

Outline for the progress report on Ocean Remote Sensing for Coastal Habitat Mapping

1. Introduction and justification

Productive coastal habitats provide many ecosystem services that are essential for the sustainable development of human societies, such as food, biodiversity, blue carbon, wave buffers and so on. However, increasing direct and indirect human impacts and climate change are reducing and degrading coastal habitats. More than 40% of the world's population lives within 100 km of the coast and this trend is continuing to increase. Such a high concentration of population in a narrow coastal zone needs a rapid response to conserve the world's coastal ecosystems and enable local communities to cope with the ongoing changes. On the other hand, the WESTPAC region is the fastest developing and most densely populated region in the world. The developing WESTPAC region therefore requires integrated coastal zone management for sustainable development with the conservation of healthy coastal habitats. To achieve it, the spatial distribution of coastal habitats and their human use have to be understood and communicated to the relevant stakeholders.

Remote sensing is one of the most cost-effective methods to produce habitat maps of broad coastal waters. Habitat map products can be used to provide local people and stakeholders with an understanding of habitat distribution in selected areas for integrated coastal management. The use of habitat distribution maps therefore requires sufficient accuracy. The project aims to provide habitat distribution maps with sufficient accuracy through the development of standard methods and the introduction of new remote sensing technologies, thereby contributing to the sustainable use of coastal habitats. In particular, to achieve SDG target 14.2 'Sustainable management and protection of marine and coastal ecosystems to enhance their resilience and avoid significant adverse impacts', Integrated coastal area management is a common and urgent task for countries in the WESTPAC region. With this recognition, the project aims to promote coastal habitat mapping using remote sensing for interdisciplinary integrated coastal area management under the UN Decade of Oceans.

Based on the strong science on satellite remote sensing accumulated through these activities over the years, the project will contribute to the promotion of a transformative integrated approach involving various stakeholders to better address the various issues of development in coastal areas causing coastal habitat degradation. The use of new technologies, such as the Google Earth Engine for more efficient image processing in coastal habitat mapping, web-based analysis software and the use of drones as a means of acquiring field survey data, are expected to be used for early detection of coastal habitat changes and early warning to society. From a social perspective, in order to effectively build and maintain monitoring systems, a social analysis is demanded for what coastal habitat maps stakeholders such as national and local governments as management and monitoring bodies, the fishing industry including aquaculture as producers of shellfish and fish, and citizens as consumers need.

2. Timeframe and objectives

Timeframe:

May 2021 to April 2025

Objectives:

- Objective 1 Identify social and technical needs related to coastal habitat mapping
- Objective 2 Exchange and share the latest information on coastal habitat remote sensing
- Objective 3 Disseminate the information on coastal habitat mapping in WESTPAC region
- Objective 4 Plan and implement capacity building activities
- Objective 5 Provide technical assistance when a member state of WESTPAC requests it
- Objective 6 Communicate with other international organisations

3. Major activities, outputs & outcomes over the last intersessional period (May 2021- April 2023)

Activities

- 1) Decade Action Incubator 3 of the UN Decade of Marine Science for Sustainable Development Regional Kick-off Conference, held on 25 November
- 2) A web-based workshop on seagrass bed mapping in the Con Dao Islands, Viet Nam was held through web on 29 June 2021
- 3) A web-based workshop was held on 30 September 2021 on mapping seagrass beds in Thailand and Viet Nam using the WESTPAC ORSP standardised methods
- 4) Contribution to the International Webinar on Advancing Remote Sensing Applications for the Sustainable Development of Ocean, Marine and Coastal Resources from 22 November to 20 December 2022
- 5) Cooperation in training courses for using a web-based seagrass mapping tool, Seagrass Mapper developed by NOWPAP in cooperation with Coastal Habitat Mapping Project from 30 November to 2 December 2021 and from 14 December to 16 December 2021.

outputs & outcomes

- 1) Contributed to the UN Decade of Marine Science for Sustainable Development Regional Kick-off Conference
- 2) Delivered standardized seagrass mapping methods with the ZOOM to Thai and Vietnamese researchers
- 3) Shared WESTPAC standardised methods to map seagrass beds and examined its possibility to apply them to map seagrass beds without broad ground truthing survey under the COVID-19 pandemic.
- 4) Gave presentations at International Webinars to disseminate the information on importance of coastal habitat mapping in WESTPAC region for SDG14 and UN Decade of Ocean Science
- 5) Contributed to capacity building in the WESTPAC region in cooperation with another UN organisation.

4.A summary of key achievements since its establishment

- 1) Established a network of researchers mapping coastal habitats, especially seagrass, using remote sensing in the WESTPAC region.
- 2) Organised a workshop for the standardisation of habitat mapping methods using satellite image analysis.
- 3) Standardised water column correction for mapping seagrass in the subtidal zone, which is well adapted to the WESTPAC region.
- 4) Organised training courses on satellite remote sensing methods and field survey methods for obtaining ground truth data in cooperation with the WESTPAC Office, JSPS and ORSP members from different countries to develop the capacity of young researchers and graduate students in the WESTPAC region.
- 5) Planned and held workshops at the WESTPAC International Scientific Conference to exchange the latest information.
- 6) Cooperated in the development of a web-based satellite image analysis application for seagrass beds, called seagrass mapper, built by NOWPAP, by introducing standardised methods in WESTPAC.
- 7) Produced and provided maps of seagrass beds by satellite remote sensing using the Depth Invariant Index, a water column correction method standardised by ORSP, contributing to the conservation of seagrass beds in the turbid Singapore Straits, which were largely undetectable using the conventional Depth Invariant Method. The results served for conservation of seagrass beds where a large scale reclamation was planned.

5. Self-assessment on implementation against objectives

During this period, on-site training courses and face-to-face workshops and meetings were not possible due to COVID-19. However, training courses on satellite image processing were conducted online, even during the COVID-19 pandemic. Steering Committee meetings and workshops were also conducted via the web. However, training courses on Ground Truth, which required on-site fieldwork, could not be conducted.

6. Problems encountered and recommended actions

Problems encountered

Face-to-face and on-site workshops and training courses could not take place due to international or domestic travel restrictions imposed by Covid 19 pandemic.

Recommended actions

Online meeting platforms for conferencing and information exchange are recommended for use in workshops and training courses, with the exception of on-site training such as training for obtaining ground truth data.

The possibility of hybrid methods of training courses using online meeting platforms as well as on-site face-to-face training and lectures on site needs to be explored.

7. Objectives to be achieved, if applicable, over the next intersessional period (May 2023- April 2025)

- 1) Hold Steering Committee (SC) meetings annually to identify social and technical issues and needs related to **ocean remote sensing concerning coastal habitat mapping, blue carbon-related issue and pollution** in each country **based on the progress of coastal habitat mapping**
- 2) Exchange and share the latest information on **ocean remote sensing** and disseminate this information to the WESTPAC region
- 3) Plan and implement at least one capacity-building activity each year
- 4) Provide technical assistance to address **ocean remote sensing**, as requested by a country in the WESTPAC region
- 5) Produce more than one **thematic map produced under the project** per member
- 6) Contribute to UN decade of Ocean Science such as CoastPredict and Maline Life 2020 and 30 by 30 of the Convention on Biodiversity through Objective 5
- 7) Communicate with other relevant international organisations such as UNEP-NOWPAP etc.

8. Planned activities for May 2023- April 2025

- 1) Hold Steering Committee (SC) meetings annually to identify social and technical issues and needs related to **ocean remote sensing** in each country
- 2) Organise at least one web-based or face-to-face workshop each year
- 3) Plan and implement at least one capacity-building activity each year
- 4) Provide technical assistance to address **ocean remote sensing**, as requested by a country in the WESTPAC region
- 5) Produce more than one thematic map produced under the project per member
- 6) Demonstration of remote sensing technology on seagrass mapping in selected pilot sites
- 7) Cooperation with other UN organisations for seagrass mapping

[provide, in tabular form, the action items that should be included in the work plan and budget]

Program/project	Activities	Expected outputs	Expected outcomes	Date and place	Funding Required		Remarks
					IOC	Other sources (i.e. from national or international)	
	1. Steering Committee Meeting	To identify social and technical issues and needs related to ocean remote sensing in each country and to coordinate a training course and a workshop	Sharing new techniques Contributing to capacity development Disseminate information	2023 (online) 2024 (online) 2025 (online)	No cost	No cost	
	2. Demonstration of remote sensing technology on ocean remote sensing in selected pilot sites in cooperation with local authorities 1). Technical meeting at three sites 2). Generate thematic maps at three sites 3). Transfer mapping technics to researchers & local authorities at three sites	To demonstrate remote sensing technics to researchers/local authorities concerning ocean remote sensing that they don't use the technics To inform on the methods to monitor marine environment in broader areas that ground surveys can't cover To transfer remote sensing techniques to local researchers and authorities responding to their need	Thematic maps generated by local researchers/authorities Implementing remote sensing technics for generating thematic maps from satellite images to researchers/local authorities monitoring marine environment Recommendation to marine policy	Sites to be decided upon the steering meetings 1) Technical meeting by December 2024. 2) Generate thematic maps by December 2024 3) Transfer mapping technics by April 2025.	20K	10K Japan Society for the Promotion of Science or the University of Tokyo	

Program/project	Activities	Expected outputs	Expected outcomes	Date and place	Funding Required		Remarks
					IOC	Other sources (i.e. from national or international)	
	3. Scaling up workshop on ocean remote sensing with remote sensing for reviewing the results of several sites	<p>To summarize the demonstration activities</p> <p>To share direction of use thematic maps produced by the project</p> <p>To expand demonstration sites</p>	<p>Increase in authorities using the remote sensing technics</p> <p>Increase in reliable thematic maps in WESTPAC region by remote sensing technics</p> <p>Dialogue with local researchers and authorities to implement marine environment conservation policy with use of thematic maps</p> <p>Publication</p>	<p>Scaling up workshop on ocean remote sensing by December 2024</p> <p>Dialogue with local researchers and authorities by December 2024</p> <p>Publication by April 2025</p>	20K	10K Japan Society for the Promotion of Science or the University of Tokyo	
	4. Capacity building	One capacity building activity (online) every year conducted in line with UN Decade of Ocean Science for Sustainable Development. Possible topics include: i) efficient field survey methods; ii) new technologies for remote sensing such as drone or Google Earth Engine;	Two early-career ocean scientists in WESTPAC region who participated in the capacity building activity deliver presentations on their studies by April 2025.	May 2023-April 2025	No cost	In kind (Univ. Tokyo, Kitasato Univ. etc.)	

Program/project					Funding Required		Remarks
	Activities	Expected outputs	Expected outcomes	Date and place	IOC	Other sources (i.e. from national or international)	
		iii) new satellite image analysis methods such as AI or machine learning, etc.					
	5. Cooperation with other UN organisations	Cooperation to training courses or providing knowledge/techniques	Capacity building in the WESTPAC Region/Promotion of coastal habitat mapping	Not decided	No cost	No cost	