

## **Proposal for development of remote sensing data analysis training programs and organization of training courses**

### **1. Background**

Improving skills and/or knowledge of ocean remote sensing in the NOWPAP region is one of the essential things pointed out in the past CEARAC FPMs and in the integrated reports on ocean remote sensing for the NOWPAP region (2005, 2011). In the NOWPAP Medium-term Strategy (MTS) 2018-2023 approved in 2018, capacity building of stakeholders is also an important issue to be resolved. In Priority Area 2: Assess status of the marine and coastal environment in the MTS, it is required to present the status of marine and coastal environment based on reliable information and data. The MTS also suggests strengthening science-policy interface and RACs' role as information and/or technical resources for policy- and decision-makers, for which meetings to conduct scientific analysis, capacity building and training, and communication and public outreach are crucial.

CEARAC has planned to organize the 5<sup>th</sup> training course on remote sensing data analysis; however, due to COVID-19 pandemic, it is likely that the training course will be conducted in a webinar-style. Therefore, CEARAC has worked on developing web-based tools for satellite data analysis and teaching materials which are specifically fabricated to suit to online lessons. Then, from the year of 2022 on, CEARAC plans to enrich the currently developing tools and materials to establish a program to provide a training course on remote sensing data analysis regularly in either a virtual or an in-person style, depending on the needs and circumstances of the time.

In May 2021, there was a request to NOWPAP RCU from the Secretariat of GEO Blue Planet Initiative, which has been developing the methodology for the eutrophication indicators of SDG target 14.1.1a, to apply the NOWPAP Eutrophication Assessment Tool (NEAT) developed by CEARAC to the Bay of Bengal and the Chesapeake Bay. Upon this request, CEARAC has been preparing an option which enables to upload regionally tuned satellite derived chlorophyll-a (CHL) to the Global Eutrophication Watch, a web-tool developed based on the NEAT and the Google Earth Engine (GEE). CEARAC has also been developing an online satellite data evaluation tool to efficiently validate and tune satellite data for other part of the world ocean. In addition, Ocean Remote Sensing Program of the IOC Sub-Commission for the Western Pacific (IOC/WESTPAC) started using the cloud-based seagrass mapping tools, developed by CEARAC by using the GEE and the Amazon Web Service (AWS).

Thus, this proposal aims at developing programs for capacity building of a usage of

satellite data in monitoring and assessment of the marine environment not only in the NOWPAP region but also other regions worldwide.

## **2. Objectives**

Objectives of this activity are to consolidate the latest knowledge and know-how of satellite remote sensing of the marine environment, to provide an opportunity to learn the state-of-the-art data analysis techniques, and to contribute to capacity building of the NOWPAP region in terms of utilization of satellite remote sensing of the marine environment. In addition, by disseminating use of the NEAT based eutrophication assessment tool and the cloud-based seagrass mapping tools in other parts of the world ocean, CEARAC also tries to build a scheme to receive feedbacks from other geographical regions to improve quality of the developed tools.

## **3. Tasks**

### **3.1 Enhancement of the webinar website**

CEARAC will enhance a webinar website to be built in the 2020-2021 biennium by adding the following functions and contents.

<Enhancement of functions>

- Adding functions for time series data analysis of SST and chlorophyll-a (CHL)
- Adding functions for correlation analysis (satellite to satellite inter-comparison and/or satellites to in-situ data)
- Improving the masking function in mapping seagrass
- Improving filed data management in mapping seagrass
- Adding a function to batch process satellite images for mapping seagrass

<Enrichment of contents>

- Adding user interviews from the NOWPAP region
- Adding user interviews from other regions outside the NOWPAP region
- Preparing a manual for time series data analysis of SST and CHL
- Updating manuals of the cloud-based seagrass mapping tools; Seagrass Mapper (cloud based seagrass mapping tool) and Seagrass Trainer (field seagrass information management tool)

### **3.2 Organization of regular webinar**

Webinar on remote sensing data analysis will be regularly held targeting at young researchers, students and governmental officials (approx. 25 people) in the NOWPAP

member states to teach monitoring and assessment of the marine environment using remote sensing. Tuition to attend the webinar will be free and the course has two main themes: (1) monitoring and assessment of water quality by ocean colour remote sensing; and (2) mapping seagrass by optical sensors. Each theme will be conducted in three consecutive days and there are two sessions of 90-minute lessons in each day (Table 1). The course is conducted in English, and all trainees need to use a computer. Two webinars for each theme will be conducted in every year during the 2022-2023 biennium.

Table 1. Syllabus of the webinar on remote sensing data analysis

<b>Day</b>	<b>Lesson</b>	<b>Monitoring and assessment of water quality by ocean colour remote sensing</b> (L=lecture, H=hands-on demonstration)
1	1	Satellite Biological Oceanography (L)
	2	Processing of data-quality flags (H) Validation of satellite data with ground truth data (H)
2	3	Introduction of ocean color sensors (L)
	4	Developing time-series data (daily average, monthly average) (H)
3	5	Application of Ocean Colour Sensor (eutrophication, red tide and HAB) (L)
	6	Time-series analysis (extracting trend and/or data in regions of interest) (H)

<b>Day</b>	<b>Lesson</b>	<b>Mapping by optical sensors</b> (L=lecture, H=hands-on demonstration)
1	1	Seagrass beds and coastal ecosystems (L)
	2	Preparation of ground truth data as training data sets (H)
2	3	Theory of detection seagrass beds by remote sensing (L)
	4	Classification of satellite images (H)
3	5	Basics of image classifications (L)
	6	Accuracy validation (H)

### 3.3 Organization of an onsite training course

CEARAC will continue seeking possibilities of organizing a conventional onsite training course while monitoring on the situation of COVID-19 pandemic and availability of funding and collaborative organizations.

#### 4. Application and selection of trainees

Announcement of the training course will be posted on the webinar website, and those who are interested will send an application form to the CEARAC Secretariat. Applicant will be selected by the organizing committee consisting of the people recommended by CEARAC FPs.

#### 5. Cooperation with other relevant organizations

In the past four training courses, CEARAC received financial support from the North Pacific Marine Science Organization (PICES), IOC Sub-Commission of the Western Pacific (IOC/WESTPAC), the International Ocean Colour Coordinating Group (IOCCG), and some local universities. CEARAC will contact these organizations for conducting the fifth training course in a co-operative manner.

#### 6. Schedule

The timeline of this activity is shown below.

Time		Action	Main body
2021	August	Proposal and approval of the workplan at FPM18	CEARAC and CEARAC FPs
	Q4	Proposal and approval of NOWPAP workplan and budget at IGM24	National FPs
2022	spring	Adoption of the workplan at FPM19	CEARAC FPs and CEARAC
		Enhancement of the functions and contents of the webinar website	CEARAC
	summer	Monitoring and evaluation of water quality by ocean colour remote sensing	Nominated experts and CEARAC
	fall	Mapping seagrass by optical sensor	Nominated experts and CEARAC
2023	spring	Enhancement of the functions and contents of the webinar website	CEARAC
	summer	Monitoring and evaluation of water quality by ocean colour remote sensing	Nominated experts and CEARAC

	fall	Mapping seagrass by optical sensor	Nominated experts and CEARAC
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\*In case of receiving requests and/or external funding from relevant organizations/institutions including NOWPAP Partners, and taking the COVID-19 pandemic situation in the NOWPAP region into consideration, a conventional in-person training course may be organized.

## 7. Budget

USD 20,000 will be used for enhancement of the webinar website. Enhancement of functions and enrichment of contents will be conducted annual basis.

\* In case an on-site training course is organized, the total budget can be increased by obtaining external funds from relevant organizations/institutions including NOWPAP Partners.