TERM OF REFERENCE

1. Consultancy Summary:

<table>
<thead>
<tr>
<th>Consultancy Title:</th>
<th>Regional Remote Sensing and Image Interpretation Expert for MRC-KfW’s LMB Wetlands Management and Conservation Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultancy Type:</td>
<td>Special Service Agreement (SSA), type (a) One-time assignment</td>
</tr>
<tr>
<td>Duration:</td>
<td>65 working days from 1 April to 31 December 2020</td>
</tr>
<tr>
<td>Division:</td>
<td>Environmental Management Division, MRCS</td>
</tr>
<tr>
<td>Working Station:</td>
<td>Home-based with travelling to MRC Secretariat and MRC Member Countries (MCs)</td>
</tr>
<tr>
<td>Total Budget:</td>
<td></td>
</tr>
</tbody>
</table>

2. General Background:

2.1 Background and Objectives of the Consultancy:

The Mekong River Commission (MRC) was established by the 1995 Agreement on Co-operation for the Sustainable Development of the Mekong River Basin, between the governments of Cambodia, Laos, Thailand and Viet Nam. In accordance with this Agreement, the Mission of MRC is: “To promote and coordinate sustainable management and development of water and related resources for the countries’ mutual benefit and the people’s well-being by implementing strategic programme and activities and providing scientific information and policy advice”.

The Lower Mekong Basin (LMB) contains a great number and diversity of wetlands which support a wealth of biodiversity and provide a wide range of ecological service functions and natural resources that support food security, livelihoods and a range of other important social, economic and cultural values. Wetlands and their associated biodiversity are becoming increasingly threatened and the loss of wetlands in the LMB has been enormous. Increasing local population numbers, resulting in more intensive use of wetlands and ultimately drainage and conversion to
agricultural lands or urban settlements, combined with increasing flood protection, further threaten these valuable ecosystems.

To prevent further loss or degradation of the Mekong wetlands, policy makers, wetland managers and local populations will be supported in managing their wetlands by providing tools and capacity development for wetland inventory and the assessment of wetland ecological functions and ecosystem services.

The former MRC Environment Programme and the current MRC Environmental Management Division) have been generating data, information and knowledge for decision making in order to balance economic development and environmental conservation. In addition to establishing systems for monitoring the Basin’s environmental health, improving policies and legislation, and encouraging co-operation among the riparian countries, the implementation is also charged with increasing environmental awareness amongst the public.

The Mekong River Commission Secretariat (MRCS) has undertaken LMB wetland activities since before the establishment of the 1995 Mekong Agreement. For instance, MRCS developed the MRC wetland classification system in 1993 and the LMB Wetland GIS data set in 2003. This data set was further updated in 2009, by MRCS Basin Development Programme (BDP), and has been used to varying degrees by the Member Countries. MRCS organized a number of wetlands related training events at the national and regional level to build the capacity of MCs. To ensure the aquatic ecological health of the region, the former MRC Environment Programme and the current Environmental Management Division undertakes in every second year the Ecological Health Monitoring on 41 locations in the LMB. The former MRC EP supported the initiative of developing a Wetland Inventory Methodology Framework (WIMF) for the purposes of inventorying wetlands in the LMB Countries. Since 2011, EP has worked with KfW Development Bank to establish the LMB Wetlands Management and Conservation Programme which is a Joint MRC & German Development Cooperation Initiative on Wetland Ecosystem Services Delivery in the Lower Mekong Region.

This task directly contributes to the achievements of MRC Annual Work Plans 2019-2020 and MRC Strategic Plan (2016-2020) particularly Outcome 3 “Guidance for the development and management of water and related projects and resources shared and applied by national planning and implementing agencies”; Output 3.9 “Methodologies for sustainable use and management of wetlands developed and implementation supported” and Activity 3.9.1 “Project preparation, inception and kick-off”. This Output 3.9 is linked to Output 2.8 “Strategy for basin-wide environmental management for prioritised environmental assets developed and approved”.

In an effort to improve the wetland database system and to provide the dynamic mapping system displaying spatial information of important LMB wetlands, The MRCS ED is looking for a Regional Remote Sensing and Image Interpretation Expert to work closely with ED’s National Focal Points and implementing/line agencies of the Member Country (MC) and ED staff on reviewing, developing and updating wetland database system and maps in the LMB.

The main objectives of this assignment are to:

- Develop wetland classification system and its definition for the MRC; and
• Generate series of, consistent and dynamic/interactive wetland maps of LMB wetlands in 2010, 2015 and 2020 by using optical and microwave remote sensing technologies together with satellite-based product such as SMI.

2.2 Expected Final Products:

1. Detailed wetland classification system and its definition developed by using FAO-GLCCS;
2. Time series of LMB dynamic wetland maps of 2010, 2015 and 2020; developed and quality assured; and
3. A set of databases for remote sensing imageries and GIS databases well organized and hand over to the MRCS ED for documentation.

3. Required Deliverables, Timelines and Responsibilities:

3.1 Deliverables and Concrete Timelines:

A tentative schedule is provided below. The exact schedule will depend on the timing of the contracting of the consultant, but it is anticipated that the assignment will commence in 1st April 2020 until 31st December 2020.

<table>
<thead>
<tr>
<th>No.</th>
<th>Tasks</th>
<th>Required Deliverables</th>
<th>Estimated Time (Days)</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acquire optional and microwave remote sensing for wetland mapping</td>
<td>Landsat 8 and Sential-1 and SMI collected</td>
<td>10</td>
<td>31 Apr 2020</td>
</tr>
<tr>
<td>2</td>
<td>Conduct radiometric and spectral correction of all datasets</td>
<td>Both optical and microwave data quality assured</td>
<td>5</td>
<td>31 May 2020</td>
</tr>
<tr>
<td>3</td>
<td>Construct wetland classification system and definition for the MRC</td>
<td>Wetland classification system and definition constructed using FAO-GLCCS software</td>
<td>15</td>
<td>30 Jun 2020</td>
</tr>
<tr>
<td>4</td>
<td>Conduct Image interpretation and wetland classification for 2010, 2015 and 2020</td>
<td>First draft of wetland map for 2010, 2015 and 2020</td>
<td>25</td>
<td>30 September 2020</td>
</tr>
<tr>
<td>5</td>
<td>Check quality wetland project, polish the datasets and produce an LMB wetland map</td>
<td>A final LMB wetland map prepared and delivered to MRCS-ED team</td>
<td>5</td>
<td>31 Oct 2020</td>
</tr>
<tr>
<td>6</td>
<td>Participate in the MRC meetings and consultations</td>
<td>Training materials, ppt presentations.</td>
<td>5</td>
<td>30 Nov 2020</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>65</strong></td>
<td><strong>Apr-Nov 2020</strong></td>
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</table>
3.2 Required Tasks and Responsibilities:

Under the management direction of the Division Director and technical advice of the Chief of Environment Management Officer, the incumbent performs the following duties:

- Coordinate, support and carry out the analysis of remote-sensed data (optical and microwave remote sensing) by using object-based classification system for generating the LMB wetland map for 2010, 2015 and 2020;
- Conduct spectral and radiometric correction for all remote sensing datasets before data analysis and interpretation.
- Interpret time series annual wetland maps using optical, microwave remote sensing dataset together with satellite based- product such as SMI or other available datasets to support the analysis.
- Update the existing MRC wetland classification system, with definitions, using the international wetland classification system by adopting the FAO standard;
- Update timeseries wetland data and maps for 2010, 2015 and 2020 in the LMB;
- Develop change detection of maps of wetland and indicating the status and trend of wetland changes from 2010 to 2020;
- Develop and maintain geo-spatial database and conduct change detection analysis of various wetland maps;
- Provide relevant capacity building services to relevant national agencies and MRCS staff;
- Develop decision rules for defining standardize wetland maps of 2010, 2015 and 2020 in the LMB;
- Maintain and update the Remote Sensing dataset relevant to wetland maps/project and stored at MRCS Environment Management Division;
- Assists the CEMO and relevant officers of ED in organizing relevant national and regional technical consultation meetings on wetland mapping and its classifications;
- Process spatial datasets and create data management for the project;
- Coordinate and support the work of the MRC’s regional technical/expert group related to approach and methodology for wetland mapping and data management (if applicable), and contribute to the work of other regional groups as required;
- Ensure that relevant knowledge and products developed by the consultant are quality assured and available at the national level to assist decision-making processes;
- Perform any other relevant tasks as required.

4. Working Arrangement:

4.1 Director Supervisor:

The consultant will be working under the overall supervision of the Director of the Environmental Management Division.
4.2 **Communication Line:**

The consultant will be under the direct supervision of the Chief Environment Management Officer as well as in close consultation with an Ecosystem and Wetland Specialist.

5. **Payment Mode:**

Payment will be made based on the actual number of working days with the MRC’s daily timesheet template provided by the consultant. Travel and subsistence costs will be included in the working day rate of the consultant. Tasks will be assessed and technically endorsed and approved by the ED’s Ecosystem and Wetland Specialist prior to payment.

<table>
<thead>
<tr>
<th>Main Tasks and Required Deliverables</th>
<th>Percent of payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>After signing of the contract and upon submitted of original invoice.</td>
<td>20 %</td>
</tr>
<tr>
<td>After the completion, submission to and approval by MRCS ED of related deliverables of tasks 1, 2 &amp; 3;</td>
<td>26 %</td>
</tr>
<tr>
<td>After the completion, submission to and approval by MRCS ED of related deliverables of task 4;</td>
<td>39 %</td>
</tr>
<tr>
<td>After the completion, submission to and approval by MRCS ED of related deliverables of tasks 5 &amp; 6;</td>
<td>15 %</td>
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6. **Qualifications and Requirements:**

- At least Master or higher degree in remote sensing, geography or related field;
- At least 8 years of experience and knowledge on remote Sensing and Image processing for land cover and wetland mapping are required;
- Minimum 8 years of experience in remote sensing, image processing and interpretation applications;
- At least 5 years in using of remote sensing in land cover mapping and other environmental monitoring in the Mekong Region;
- Strong leadership and experience in leading the regional project for land cover or wetland mapping for the Mekong are required;
- Strong knowledge and experience in using and perfectly handling the remote sensing object-based classification system such as FAO-GLCCS software including Madcat or recognition and or other similar remote sensing software are mandatory;
- Excellence experience in developing land cover, wetland or flood map using both optical and microwave remote sensing data and technologies in the Mekong Region are required.
- Experience in spatial natural resources information and data analysis and interpretations;
- Demonstrating knowledge of natural resources classification systems and mapping, preferably in relation to the Mekong region or similar natural environments;
- Experience in applying satellite remote sensing, both SAR (Synthetic Aperture Radar) and optical imageries, to GIS for natural resources mapping and inventories is an advantage;
• Good knowledge about MRC information and knowledge management and MRCS database system including DSF for high level and complex assessment of natural resources system for the Lower Mekong Basin would be highly preferable;
• Excellent inter-personal skills and able to negotiate constructively in a Mekong institution and cultural context; and
• Fluent in English, verbal and writing and strong analytical skills.

7. Intellectual Property Rights (IPR):
Intellectual property rights - IPR: Information, data, database, knowledge resources in the forms of briefings, reports, proceedings, articles, essays, etc. issued by and for the MRCS will be the MRCS property. Any utility, announcement and disclosure that are without MRCS highest levels of authority’ permission is considered illegal and will be charged by relevant local and international legal procedures.

8. Signature Block:

MRCS CEMO, ED, MRCS
Name: __________________
Date: ___________________

Consultant
Name: __________________
Date: ___________________

Director of the ED, MRCS
Name: __________________
Date: ___________________