

**DRAFT TERMS OF REFERENCE
HIRING OF CONSULTANCY SERVICES
FOR
PREPARATION OF DETAILED PROJECT REPORT
FOR PROCUREMENT OF DREDGER
UNDER
BIHAR KOSI BASIN DEVELOPMENT PROJECT**

Draft

A "Terms of Reference" may include, but is not limited to, the following elements:

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CHAPTER 1: INTRODUCTION

1. Background

Bihar is India's one of the most flood-prone state. Recurrent floods are devastating Bihar's economy and undermine poverty alleviation efforts. There is a need to develop a long-term flood management strategy for the state which is sustainable as well as economically viable.

The World Bank assisted project Bihar Kosi Basin Development Project (BKBDP) is aimed at enhancing capacity to manage flood so as to minimize flood vulnerability & flood risk in the Kosi River Basin.

The project is being implemented by Bihar Aapda Punarwas Evam Punarnirman Society (BAPEPS), created under the Societies Registration Act 1860 as a separate legal entity. Water Resources Department (WRD), Govt. of Bihar is the implementing agency (IA) with Flood Management Improvement Support Centre (FMISC). In order to facilitate the execution of an activity "Procurement of Dredger for Kosi River Basin" under BKBDP, a consultancy having due expertise and experience is required. Therefore, a consultancy is to be hired by WRD and will be selected in accordance with the Quality and Cost Based Selection (QCBS).

2. The Kosi River

The Kosi River in north Bihar plains of eastern India is a major tributary to the Ganga river system and has long been considered as a problematic river due to recurrent and extensive flooding and frequent changes in its course. The gently sloping alluvial surface of the Kosi has been described as "inland delta", "cone" and "megafan" by various researchers owing primarily to building up of a very large positive topography caused by deposition of enormous quantity of sediment carried by the river which it is **unable to transport**. During the last two centuries, for which records are available, the Kosi River has had a preferentially westward movement by nearly 120 kilometers across its fan surface. Many of the old courses of the river are clearly discernible on satellite images and some of them carry water also during monsoon periods. These movements have been described as **auto-cyclic and stochastic**, typical in most of the alluvial fans across the world. There was a proposal to close a number of interlacing branch channels of the Kosi within the embankment in order to increase the capacity of the main channel as well as increase in the equilibrium depth of the channel; as it was

found that blocking of several dhars at or near the points of off-take proved successful in ordinary floods to check erosion and damage which used to occur otherwise. **The report of the technical committee constituted under Government of Bihar in 1965 observed that the object of achieving one single deep channel in this process would require years of patience and careful work. Later on this practice was found to be impractical in view of the magnitude of the problem. However, the 1965 Committee had strongly recommended dredging as a means to maintain and improve silt carrying capacity of the Kosi.** It also recommended for disposal of dredged material and proposed that (i) Low lying areas along the flood embankment can be used all along the river for this purpose (ii) Land reclamation aspect by using the **dredged** material could be considered (iii) The dredged material could be used in widening and in some **localities** in raising the flood embankments & (iv) The dredged material could be used to close the mouths of subsidiary channels. Then, again in the year 1976, the Kosi Board of consultants headed by eminent engineer Shri Kanwar Sain contemplated of resorting to dredging in specific reaches for tackling the problem of protection of Kosi flood embankments against erosion. The Board in their Eighth meeting held on 17/12/1975 to 23/12/1975 also endorsed for closure of dhars in various vulnerable reaches. It also emphasized the urgency of river dredging with a view to developing a central channel by river dredgers. The Board also felt that if immediate action is taken to prevent small dhars off-shooting from central channel, attack of river could be checked effectively. **However, serious limitations regarding resources were noticed in the proposition of river dredging and that it may not be possible to complete the dredging of the pilot channels in specific reaches in one working season and in that case with the onset of floods, the dredged channel will be liable to silting and thus the partly excavated channel would be rendered totally ineffective.** The Kosi High Level Committee in its report after site inspection on the river Kosi from 19/11/2010 to 22/11/2010 and from 19/10/2011 to 22/10/2011 also recommended that "The main objective of river training works should be for **confining the dominant flow in a central channel downstream of the barrage** so that major problems, which are being encountered every year on the downstream and upstream of the barrage are mitigated." Availability of dredgers exclusively at different sites in the Kosi River will enable the recurring dredging work for keeping the river flow in a defined central channel as well as removing possibility of any threat of embankment breaches leading to large scale flood disasters. It is expected that a **Dredging mechanism system design** will allow the Water Resources Department of Bihar to better manage the embankment

and lower the sediment load which protects the local population and productive agricultural areas.

3. Objective

The objective of the proposed Consultancy Services is to select a consultant to prepare a DPR to find out the suitability of the dredging among numerous non-structural measures of flood mitigation as well as selection of procurement of dredger for one of the prime actions as channelizing the river in such a way that it will not interact with embankment with any potential damage and also to reduce the sediment load, so as to ensure the adequate conveyance with proper depth to conduce voluminous water with natural flow.

The comprehensive DPR will consist of various activities regarding procurement, clearance, operation and maintenance of dredger in Kosi River for morphological dredging including maintenance dredging at least for five years. It also includes various aspects such as cost estimates/Bid Document and prerequisite documents/technical justifications regarding necessity of dredging, identification of best practice in dredging technology based on national & international practices, different type of dredgers, selection of dredger, Functional requirement of dredging operation, Designing a dredger and its vetting, procurement of dredger, Deployment plan of dredger in Kosi Basin, implementation methodology with dredge site plan, monitoring methodology, dredged material management Plan, dredger regulatory Plan, Environmental Impact Assessment and its clearance, Social Impact Surveys, Community Consultations and Participation, Design of necessary Workshop and working guidelines, measurement and payment procedure of dredging works and Design of institutional Framework for operation and maintenance.

CHAPTER 2: SCOPE OF WORK

For optimal flood risk management, the State of Bihar is planning different aspects or techniques available for flood hazard mitigation in Kosi River. One of the suggestions is dredging in Kosi River as explained in Background part of document. In support and synthesis of various report & different suggestions under Bihar Kosi Basin Development Project funded by the World Bank, State of Bihar is planning to procure dredgers for Kosi River for which a Detailed Project Report is to be prepared. ***The study area is from downstream from Kosi Barrage upto Koparia, Saharsa, Bihar and report should be designed in such a manner, it should be at least valid for five years from the date of completion of all the tasks and activities.***

The Scope of work shall include but not limited to the following:

1. Explore necessity of dredging, best practice in dredging technology, different type of dredger used for dredging and methodology for selection of dredger under constraint of river dredging. Also, it should include morphological and maintenance dredging in rivers and international and national case histories and success stories of river dredging.
2. Prepare a report on functional requirement of dredging operation under constraint of Kosi River Basin. The report should discuss present scenarios of dredging operation, state its limitations and based on functional requirement propose a design mechanism for dredging operation and maintenance.
3. Design a dredger with its sub components like dredger support vessel, survey equipment, etc. based on functional requirement of Kosi River Basin and conducts its vetting by National or International Govt. or semi-Govt. Agency or Renowned Institute having expertise in the field of dredger and dredging.
4. Prepare a Bid Document with Technical Specification for dredger with its sub components like dredger support vessel, survey equipment, etc. Also, prepare an economical deployment and possible Housing plan of dredger in Kosi River.
5. Prepare a report on present mechanical workshop with State of Bihar under Water Resources Department at Birpur and provide necessary suggestions and improvement in connection with dredger and its sub

- components like dredger support vessel, survey equipment, etc. The suggestions and improvement shall comprise all technical details, estimates, drawing and necessary documents like Bid Document for any purchase, ToR for hiring agency to work in workshop, Guidelines to work under workshop including safety protocols, etc.
6. Prepare a report on implementation methodology of dredging operation and maintenance. The report shall comprise all technical details and proper guidelines regarding implementing the dredging operation including safety protocols and maintenance protocols of machineries. The Environmental and social Impact Assessment and its clearance, community consultation and participations, dredging regulatory Plan, dredge site plan, monitoring methodology, measurement and payment procedure of dredging works and Design of institutional Framework for operation and maintenance shall be integral part of report.
 7. Carry out an environmental and social impact assessment for the proposed dredging operation and recommend consultation and preparation frame work of Environment/Social Management/Action Plan in line with the applicable World Bank policy.
 8. Prepare a Plan for dredged material management.
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CHAPTER 3: TASKS & DELIVERABLES

1. Deliverable and Time schedule

The Part 0 to 7 shall be completed within a period of 210 days or 7 months from the effective date. During the entire period of contract, the consultant shall prepare and submit the reports/ deliverables in constraint with time allotted as detailed below.

Say, effective Date of agreement = D

Part 0 Inception report	D+10
Inception Report shall be submitted within 10 days covering overview of tasks/ activities and work plan.	

Part 1	Preliminary Report (PR)	Time allotted (in days)
	Explore necessity of dredging, best practice in dredging technology, different type of dredger used for dredging and methodology for selection of dredger under constraint of river dredging. Also, it should include morphological and maintenance dredging in rivers and international and national case histories and success stories of river dredging.	D+35
Tasks	1 Describe Sediment Management & Necessity of Dredging incorporating national and international case histories under constraint of river dredging. Also, describe future of dredging for sediment management in rivers.	Deliverables Preliminary Report (PR)
	2 Describe latest best Practice in dredging technology at national & international levels.	
	3 Describe dredger, its type and working methodology. Latest technology in river dredging shall also be part of Description.	
	4 Describe methodology for selection of dredger under constraint of river dredging.	
	5 Describe different types of river dredging. Description shall cover Morphological & Maintenance dredging in detail with national and international case histories.	
	6 Describe and prepare a plan for long term planning of sediment management using dredging in Kosi River.	

Part 2		Study of Functional Requirement (SFR)	Time allotted (in days)	
Prepare a report on functional requirement of dredging operation under constraint of Kosi River Basin. The report should describe present scenarios of dredging operation, state its limitations and based on functional requirement propose a design mechanism for dredging operation and maintenance.		D+55		
Tasks	1	Describe present scenarios of dredging in State of Bihar under Water Resources Department and state its limitations.	Deliverables	Study of Functional Requirement (SFR) Report
	2	Describe functional requirement of dredging operation in Kosi River basin. Prepare an Estimation of Sediment in Kosi River Basin.		
	3	Propose in detail a design mechanism for dredging operation and maintenance in Kosi River Basin. The design mechanism shall comprise micro level detailing of dredging operation and maintenance in Kosi River Basin.		

Part 3		Design & Vetting (D&V)	Time allotted (in days)	
Design of dredger with its sub components like dredger support vessel, survey equipment, etc. based on functional requirement of Kosi River Basin and conducts its vetting by National or International Govt. or semi-Govt. Agency or Renowned Institute having expertise in the field of dredger and dredging.		D+85		
Tasks	1	Design (in details) of dredger with its sub components like dredger support vessel, survey equipment, safety equipments, dredger docking/hosing requirement, etc. which is suitable and economical for Kosi River Dredging Operation. The design should contain all technical detailing with drawings. Note: - Design for capacity, efficiency, Transportation of material and vessel unit is necessary.	Deliverables	Design & Vetting (D&V) Report consisting design Report, Certificate Report & Bid Document.
	2	Conduct its vetting by National or International Govt. or semi-Govt. Agency or Renowned Institute having expertise in the field of dredger and dredging.		
	3	Describe manpower needed for dredging operation and maintenance and also, prepare estimate for it and provide bid document to hire required manpower.		

Part 4		Bid Document	Time allotted (in days)	
		Prepare a Bid Document with Technical Specification for dredger with its sub components like dredger support vessel, survey equipment, etc... Also; prepare an economical deployment and possible Housing plan of dredger in Kosi River.	D+95	
Tasks	1	Prepare a Bid Document with Technical Specification for dredger with its sub components like dredger support vessel, survey equipment, safety equipments, dredger docking/hosing requirement, etc.	Deliverables	Report with Bid Document
	2	Prepare a report for economical deployment and possible Housing/ Docking plan of dredger in Kosi River.		

Part 5		Workshop	Time allotted (in days)	
		Prepare a report on present mechanical workshop under Water Resources Department at Birpur and provide necessary suggestions and improvement in connection with dredger and its sub components like dredger support vessel, survey equipment, etc. The suggestions and improvement shall comprise all technical details, estimates, drawing and necessary documents like Bid Document for any purchase, ToR for hiring agency to work in workshop, Guidelines to work under workshop including safety protocols, etc.	D+110	
Task	1	Prepare a report on present mechanical workshop under Water Resources Department at Birpur.	Deliverables	Report with bid Document, ToR & Guidelines
	2	Evaluation of existing workshop for necessary suggestions and improvement in connection with dredger maintenance and up keeping and its sub components like dredger support vessel, survey equipment, etc.		
	3	Prepare all technical details estimates, drawing and necessary documents like Bid Document for required improvement and purchase of necessary equipment or any purchase, ToR and Bid Document for hiring agency to make workshop functional, Guidelines for working in workshop including safety protocols, etc.		

Part 6	Implementation Methodology (IM)		Time allotted (in days)
	<p>Prepare a report on implementation methodology of dredging operation and maintenance. The report shall comprise all technical details and proper guidelines regarding implementing the dredging operation including safety protocols and maintenance protocols of machineries. The Environmental Impact Assessment and its clearance and preparation of environmental management plan, community Survey, dredging regulatory Plan, dredge site plan, monitoring methodology, measurement and payment procedure of dredging works and Design of institutional Framework for operation and maintenance shall be integral part of report.</p>		D+140 Report
Tasks	1	<p>Prepare a report implementation methodology of dredging operation and maintenance. The report shall comprise all technical details and proper guidelines regarding implementing the dredging operation including safety protocols and maintenance protocols of machineries.</p>	Deliverables Report with EIA & EMP, Certificate, Dredging Regulatory Plan (DRP), Dredge Site Plans (DSPs), etc.
2	<p>Prepare Environmental Impact Assessment, and its clearance.</p>		
3	<p>Conduct community or Socio-Economic Survey.</p>		
4	<p>Prepare dredging regulatory Plan and provide guidelines to prepare it for next time.</p>		
5	<p>Prepare dredge site plans and provide guidelines to prepare it for next time.</p>		
6	<p>Prepare a report on monitoring methodology & measurement and payment procedure of dredging works.</p>		
7	<p>Design of institutional Framework for operation and maintenance.</p>		

Part 7		Dredged Material Management Plan (DMMP)	Time allotted (in days)	
Prepare a Plan for dredged material management.			D+180	
Tasks	1	Provide various literature Survey for preparation of Dredged material management Plan	Deliverables	DMMP Report
	2	Prepare a report on possible Scope of dredged material management plan.		
	3	Report shall also identify possible industries that can use dredged material.		
	4	Report shall also cover possible future use of dredged material management.		
	5	Report shall also identify sediment as resource.		
	6	Prepare detailed sustainable dredged material management plan for Kosi River.		

Draft Final Report	D+190
Report shall consists all parts (part 0 to part 7) including all the findings, results, output, reports and other deliverables with action taken on earlier submission against Part 0 to Part 7.	
Final Report	D+210
Report shall consists all parts (part 0 to part 7) including all the findings, results, output, reports and other deliverables with action taken on earlier submission against Part 0 to Part 7.	

Note: Bid Documents or similar should follow the format and guidelines of World Bank Procurement Procedure.

The reports will be reviewed by a Standing Review Committee constituted by WRD. The committee would review and respond on the deliverable/ report within 10 working days after submission of report by the Consultant. The consultant would liable to incorporate the suggestions/ comments of SRC.

2. Data, Services and Facilities to be provided by the Client

The following amenities will be provided by the Client:

1. Provide available historic and current relevant data for the assignments for reference.
2. Provide office space for two staff of the consultant to work at the FMISC. Provide available historic and

current relevant data for the assignments for reference.

3. Chief Engineer, Flood Control & Drainage, Water Resources Department, Birpur with other Four (4) members (From Birpur Zone) nominated by Chief Engineer, Flood Control & Drainage, Water Resources Department, Birpur, Chief Engineer, Mechanical, Water Resources Department, Patna with other Four (6) members (three from Birpur Zone and three from Patna Zone) and FMISC, Patna will monitor the progress and provide any assistance that may be required for successful completion of work. The consultant shall work closely with the concerned WRD field offices during all field work. This will help obtain objective assessment of field conditions particularly on the riverine/embankment asset status.
4. The client will assist in obtaining the office data on the riverine/embankment structures in the basin. The client shall assist in obtaining any other data as found necessary by the consultants from other government sources to enable the consultants to perform the tasks.
5. Any other facilities mutually agreed upon by consultant and the client.

3. Responsibility of the Consultants

1. The consultant shall carry out the study in a professional manner in keeping with internationally accepted standards using qualified and appropriate staff. They will Endeavour to implement with diligence within the agreed time.
2. The consultants shall be responsible for accuracy of all data used in the project preparation and design/drawings as part of the project. The data available with Water Resources Department, Bihar shall be use by consultant. For any other data which is needed to complete the work shall be consultant's obligation.
3. The consultant shall conduct and complete the consultancy assignment as per the requirements of terms of reference.
4. The consultant shall deploy necessary resources to collect related data. No any extra payment shall be reimbursed for it.
5. The consultant shall set up a local office in Patna. Necessary infrastructure for office and technical work will be created in the local office.

6. All reports and data specifically procured under this consultancy assignment shall be handed over to the client after completion of the project.
7. Consultant shall make its own arrangement for all the equipments, software, computers, laptops, printers or any other tools required for execution of the work, at their cost.
8. Conduct and complete the consultancy as per the agreed ToR and scope of the consultancy, leading to delivery of contracted items.
9. The consultant shall arrange transport, etc. for site visit of Kosi River by client at least four times.
10. The consultant shall provide training to departmental officers/ field engineers for monitoring of Operation and Maintenance of dredging activity including hydrographic survey.

CHAPTER 4: CONSULTANCY FIRM & KEY PERSONNELS REQUIREMENTS

1. Key Personnel's Requirement

The Consultant will also, engage the minimum key experts of required qualification and experience as detailed below. Consultant shall make his own assessment for the requirement of any additional key or non-key expert, which he feels is required for the successful and satisfactory completion of the work. Consultant shall quote accordingly. No any extra claim shall be made by the client on any such account. Consultant should allow providing extra qualification and experience. The extra qualification and experience shall make extra marks in evaluation process.

S.No.	Position	No. of Man-days	Education Qualification	Experience	General role and Responsibilities
1	Project Team Leader	210	B.E./B.Tech or equivalent in Civil Engineering, Post Graduation or equivalent in Water resources engineering or River Engineering or Marine Engineering	12 years work experience in river engineering, River Sediment Management, River dredging. 2 years working experience in externally funded projects of World Bank, ADB or similar. Extensive knowledge of hydrology and hydrodynamic of River Basin. Proven experience in setting up Plans for Sediment Management in large river basin. Experience in planning a Dredging operation and maintenance for sediment management. Experience in Sediment Management in Indian/ Asian river basins. Proven experience in developing successful design, implementation, and management of projects (including financial management) ensuring alignment with requirements of concerned institutions and development partners. Ability and willingness to travel in remote areas.	He is responsible to coordinate all the work and providing deliverable in time. He should also make his contribution to deliverable and help in whole documentation preparation.

S.No.	Position	No. of Man-days	Education Qualification	Experience	General role and Responsibilities
2	Environmental Management Expert	60	Master degree in environmental Sciences or closely related field	At least 8 years of relevant experience in preparing Environmental Impact Assessment Report pre and post a large civil project. At least 3 years of experience in River Environmental Management. 1 years working experience in externally funded projects of World Bank, ADB or similar. Extensive knowledge of River and fresh water ecology. Working experience in Environmental impact assessment of marine (Port) or Riverine dredging is desirable. Experience in environmental friendly ways of sediment management.	EM expert will be responsible for thorough assessment of existing River and flood plain ecology and its co-existence with man and his activities. He will be required to elaborate on every negative impact that a dredging operation may have on surrounding environment and help in whole documentation preparation.
3	River Engineer	210	B.E./B.Tech or equivalent in Civil Engineering, Post Graduation or equivalent in River Engineering	8 years working experience in river engineering, River Sediment Management, dredging. 2 years working experience in externally funded projects of World Bank, ADB or similar. Extensive knowledge of hydrology and hydrodynamic of River Basin. Proven experience in setting up Plans for Sediment Management in large river basin. Experience in planning a Dredging operation and maintenance for sediment management. Experience in Sediment Management in Indian river basins.	His prime responsibility would be to study and evaluate need for river training. He will assess training measures to be applied, quantify removal of sediment and ensure channel and bank stability after dredging/ training operation and etc. and help in whole documentation preparation.
4	Procurement Specialist	60	B.E./B.Tech or MBA or Equivalent	5 years working experience in procurement procedures especially in preparation of Bid Document and procurement plan. 3 years working experience in externally funded projects of World Bank, ADB or similar. Extensive knowledge in preparation of Bid document as per World bank guidelines.	His prime responsibility would be to prepare all Bid documents and procurement plan. He should also access all estimates also and help in whole documentation preparation.

S.No.	Position	No. of Man-days	Education Qualification	Experience	General role and Responsibilities
5	Social Development Specialist	60	Master's degree in Social Science/Disaster Management/Community Development or similar discipline	Minimum of 10 years and preferably over 15 Years of experience in participatory disaster management and 5 year experience in developing community-based organizations for early warning system and in organizational arrangements for disaster risk management. Working experience in flood risk management will be preferable. Willing to travel and work in the rural and remote areas.	His responsibilities include interaction with local people to assess degree of acceptance of dredging operation by the communities. He will prepare documents describing communities' demands and expectations from such operations and apprise dredger operators and the clients regarding any degree of resentment among people. Also, help in dredged material management plan and help in whole documentation preparation.
6	GIS Specialist	180	Master's Degree in Geoinformatics / Geology/Hydroinformatics or related field	5 years' experience in RS and GIS applications for resource mapping, preparation and integration of GIS datasets, experience in integrating global satellite derived data; experience in hydrologic application, 3D analysis and experience in flood inundation mapping.	GIS specialist would be responsible for study of River behavior over past years and apprise Team leader and co-specialists about any change in River morphology. He will keep a map documentation of total Geographical setting of the area of operation. He should also responsible for regulatory and dredge site plans and dredged material management plan.
7	Dredger specialist	180	B.E./B.Tech or equivalent in Mechanical Engineering	8 years working experience in River dredging. Extensive knowledge of Dredger and dredging. Proven experience in operation and maintenance as well as dredged material management. Experience in designing and configuring basic elements of Dredger.	This dredger specialist would be mainly responsible for providing knowledge to up keep of dredger and all allied accessories and help in whole documentation preparation.

S.No.	Position	No. of Man-days	Education Qualification	Experience	General role and Responsibilities
8	Hydrographic Surveyor	60	B.E./B.Tech or equivalent in Civil Engineering	Minimum of 10 years of experience in bathymetric, topographic and river channel surveying. Willing to travel and work in remote areas.	His prime responsibility will be to provide guidelines and specification of survey equipment and its planning, operation, etc. and help in whole documentation preparation.

2. Consultant's Selection Method

The selection method will be Quality Cost Based Selection (QCBS).

3. Duration of Consultancy

7 months.

CHAPTER 4: PAYMENT SCHEDULE

Description		Payment Schedule
Advance	After signing of contract as advance against a bank guarantee	10%
All payment needs to be paid after submission and approval of the required reports		
Part 0	Inception Report (PR)	10%
Part 1	Preliminary Report (PR)	
Part 2	Study of Functional Requirement (SFR)	
Part 3	Design & Vetting (D&V)	15%
Part 4	Bid Document	
Part 5	Workshop	10%
Part 6	Implementation Methodology (IM)	
Part 7	Dredged Material Management Plan (DMMP)	25%
Draft Final Report		15%
Final Report		15%