



**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)**

**Eleventh Intergovernmental Session of the IOC Sub-
Commission for the Western Pacific (WESTPAC-XI)**
Qingdao, China, 21-23 April 2017

Item 5.2.2 of the Provisional Agenda

**PROGRESS REPORT ON
CORAL REEF UNDER CLIMATE AND ANTHROPOGENIC PERTURBATIONS
(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 Coral Reef Resilience to Climate Change and Human Impacts (Former name: WESTPAC-CorReCAP).

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. Coral Reef Resilience to Climate Change and Human Impacts (Formerly referred to as Coral Reef Under Climate and Anthropogenic Perturbations, CorReCAP)

II. Project objectives and expected outputs/outcomes

2. Objectives for IOC/WESTPAC-CorReCAP Project:

- (1) To understand the biogeochemical and ecological processes of coral reefs in WESTPAC in different geographic, physical and environmental settings, as well as different types of human interventions;
- (2) To evaluate the consequence of impact of climate change and other human activities on the health of coral reefs and their sustainable use; and
- (3) To promote capacity building in areas related to research on coral reefs through sharing scientific knowledge and training activities, as well as collaboration within research networks in WESTPAC.

3. Expected Outputs/Out-comes:

- (1) Establishment of a network for research on coral reefs and collaborative coordination with other projects in the region;
- (2) Increase in the ability of capacity building in WESTPAC through exchange of experts, transferring of techniques and training through research;
- (3) Issue of an assessment report on status of coral reefs in WESTPAC in accordance to IOC Medium-Term Strategy;
- (4) Joint publication of research results as monograph and/or special issue in international media.

III. Principal Investigator (Chairperson) and Project Steering Group

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IV. Terms of Reference of the Program Steering Group

The group will have the functions and will carry out the following activities during the life time of this project:

- To review the actual status/conditions of major coral reef ecosystems in WESTPAC and identify critical issues of action that are required for its Sub-Commission;
- To and provide recommendations related to sustainability of coral reef ecosystems and undertake cost-effective implementation of these recommendations, within the frame of IOC Medium-Term Strategy;
- To ensure effective interaction/communication with other regional inter-governmental and non-governmental organizations on coral reef systems research;
- To promote capacity building within WESTPAC on coral reef research and education as well as establish the coordination with other sub-commissions of IOC.

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

1. Members of the project participated in the International Seminar on the Straits of Malacca and the South China Sea on the topic Recent Research on the Marine and Social Science in the Straits of Malacca and the South China Sea, November 2015, Kuala Terengganu, Malaysia. Coral reef ecosystem was highlighted as an emerging issue in research topics on the Straits of Malacca and the South China Sea.
2. Members of the project presented their research findings at the 18th Annual Conference of the Japanese Coral Reef Society, November 2015, Tokyo, Japan. The research topics focused on local extinction risk assessment of corals at a regional level and checklist of benthic cnidarians from coral communities.
3. Members of the project attended and presented their research outputs at the International Council for the Exploration of the Sea (ICES) Annual Science Conference 2015, Copenhagen, Denmark. The research aspects included climate change impacts and adaptive strategies and challenges in minimizing illegal, unreported and unregulated (IUU) fishing of small-scale fisheries sector.
4. Members of the project attended and presented some research outputs at the ICRI 30th General Meeting in December 2015, Pattaya, Thailand.
5. Members of the project participated in the workshop on the influence of metapopulation structure and connectivity on the response of coral reefs to climate change and ocean acidification, March 2016, Okinawa Institute of Science and Technology (OIST), Okinawa, Japan.
6. Members of the project organized a session on coral reef conservation under global environmental change at the 23rd Pacific Science Congress, June 2016, Taiwan. The presentation topics included coral reef monitoring and conservation for adaptation to climate change in the Andaman Sea, managing coral reefs and related ecosystem in the South China Sea, assessing coral reef resilience to coral bleaching in the Gulf of Thailand and anthropogenic disturbance as a driver of coral disease prevalence.
7. Members of the project co-organized a session on marine resource sustainability, conservation and management in the Coral Triangle & Southeast Asia at the 13th International Coral Reef Symposium, June 2016, Hawaii, USA. Forty five research papers from Indonesia, Philippines, Malaysia, India, Myanmar, Vietnam, Taiwan and Australia were presented.
8. Members of the project organized a session on science-based management of sustainable marine tourism in Southeast Asia at the International Marine Conservation Congress (IMCC4) - Society of Conservation Biology, July 2016, Newfoundland and Labrador, Canada. Several papers concerning sustainable uses of coral reefs were presented.

9. Members of the project involved in the establishment of Thailand's Coral Bleaching Taskforce 2016 and carried out a pilot project on *in situ* shading experiments during the coral bleaching event to protect vulnerable corals in the Gulf of Thailand.
10. Workshop on "IOC/WESTPAC-CorReCAP" at Shanghai in March 2016, with participants from China, Australia, Philippines, Thailand and Korea. During the meeting, participants discussed on the research progress of this project with consensus on publication of a monograph of coral reefs of the Western Pacific Region. The book has several advantages and can be used for training activities of the CorReCAP Project for young scientists and graduate students. The proposed chapters of the books are as follows:
 - Hydrodynamics in coral reef ecosystems
 - Anthropogenic environmental impacts on coral reefs in the Western Pacific
 - Advances in coral biology
 - Reef ecology in the Western Pacific for adaptation to global change
 - Biogeochemical cycles of coral reef ecosystems
 - Climate change and records from coral reefs
 - Environmental and climate proxies embedded in coral skeletons
 - Social and economic dimensions of coral reefs
 - Change of coral communities and implications

Leading authors, authors, potential additional contributors and reviewers were assigned and invited. The outlines of most chapters were completed. Some chapters have been drafted and are on the peer reviewing process.

11. Workshop on the "IOC/WESTPAC-CorReCAP" to be planned on the 10th WESTPAC International Scientific Conference at Qingdao in April 2017. It is planned to review the progress of book chapter preparation for the proposed monograph on coral reefs in the Western Pacific.
12. Members of the project attended and presented their activities at the 10th WESTPAC International Scientific Conference in Qingdao in April 2017.
13. The young scientist network for coral reef research in the Western Pacific has been initiated by some trainees of the IOC/WESTPAC-CorReCAP training courses. The IOC/WESTPAC-CorReCAP Project organized three training courses successfully during 2010 – 2014 for graduate students and early career scientists. The training courses were conducted at Koh Samui, Thailand, Sanya, China and Nha Trang, Vietnam, covering various aspects: impact of sedimentary dynamics and biogeochemistry on coral reefs, water quality and impact on coral reefs and resilience of coral reefs to the climate change and anthropogenic disturbances. A total of 65 trainees from China, Indonesia, Malaysia, Philippines, South Korea, Thailand and Vietnam participated in the training courses.

VI. Problems encountered and actions to be considered by the 11th Intergovernmental Session, tentatively scheduled for April 21-23, 2017, Qingdao, China

The most critical problem encountered by this project is the lack of funding for the initiate of continuous "Capacity Development" in this region. The IOC/WESTPAC-CorReCAP Project has managed three training courses for students and early career scientists successfully. The first training course was taken at Koh Samui, Thailand in 15-18 June, 2010 with the topic of "Impact of Sedimentary Dynamics and Biogeochemistry on Coral Reefs". *The training activity was designed to establish an international research network as well as build capacity in the field of sedimentary dynamics on coral reefs by sharing information, technology and methodology among researchers and experts from inside and outside the WESTPAC region.* The second training course was at Sanya, China in 8-11 June, 2011 on "Water Quality and Impact on Coral Reefs". Through this training course, students had investigated the effect of water quality on coral reefs and the status of reefs in Sanya with strong human disturbance. Students learned some basic skills on reef survey and measurements of water quality parameters. The third one was at Nha Trang of Vietnam

in 18-21 April 2014 on “Resilience of Coral Reefs to the Climate Change and Anthropogenic Disturbances”. It covered the topics of risk assessment on coral reefs; techniques for examining recruitment of corals and environmental factors that influence coral settlement and post-settlement survivorship; measuring ecological factors that can be used as resilience indicators to facilitate coral reef management under climate change and anthropogenic disturbances. To further enhance the capacity building for coral reefs related studies, especially fill the gap of knowledge and make links between cross-disciplinary research experiences on coral reef ecosystems. The IOC/WESTPAC-CorReCAP Project submitted a proposal to IOC/WESTPAC Secretariat in May 2016 to seek for financial support in order to organize the forth training course as a summer school in 2017, and the proposed title of training course is “Impact of Anthropogenic Forcing on Coral Reefs and Consequence at Ecosystem System Level”. The training course has been prepared with some discussions about venue, course outline, resource persons and supporting facilities.

VII. Workplan and Budget for May 2017 – May 2019

Project	Activities	Objectives	Expected outputs/outcomes	Date and place	Funding Required		Remark
					IOC	Other sources (i.e. from national or international)	
Coral Reef Resilience to Climate Change and Human Impacts	1. Workshop	Evaluation of chapters for the monograph of coral reefs in the Western Pacific	Draft of monograph	April 2017	-	US\$ 5K	
	2. Summer School	Extensive training on “Impact of Anthropogenic Forcing on Coral Reefs and Consequence at Ecosystem System Level”	Report on Capacity Building of the project	Fall 2017	US\$ 10K	US 10K	
	3. Workshop	Brainstorming and discussion on coral reef management and conservation in the Western Pacific	Report on recommendations for coral reef management and conservation from the WESTPAC-CorReCAP Project	June 2018	US\$ 5K	US\$ 5K	In collaboration with the Asia Pacific Coral Reef Society, organize the workshop during the 4 th APCRS in Cebu, Philippines
	4. Workshop	Enhancing young scientist network for coral reef research in the Western Pacific	Research proposal(s) for collaborative project(s) of young scientists	2019	-	US\$ 10K	In collaboration with the young scientist network for coral reef research in the Western Pacific