Final Financial Proposal.
<b>Topic</b>	<b>Reimbursable costs – R-23 – high performance computer</b>
<b>Deliberation</b>	The Client queried about the cost and the currency of high performance computing. The Consultant clarified that the cost covers purchase of number crunchers – modern high end computers – required for mathematical modeling purposes. The computers will be purchased by the Consultant in Bangladesh, used during the project and handed over to the Client on completion.
<b>Actions</b>	None
<b>Topic</b>	<b>Reimbursable costs – R-25 – Logistics (IWM)</b>

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<b>Deliberation</b>	The Client queried about the unit costs and quantities of the logistics and asked the Consultant to provide further details on each cost item.
<b>Actions</b>	Consultant to submit a draft document tomorrow with improved explanatory wording, and to provide additional breakdown of cost items with the Final Financial Proposal. Consultant to incorporate improved wording in and add breakdowns to in the Final Financial Proposal and submit this within two weeks.

It was decided to reconvene tomorrow at 13:00.

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## CEIP-1 S4: Minutes of Meeting of 26 January 2017

## Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB)</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with Sub-Consultants: University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. I.A. Khan -International Technical Expert of Procurement Panel for CEIP-1	Dr. Christian Grøn – DHI
Mr. M. Aminul Haque-National Procurement Expert of Procurement Panel for CEIP-1	Dr. Claus Skotner – DHI
Mr. Narayan D. Sharma International Procurement Specialist of Procurement Panel for CEIP-1	Dr. Ranjit Galappatti – DHI
	Mr. Zahir-ul-Haque Khan – IWM

## Summary of Discussions

Topic	Reimbursable expenses -- survey items by US universities and IWM
Deliberation	The Consultant presented the item description of the proposed reimbursable costs of all survey activities numbered R-15 through R-22. The Panel noted the description provided and the associated costs except for items R-15B.7, R-16A.2, R-16A.5 and R-16A.6 for which it requested the Consultant to provide proper and detailed description of these items.
	A general remark revolved around the fact that some of the universities have estimated costs in USD despite the fact that some of these will be in BDT. It was agreed that the expenditure which would be incurred in Bangladesh would be shown as BDT reimbursable cost and invoiced in BDT.
Actions	Consultant to incorporate the changes into Final Financial Proposal
Topic	<b>Reimbursable Items – R-1 – R-14 and R-23-R-25</b>
Deliberation	The Client noted other reimbursable items and accepted those with the recent changes made by the Consultant.
Actions	None
Topic	<b>Remuneration rates</b>
Deliberation	At the request of the Panel, the Consultant agreed to provide a set of remuneration rates proposed in the Consultant's proposal and those agreed upon for the contract.
Actions	Consultant to provide a table listing remuneration rates from its proposal and as agreed during negotiations.
Topic	<b>Contract issues</b>
Deliberation	The Consultant has previously provided a list of proposed modifications to the special conditions of contract, please refer to Appendix of these minutes. The proposed list was discussed and only the one related to the Consultant's liability was considered for acceptance, which would be incorporated in the draft contract for review and approval of the competent authority.
Actions	None

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**Appendix– The Consultant's Suggested Changes to Special Conditions of Contract**

Item	Reference	Issue	Suggested wording/addition to SC	Status
1	General	Joint Venture and/or its partners registration in Bangladesh	Clarification: Is registration required?	Yes
2	§18	Suspension	Add: 18.2 The Consultant may suspend work, if payments are not completed according to schedule	Not accepted by the Client, the Consultant can according to §19.1.3 terminate the contract if not paid.
3	§19	Termination	Delete: 19.1.1 e)	Not accepted by the Client.
4	§19	Termination	Add: 19.1.3 e) If the Client and the Consultant fail to agree upon the interpretation of the Contract, the Consultant may terminate the Contract.	Not accepted by the Client.
5	§22	Confidential information	Add: The confidentiality expires after 5 years	Not accepted by the Client
6	§23	Liability	Add: Limitation of the Consultant's Liability towards the Client to the total of the ceiling amount of the contract: (a) Except in the case of gross negligence or willful misconduct on the part of the Consultant or on the part of any person or a firm acting on behalf of the Consultant in carrying out the Services, the Consultant shall not be liable to the Client: (i) for any indirect, incidental or consequential loss or damage, loss of profit, loss of business, loss of value, loss of production loss of data or any other form of indirect loss or for any claims, losses or damages to or incurred by the Client or any third party if the Services have been amended in	The Consultant also discussed its liability limitations considering a cap of three (3) times the contract remuneration amount, two (2) times the contract amount without contingency and tax. Wording as the Contract on CEIP-1 with Royal HaskoningsDHV.  Considering the insurance limitation of DELTARES, the Consultant further requested the Client to allow USD 20 million cap of its liability towards the Client.  The Consultant's latest proposed cap of its liability

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Item	Reference	Issue	Suggested wording/addition to SC	Status
			<p>any way without the prior written consent of the Consultant or if the Services has been used for anything other than the specific and intended use for which the Services were created and delivered; and/or</p> <p>(ii) for any direct loss or damage that exceeds the total value of the Contract;</p> <p>(b) This limitation of liability shall not be construed as providing the Consultant with any limitation or exclusion from liability, which is prohibited by the Applicable Law.</p>	USD 20 million and the suggested wordings are under consideration by the Client; and if accepted, these would be incorporated appropriately in the contract for approval of the competent authority.
7	§24	Professional liability insurance	Clarification: We anticipate that the documentation need not be made available until project signing.	Yes
8	§24	Workers Insurance according to Bangladesh law	Modify: Workers insurance according to Consultants law.	Not accepted by the Client.
9	§27	IPR	Add: The preceding shall however not apply to any software (either in the form of source code, object code or executable versions), at any time owned, developed, created, modified improved and/or applied by the Consultant (hereinafter referred to as "Consultant's Software) Additionally any know-how, tools, scripts, methods and other intangible Intellectual Property Rights developed by the Consultant or ascertained by the Consultant in connection with performing the Services shall be the exclusive property of the Consultant. If needed, the Consultant shall grant to the Client a royalty-free, non-exclusive license, in accordance with the license conditions as determined by the Consultant, to the Client to use the Contractor Software or other Intellectual Property Rights	Not accepted by the Client.

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Item	Reference	Issue	Suggested wording/addition to SC	Status
			of the Contractors for purposes related to the Contract.	
10	§35	Security of staff	Add e): The Client will provide protection measures if required free of charge for the consultant.	The Client explained that this as a policy matter is dealt with by the Government. High Priority is given to security of foreign nationals working in the country. The Client cannot directly provide security measures. However, on request of Consultant, the Client can ask the local Police to provide protection.
11	§45	Approval of final report	Modify d): .. shall have been submitted by the consultant and approved as satisfactory by the client according to criteria agreed upon in advance by the client and the consultant ...	Not accepted by the Client.

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Christian Gron  
Executive Director, OHI  
Signed by: Christian Gron

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## Minutes of Meeting of 23 January 2018 12.00

## Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB) and on behalf of the Client the Procurement Panel</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain (BWDB Project Director CEIP-I)	Mr. Christian Grøn – DHI
Mr. I.A. Khan (International Technical Expert)	Mr. Claus Skotner – DHI
Mr. A.K.M. Bodruddoza (Procurement Specialist)	Mr. Alessio Giardino – DELTARES
Mr. Narayan Sharma (International Procurement Specialist)	Mr. Zahir-ul-Haque Khan – IWM
Jakaria Pervez (BWDB)	Abu Saleh Khan (IWM, Deputy Executive Director)
Kabir Ahmed (Additional Director, Accounts, BWDB)	

## Summary of Discussions

<b>Topic</b>	Overall adjustment in activities and allocated man-months by the Consultant to carry out the proposed work
<b>Finding</b>	<p>Q)</p> <p>The Client raised concerns that the reduction in man-months and activities by the Consultant, as required by the Client during previous negotiations, and reflected in the revised proposal (v. November 2017), have been very significant. The Client requested revisiting all items in the technical and financial proposal in order to re-include some of the activities which had been deleted or reduced, considering desirability to achieve the objectives and quality output of the study.</p> <p>A) The Consultant agrees. The revision of required items in the technical and financial proposals, also including the Proposal Adaptations document</p>
<b>Action</b>	Consultant to make necessary changes
<b>Topic</b>	"Proposal Adaptations" document not in the Contract
<b>Finding</b>	<p>Q) The Client suggests to have this document reflected in the Minutes of the discussion but not as integral part of the contract.</p> <p>A) The Consultant suggests to have the document "Proposal Adaptation 3rd Version" in Annex of the Minutes and as integral part of the contract. This will</p>

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	make the entire process of proposal adaptation more transparent.
Action	The Consultant to revise the Proposal Adaptation document which will then be included in Annex of the Minutes of Negotiations January 2018.
Topic	<b>Number of field days for international experts (Proposal Adaptation – Component 2)</b>
Finding	<p>Q) The client indicated the importance of data collection and quality assurance for the project. The client expressed concerns that the number of field days for international experts in the revised proposal FIN-4 (v. November 2017) and equal to 299 days is not sufficient for quality and reliable data collection considering improved methods. The Consultant agreed to increase field days of international experts from 299 to 670 days adjusting without changing the total days.</p>
Action	The Consultant to increase the number of allocated field days for international experts to 670. Number of field days in FIN-3 and FIN-4 are to be made consistent.
Topic	<b>A computer workstation has been deleted (Proposal Adaptation – Component 3)</b>
Finding	<p>Q) The client would like to understand if/how the work can be carried out by removing this workstation.</p> <p>A) The Consultant explained that these costs have been removed to reduce costs and that data processing can be done free-of-charge in the US.</p> <p>The client suggested that data processing shall be carried out also in Bangladesh involving the professionals of BWDB and others; this will enable to develop the skill and knowledge of the Bangladeshi professional which is one of the objectives of the research project. Consequently, the workstation to be purchased and installed in CEIP-1 project in Bangladesh.</p>
Action	The consultant to include the workstation again, as the Client find computer capacity available in Bangladesh is important
Topic	<b>SET Table Surveys Reduction from 24 to 16 installations (Proposal Adaptation – Component 3)</b>
Finding	<p>Q) The client would like to understand the consequence for this reduction and whether it is possible to increase this number back to 24.</p> <p>A) The Consultant suggests that the current number of installation is adequate to the project in hand.</p>
Action	None
Topic	<b>PhD costs (FIN-4 R7 and R8)</b>
Finding	Unit in the table is wrong.
Action	The Consultant to correct Unit in the table
Topic	<b>PHD costs US (FIN-4 R8)</b>
Finding	<p>Q) Original costs for one PhD cost US for 5 years was 153, 750 USD, in the revised proposal is 217,724 USD</p> <p>A) The Consultant to check costs for the PhD student</p>
Action	Consultant to check cost for one PhD student US
Topic	<b>One additional PhD costs from BWDB to IHE (FIN-4 R7)</b>
Finding	Q) The Client requests to increase the number of PhD students at IHE to 2. This will allow having one PhD student from BWDB at IHE, considering the desirability

	of capacity building BWDB engineers to take over this highly advanced research study with a basic salary paid for 2 years by BWDB in Bangladesh.
	A) The Consultant agrees.
Action	The Consultant to add one additional PhD at IHE. Costs are 130,000 Euros, including tuition fees for 4 years and basic salary for the student for a period of 2 years.
Topic	<b>Overseas courses at IHE at a cost of 75,000 Euros (FIN-4 R9)</b>
Finding	Q) The Client would like to understand what is exactly included as part of this cost item. The Client emphasised the need of capacity building of BWDB professionals. Considering this fact, the Client requested to increase the number of participants to these courses from 5 to 20 persons. Training may be conducted in 1 to 3 batches.  A) The Consultant confirms that this figure is a maximum ceiling. Details on how money will be spent will be provided before incurring these expenses. The number of participants attending the overseas courses will be increased to 20.
Action	The consultant to increase the number of participants from 5 to 20. Price is increased accordingly from 75,000 Euros to 300,000 Euros
Topic	<b>Overseas study tours (FIN-4 R10)</b>
Finding	Q) The Client requested to include overseas training in the US, considering development of skill and knowledge in relevant discipline.  A) The Consultant agrees and will increase the budget for this activity accordingly.
Action	The Consultant to include overseas tours to US as part of this activity. The budget is increased accordingly from 25,000 Euros to 55,000 Euros.
Topic	<b>Workshops (FIN-4 R11)</b>
Finding	Q) It was discussed and agree that in addition to workshops national training courses should be provisioned. The Client agreed to appropriately increase the budget for this activity.  A) The Consultant agrees.
Action	The Consultant to increase budget for this activity. The Consultant advised to increase from 7,700,000 to 8,800,000 BDT
Topic	<b>Travel budget Bangladeshi Nationals to visit Lamont (FIN-4 R15-A1)</b>
Finding	Q) Inclusion of Dhaka University and IWM in this activity is not explained.  A) The Consultant agrees to remove these.
Action	The Consultant to remove Dhaka University and IWM from this item. BWDB will associate other stakeholders with this activity as required.
Topic	<b>Archiving GPS data (FIN-4 R-15B.5) Also include BWDB</b>
Finding	Q) The Client requested to have BWDB included here.  A) The Consultant agrees.
Action	The Consultant to update the description of this activity accordingly.
Topic	<b>Costs for all items between R15 to R25 (FIN-4) are all provided in USD</b>

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<b>Finding</b>	Q) The Client stated that for items purchased in Bangladesh, currency should be specified in BDT instead of USD  A) The Consultant agrees.
<b>Action</b>	The Consultant to check all items costs and for items purchased solely in Bangladesh, costs are expressed in BDT.
<b>Topic</b>	<b>Bathymetric surveying is reduced by 30% and suspended sediment sampling by 70% (Proposal Adaptation – Component 3)</b>
<b>Finding</b>	Q) The Client asked to check that reduction in activities are made consistent with related survey activity.
<b>Action</b>	The Consultant to check consistency in FIN-4 for this item
<b>Topic</b>	<b>Directional wave height measurement equipment will not be purchased (Proposal Adaptation – Component 3)</b>
<b>Finding</b>	Q) The Client would like to understand the possible implications for the project of not having a wave buoy installed.  A) The Consultant explained that a wave buoy is not required to achieve the overall objectives of the study.
<b>Action</b>	None
<b>Topic</b>	<b>FIN-4: R25-A7 (car) + R25-A8 (microbus)</b>
<b>Finding</b>	Q) In order to have smooth operations of the project activities, Consultant requested to have two cars included in the project. The total period should be 30 months instead of 32.  A) It was agreed upon.
<b>Action</b>	The Consultant to revise FIN-4 accordingly
<b>Topic</b>	<b>FIN-4: footnotes</b>
<b>Finding</b>	Q) After some discussion the number of footnotes at the end of the table were aimed to be rationalized removing some irrelevant ones in order to differentiate between items reimbursed at costs and fixed rates
<b>Action</b>	The Consultant to revise the footnotes accordingly.
<b>Topic</b>	<b>Data Storage and Data Dissemination (Technical Proposal – Component 3)</b>
<b>Finding</b>	Q) The Client would like to understand how data will be stored and disseminated during the project.  A) The Consultant confirmed that a Sharepoint system will be set up. The project will not develop a new ad-hoc and interactive Water Information System.
<b>Action</b>	None
<b>Topic</b>	<b>A postdoctoral fellow was budgeted at Columbia University full-time with 50% cost-sharing of the Lamont Earth Institute. This cost-sharing has now been cancelled and the research tasks transferred to the national experts (Proposal Adaptations – Component 3)</b>
<b>Finding</b>	Q) The Client requested to check whether this item is still in the Technical Proposal.  A) The Consultant confirmed that this item will be checked.
<b>Action</b>	The Consultant to check consistency of the Technical Proposal on this item.

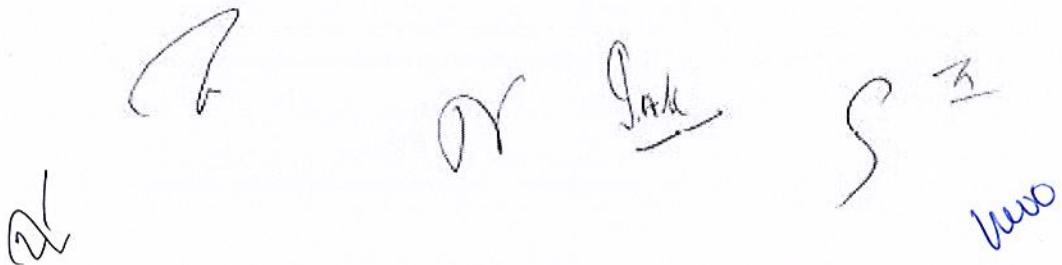
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<b>Topic</b>	<b>International contribution to sediment sampling has been removed, transferring SSC sampling and assessment of tidal channels deposition to national experts (Proposal Adaptations – Component 3)</b>
<b>Finding</b>	<p>Q) The Client asked to rephrase this sentence</p> <p>A) The sentence has been rephrased as follows: "for Sediment sampling international expert will be involved in data collection along with the national experts, including SSC sampling and assessment of tidal channels deposition."</p>
<b>Action</b>	Consultant to adjust the field days as required.
<b>Topic</b>	<b>Data procurement costs have been reduced, but an amount for this item has been maintained and furthermore, secondary data procurement in Bangladesh was included under the national sediment sampling reimbursables (Proposal Adaptations – Component 3)</b>
<b>Finding</b>	Q) The Client requested to rephrase this statement.
<b>Action</b>	The sentence has been rephrased as follows: "Data procurement costs is reduced, and adjusted with secondary data procurement in Bangladesh was included under the national sediment sampling reimbursables."
<b>Topic</b>	<b>Modelling software costs (Proposal Adaptations – Component 3)</b>
<b>Finding</b>	<p>Q) The Client stated that some of these software and models will be available at BWDB also after the completion of the project.</p> <p>A) The Consultant agrees and has included in the project budget provisions for permanent software procurement with licenses at original budget</p>
<b>Action</b>	The Consultant to include costs for software procurement and licence for MIKE and Delft3D software in the proposal.
<b>Topic</b>	<b>Number of statistical tests for climate change scenarios (Proposal Adaptations, Component 4)</b>
<b>Finding</b>	<p>Q) The Client would like to increase the number of statistical tests for climate change scenarios from two to three.</p> <p>A) The Consultant agrees. This will result in a time increase of 1 month for expert INK-28</p>
<b>Action</b>	The Consultant to increase the time for expert INK-28 from 1.0 man-month to 2.0 man-months
<b>Topic</b>	<b>Update of design strategies for polder and dyke functional and conceptual design (Proposal Adaptations, Component 6)</b>
<b>Finding</b>	<p>Q) The Client questioned whether innovative project findings will be included in order to derive update criteria to improve conceptual and functional polder and dyke design.</p> <p>A) The Consultant agrees that current method of polder and dyke design will be reviewed and provide new and innovative method of designing the polders and dykes.</p>
<b>Action</b>	The Consultant will ensure the above deliverable.
<b>Topic</b>	<b>"Action Plan for Capacity Building of Professionals and Stakeholders in Planning, Design, Construction Supervision and Management of Polders" (Proposal</b>

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	<b>Adaptations, Component 8)</b>
<b>Finding</b>	Q) The Client raised concern about activities associated with capacity building of the BWD8. Such items were discussed in detail and changes agreed to to ensure that Client's concerns were adequately addressed  A) The Consultant agrees.
<b>Action</b>	The Consultant to update this section.
<b>Topic</b>	<b>PhD under Proposal Adaptation (Component 9)</b>
<b>Finding</b>	Q) The Client pointed out this this item is not relevant to component 9.  A) The Consultant agrees.
<b>Action</b>	The Consultant to remove the statement from this Component
<b>Topic</b>	<b>Maximum number of man-months of the different experts in FIN-3 from 30 to 28</b>
<b>Finding</b>	Q) The Client requested to limit the maximum number of man-months from 30 to 28 except DTL, to account for vacation time of the different experts included as full-time in the project  A) The Consultant agrees
<b>Action</b>	The Consultant to make appropriate changes to FIN-3
<b>Topic</b>	<b>Split between time at site and in Dhaka under Field (FIN-3)</b>
<b>Finding</b>	Q) The Client requested to split the number of man-months in the field between time in Dhaka and at site.  A) The Consultant confirms that this split can be made individually for national experts only. During inception phase it will be discussed how to distribute time of individual international experts between time at site and in Dhaka, but with at the least 670 days outside Dhaka.
<b>Action</b>	The Consultant to adjust time in the field for individual international and national experts only
Subsequent meeting scheduled for 24 January 2018, 16.00 pm at Client premises.	


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## Minutes of Meeting of 24 January 2018

## Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB) and on behalf of the Client the Procurement Panel</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain (BWDB Project Director CEIP-I)	Mr. Christian Grøn – DHI
Mr. I.A. Khan (International Technical Expert)	Mr. Claus Skotner – DHI
Mr. A.K.M. Bodruddoza (Procurement Specialist)	Mr. Alessio Giardino – DELTARES
Mr. Narayan Sharma (International Procurement Specialist)	Mr. Zahir-ul-Haque Khan – IWM Abu Saleh Khan (IWM, Deputy Executive Director)

## Summary of Discussions

<b>Topic</b>	<b>Meeting between the top management of BWDB, DHI, Deltares and IWM</b>
<b>Finding</b>	Q) The Consultant suggested that, before final approval and signature of the contract, a meeting should be held between the top level managers of DHI, Deltares, and BWDB. The meeting will serve to get a common understanding on project and risks involved.
	A) The Client agrees.
<b>Action</b>	The Client to notify for a meeting with top managers of the three organisations before final approval and signature of the contract.
<b>Topic</b>	<b>Review of FIN-3 according to the items discussed during the meeting on the 23-January 2017</b>
<b>Finding</b>	All revisions to the financial proposal, as discussed on the 23-Jan-2018, were analysed and agreed with the client.  The changes are reflected in TECH-6, FIN-3 and FIN-4.
<b>Action</b>	The Consultant to implement agreed changes to TECH-6, FIN-3 and FIN-4.
<b>Topic</b>	<b>Proposal Adaptation – 4<sup>th</sup> Version</b>
<b>Finding</b>	All revision to the Proposal Adaptation document – 4 <sup>th</sup> version, as discussed on the 23-Jan-2018, were analysed and agreed upon.
<b>Action</b>	None
<b>Topic</b>	<b>Draft Contract</b>

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#### IV. Appendices

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<b>Finding</b>	<p>The draft Contract has been analysed jointly by the Client and the Consultant.</p> <p>The following modifications to the contract have been agreed between the Client and the Consultant:</p> <ul style="list-style-type: none"> <li>- The contract will be signed by Christian Grøn (OHI) on behalf of the Joint Venture (DHI-Deltasres)</li> <li>- Consultant liability (23.1) and professional liability (24.1) are limited to 16 Million Euros</li> <li>- Updated values from financial proposal to be included as part of 41.2</li> </ul> <p>Additionally, a number of minor (textual) modifications have been suggested.</p>
<b>Action</b>	<ul style="list-style-type: none"> <li>- DHI-Deltasres to send a fresh Power of Attorney to the Client authorising Christian Grøn to sign of the contract on behalf of the said JV.</li> <li>- The Consultant to provide the Client with additional explanation about the index for price adjustment of remuneration for NL (42.3).</li> </ul>
<b>Topic</b>	<b>Budget allocation and approval being processed</b>
<b>Finding</b>	<p>It is noted by the client, that as per the latest cost estimate the required budget for this service recalculated by the Client to BDT is BDT 1,209.00 million, but the approved budget allocation in the DPP is BDT 720.09 million (including BDT 50 million contingency). A process has been initiated to increase the allocation to the required amount of BDT 1,209.00 million. The Client is hopeful that this will be approved. However, in the event the budget is not increased, then the parties shall jointly develop and agree a strategy to complete the contract within the approved allocated budget in the DPP, ensuring the delivery of reasonable essential deliverables and salvaging the data and materials etc. for future utilization.</p> <p>The closing strategy shall also ensure that the contractually due payments to the Consultant for the up to date services provided shall be covered in full.</p>
Subsequent meeting scheduled for 25 January 2018, 10.00 am at Client premises.	

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## Minutes of Meeting of 25 January 2018 10.00

## Meeting Participants

<b>Client: Bangladesh Water Development Board (BWDB) and on behalf of the Client the Procurement Panel</b>	<b>Consultant: JV of DHI (lead) and DELTARES, in association with University of Colorado, Columbia University and Institute of Water Modelling (IWM)</b>
Mr. Md. Delwar Hossain (BWDB Project Director CEIP-I)	Mr. Christian Grøn - DHI
Mr. I.A. Khan (International Technical Expert)	Mr. Claus Skotner - DHI
Mr. A.K.M. Bedruddoza (Procurement Specialist)	Mr. Alessio Giardino - DELTARES
Mr. Narayan Sharma (International Procurement Specialist)	Mr. Zahir-ul-Haque Khan - IWM Abu Saleh Khan (IWM, Deputy Executive Director)

## Summary of Discussions

<b>Topic</b>	<b>Budget ceiling for car and minibus</b>
<b>Finding</b>	Q) The Client requested to return to the original ceiling budget for car and microbus, respectively down to 60,000 BDT/month/car and 65,000/month.  A) The Consultant agreed.
<b>Action</b>	The Consultant to update the financial proposal accordingly.
<b>Topic</b>	<b>Agreement on Minutes of current negotiation session (23-24 January 2018)</b>
<b>Finding</b>	Q) The Client provided comments and corrections on minutes of current negotiation session (23-25 January 2018)  A) The Consultant verified comments and correction on the minutes and finalized the minutes
<b>Action</b>	None
<b>Topic</b>	<b>Initialisation of Draft Contract</b>
<b>Finding</b>	The Draft Contract documents were initialised
<b>Action</b>	None

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Appendix

Bangladesh Morphology and Climate Adaptation, Coastal Embankment Improvement Project, Phase-I (CEIP-I)

**Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone (Sustainable Polders Adapted to Coastal Dynamics)**

**Proposal Adaptations, 4<sup>th</sup> version**

This appendix to the minutes of negotiations summarizes the adaptations made during contract negotiations from April 2016 to January 2018.

The adaptations reflect the reduced costs and project period needed, as well as the implementation of those suggested by the Consultant and agreed upon with the BWDB and the Procurement Panel during negotiations. The adaptations maintain the overall objective of the RfP and the original Proposals but adapt the approach of work and compress the project work in time. Accordingly, the adaptations constitute an integrated part of the contract and takes precedence, to the extent stated therein, over the original Proposals.

In order to adapt the proposals and deliver the key deliverables of the RfP with reduced budget and project period, an adjusted project approach has been necessary. The project delivery has been optimized, removing all non-essential activities, allowing for work in parallel rather than sequentially, emphasizing establishment of data collection equipment, methods and competences, providing model ensembles and deriving first generation recommendations prepared for subsequent continuous improvement.

The adaptations made are summarized below under the following headers:

- A. Fees
- B. Remuneration
- C. Reimbursables
- D. Reduction in project period
- E. Adaptation details

**A. Fees**

During the negotiations, concerns were raised with respect to the overall fee and to rates of identified international experts. Accordingly, the Consultant has offered and implemented the following fee reductions:

- Reduction of management fee to 2.5% for all sub-Consultants
- DHI agent fee reduced to half and covered by the Consultant
- Bank guarantee costs transferred from reimbursables to coverage by the Consultant fee, thus reducing the realized Consultant fee accordingly
- Harmonization of all international fees to 7.5%, 21.7% for the team leader
- Discretionary discount on the fee for two international experts, professor Zheng Wang and Professor Dano Roelvink, from 7.5% to 5%
- Reduction of the R&D fee on national experts from 10% to 5%

#### B. Remuneration

During negotiations, it was suggested to reduce the number of man months to be devoted to the project, as compared to the indicative list given in the Terms of Reference, if this could serve to reduce the costs while still achieving the key project objectives, applying reassignment among, reduction in and salary/overhead/social charges cuts for national and international experts:

- Activities that are not essential for fulfilling the overall objectives have been deleted with staffing revised to optimize efficient delivery.
- The capacity building nature of this project has been emphasized to an approach with international experts responsible for transfer of knowledge, and national experts providing most of the work in the field.
- To allow for this without increasing project risks, the technical and management/coordination capacity has been strengthened.
- The Team Leader salary has been reduced to the latest documented salary
- Reduction of overhead and social charges on national experts to 95% and 29%, respectively
- Application of 2016 basic monthly salary instead of 2015 values with 2% escalation added
- Transfer of remuneration escalation 2017-20 to coverage by provisional contingencies
- Away from headquarters allowances have been harmonized at a lower level

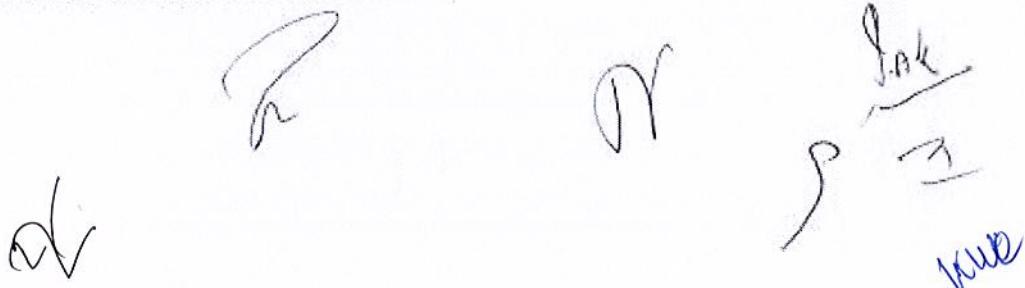
In response to the requested reduction in remuneration and project period, the input was reduced further to 159.6 international expert months and 578 national expert months.

#### C. Reimbursables

The budget for reimbursables was scrutinized during the negotiations. The following reductions have been implemented:

- Reduction in flight, accommodation and living expenses
- Commitment of salary from IWM and BWDB for the overseas PhDs in the EU and reduction to 1 in the US
- Reduction in field equipment and services
- Data procurement reduced
- Reduction in printing, translating and reproduction
- Reduction in logistics in Bangladesh
- Reduction of miscellaneous and mobilization costs
- Removal of reimbursable escalation 2016-20

Among the reductions are in particular transfer of operation of monitoring activities from international to national staff listed under remuneration.



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D. Reduction in project period

The reduction in project period has been complied with implementing the following adaptations:

- Derived reduction in costs for logistics, support staff, rentals and operations
- Redistribution and reduction of field survey staffing
- Allowing for work in parallel rather than sequentially
- Emphasizing establishment of data collection equipment, methods and competences
- Providing workable model ensembles
- Deriving first generation recommendations
- Providing capacity building for post-project subsequent continuous improvement

In response to the requested reduction in project period and the derived parallel field data collection and modelling/analysis, a continuation after project period will enhance credibility and applicability of the project outcome.

E. Adaptation details

These adaptations are further detailed by component as described in the technical proposal, below.

*Component 2 –Literature review*

Input of international experts in data collection has been reduced, which results also in savings of travel time.

*Component 3: Development of input datasets for modelling the physical processes*

Overall, the monitoring activities have been optimized from a very ambitious, research focused data sampling program to a level, which can adequately support the modelling work. The reduced project period has reduced number of data points in time as consequence and for some measurements, data will be compiled for modeling, before stabilization of newly installed equipment is complete. To mitigate the effects to the extent possible, building upon previous data collection campaigns and knowledge of critical data gaps will be applied. During project inception and implementation, the monitoring activities may need adjustment within the project activities, and model uncertainties will be reviewed to reveal needs for future monitoring beyond the present project.

Control of data quality for available and project produced data is an initial and inherent part of all data analysis and derived modeling, including review of applied methods.

SET tables surveys have been reduced from 24 to 16 installations. GPS survey for subsidence and INSAR calibration has been reduced from 7 installations to 4 installations. Borehole survey is reduced from 120 to 80 locations. Sediment field data collection will be in 2 seasons, not in 4-5 seasons. Field logistics costs have been reduced, assuming the Consultant project office will provide cars for field transportation.

Bathymetric surveying is reduced by 30%.

Number of tidal discharge measurements of Gangril by ADCP reduced from 60 to 44.

Number of vertical sediment samples at Brahmaputra River reduced from 1,080 to 1,056.

Reports and data will be shared via a SharePoint site accessible for different project users and the client, substituting development of a new specific and interactive Water Information System.

Sediment sampling has been transferred to national experts, including SSC sampling and assessment of tidal channels deposition.

Data procurement costs is reduced, and adjusted with secondary data procurement in Bangladesh was included under the national sediment sampling reimbursables.

Software costs have been included to cover database software for the BWDB database and for software for BWDB after project completion. Modelling software (licenses and dongles) will be available at IWM and at the project office for the duration of the project as required for project delivery.

*Component 4: modelling of the Long-Term Physical Processes in the Coastal Zone of Bangladesh*

Overall, some research focused, duplicate efforts have been removed, as these were more of a scientific than a practical importance. Efforts have been focused with respect to scenarios in order to attain the information required for the purpose of the project, although with reduced resolution.

There was overlap in the proposed two mesoscale modeling systems Delft3D and MIKE, focus will now be on Delft3D, whereas intermodel comparisons will not be implemented, and new development in MIKE is omitted.

Microscale modeling will be done with the MIKE model with simulations done in depth-averaged mode. Selected typical events will modeled, and the number of polder scenarios modelled will include five representative optimization scenarios.

Three different statistical tests will be implemented to analyze trends in rainfall data from historical datasets.

Storm surge and salinity modeling has been optimized to include ongoing work within IWM and the CEIP overarching project. The proposed 3D model development for salinity intrusion will be omitted.

Directional wave height measurement equipment will not be purchased and applied and accordingly, wave modeling will be based on available offshore data combined with currently available near-shore model only.

The amount reserved for purchase of high performance computer and computer time was reduced. Colorado University has kindly offered free of charge that calculations requiring high performance can be provided by them, standard number crunchers will be purchase and applied in addition, allowing calculations done in Bangladesh.

*Component 5: Finalisation of Approach for Reconstruction of the Polder at Different Coastal Zones, including their Phasing and Construction Program*

Design for a fixed number of 3 polders will be delivered. Also, the task proposed to make polder socio-economic mapping for 139 polders will be adapted to focus especially on the 17 selected polders of CEIP-1.

#### IV. Appendices

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*Component 6: Updating of Design Parameters and Specifications for Planning and Design Works and Management Practices of the Polders including Development of Performance Monitoring Mechanism.*

Overall, the focus of update of design will be on the design strategy and functional/conceptual design. Based upon the project findings and with some leverage of ongoing work in the overall CEIP project, methods for design will be reviewed, and updates of guidelines with new methods suggested as pertinent.

The strategy for the most efficient stakeholder meeting number and format will be decided in the inception phase.

*Component 7: Investment plan for the entire CEIP*

The objective is to enable an investment plan for coastal embankment improvement for the coastal area considering a polder a robust economic unit in terms of long-term sustainability. This will be exemplified based on the selected 17 polders.

*Component 8: Action Plan for Capacity Building of Professionals and Stakeholders in Planning, Design, Construction Supervision and Management of Polders*

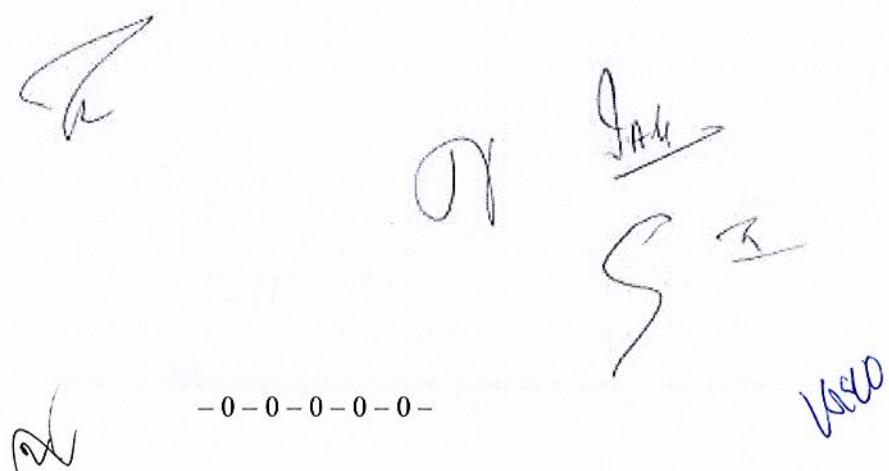
In the EU, one PhD will have salary paid for by the BWDB 2 out of the 4 years, and the second PhD is expected to be a national key or non-key IWM expert with salary covered under remuneration.

In the US, one PhD has been omitted.

For both PhDs, all costs must be invoiced and paid within the project period, irrespective of *de facto* completion dates.

*Component 9: Outreach program and communication strategy towards transparency and accountability*

None.

  
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