Workplan and budget on development of a tool for mapping seagrass distribution in the NOWPAP region

1 Background

Seagrass and seaweed in coastal areas have been given special attention in recent years in terms of their potential for conservation of marine biodiversity and absorption of CO_2. CEARAC initiated its activities on mapping seagrass in the 2014-2015 biennium with development of a manual for seagrass and seaweed beds distribution mapping with satellite images and conducted case studies on mapping seagrass in the selected sea areas in the NOWPAP region for evaluation of the developed manual. In the 2016-2017 biennium, CEARAC completed activity of feasibility study towards assessment of seagrass distribution in the NOWPAP region, in which CEARAC envisions estimating seagrass distribution in the entire coastal seas of the NOWPAP region in the future by using satellite images. Through the feasibility study, CEARAC identifies obstacles and required future actions towards assessment of seagrass distribution in the NOWPAP region. By now, CEARAC with national experts has collected information and developed a prototype of Cloud GIS to be used to estimate distribution of seagrass by analyzing satellite images.

The first international workshop on assessment of seagrass distribution in the NOWPAP region was organized in Himi, Toyama, Japan on August 3, 2017 with relevant experts and researchers in the NOWPAP region and UNEP/GRID-Arendal, and the participants agreed on the necessity of developing a tool for mapping seagrass distribution in the NOWPAP region. Following this consensus, CEARAC proposed an activity on development of a tool for mapping distribution of seagrass in the NOWPAP region in the 2018-2019 biennium in the 15th NOWPAP CEARAC FPM (August 2017, Toyama, Japan). The meeting agreed to submit this proposal to the 22nd NOWPAP Intergovernmental Meeting (IGM) held in December 2017, where the proposed workplan of NOWPAP activities for the 2018-2019 biennium was adopted.

Table 1. CEARAC activities on assessment of seagrass distribution in the NOWPAP region

Year	Activity	Deliverable
2014-2015	- Developing a manual for seagrass and seaweed beds distribution mapping with satellite images and implementing case studies on seagrass mapping in selected sea areas in the NOWPAP region	- Manual for seagrass and seaweed beds distribution mapping with satellite images - Case study report on seagrass mapping in the selected sea areas in the NOWPAP region

2016-2017	- Implementing Feasibility Study towards assessment of seagrass distribution in the NOWPAP region	- Feasibility study report towards assessment of seagrass in the NOWPAP region

2 Objective

Objective of this activity is to develop a tool for mapping seagrass distribution in the coastal areas in the NOWPAP region by using satellite images. Depending on availability of external fund, the developed mapping tool will function on a website so that website users can easily and voluntarily update field data/information of seagrass beds for estimation of their distribution in the target area.

3 Tasks

3.1 Update of information on seagrass distribution

Seagrass information collected by the experts in the NOWPAP member states through the 2016-2017 activity was added in a cloud GIS prototype developed by NPEC (http://map.nowpap3.go.jp/). However, regular update of information is necessary since there is a information gap among the member states. To fill in the gap, CEARAC plans to provide smartphone applications such as “Seagrass Spotter (Figure 1)” for researchers, organizations, groups and/or citizens to collect field data/information to collect field data/information of seagrass. Collected information will be verified by nominated experts of the NOWPAP member states to maintain its quality.

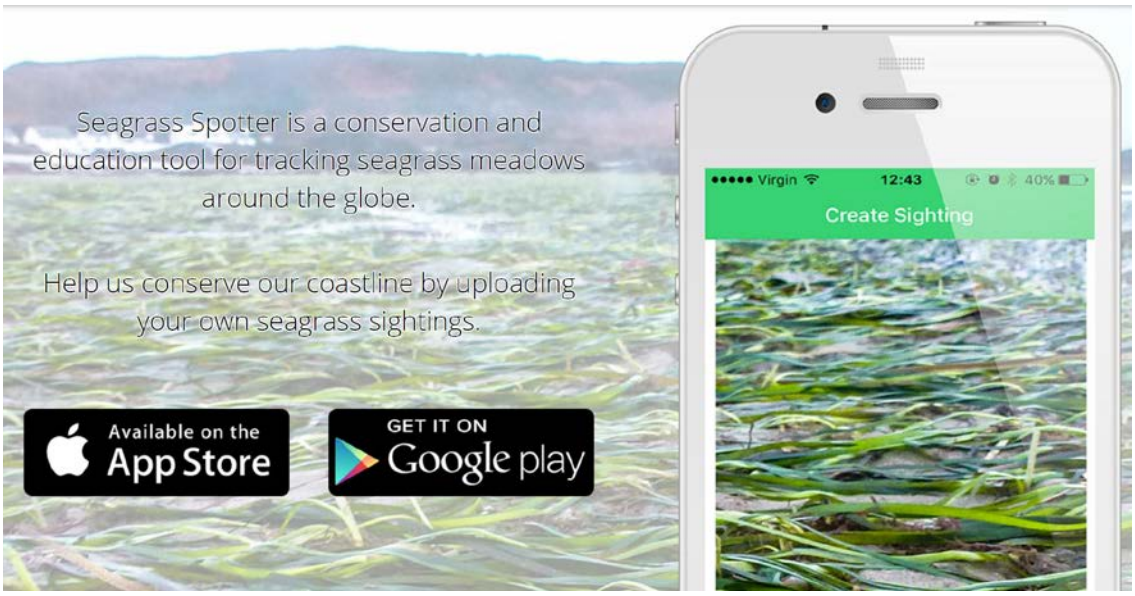

Figure 1. An example of smartphone applications to map seagrass meadows, “Seagrass Spotter,” developed by Project Seagrass, England-based environmental charity for conservation of seagrass ecosystems

3.2 Development of a tool for mapping seagrass distribution with satellite images using cloud computing technology

When seagrass distribution is estimated based on satellite images, a series of steps is taken: purchasing or obtaining satellite images and developing training data sets based on field monitoring data for classification. However, this process requires profound knowledge on analysis of satellite images and it takes long time to complete all steps from downloading and selecting data to correcting radiance by depth. Indeed, the feasibility study towards assessment of seagrass distribution in the entire coastal areas in the NOWPAP region concluded that it is unrealistic to conduct the assessment with the conventional way because of its consumed time and financial burden.

On the other hand, using cloud computing technology for satellite image analysis has become common in recent years. Cloud services such as Amazon Web Services (AWS) or Google Earth Engine are available now, and this technology enables mapping global terrestrial vegetation and/or land use/ land cover changes at high spatial resolution of 30 meters. In case of coastal areas, it is possible to identify moisture of land surface using time series of Landsat data archive (1984-2015) to visualize changes of land use such as reclamation (Figure 2).

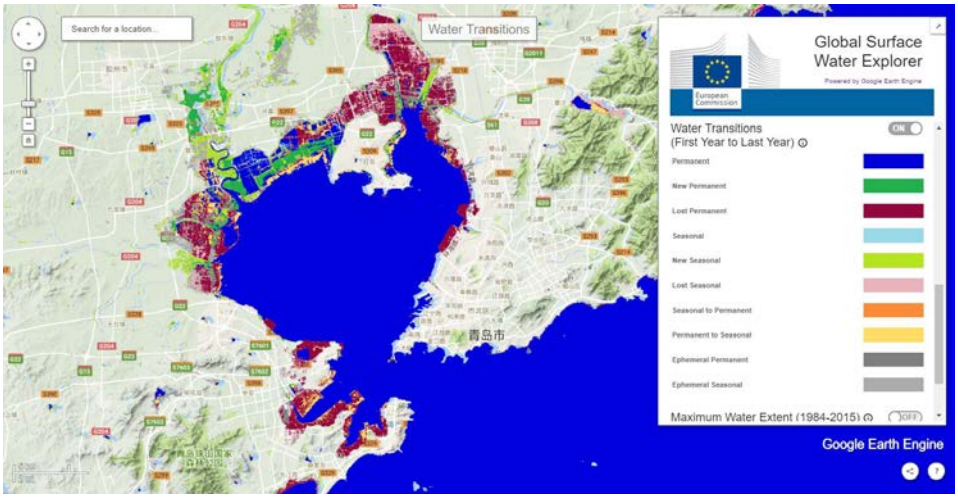

Figure 2. Temporal change of Land surface moisture around Jaouzohu Bay in Qingdao, China shown in Global Surface Water Explorer (https://global-surface-water.appspot.com/). Red areas are newly expanded lands created by reclamation.

Currently, Northwest Pacific Region Environmental Cooperation Center (NPEC), host organization of CEARAC, has been evaluating use of cloud computing technology to map seagrass beds with Landsat-8 Operational Land Imager (30-meter resolution) data. CEARAC plans to develop a tool for mapping seagrass distribution based on the evaluation results by

NPEC and share such a tool among the NOWPAP member states.

3.3 Development of a website for mapping seagrass distribution with satellite images

CEARAC will incorporate the tool developed in 3.2 in a website and provide services to users for mapping distribution of seagrass in their regions of interest using cloud computing technology. Similar services are already realized in mapping terrestrial biomass and water. 'MapBiomass' project enables visualization of changes in land use / land cover in Brazil and neighboring countries at high speed and low cost by active involvement of various organizations and the citzens (Figure 3).

Figure 3. Website of MapBiomass project.

http://mapbiomas.org/

By development of a website in which both obtaining field data/information and updating a map of seagrass distribution are functioned, it is possible to evolve this CEARAC project to locally owned one by participation of local governments and citizens. However, to maintain a high quality of the developed seagrass distribution map, CEARAC will set criteria for developing training data sets to classify satellite images and verifying developed map. Then, the maps that meet the criteria can be open to the public on the website.

Since the development of the website using the cloud computing technology require additional funding, CEARAC will implement task 3.3 only if the funding is secured. Firstly, CEARAC will prepare a proposal in 2018 for external resources available from 2019 on.

4 Expected outcomes

With the use of the developed mapping tool, various stakeholders including governments, citizens, fisheries and/or politicians can share the same knowledge of distribution of seagrass. When the area of seagrass beds in coastal areas is identified, such information can be used for planning policies to conserve and/or recover seagrass beds, and also to estimate the

amounts of CO_2 absorbed in the sea.

In addition, this activity can cooperate with a project of Ocean Remote Sensing in IOC/WESTPAC, and can be applied in the Southeast Asian countries as well.

5 Schedule

The timeline of this activity is shown below.

Time		Action	Main body
2018	May	Review/adoption of the workplan at FPM16	- CEARAC FPs - CEARAC Secretariat
	June to October	- Update of field data/information of seagrass distribution - Baseline design of a tool for mapping seagrass distribution with satellite images using cloud computing technology	- Consultant and nominated experts - CEARAC Secretariat and consultant
	November	Development of a tool for mapping seagrass distribution with satellite images using cloud computing technology	CEARAC Secretariat and consultant
2019	October		
	Q3 to Q4	Construction of web-based service for mapping seagrass distribution	CEARAC Secretariat and consultant

6 Budget

Task	Time	Deliverables	To be completed	Main body	Budget (US$)
Update of field data/information of seagrass distribution	2018 Q2	Updated field data/ info. of seagrass distribution	2018 Q3	Consultant and nominated experts	15,000
Development of a tool for mapping seagrass distribution	2018 Q4	A tool for mapping seagrass distribution	2019 Q3	CEARAC Secretariat and consultant	25,000
Construction of web-based service for mapping seagrass distribution	2019 Q3	Web-based service for mapping seagrass distribution	2019 Q4	CEARAC Secretariat and consultant	External fund
Total					40,000