



## Hydrologic Assessment for Tanks in Cascades under OIIPCRA

### **SELECTION OF CONSULTANT (QCBS Lumpsum)**

Description of Work: Terms of Reference (ToR) for Consultancy agency for Hydrologic Assessment for Tanks in Cascades under OIIPCRA

Client: Department of Water Resources, Government of Odisha  
Country: INDIA  
**Dated: 30-09-2020**

Name of Project: **ODISHA INTEGRATED IRRIGATION PROJECT FOR CLIMATE RESILIENT AGRICULTURE (OIIPCRA)**

World Bank Project ID: **P163533**

**ODISHA COMMUNITY TANK DEVELOPMENT AND MANAGEMENT SOCIETY**

7<sup>th</sup> Floor, Rajiv Bhawan, Bhubaneswar-751001

**Email: [spuoipcra.od@gov.in](mailto:spuoipcra.od@gov.in)**

## Terms of Reference for Hydrologic Assessment for Tanks in Cascades

### 1. Introduction and Project Implementation Arrangement:

The Government of Odisha in partnership with the Government of India is implementing the World Bank assisted project “Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA)”. The OIIPCRA project aims to intensify and diversify agricultural production, enhance climate resilience and improve water productivity in selected cascades of Odisha. The project is funded by World Bank, will be implemented over a period of 6 years in 15 districts of Odisha. The total project cost is 235.40 million US \$.

The project is implemented jointly by three line-departments, i.e., (1) Department of Water Resources, Government of Odisha, (2) Department of Agriculture and Farmers Empowerment, Government of Odisha, and (3) Department of Fishery and Animal Resource Development, Government of Odisha, with clearly defined role and responsibilities. The State Project Management Unit (SPMU) at State Level is leading the implementation. A Technical Steering Committee, headed by the Chief Secretary, Government of Odisha is the overall review and policy support system. At the district level, the office of the Collector and District Magistrate are the nodal to steer the project and there is a district level committee, in the name of District Level Project Management Team (DLPMT) to monitor and supervise the project activities.

### 2. Project Objectives:

The project development objective is “to intensify and diversify agriculture production, enhance climate resilience in selected districts of Odisha”. The project beneficiaries will include small and marginal farmers, Pani Panchayats, farmer producer organizations and other agro-entrepreneurs.

As development in Odisha accelerates and the impact of climate change becomes increasingly visible, competition over water between water users increases and water allocation becomes increasingly challenging. In Odisha, large numbers of small, medium and large reservoirs have been developed over time. While some of those reservoirs operate on a stand-alone basis, many others are part of a cascade, where water inflows in a reservoir located in the tail-end of that cascade depend on the water outflows from reservoirs located in the top-end of those same cascades. Investing in hydraulic infrastructure therefore needs to take into consideration the hydrological interactions between all tanks in a cascade and needs to seek hydraulic win-wins instead of zero-sum investments at cascade level.

In response to these challenges, the OIIPCRA project intends to identify opportunities for investments in hydraulic infrastructure at the level of a cascade of reservoirs. In doing so, the project aims to maximize water availability at the cascade level. To that end, OIIPCRA intends to undertake a study that will identify investments in hydraulic infrastructure at cascade level. in all 15 districts of Odisha. The approach will be applied to those tanks in the 15 districts that have been identified as being part of a cascade. There are about **150 numbers** of such tanks in the total project area, located in more than 50 separate cascades. An abstract list of such tanks is appended in the Paragraph-7 with their administrative location for reference.

### 3. Objectives of the Consultancy:

The objective of the assignment is to identify investments in cascades of reservoirs that capture opportunities for improving water availability as cascade level. It is important to note that all reservoirs in those cascades will be eligible for investment.

The assignment will include: (i) to delineate the cascades that the water storage structures (tanks/check dams/dams) that are part of the Project are located in. The consultant will also identify any additional water storage structures that are not among the identified MI structures but that need to be incorporated when adopting a cascade approach; (ii) for each of the cascades that are part of the Project, to conduct pre- and post-Project water accounting in the proposed tanks and cascades using reliable data (field and remote sensing) and simplified empirical methods using latest hydrological technologies & models to identify water availability hotspots; (iii) identify feasible investment proposals that improve the overall water availability in the cascade and enhances water productivity and efficiency in an environmentally sustainable, holistic and eco-sensitive approach for cascade management, ecological preservation, de-siltation and improved ground water recharge and enhanced surface water availability in compliance with the Environmental Management Framework disclosed under the project; and (iv) capacity strengthening of staff of the Water Resources Department

### 4. Outline of the Tasks to be carried out:

#### i. Delineation of Cascades

For those reservoirs that have been identified as being part of a cascade (“red tanks”) the consultant will propose a delineation of those cascades that the water storage structures (tanks/check dams/dams) that are part of the Project are located in. Cascades should not be too large or too small. Ideally, the delineation strikes a compromise between hydrological and social considerations. The consultant will review the catchment areas of the tanks and of the cascade (using remote sensing information and other secondary data including the “show elevation profile” feature in Google Earth), and identify other water storage structures that are located in the same cascade. The consultant will also consult with local authorities and stakeholders and conduct field visits to ensure the social coherence of the cascade, and will submit the proposed delineation to the client for approval.

#### ii. Water Accounting

For each of the proposed cascades, the consultant will develop a pre- and post-project water accounting for Khariff and Rabi seasons, including surface water and groundwater, considering all current and future uses (irrigation, drinking water, fisheries, dead storage, environmental/sanitary requirements (if any), navigation, etc.) and taking into consideration the impacts of climate change. The consultant will also consider the hydrological interdependency of the water uses in the cascade. The consultant will develop a simplified methodology while ensuring the accuracy of the data and the estimates that have been used in preparing the water balance. On the basis of the cascade water accounting, the consultant will identify water availability and vulnerability hotspots, including areas likely to be impacted by saline ingress/intrusion.

**iii. Identify investments**

On the basis of the analyses described in (i) and (ii), the consultant will identify investments that present a clear win-win at tank and cascade level over the pre-project situation. The consultant will provide quantified evidence that the proposed investments increase water availability or water productivity at cascade level and have no negative impact on the water availability in any of the downstream tanks located in the same cascade, and will prepare a simplified pre- and post-project water balance at tank and cascade level. The development and investment plans should integrate environmental sustainability with respect to issues identified and be in compliance with the Environmental Management Framework disclosed under the OIIPCR project. The consultants shall identify the anticipated environmental impacts of the investments and mitigation measures in each cascade. The entire cascade delineated in (i) will be eligible for investment.

**iv. Capacity Strengthening**

Throughout the assignment, the consultant will work closely with staff from the Water Resources Department and will conduct at least **10 (Ten)** training events.

**5. Responsibilities of the Consultant:**

The Consultant while carrying out the above works shall abide by the following:

- i. The Consultant shall supplement his findings with actual site verification.
- ii. The Consultant shall be responsible for all transportation and accommodation at the project sites and headquarters in order to carry out the assignment.
- iii. The Consultant shall work in close contact with the Project Participants such as State Project Management Unit, District Project Management Units, Support Organizations, Field Engineers, Water Users Association and local administrative authorities.
- iv. The Consultant shall be responsible to obtain satellite imageries as may be required to carry out their assignment. The cost of the procurement of such imageries shall be borne by the Client. The Consultant shall be responsible to hand over the imageries to the client at the end of the assignment.

**6. Report Deliverables the Consultant:**

<b>Sl No.</b>	<b>Report</b>	<b>Content</b>	<b>Scheduled time for submission</b>	<b>Quantity</b>
1)	Inception Report confirming completion of Task 1	Inception report, including a review of the delineation of the cascades (task 1).	Within two weeks from the date of signing of the contract	4 Print Copy + Electronic Copy in MS Word and pdf
2)	Water Accounting report, confirming completion of Task 2	Detailed "Water Accounting" Report, including the assessment of inflow-outflow, storage, ET, availability, potential etc. in the cascades and tanks (task 2).	Within 6 weeks from the date of signing of the contract	4 Print Copy + Electronic copy in MS Word and pdf

3)	Final report including a review of the impact of the investments conforming completion of Task 3 and the entire assignment	Final report of the assignment, including a review of the impact of the proposed investments on water availability in the downstream tanks that are located in the same cascade. The Final report shall also include the spatio-temporal data used for Tasks 1, 2 and 3 along with GIS database used/developed.	Within 10 weeks from the date of signing the contract	4 Print Copy + Electronic copy in MS Word and pdf
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## 7. List of Districts & Blocks covering the tanks in Cascade:

LIST OF DISTRICTS & BLOCKS HAVING TANKS CATEGORISED AS RED TANKS (TANKS IN CASCADE) UNDER OIIPCRA					
Sl No.	District	No. of Tanks under OIIPCRA	Blocks Covered	Designed CCA in Ha	
				Khariff	Rabi
1	2	3	4	5	6
1	Balangir	3	Balangir, Bangomunda, Titlagarh	1,432.00	607.00
2	Balasore	1	Bahanaga	162.00	-
3	Bargarh	6	Gaisilet, Padampur, Paikamal	1,109.00	243.00
4	Bhadrakh	1	Bonth	116.00	20.00
5	Boudh	1	Kantamal	53.00	-
6	Ganjam	82	Aska, Beguniapada, Bellaguntha, Bhanjanagar, Buguda, Chhatrapur, Dharakote, Digapahandi, Ganjam, Hinjili, Jagannath Prasad, Kabisurya Nagar, Khallikote, Kukudakhandi, Polasara, Purusottampur, Sanakhemundi, Seragada, Sorada	4,294.80	54.00
7	Jajpur	2	Danagadi, Dasarathpur	318.00	150.00
8	Kalahandi	15	Bhawanipatna, Dharmagarh, Junagarh, Kesinga, Lanjigarh, M. Rampur, Narla	780.00	16.00
9	Keonjhar	13	Anandpur, Ghasipura, Ghatagaon, Harichandanpur, Joda, Keonjhar	6,602.00	1,593.00
10	Mayurbhanj	22	Barasahi, Betnoti, Bijatala, Bisoi, Gopabandhu Nagar, Karanjia, Khunta, Rairangpur, Samakhunta, Saraskana, Udala	1,614.00	-
	Grand Total	146		16,480.80	2,683.00

**Note:** The List of Districts & Block may be subject to change at the time of detail proposal.

## 8. Key positions for the Consulting firm:

Sl No.	Position	Qualification & Experience	Number	Input in Months
1)	Team leader/ Hydrologist	Postgraduate qualification in Engineering with Hydrology/ Water Resources or related Engineering subjects (preferably PhD) having at least 10 years of experience in water resources assessment, development and management of which at least 2 years were related to hydrological assessment at Basin/Sub-basin/large catchments scale having competency in using conventional as well as modern tools	1	4
2)	Hydro-geologist	Postgraduate qualification in Engineering with Hydro-geology/ Water Resources or related Engineering subjects having at least 10 years of experience in water resources assessment, development and management of which at least 2 years were related to hydro-geological assessment	2	3

		at Basin/Sub-basin/large catchments scale having competency in using conventional as well as modern tools		
3)	Irrigation specialist	Postgraduate qualification in Engineering with Irrigation or related Engineering subjects having at least 10 years of experience in water resources assessment, development and management of which at least 2 years were related to irrigation assessments having competency in using conventional as well as modern tools	2	4
4	Environmental Specialist	Postgraduate qualification in Environmental Engineering / Environmental Science or related fields having at least 7 years of experience in natural resources / environmental management, preferably in water resources.	3	4
<b>Other Staff</b>				
4)	Sociologist	Postgraduate qualification in Sociology or any other Humanities subjects having at least 10 years of experience in sociology, social development, community mobilization and change management	3	4
5)	Remote sensing specialist	Minimum 5 years of experience after PG in processing satellite data. Experience should be in handling optical and active/passive microwave remote sensing.	2	3

## 9. Duration of the Consultancy

The total duration for completing the task will be 4 (four) months from the date of signing of the contract.

## 10. Data to be provided by OIIPCRA

1. Location files in Kml file/s containing:
  - a. Tank location
  - b. Command area
  - c. Boundary of the tanks in the sub-basin

## 11. Communication Address

The Expression of Interest to be submitted by speed post/Courier to the following address;

Project Director, OCTDMS  
7<sup>th</sup> Floor, Rajiv Bhawan,  
Bhubaneswar-751001  
Ph: 0674-2391363

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