

# MOU FOR CONSULTANCY SERVICES FOR MORPHOLOGICAL STUDIES OF RIVERS MAHANADI, MAHANANDA AND HOOGLY USING REMOTE SENSING TECHNIQUE

## PREAMBLE

Central Water Commission (CWC) desires for the Morphological Studies on various Indian Rivers using Remote Sensing Technique. In this connection, CWC approached IITs/NIT to carry out the above studies and in-principle, they have agreed to do the studies. In the first meeting of "Consultancy Evaluation –Cum- Monitoring Committee (CEMC)" with IITs/NIT, the objectives and detailed scope of works were finalized. Accordingly, IITs/NIT were requested to submit their consultancy proposals. In response, IIT Kharagpur submitted the consultancy proposal for Morphological Studies of rivers Mahanadi, Mahananda and Hoogly using Remote Sensing Technique (hereinafter referred as work).

## 1. GENERAL & SPECIAL CONDITIONS OF THE MOU

Memorandum of Understanding (MOU) between Central Water Commission, Government of India (hereinafter called the CWC) represented by the Director, Morphology Directorate, on one part and Indian Institute of Technology Kharagpur (hereinafter called the IIT Kharagpur), on other part, on this day...3rd.....of month...March...of year....2016...

WHEREAS,

CWC has engaged Indian Institute of Technology Kharagpur for Consultancy services for Morphological Studies of rivers Mahanadi, Mahananda and Hoogly using Remote Sensing Technique.

Now, therefore in consideration of terms and conditions contained herein the parties hereto agree as follows:

- 1.1 It has been agreed by both the parties that the above said proposal with respect to awarded work, which has been accepted by CWC and conveyed, vide order No./.....dated..... and the same is deemed to form part of this MOU. No 4/19/2012/IIT KGP/Morpho/140-152 dated 18/3/2015
- 1.2 It is discussed mutually and agreed that CWC will arrange payment for the execution of the work to IIT Kharagpur as detailed in the Table-2 which is deemed to form part of this MOU.
- 1.3 In consideration of the payment to be made to IIT Kharagpur as hereinafter mentioned, IIT Kharagpur hereby covenant with the CWC that IIT Kharagpur will perform its duties with all reasonable skill, care and diligence and in accordance with the work proposal and provide all services necessary for carrying out of such work according to the work



proposal, and shall assume all the duties, obligations and responsibilities attributes to them as set forth in the work proposal.

1.4 The expected deliverables will be provided to the CWC.

## 2. OBJECTIVES

The specific objectives of works are:

- (i) Compile complete river drainage map in GIS by integrating available secondary maps in WRIS of CWC. Collect additional required information on major flood protection structures, existing water resources projects, important cities/ towns, CWC H.O sites, airport, island etc. , and to be integrated with final river drainage maps.
- (ii) Study shifting of river course and also changes in its Plan form from the base year (say 1970) till 2010, by collecting 4 sets of satellite imageries at 10 years interval in addition to one set of Survey of India toposheets for the base year on a scale of 1:50,000. In case toposheets are available for older period say 1950, the base year may be shifted accordingly.
- (iii) Compile Changes in Land Use/Land cover, and study of its impact on river Morphology.
- (iv) Channel Evolution Analysis to describe the status of the river channel. The analysis of the channel dimension, pattern, and longitudinal profile identifying distinct river reaches i.e. channel in upper reaches, channel in flood plain with bank erosion etc. This segregation of the reaches is to be determined by using Channel Evolution Analysis.
- (v) Work out the rate of bank erosion/deposition in term of erosion length & erosion area w.r.t. base year at 50 km interval.
- (vi) Assess the present condition of critical reaches of the main channel of river may be assessed by conducting ground reconnaissance. Field recon trips may be taken, if required.
- (vii) Evaluate the impacts of major hydraulic structures on morphological behaviour of river course and its impacts on river morphology.
- (viii) Evaluate braiding pattern of river by using Plan -Form Index (PFI) criteria along with its threshold classifications.
- (ix) Compile information (if any) on flood affected areas in the vicinity of river course prepared by National Remote Sensing Service Centre (NRSC) using Multi-temporal

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- satellite data of IRS WiFS (188m) and Radarsat ScanSAR Wide & Narrow (100m & 50m) for flood images for Bihar and Assam.
- (x) Plot probability curve (Exceedance Probability vs Flow rate) and show flow rates corresponding to return period of 1.5 year and 2 years for different CWC H.O. locations. The observed flows need to be normalised before using for analysis.
  - (xi) Relate the morphological changes in river on the basis of available peak discharges of different years in the time domain considered in this study. Study impact of changes in annual rainfall in the basin on river morphology.
  - (xii) Identify critical and other vulnerable reaches, locations. Analysis of respective rate of river course shifting and based on it, future predication of river course behaviours.
  - (xiii) Suggest suitable river training works for restoration of critical reaches depending on site conditions.

### 3. DETAILED SCOPE OF WORK

- (i) The required inventory of one set of Survey of India (SOI) toposheets in respect of reference time datum on a scale of 1:50,000 is to be procured from SOI by the Consultant. The inventory of satellite imageries having spatial resolution of 23.5 m , IRS LIS-I, LIS-II, LIS-III may be worked out covering the study area, and to be procured from NRSC.
- (ii) One set of SOI topo-sheets (say year 1970) and digital satellite imageries of IRS LISS-I, LIS-II and LISS-III sensors, comprising scenes for the years 1980, 1990, 2000 and 2010 are to be used for the present study. In case of non-availability of above data, the foreign satellite data of similar resolution may also be used. The maps and imagery are registered and geo-referenced with respect to Survey of India (1:50,000 scale) toposheets w.r.t. to base year by using standard technique & GIS tool.
- (iii) Delineation of River Bank Line, River Centre Line alongwith generation of important GIS layers of river banks, major hydraulic structures, embankments/levees, railway bridge line, island, airport, cities/towns/villages, and important monuments etc. located in the vicinity of river banks for the selected years of the studies are to be part of studies.
- (iv) Estimation of left & right bank shifting amount(s) w.r.t. base year & appropriate graphical plotting of these shifting.
- (v) Evaluation of braiding of different river course reaches by using Plan Form Index (PFI)

