Item 5.2.4 of the Provisional Agenda

PROGRESS REPORT ON
OCEAN REMOTE SENSING FOR COASTAL HABITAT MAPPING
(May 2015–April 2017)

In accordance with Terms of Reference of IOC Sub-Commission for the Western Pacific, the report is provided to facilitate the consideration by the Sub-Commission on the progress made on the WESTPAC project on Ocean Remote Sensing for Coastal Habitat Mapping.

The Sub-Commission is invited to discuss about the progress made over the past intersessional period, provide directives and advice on its future development, and further identify resources and national commitments to its implementation in the region.
I. Project

1. Ocean Remote Sensing for Coastal Habitat Mapping

II. Project Objectives and Expected Outputs/Outcomes

2. Coastal habitats having high productivity provide numerous ecological services such as foods, protection from strong waves through buffering effect, fixation of CO2 through photosynthesis, fostering biodiversity etc. However, increasing human impacts via direct and indirect ways and climate change decrease and degrade coastal habitats. The WESTPAC region is developing most rapidly in the world. The developing WESTPAC region needs an integrated coastal area management for sustainable development maintaining healthy coastal habitats. For its establishment, it is indispensable to know spatial distributions of habitats and human use of coastal waters and to inform them to stakeholders. Remote sensing is one of the most cost-effective methods for mapping them in broad coastal waters. Since 2014, NASA has provided non-commercial satellite images with ultra-high spatial resolution optical sensors (30 m), LANDSAT8 OLI, similar to LANDSAT TM and ALOS AVNIR2 available from 2006 to 2011. Using LANDSAT8 OLI images it may be possible to make habitat map in the WESTPAC region. The project decided to start to map seagrass beds in WESTPAC region at the kick-off workshop in Busan in 2010. From 2012 to 2015, the project aims to establish a network of researchers working on remote sensing studies concerning habitat mapping, especially seagrass mapping. It also aims to standardize methods to map seagrass beds suitable for WESTPAC region. Products of habitat maps can be used for delivering our understanding of habitat distributions at selected areas to local people and stakeholders with the standardized remote sensing methods for integrated coastal management. Detected changes provide insights on alters in environmental setting such as human impacts and climate change.

III. Project Leader (Chairperson) and Project Steering Group

3. Project leader:

Dr. Teruhisa Komatsu
(Atmosphere and Ocean Research Institute, The University of Tokyo)

4. Project Steering Group:

Prof. Mazlan Hashim (Universiti Teknologi Malaysia, Malaysia)
Dr. Aidy Muslim (Universiti Trengannu, Malaysia)
Ms. Thidarat Noiraksar (Brapha University)
Dr. Anchana Prathep (Prince Songkla University, Thailand)
Mr. Luong Cao Van (Institute of Marine Environment and Resources, Vietnam)
Mr. Phan Minh Thu (Institute of Oceanography, Vietnam)
Dr. Hoang Son Tong Phuc (Institute of Oceanography, Vietnam)
Prof. Kenichi Hayashizaki (Kitasato University, Japan)
Dr. Tatsuyuki Sagawa (Remote Sensing Technology Center, Japan),
Prof. Sam Wouthyen (LIPI, Indonesia)
Dr. Nurjannah Nurdin (Hasanuddin University, Indonesia)
Mr. Sophany Phauk (Royal University of Phenom Phen, Cambodia)

IV. Terms of Reference of the Program Steering Group

5. The Terms of Reference of the project from May 2015 to May 2017 is as follows:

1) to establish a network of researchers working on remote sensing of seagrass mapping: all members
2) to standardize satellite image analysis: Prof. Teruhisa Komatsu, Prof. Mazlan Hashim, Dr. Tatsuyuki Sagawa and Dr. Hoang Son Tong Phuc

3) to standardize sea truthing methods: Prof. Kenichi Hayashizaki, Prof. Anchana Prathep, Ms. Thidarat Noiraksar and Prof. Teruhisa Komatsu

4) to apply the standardized methods of seagrass mapping to target areas: all members

5) to organize workshops to standardize remote sensing methods: Prof. Teruhisa Komatsu, Prof. Mazlan Hashim, Prof. Kenichi Hayashizaki, Dr. Tatsuyuki Sagawa, Mr. Phan Minh Thu, Dr. Hoang Son Tong Phuc and Prof. Anchana Prathep

V. Activities carried out and/or to be carried out during the last intersessional period (May 2015 – April 2017)

1. ORSP members published in an international journal


Fig. 1 Ocean Science Journal in which our members’ articles are published

2) Local workshop on ORSP for ICAM for beginners in Thailand scheduled in mid-December 2016

6. The first local workshop on ORSP for ICAM will be held at Prince of Songkla University in Hat Yai, Thailand in mid-December 2016 in collaboration with Core-to-Core Program of Japan Society for Promotion of Science entitled as “Research and education network on Southeast Asian coastal ecosystems” conducted by Atmosphere and Ocean Research Institute, The University of Tokyo. This workshop is to initiate graduate students, who don’t specialize in remote sensing, into habitat mapping with use of satellite image analysis. Participants will learn ABC of remote sensing and habitat mapping method through computer exercise using free software.
3) Trial of cooperative study between HAB and ORSP projects on harmful algal blooms in Lampung Bay, Sumatra Island in 2015-2016

7. Project leader participated in trial of cooperative study between HAB and ORSP projects on harmful algal blooms in Lampung Bay, Sumatra Island, where HAB has frequently occurred, from 19 to 24 October 2015. This study aims to examine holistically balance between exploitation and use of coastal waters and conservation of marine environments by combining scientific knowledges on occurrence mechanisms of HAB with spatial and temporal changes in use of coastal waters including a land area detected by satellite remote sensing and grasping the present situation through inquiries on economic and social impacts of HAB and countermeasures against the HAB. Satellite remote sensing revealed that the numerous fishing facilities forming a rectangle with an edge of ~10 m were distributed in Lampung Bay (Fig. 2). The officer at Lampung Aquaculture Center hadn't recognized their deployments there. Our field survey showed that they were fishing facilities called Bagan in Indonesian that catch larvae and small fish with net after luring them by light at night. We also conducted discussion between our research group members and fishermen and also local researchers (Fig. 3). This study gave us a good occasion to form transboundary research to resolve a present coastal problem.

Fig. 2. Satellite image of PALSAR-2 HV polarization taken on 13 July 2015 (left) showing picture of Bagan taken on 22 October 2015 (right) as small brighter dots in the left image.

Fig. 3. Discussion between the research group and local fishermen on 21 October 2015 (left) and discussion between the research group members and local researchers at Aquaculture Research Center of Lampung on 23 October 2015 (right).
VI. Problems encountered and actions to be considered by the 11th Intergovernmental Session, tentatively scheduled for April 21-23, 2017, Qingdao, China

8. After termination of ALOS operation in spring 2011, non-commercial satellite images with ultra-high spatial resolution are not available even though LANDSAT 8 with visible multibands of 30 m resolution has been successfully launched in February 2013 and operated since 2013. Because seagrass and seaweed beds are patchily distributed, visible multiband satellite images with high spatial resolution are needed to map their distributions precisely. European Space Agency (ESA) launched Sentinel-2 with multiband sensors with a spatial resolution of 10 m. Satellite images of Sentinel-2 multiband are suitable for coastal habitat mapping in WESTPAC region. It is expected that ESA provides those on WESTPAC region.
## VII. Workplan and Budget for May 2017 – May 2019

<table>
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<tr>
<th>Project/Programme</th>
<th>Activities</th>
<th>Objectives</th>
<th>Expected outputs/outcomes</th>
<th>Date and place</th>
<th>Funding Required</th>
<th>IOC</th>
<th>Other sources (i.e. from national or international)</th>
<th>Remark</th>
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</thead>
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<tr>
<td></td>
<td>1. Strategic meeting</td>
<td>Discussion on future activities, especially on capacity and scientific developments</td>
<td>List of training courses Drafts of outreach material</td>
<td>Date and place not decided in 2017 and 2019</td>
<td>20,000 USD</td>
<td></td>
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<tr>
<td>Ocean Remote Sensing Project for Integrated Coastal Area Management (ORSP)</td>
<td>2. Establishment of regional network</td>
<td>Facilitation of information exchange and dissemination</td>
<td>Networking</td>
<td>2017-2019</td>
<td>No cost</td>
<td></td>
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<td></td>
<td>3. Capacity development</td>
<td>Training workshops</td>
<td>Trained scientists and students</td>
<td>2017-2019</td>
<td>20,000 USD</td>
<td>20,000 USD (Univ. Tokyo)</td>
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<td></td>
<td>4. Interaction with other coastal habitat mapping projects</td>
<td>Information exchange and collaboration of activities</td>
<td>Enhance effectiveness of activities</td>
<td>2017-2019</td>
<td>No cost</td>
<td></td>
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<td></td>
<td>5. Production of outreach material</td>
<td>Information dissemination</td>
<td>Better understanding on coastal habitats and necessity of mapping by remote sensing</td>
<td>2017-2019</td>
<td>3,000USD (Univ. Tokyo)</td>
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<td>6. Preparation of textbook</td>
<td>Increase effectiveness of training</td>
<td>Increase and standardization of coastal habitat mapping techniques with remote sensing and production of training material</td>
<td>2017-2019</td>
<td>3,000USD (Univ. Tokyo)</td>
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