OUTLINE FOR PROGRESS REPORT (May 2021 – April 2023) AND
FUTURE WORKPLAN AND BUDGET (May 2023- April 2025)

PROGRESS REPORT ON THE OCEAN FORECASTING SYSTEM FOR THE
SOUTHEAST ASIA AREAS (OFS)

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1. Introduction and justification

The SEAGOOS Ocean Forecasting System program is planned to establish an operational ocean forecasting system for Southeast Asia and its adjacent seas, and demonstrate the value in scientific research and ocean management, resources exploitation, reduction and prevention of the impacts of natural hazards, mitigation of the impact and adaptation to climate change and variability. The Ocean Forecasting System (OFS) includes ocean model, data assimilation, ocean monitoring and observation, products generation and visualization, products distribution and service.

2. Timeframe and objectives
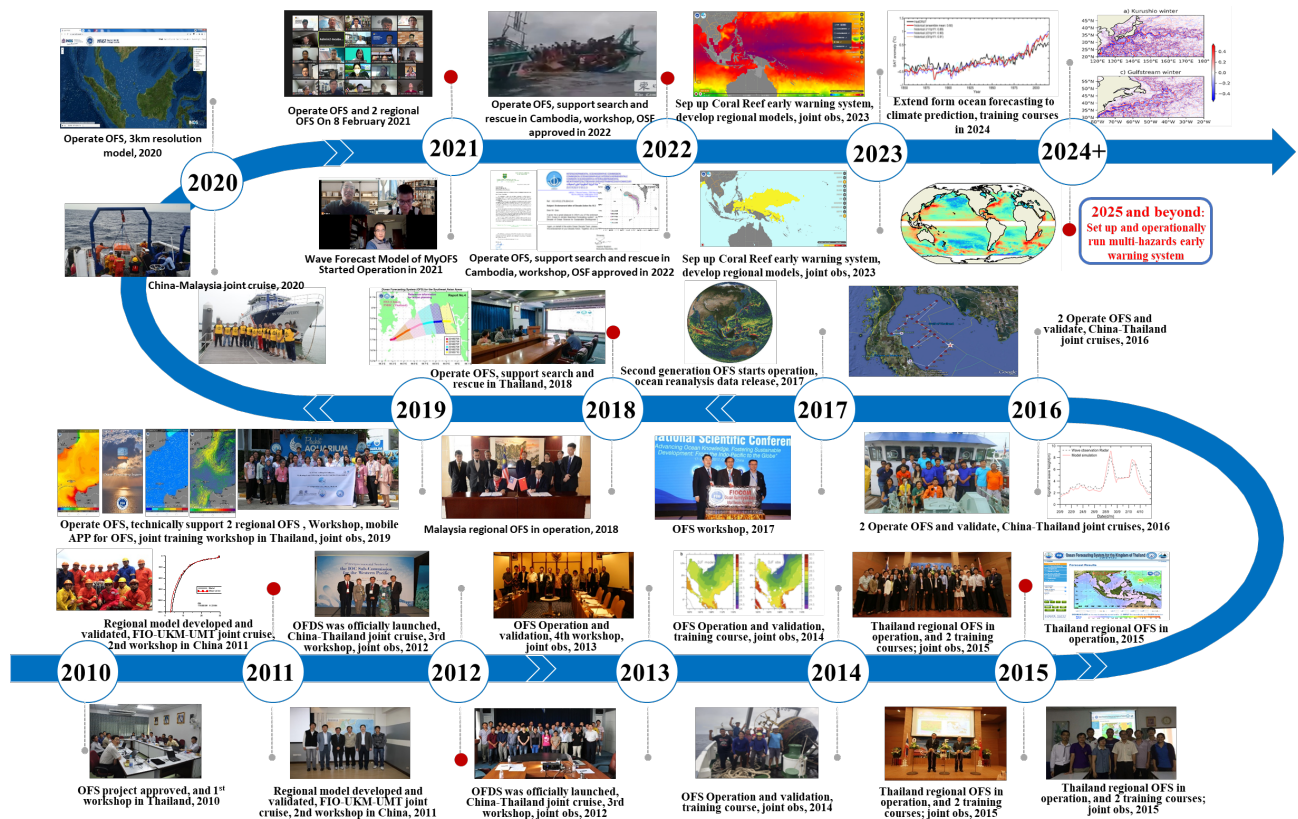
The timeframe of OFS

This project has been implemented for 13 years since 2010. The project has established global operational ocean forecasting system, transform the technology to Thailand and Malaysia, and has clearly demonstrated the value to coral breaching. Via RTRC-ODC, the capacity in national and regional level has increased. In this sense, the objectives were achieved quite well.
The objectives of OFS are as follows:
- Establishing a regional ocean forecasting system with higher resolution model for the geographic coverage;
- Establishing several pilot ocean-forecasting systems for selected subdomains;
- Improving the application of OFS to scientific research and ocean governance;

- Enhancing regional and national capacity for ocean modeling development, data assimilation, and model validation.

  Expected outputs/outcomes:
- A regional ocean forecasting system with higher resolution model for the Southeast Asian seas
- Several pilot ocean forecasting systems for selected subdomains such as the Gulf of Thailand and the Malaysian East Peninsula Shelf.
- Enhanced understanding of key processes and scientific issues of regional seas in the region; and enhanced regional capacity in numerical ocean modeling.

OFS will be a long-term project, and the objectives till 2025 include: (1) To provide operational ocean forecasting products including surface wave, sea temperature, sea salinity and ocean current etc. through the WESTPAC website; (2) To set up operational coral reef early warning system; (3) To help Thailand and Malaysia setting up high-resolution regional ocean forecasting systems.

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

(1) The OFS has been providing operational high-resolution ocean forecasting products through WESTPAC website every day during May 2021 and April 2023. And this operational service started in Feb 2017;
(2) To provide scientific guidance and technical support for 2 pilot (Thailand and Malaysia) regional operational ocean forecasting systems;
(3) The program team provided forecasting rescue area for the shipwreck accident in Cambodia in September, 2022. A fishing boat sank near Sihanouk Port in Cambodia due to a sudden failure at 10:30 am local time on September 22, 2022. Eighteen of the 41 on board were rescued immediately, while 23 others fell into the ocean and disappeared. In order to greatly improve the efficiency of search and rescue, it is urgent to forecast the marine environment and the drift path of people in the sea. Requested by the Ministry of Environment of Cambodia, OFS program set up an emergency forecast team, and provided the forecast products of wind, wave and current fields, especially the searching and rescuing area was predicted and transferred to rescue team through Mr. Meas Rithy, Deputy Director of the Coastal Zone and Marine Protection Department of the Ministry of Environment of Cambodia. Totally 6 forecasting reports were produced, and the final results confirm that the forecasting is professional and accurate;
(4) According to the requests of southeast Asian countries, and for extending the applications of OFS, the OFS team established the coral reef early warning system, to do all kind of tests before providing operational service;
(5) For capacity building, through ODC center, we helped to organize the 10th training courses during 5-16 July, 2021, and 11th training course during 22-27 Aug, 2022;
(6) We collect data and do forecasting validation during the past two years;
(7) We have took part in more than 10 times international meeting to introduce OFS to increase the visibility of OFS;
(8) The program team developed 1/32 degree resolution global surface wave-tide-circulation coupled model, which is the base for higher-resolution OFS in the future;
(9) The OFS team has achieved new scientific understanding on air-sea heat and momentum fluxes, which is crucially important for improving forecasting ability in the future;
(10) Based on this OFS program, the team successfully initiated the UN Ocean Decade Programme "Ocean to climate Seamless Forecasting System (OSF)". From OFS to OSF, the OFS can deeply involve into the UN Ocean Decade from IOC/WESTPAC; on the other hand, the OFS will extend from ocean forecasting to ocean and climate forecasting.

4. **A summary of key achievements since its establishment**

Since the establishment of this OFS program in 2010, two generation operational ocean forecasting systems have been developed, and the program has supported two national regional operational OFS (Thailand and Malaysia). While the first generation OFS ended the history that there were no operational OFS in the southeast Asia areas before 2010, and the second generation of OFS has been proving high quality ocean forecasting products and services for this southeast Asia areas. In addition, the OFS team has successfully developed the coral reef early warning system which will be in operation in 2023.

5. **Self-assessment on implementation against objectives**
   The OFS has implemented quite successful. The following is the point-to-point check

   - Establishing a regional ocean forecasting system with higher resolution model for the geographic coverage;
     Results: OFS has developed high-resolution global operational OFS, which covers the west Pacific and north Indian Oceans. The OFS has been providing operational forecast since May 2012.
   - Establishing several pilot ocean-forecasting systems for selected subdomains;
     Results: OFS has developed Thailand and Malaysia regional OFS, and both in operation.
   - Improving the application of OFS to scientific research and ocean governance;
     Results: OFS has many applications, including the search and rescue in Sep 2022 in Cambodia, the prediction of drift stone in the west Pacific etc.
   - Enhancing regional and national capacity for ocean modeling development, data assimilation, and model validation.
     Results: OFS has implemented 2 training courses through cooperation with ODC center on ocean modeling development, data assimilation, and model validation.

6. **Problems encountered and recommended actions**
   There are two problems: (1) The high cost for maintaining the operational OFS is a challenge; (2) The COVID-19 blocked in-situ observation during the past 2 years while data are important for OFS.

7. **Objectives to be achieved, if applicable, over the next intersessional period (May 2023-April 2025)**
   The following objectives are planned for the following 2 years:
   - To operationally run the OFS in the following 2 years;
   - To provide forecasting products and services for IOC/WESTPAC community;
   - To initiate the operational coral reef early warning system;
   - To cooperate with ODC center for organizing 2 training courses;
   - To extend ocean forecasting to ocean and climate forecasting.

8. **Planned activities for May 2023- April 2025**

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

| Program | Activities | Objectives | Expected outputs/outcomes | Date and place | Funding Required | | Remark |
					IOC	Other sources (i.e., from national or international)	
OFS	1. To operationally run the OFS in the following 2 years, and provide technical support for Thailand and Malaysia OFS	To provide operational forecast every day and distribute through WESTPAC website; and to provide operational forecast for two subdomains	Temperature, salinity, elevation and current within the following 5 days	Everyday, Global OFS in Qingdao, Thailand OFS at PMBC of Thailand, and Malaysia OFS at UMT of Malaysia	20K	600K USD	
	2. To provide forecasting products and services for IOC/WESTPAC community	To provide forecasting and services for emergent marine hazards and events	Forecasting reports	As needed		20K USD	
	3. To initiate the operational coral reef early warning system	To provide operational early warning for coral bleach	An operational early warning system for coral reef	2023,through internet	10K	120K USD	
	4. To cooperate with ODC center for organizing 2 training courses	To provide young scholars updated knowledge on model development, through cooperation with ODC center	Two training courses	2023 and 2024, both in Qingdao			
	5. To extend ocean forecasting to ocean and climate forecasting	To provide monthly climate prediction products for the following 1 year	Climate prediction system	Start in 2023		340K USD	